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Code of Federal Regulations

10

Parts 200 to 499

Revised as of January 1, 2000

Energy

Containing a Codification of documents of general applicability and future effect

As of January 1, 2000

With Ancillaries

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Cite this Code: CFR

To cite the regulations in this volume use title, part and section number. Thus, 10 CFR 202.21 *refers to title 10, part 202, section 21.*

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The Code of Federal Regulations is a codification of the general and permanent rules published in the Federal Register by the Executive departments and agencies of the Federal Government. The Code is divided into 50 titles which represent broad areas subject to Federal regulation. Each title is divided into chapters which usually bear the name of the issuing agency. Each chapter is further subdivided into parts covering specific regulatory areas.

Each volume of the Code is revised at least once each calendar year and issued on a quarterly basis approximately as follows:

Title 1 through Title 16.....as of January 1
Title 17 through Title 27.....as of April 1
Title 28 through Title 41.....as of July 1
Title 42 through Title 50.....as of October 1

The appropriate revision date is printed on the cover of each volume.

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(a) The incorporation will substantially reduce the volume of material published in the Federal Register.

(b) The matter incorporated is in fact available to the extent necessary to afford fairness and uniformity in the administrative process.

(c) The incorporating document is drafted and submitted for publication in accordance with 1 CFR part 51.

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An index to the text of ''Title 3—The President'' is carried within that volume.

The Federal Register Index is issued monthly in cumulative form. This index is based on a consolidation of the ''Contents'' entries in the daily Federal Register.

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RAYMOND A. MOSLEY,
Director,
Office of the Federal Register.

January 1, 2000.

THIS TITLE

Title 10—ENERGY is composed of four volumes. The parts in these volumes are arranged in the following order: parts 1–50, 51–199, 200–499 and part 500–end. The first and second volumes containing parts 1–199 are comprised of chapter I— Nuclear Regulatory Commission. The third and fourth volumes containing part 200–end are comprised of chapters II, III and X—Department of Energy, and chapter XVII—Defense Nuclear Facilities Safety Board. The contents of these volumes represent all current regulations codified under this title of the CFR as of January 1, 2000.

For this volume, Carol Conroy was Chief Editor. The Code of Federal Regulations publication program is under the direction of Frances D. McDonald, assisted by Alomha S. Morris.

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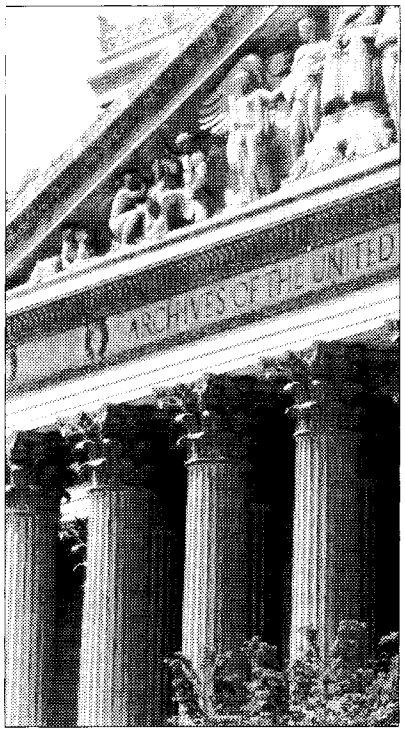

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Title 10—Energy

(This book contains parts 200 to 499)

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CHAPTER II—DEPARTMENT OF ENERGY

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EDITORIAL NOTE: Chapter II—Department of Energy is continued in the volume containing 10 CFR part 500 to End.

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AUTHORITY: Freedom of Information Act, 5 U.S.C. 552; Emergency Petroleum Allocation Act of 1973, Pub. L. 93–159; Federal Energy Administration Act of 1974, Pub. L. 93–275, E.O. 11790, 39 FR 23185.

Subpart A—[Reserved]

Subpart B—Production or Disclosure in Response to Subpoenas or Demands of Courts or Other Authorities

SOURCE: 39 FR 35472, Mar. 13, 1974, unless otherwise noted.

§ 202.21 Purpose and scope.

(a) This subpart sets forth the procedures to be followed when a subpoena, order, or other demand (hereinafter referred to as a ''demand'') of a court or other authority is issued for the production or disclosure of (1) any material contained in the files of the Department of Energy (DOE), (2) any information relating to material contained in the files of the DOE, or (3) any information or material acquired by any person while such person was an employee of the DOE as a part of the performance of his official duties or because of his official status.

(b) For purposes of this subpart, the term ''Employee of the DOE'' includes all officers and employees of the United States appointed by, or subject to the supervision, jurisdiction, or control of, the Administrator of DOE.

§ 202.22 Production or disclosure prohibited unless approved by appropriate DOE official.

No employee or former employee of the DOE shall, in response to a demand of a court or other authority, produce any material contained in the file of the DOE or disclose any information relating to material contained in the files of the DOE, or disclose any information or produce any material acquired as part of the performance of his official duties or because of his official status without prior approval of the General Counsel of DOE.

§ 202.23 Procedure in the event of a demand for production or disclosure.

(a) Whenever a demand is made upon an employee or former employee of the DOE for the production of material or the disclosure of information described in §202.21(a), he shall immediately notify the Regional Counsel for the region where the issuing authority is located. The Regional Counsel shall immediately request instructions from the General Counsel of DOE.

(b) If oral testimony is sought by the demand, an affidavit, or, if that is not feasible, a statement by the party seeking the testimony or his attorney, setting forth a summary of the testimony desired, must be furnished for submission by the Regional Counsel to the General Counsel.

§ 202.24 Final action by the appropriate DOE official.

If the General Counsel approves a demand for the production of material or disclosure of information, he shall so notify the Regional Counsel and such other persons as circumstances may warrant.

§ 202.25 Procedure where a decision concerning a demand is not made prior to the time a response to the demand is required.

If response to the demand is required before the instructions from the General Counsel are received, a U.S. attorney or DOE attorney designated for the purpose shall appear with the employee or former employee of the DOE upon whom the demand has been made, and shall furnish the court or other authority with a copy of the regulations contained in this subpart and inform the court or other authority that the demand has been, or is being, as the case may be, referred for the prompt consideration of the appropriate DOE official and shall respectfully request the court or authority to stay the demand pending receipt of the requested instructions.

§ 202.26 Procedure in the event of an adverse ruling.

If the court or other authority declines to stay the effect of the demand in response to a request made in accordance with § 202.25 pending receipt of instructions, of if the court or other authority rules that the demand must be complied with irrespective of instructions not to produce the material or disclose the information sought, the employee or former employee upon whom the demand has been made shall respectfully decline to comply with the demand. ''United States ex rel Touhy v. Ragen,'' 340 U.S. 462.

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AUTHORITY: Emergency Petroleum Allocation Act of 1973, Pub. L. 93–159; Federal Energy Administration Act of 1974, Pub. L. 93–275 (88 Stat. 96; E.O. 11790, 39 FR 23185); 42 U.S.C. 7101 *et seq.*, unless otherwise noted.

SOURCE: 39 FR 35489, Oct. 1, 1974, unless otherwise noted.

Subpart A—General Provisions

§ 205.1 Purpose and scope.

This part establishes the procedures to be utilized and identifies the sanctions that are available in proceedings before the Department of Energy and State Offices, in accordance with parts 209 through 214 of this chapter. Any exception, exemption, appeal, stay, modification, recession, redress or resolution of private grievance sought under the authority of 42 U.S.C. 7194 shall be governed by the procedural rules set forth in 10 CFR part 1003.

[61 FR 35114, July 5, 1996]

§ 205.2 Definitions.

The definitions set forth in other parts of this chapter shall apply to this part, unless otherwise provided. In addition, as used in this part, the term:

Action means an order, interpretation, notice of probable violation or ruling issued, or a rulemaking undertaken by the DOE or, as appropriate, by a State Office.

Adjustment means a modification of the base period volume or other measure of allocation entitlement in accordance with part 211 of this chapter.

Aggrieved, for purposes of administrative proceedings, describes and means a person with an interest sought to be protected under the FEAA, EPAA, or Proclamation No. 3279, as amended, who is adversely affected by an order or interpretation issued by the DOE or a State Office.

Appropriate Regional Office or appropriate State Office means the office located in the State or DOE region in which the product will be physically delivered.

Assignment means an action designating that an authorized purchaser be supplied at a specified entitlement level by a specified supplier.

Conference means an informal meeting, incident to any proceeding, between DOE or State officials and any person aggrieved by that proceeding.

Consent order means a document of agreement between DOE and a person prohibiting certain acts, requiring the performance of specific acts or including any acts which DOE could prohibit or require pursuant to § 205.195.

Duly authorized representative means a person who has been designated to appear before the DOE or a State Office in connection with a proceeding on behalf of a person interested in or aggrieved by that proceeding. Such appearance may consist of the submission of applications, petitions, requests, statements, memoranda of law, other documents, or of a personal appearance, verbal communication, or any other participation in the proceeding.

EPAA means the Emergency Petroleum Allocation Act of 1973 (Pub. L. 93–159).

EPCA means the Energy Policy and Conservation Act (Pub. L. 94–163).

Exception means the waiver or modification of the requirements of a regulation, ruling or generally applicable requirement under a specific set of facts.

Exemption means the release from the obligation to comply with any part or parts, or any subpart thereof, of this chapter.

DOE means the Department of Energy, created by the FEAA and includes the DOE National Office and Regional Offices.

FEAA means the Federal Energy Administration Act of 1974 (Pub. L. 93–275).

Federal legal holiday means New Year's Day, Washington's Birthday, Memorial Day, Independence Day, Labor Day, Columbus Day, Veterans' Day, Thanksgiving Day, Christmas Day, and any other day appointed as a national holiday by the President or the Congress of the United States.

Interpretation means a written statement issued by the General Counsel or his delegate or Regional Counsel, in response to a written request, that applies the regulations, rulings, and other precedents previously issued, to the particular facts of a prospective or completed act or transaction.

Notice of probable violation means a written statement issued to a person by the DOE that states one or more alleged violations of the provisions of this chapter or any order issued pursuant thereto.

Order means a written directive or verbal communication of a written directive, if promptly confirmed in writing, issued by the DOE or a State Office. It may be issued in response to an application, petition or request for DOE action or in response to an appeal from an order, or it may be a remedial order or other directive issued by the DOE or a State Office on its own initiative. A notice of probable violation is not an order. For purposes of this definition a ''written directive'' shall include telegrams, telecopies and similar transcriptions.

Person means any individual, firm, estate, trust, sole proprietorship, partnership, association, company, joint-venture, corporation, governmental unit or instrumentality thereof, or a charitable, educational or other institution, and includes any officer, director, owner or duly authorized representative thereof.

Proceeding means the process and activity, and any part thereof, instituted by the DOE or a State Office, either on its own initiative or in response to an application, complaint, petition or request submitted by a person, that may lead to an action by the DOE or a State Office.

Remedial order means a directive issued by the DOE requiring a person to cease a violation or to eliminate or to compensate for the effects of a violation, or both.

Ruling means an official interpretative statement of general applicability issued by the DOE General Counsel and published in the FEDERAL REGISTER that applies the DOE regulations to a specific set of circumstances.

State Office means a State Office of Petroleum Allocation certified by the DOE upon application pursuant to part 211 of this chapter.

Throughout this part the use of a word or term in the singular shall include the plural and the use of the male gender shall include the female gender.

(Emergency Petroleum Allocation Act of 1973, Pub. L. 93–159, as amended, Pub. L. 93–511, Pub. L. 94–99, Pub. L. 94–133, Pub. L. 94–163, and Pub. L. 94–385; Federal Energy Administration Act of 1974, Pub. L. 93–275, as amended, Pub. L. 94–385; Energy Policy and Conservation Act, Pub. L. 94–163, as amended, Pub. L. 94–385; E.O. 11790, 39 FR 23185; Department of Energy Organization Act, Pub. L. 95–91; E.O. 12009, 42 FR 46267)

[39 FR 35489, Oct. 1, 1974, as amended at 40 FR 36555, Aug. 21, 1975; 40 FR 36761, Aug. 22, 1975; 41 FR 36647, Aug. 31, 1976; 43 FR 14437, Apr. 6, 1978]

§ 205.3 Appearance before the DOE or a State Office.

(a) A person may make an appearance, including personal appearances in the discretion of the DOE, and participate in any proceeding described in this part on his own behalf or by a duly authorized representative. Any application, appeal, petition, request or complaint filed by a duly authorized representative shall contain a statement by such person certifying that he is a duly authorized representative, unless a DOE form requires otherwise. Falsification of such certification will subject such person to the sanctions stated in 18 U.S.C. 1001 (1970).

(b) Suspension and disqualification: The DOE or a State Office may deny, temporarily or permanently, the privilege of participating in proceedings, including oral presentation, to any individual who is found by the DOE—

(1) To have made false or misleading statements, either verbally or in writing;

(2) To have filed false or materially altered documents, affidavits or other writings;

(3) To lack the specific authority to represent the person seeking a DOE or State Office action; or

(4) To have engaged in or to be engaged in contumacious conduct that substantially disrupts a proceeding.

§ 205.4 Filing of documents.

(a) Any document, including, but not limited to, an application, request, complaint, petition and other documents submitted in connection therewith, filed with the DOE or a State Office under this chapter is considered to be filed when it has been received by the DOE National Office, a Regional Office or a State Office. Documents transmitted to the DOE must be addressed as required by § 205.12. All documents and exhibits submitted become part of an DOE or a State Office file and will not be returned.

(b) Notwithstanding the provisions of paragraph (a) of this section, an appeal, a response to a denial of an appeal or application for modification or recision in accordance with §§ 205.106(a)(3) and 205.135(a)(3), respectively, a reply to a notice of probable violation, the appeal of a remedial order or remedial order for immediate compliance, a response to denial of a claim of confidentiality, or a comment submitted in connection with any proceeding transmitted by registered or certified mail and addressed to the appropriate office is considered to be filed upon mailing.

(c) Hand-delivered documents to be filed with the Office of Exceptions and Appeals shall be submitted to Room 8002 at 2000 M Street, NW., Washington, D.C. All other hand-delivered documents to be filed with the DOE National Office shall be submitted to the Executive Secretariat at 12th and Pennsylvania Avenue, NW., Washington, D.C. Hand-delivered documents to be filed with a Regional Office shall be submitted to the Office of the Regional Administrator. Hand-delivered documents to be filed with a State Office shall be submitted to the office of

the chief executive officer of such office.

(d) Documents received after regular business hours are deemed filed on the next regular business day. Regular business hours for the DOE National Office are 8 a.m. to 4:30 p.m. Regular business hours for a Regional Office or a State Office shall be established independently by each.

§ 205.5 Computation of time.

(a) *Days.* (1) Except as provided in paragraph (b) of this section, in computing any period of time prescribed or allowed by these regulations or by an order of the DOE or a State Office, the day of the act, event, or default from which the designated period of time begins to run is not to be included. The last day of the period so computed is to be included unless it is a Saturday, Sunday, or Federal legal holiday in which event the period runs until the end of the next day that is neither a Saturday, Sunday, nor a Federal legal holiday.

(2) Saturdays, Sundays or intervening Federal legal holidays shall be excluded from the computation of time when the period of time allowed or prescribed is 7 days or less.

(b) *Hours.* If the period of time prescribed in an order issued by the DOE or a State Office is stated in hours rather than days, the period of time shall begin to run upon actual notice of such order, whether by verbal or written communication, to the person directly affected, and shall run without interruption, unless otherwise provided in the order, or unless the order is stayed, modified, suspended or rescinded. When a written order is transmitted by verbal communication, the written order shall be served as soon thereafter as is feasible.

(c) *Additional time after service by mail.* Whenever a person is required to perform an act, to cease and desist therefrom, or to initiate a proceeding under this part within a prescribed period of time after issuance to such person of an order, notice, interpretation or other document and the order, notice, interpretation or other document is served by mail, 3 days shall be added to the prescribed period.

§ 205.6 Extension of time.

When a document is required to be filed within a prescribed time, an extension of time to file may be granted by the office with which the document is required to be filed upon good cause shown.

§ 205.7 Service.

(a) All orders, notices, interpretations or other documents required to be served under this part shall be served personally or by registered or certified mail or by regular United States mail (only when service is effected by the DOE or a State Office), except as otherwise provided.

(b) Service upon a person's duly authorized representative shall constitute service upon that person.

(c) Service by registered or certified mail is complete upon mailing. Official United States Postal Service receipts from such registered or certified mailing shall constitute *prima facie* evidence of service.

§ 205.8 Subpoenas, special report orders, oaths, witnesses.

(a) In this section the following terms have the definitions indicated unless otherwise provided.

(1) ''DOE Official'' means the Secretary of the Department of Energy, the Administrator of the Economic Regulatory Administration, the Administrator of Energy Information Administration, the General Counsel of the Department of Energy, the Special Counsel for Compliance, the Assistant Administrator for Enforcement, the Director of the Office of Hearings and Appeals, or the duly authorized delegate of any of the foregoing officials.

(2) ''SRO'' means a Special Report Order issued pursuant to paragraph (b) of this section.

(b) (1) In accordance with the provisions of this section and as otherwise authorized by law, a DOE Official may sign, issue and serve subpoenas; administer oaths and affirmations; take sworn testimony; compel attendance of and sequester witnesses; control dissemination of any record of testimony taken pursuant to this section; subpoena and reproduce books, papers, correspondence, memoranda, contracts agreements, or other relevant records

or tangible evidence including, but not limited to, information retained in computerized or other automated systems in possession of the subpoenaed person. Unless otherwise provided by Subpart O, the provisions of this section apply to subpoenas issued by the office of Hearings and Appeals with respect to matters in proceedings before it.

(2) A DOE Official may issue a Special Report Order requiring any person subject to the jurisdiction of the ERA to file a special report providing information relating to DOE regulations, including but not limited to written answers to specific questions. The SRO may be in addition to any other reports required by this chapter.

(3) The DOE Official who issues a subpoena or SRO pursuant to this section, for good cause shown, may extend the time prescribed for compliance with the subpoena or SRO and negotiate and approve the terms of satisfactory compliance.

(4) Prior to the time specified for compliance, but in no event more than 10 days after the date of service of the subpoena or SRO, the person upon whom the document was served may file a request for review of the subpoena or SRO with the DOE Official who issued the document. The DOE Official then shall forward the request to his supervisor who shall provide notice of receipt to the person requesting review. The supervisor or his designee may extend the time prescribed for compliance with the subpoena or SRO and negotiate and approve the terms of satisfactory compliance.

(5) If the subpoena or SRO is not modified or rescinded within 10 days of the date of the supervisor's notice of receipt, (i) the subpoena or SRO shall be effective as issued; and (ii) the person upon whom the document was served shall comply with the subpoena or SRO within 20 days of the date of the supervisor's notice of receipt, unless otherwise notified in writing by the supervisor or his designee.

(6) There is no administrative appeal of a subpoena or SRO.

(c) (1) A subpoena or SRO shall be served upon a person named in the document by delivering a copy of the document to the person named.

(2) Delivery of a copy of the document to a natural person may be made by:

(i) Handing it to the person;

(ii) Leaving it at the person's office with the person in charge of the office;

(iii) Leaving it at the person's dwelling or usual place of abode with a person of suitable age and discretion who resides there;

(iv) Mailing it to the person by registered or certified mail, at his last known address; or

(v) Any method that provides the person with actual notice prior to the return date of the document.

(3) Delivery of a copy of the document to a person who is not a natural person may be made by:

(i) Handing it to a registered agent of the person;

(ii) Handing it to any officer, director, or agent in charge of any office of such person;

(iii) Mailing it to the last known address of any registered agent, officer, director, or agent in charge of any office of the person by registered or certified mail, or

(iv) Any method that provides any registered agent, officer, director, or agent in charge of any office of the person with actual notice of the document prior to the return date of the document.

(d)(1) A witness subpoenaed by the DOE shall be paid the same fees and mileage as paid to a witness in the district courts of the United States.

(2) If in the course of a proceeding conducted pursuant to subpart M or O, a subpoena is issued at the request of a person other than an officer or agency of the United States, the witness fees and mileage shall be paid by the person who requested the subpoena. However, at the request of the person, the witness fees and mileage shall be paid by the DOE if the person shows:

(i) The presence of the subpoenaed witness will materially advance the proceeding; and

(ii) The person who requested that the subpoena be issued would suffer a serious hardship if required to pay the witness fees and mileage. The DOE Official issuing the subpoena shall make the determination required by this subsection.

(e) If any person upon whom a subpoena or SRO is served pursuant to this section, refuses or fails to comply with any provision of the subpoena or SRO, an action may be commenced in the United States District Court to enforce the subpoena or SRO.

(f) (1) Documents produced in response to a subpoena shall be accompanied by the sworn certification, under penalty of perjury, of the person to whom the subpoena was directed or his authorized agent that (i) a diligent search has been made for each document responsive to the subpoena, and (ii) to the best of his knowledge, information, and belief each document responsive to the subpoena is being produced unless withheld on the grounds of privilege pursuant to paragraph (g) of this section.

(2) Any information furnished in response to an SRO shall be accompanied by the sworn certification under penalty of perjury of the person to whom it was directed or his authorized agent who actually provides the information that (i) a diligent effort has been made to provide all information required by the SRO, and (ii) all information furnished is true, complete, and correct unless withheld on grounds of privilege pursuant to paragraph (g) of this section.

(3) If any document responsive to a subpoena is not produced or any information required by an SRO is not furnished, the certification shall include a statement setting forth every reason for failing to comply with the subpoena or SRO.

(g) If a person to whom a subpoena or SRO is directed withholds any document or information because of a claim of attorney-client or other privilege, the person submitting the certification required by paragraph (f) of this section also shall submit a written list of the documents or the information withheld indicating a description of each document or information, the date of the document, each person shown on the document as having received a copy of the document, each person shown on the document as having prepared or been sent the document, the privilege relied upon as the basis for withholding the document or information, and an identification of the person whose privilege is being asserted.

(h)(1) If testimony is taken pursuant to a subpoena, the DOE Official shall determine whether the testimony shall be recorded and the means by which the testimony is recorded.

(2) A witness whose testimony is recorded may procure a copy of his testimony by making a written request for a copy and paying the appropriate fees. However, the DOE official may deny the request for good cause. Upon proper identification, any witness or his attorney has the right to inspect the official transcript of the witness' own testimony.

(i) The DOE Official may sequester any person subpoenaed to furnish documents or give testimony. Unless permitted by the DOE Official, neither a witness nor his attorney shall be present during the examination of any other witnesses.

(j)(1) Any witness whose testimony is taken may be accompanied, represented and advised by his attorney as follows:

(i) Upon the initiative of the attorney or witness, the attorney may advise his client, in confidence, with respect to the question asked his client, and if the witness refuses to answer any question, the witness or his attorney is required to briefly state the legal grounds for such refusal; and

(ii) If the witness claims a privilege to refuse to answer a question on the grounds of self-incrimination, the witness must assert the privilege personally.

(k) The DOE Official shall take all necessary action to regulate the course of testimony and to avoid delay and prevent or restrain contemptuous or obstructionist conduct or contemptuous language. DOE may take actions as the circumstances may warrant in regard to any instances where any attorney refuses to comply with directions or provisions of this section.

(Emergency Petroleum Allocation Act of 1973, Pub. L. 93–159, as amended, Pub. L. 94–163, and Pub. L. 94–385; Federal Energy Administration Act of 1974, Pub. L. 93–275, as amended, Pub. L. 94–332, Pub. L. 94–385, Pub. L. 95–70, and Pub. L. 95–91; Energy Supply and Environmental Coordination Act of 1974, Pub. L. 93–319, as amended; Energy Policy and Conservation Act, Pub. L. 94–163, as

amended, Pub. L. 94–385, and Pub. L. 95–70; Department of Energy Organization Act, Pub. L. 95–91; E.O. 11790, 39 FR 23185; E.O. 12009, 42 FR 46267)

[44 FR 23201, Apr. 19, 1979]

§ 205.9 General filing requirements.

(a) *Purpose and scope.* The provisions of this section shall apply to all documents required or permitted to be filed with the DOE or with a State Office.

(b) *Signing.* All applications, petitions, requests, appeals, comments or any other documents that are required to be signed, shall be signed by the person filing the document or a duly authorized representative. Any application, appeal, petition, request, complaint or other document filed by a duly authorized representative shall contain a statement by such person certifying that he is a duly authorized representative, unless an DOE form other wise requires. (A false certification is unlawful under the provisions of 18 U.S.C. 1001 (1970)).

(c) *Labeling.* An application, petition, or other request for action by the DOE or a State Office should be clearly labeled according to the nature of the action involved (*e.g.*, ''Application for Assignment'') both on the document and on the outside of the envelope in which the document is transmitted.

(d) *Obligation to supply information.* A person who files an application, petition, complaint, appeal or other request for action is under a continuing obligation during the proceeding to provide the DOE or a State Office with any new or newly discovered information that is relevant to that proceeding. Such information includes, but is not limited to, information regarding any other application, petition, complaint, appeal or request for action that is subsequently filed by that person with any DOE office or State Office.

(e) *The same or related matters.* A person who files an application, petition, complaint, appeal or other request for action by the DOE or a State Office shall state whether, to the best knowledge of that person, the same or related issue, act or transaction has been or presently is being considered or investigated by any DOE office, other Federal agency, department or instrumentality; or by a State Office, a state or municipal agency or court; or by any law enforcement agency; including, but not limited to, a consideration or investigation in connection with any proceeding described in this part. In addition, the person shall state whether contact has been made by the person or one acting on his behalf with any person who is employed by the DOE or any State Office with regard to the same issue, act or transaction or a related issue, act or transaction arising out of the same factual situation; the name of the person contacted; whether the contact was verbal or in writing; the nature and substance of the contact; and the date or dates of the contact.

(f) *Request for confidential treatment.* (1) If any person filing a document with the DOE or a State Office claims that some or all the information contained in the document is exempt from the mandatory public disclosure requirements of the Freedom of Information Act (5 U.S.C. 552 (1970)), is information referred to in 18 U.S.C. 1905 (1970), or is otherwise exempt by law from public disclosure, and if such person requests the DOE or a State Office not to disclose such information, such person shall file together wiht the document a second copy of the document from which has been deleted the information for which such person wishes to claim confidential treatment. The person shall indicate in the original document that it is confidential or contains confidential information and may file a statement specifying the justification for non-disclosure of the information for which confidential treatment is claimed. If the person states that the information comes within the exception in 5 U.S.C. 552(b)(4) for trade secrets and commercial or financial information, such person shall include a statement specifying why such information is privileged or confidential. If the person filing a document does not submit a second copy of the document with the confidential information deleted, the DOE or a State Office may assume that there is no objection to public disclosure of the document in its entirety.

(2) The DOE or a State Office retains the right to make its own determination with regard to any claim of confidentiality. Notice of the decision by the DOE or a State Office to deny such claim, in whole or in part, and an opportunity to respond shall be given to a person claiming confidentiality of information no less than five days prior to its public disclosure.

(g) *Separate applications, petitions or requests.* Each application, petition or request for DOE action shall be submitted as a separate document, even if the applications, petitions, or requests deal with the same or a related issue, act or transaction, or are submitted in connection with the same proceeding.

§ 205.10 Effective date of orders.

Any order issued by the DOE or a State Office under this chapter is effective as against all persons having actual notice thereof upon issuance, in accordance with its terms, unless and until it is stayed, modified, suspended, or rescinded. An order is deemed to be issued on the date, as specified in the order, on which it is signed by an authorized representative of the DOE or a State Office, unless the order provides otherwise.

§ 205.11 Order of precedence.

(a) If there is any conflict or inconsistency between the provisions of this part and any other provision of this chapter, the provisions of this part shall control with respect to procedure.

(b) Notwithstanding paragraph (a) of this section, subpart I of part 212 of this chapter shall control with respect to prenotification and reporting and subpart J of part 212 of this chapter shall control with respect to accounting and financial reporting requirements.

§ 205.12 Addresses for filing documents with the DOE.

(a) All applications, requests, petitions, appeals, reports, DOE or FEO forms, written communications and other documents to be submitted to or filed with the DOE National Office in accordance with this chapter shall be addressed as provided in this section. The DOE National Office has facilities for the receipt of transmissions via TWX and FAX. The FAX is a 3M full duplex 4 or 6 minute (automatic) machine.

FAX Numbers	TWX Numbers
(202) 254–6175	(701) 822–9454
(202) 254–6461	(701) 822–9459

(1) Documents for which a specific address and/or code number is not provided in accordance with paragraphs (a)(2) through (7) of this section, shall be addressed as follows: Department of Energy, Attn: (name of person to receive document, if known, or subject), Washington, DC 20461.

(2) Documents to be filed with the Office of Exceptions and Appeals, as provided in this part or otherwise, shall be addressed as follows. Office of Exceptions and Appeals, Department of Energy, Attn: (name of person to receive document, if known, and/or labeling as specified in §205.9(c)), Washington, DC 20461.

(3) Documents to be filed with the Office of General Counsel, as provided in this part or otherwise, shall be addressed as follows: Office of the General Counsel, U.S. Department of Energy, Attn: (name of person to receive document, if known, and labeling as specified in §205.9(c)), 1000 Independence Avenue, Washington, DC 20585.

(4) Documents to be filed with the Office of Private Grievances and Redress, as provided in this part or otherwise, shall be addressed as follows: Office of Private Grievances and Redress, Department of Energy, Attn: (name of person to receive document, if known and/or labeling as specified in §205.9(c)), Washington, DC 20461.

(5) All other documents filed, except those concerning price (see paragraph (a)(6) of this section), those designated as DOE or FEO forms (see paragraph (a)(7) of this section), and ''Surplus Product Reports'' (see paragraph (a)(8) of this section), but including those pertaining to compliance and allocation (adjustment and assignment) of allocated products, are to be identified by one of the code numbers stated below and addressed as follows: Department of Energy, Code——, labeling as specified in §205.9(c), Washington, DC 20461.

CODE NUMBERS

	Code
Product:	
Crude oil	10
Naphtha and gas oil	15
Propane, butane and natural gasoline	25
Other products	30
Bunker fuel	40
Residual fuel (nonutility)	50
Motor gasoline	60
Middle distillates	70
Aviation fuels	80
Submissions by specific entities:	
Electric utilities	45
Department of Defense	55

(6) Documents pertaining to the price of covered products, except those to be submitted to other offices as provided in this part, shall be addressed to the Department of Energy, Code 1000, Attn: (name of person to receive document, if known, and/or labeling as specified in § 205.9(c)), Washington, DC 20461.

(7) Documents designated as DOE or FEO forms shall be submitted in accordance with the instructions stated in the form.

(8) ''Surplus Product Reports'' shall be submitted to the Department of Energy, Post Office Box 19407, Washington, DC 20036.

(9) Documents to be filed with the Director of Oil Imports, as provided in this part or otherwise, shall be addressed as follows: Director of Oil Imports, Department of Energy, P.O. Box 7414, Washington, DC 20044.

(10) Petitions for rulemaking to be filed with the Economic Regulatory Administration National Office shall be addressed as follows: Economic Regulatory Administration, Attn: Assistant Administrator for Regulations and Emergency Planning (labeled as ''Petition for Rulemaking,'') 2000 M Street, N.W., Washington, DC 20461.

(b) All reports, applications, requests, notices, complaints, written communications and other documents to be submitted to or filed with an DOE Regional Office in accordance with this chapter shall be directed to one of the following addresses, as appropriate:

REGION 1

Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont; Regional Office, Department of Energy, 150 Causeway Street, Boston, Massachusetts 02114.

REGION 2

New Jersey, New York, Puerto Rico, Virgin Islands; Regional Office, Department of Energy, 26 Federal Plaza, New York, New York 10007.

REGION 3

Delaware, District of Columbia, Maryland, Pennsylvania, Virginia, West Virginia; Regional Office, Department of Energy, Federal Office Building, 1421 Cherry Street, Philadelphia, Pennsylvania 19102.

REGION 4

Alabama, Canal Zone, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina; Regional Office, Department of Energy, 1655 Peachtree Street NW., Atlanta, Georgia 30309.

REGION 5

Illinois, Indiana, Michigan, Minnesota, Ohio, Wisconsin; Regional Office, Department of Energy, 175 West Jackson Street, Chicago, Illinois 60604.

REGION 6

Arkansas, Louisiana, New Mexico, Oklahoma, Texas; Regional Office, Department of Energy, 212 North Saint Paul Street, Dallas, Texas 75201.

REGION 7

Iowa, Kansas, Missouri, Nebraska; Regional Office, Department of Energy, Federal Office Building, P.O. Box 15000, 112 East 12th Street, Kansas City, Missouri 64106.

REGION 8

Colorado, Montana, North Dakota, South Dakota, Utah, Wyoming; Regional Office, Department of Energy, Post Office Box 26247, Belmar Branch, Denver, Colorado 80226.

REGION 9

American Samoa, Arizona, California, Guam, Hawaii, Nevada, Trust Territory of the Pacific Islands; Regional Office, Department of Energy, 111 Pine Street, San Francisco, California 94111.

REGION 10

Alaska, Idaho, Oregon, Washington; Regional Office, Department of Energy, Federal Office Building, 909 First Avenue, Room 3098, Seattle, Washington 98104.

(Emergency Petroleum Allocation Act of 1973, 15 U.S.C. 751 *et seq.*, Pub. L. 93–159, as amended, Pub. L. 93–511, Pub. L. 94–99, Pub. L. 94–133, Pub. L. 94–163, and Pub. L. 94–385; Federal Energy Administration Act of 1974, 15 U.S.C. 787 *et seq.*, Pub. L. 93–275, as amended, Pub. L. 94–332, Pub. L. 94–385, Pub. L. 95–

70, and Pub. L. 95–91; Energy Policy and Conservation Act, 42 U.S.C. 6201 *et seq.*, Pub. L. 94–163, as amended, Pub. L. 94–385, and Pub. L. 95–70; Department of Energy Organization Act, 42 U.S.C. 7101 *et seq.*, Pub. L. 95–91; E.O. 11790, 39 FR 23185; E.O. 12009, 42 FR 46267)

[39 FR 35489, Oct. 1, 1974, as amended at 40 FR 36555, Aug. 21, 1975; 45 FR 37684, June 4, 1980]

§ 205.13 Where to file.

(a) Except as otherwise specifically provided in other subparts of this part, all documents to be filed with the ERA pursuant to this part shall be filed with the appropriate ERA Regional Office (unless otherwise specified in part 211 of this chapter), except that all documents shall be filed with the ERA National Office that relate to:

(1) The allocation and pricing of crude oil pursuant to subpart C of part 211 and part 212 of this chapter;

(2) Refinery yield controls pursuant to subpart C of part 211 of this chapter;

(3) The pricing of propane, butane and natural gasoline pursuant to part 212 of this chapter and the allocation of butane and natural gasoline pursuant to part 211 of this chapter;

(4) The allocation and pricing of middle distillate fuels pursuant to subpart G of part 211 and part 212 of this chapter, filed by electric utilities;

(5) The allocation and pricing of aviation fuel pursuant to subpart H of part 211 and part 212 of this chapter, filed by civil air carriers (except air taxi/commercial operators);

(6) The allocation and pricing of residual fuel oil pursuant to subpart I of part 211 and part 212 of this chapter, filed by electric utilities;

(7) The allocation and pricing of naphtha and gas oil pursuant to subpart J of part 211 and part 212 of this chapter;

(8) The allocation and pricing of other products pursuant to subpart K of part 211 and part 212 of this chapter;

(9) An application for an exemption under subpart E of this part; requests for a rulemaking proceeding under subpart L of this part or for the issuance of a ruling under subpart K of this part; and petitions to the Office of Private Grievances and Redress under subpart R of this part;

(10) The pricing of products pursuant to part 212 of this chapter, filed by a refiner; and

(11) The allocation of crude oil and other allocated products to meet Department of Defense needs pursuant to part 211 of this chapter.

(12) The allocation of crude oil and other allocated products to be utilized as feedstock in a synthetic natural gas plant, pursuant to §211.29.

(13) Allocations, fee-paid and fee-exempt licenses issued pursuant to part 213 of this chapter.

(b) Applications by end-users and wholesale purchasers for an allocation under the state set-aside system in accordance with §211.17 shall be filed with the appropriate State Office.

(c) Applications to a State Office or a DOE Regional Office shall be directed to the office located in the state or region in which the allocated product will be physically delivered. An applicant doing business in more than one state or region must apply separately to each State or region in which a product will be physically delivered, unless the State Offices or Regional Offices involved agree otherwise.

[39 FR 35489, Oct. 1, 1974, as amended at 39 FR 36571, Oct. 11, 1974; 39 FR 39022, Nov. 5, 1974; 40 FR 28446, July 7, 1975; 40 FR 36555, Aug. 21, 1975; 44 FR 60648, Oct. 19, 1979]

§ 205.14 Ratification of prior directives, orders, and actions.

All interpretations, orders, notices of probable violation or other directives issued, all proceedings initiated, and all other actions taken in accordance with part 205 as it existed prior to the effective date of this amendment, are hereby confirmed and ratified, and shall remain in full force and effect as if issued under this amended part 205, unless or until they are altered, amended, modified or rescinded in accordance with the provisions of this part.

§ 205.15 Public docket room.

There shall be established at the DOE National Office, 12th and Pennsylvania Avenue, NW., Washington, DC, a public docket room in which shall be made available for public inspection and copying:

(a) A list of all persons who have applied for an exception, an exemption, or an appeal, and a digest of each application;

(b) Each decision and statement setting forth the relevant facts and legal basis of an order, with confidential information deleted, issued in response to an application for an exception or exemption or at the conclusion of an appeal;

(c) The comments received during each rulemaking proceeding, with a verbatim transcript of the public hearing if such a public hearing was held; and

(d) Any other information required by statute to be made available for public inspection and copying, and any information that the DOE determines should be made available to the public.

Subparts B–E [Reserved]

Subpart F—Interpretation

§ 205.80 Purpose and scope.

(a) This subpart establishes the procedures for the filing of a formal request for an interpretation and for the consideration of such request. Responses, which may include verbal or written responses to general inquiries or to other than formal written requests for interpretation filed with the General Counsel or his delegate or a Regional Counsel, are not interpretations and merely provide general information.

(b) A request for interpretation that includes, or could be construed to include an application for an exception or an exemption may be treated solely as a request for interpretation and processed as such.

(Emergency Petroleum Allocation Act of 1973, Pub. L. 93–159, as amended, Pub. L. 93–511, Pub. L. 94–99, Pub. L. 94–133, Pub. L. 94–163, and Pub. L. 94–385, Federal Energy Administration Act of 1974, Pub. L. 93–275, as amended, Pub. L. 94–385, Energy Policy and Conservation Act, Pub. L. 94–163, as amended, Pub. L. 94–385; E.O. 11790, 39 FR 23185; Department of Energy Organization Act, Pub. L. 95–91; E.O. 12009, 42 FR 46267)

[39 FR 35489, Oct. 1, 1974, as amended at 43 FR 14437, Apr. 6, 1978]

§ 205.81 What to file.

(a) A person filing under this subpart shall file a ''Request for Interpretation,'' which should be clearly labeled as such both on the request and on the outside of the envelope in which the request is transmitted, and shall be in writing and signed by the person filing the request. The person filing the request shall comply with the general filing requirements stated in § 205.9 in addition to the requirements stated in this subpart.

(b) If the person filing the request wishes to claim confidential treatment for any information contained in the request or other documents submitted under this subpart, the procedures set out in § 205.9(f) shall apply.

§ 205.82 Where to file.

A request for interpretation shall be filed with the General Counsel or his delegate or with the appropriate Regional Counsel at the address provided in § 205.12.

(Emergency Petroleum Allocation Act of 1973, Pub. L. 93–159, as amended, Pub. L. 93–511, Pub. L. 94–99, Pub. L. 94–133, Pub. L. 94–163, and Pub. L. 94–385; Federal Energy Administration Act of 1974, Pub. L. 93–275, as amended, Pub. L. 94–385; Energy Policy and Conservation Act, Pub. L. 94–163, as amended, Pub. L. 94–385; E.O. 11790, 39 FR 23185; Department of Energy Organization Act, Pub. L. 95–91; E.O. 12009, 42 FR 46267)

[39 FR 35489, Oct. 1, 1974, as amended at 43 FR 14437, Apr. 6, 1978; 43 FR 17803, Apr. 26, 1978]

§ 205.83 Contents.

(a) The request shall contain a full and complete statement of all relevant facts pertaining to the circumstances, act or transaction that is the subject of the request and to the DOE action sought. Such facts shall include the names and addresses of all affected persons (if reasonably ascertainable) and a full discussion of the pertinent provisions and relevant facts contained in the documents submitted with the request. Copies of all relevant contracts, agreements, leases, instruments, and other documents shall be submitted with the request. When the request pertains to only one step of a larger integrated transaction, the facts, circumstances, and other relevant information pertaining to the entire transaction must be submitted.

(b) The request for interpretation shall include a discussion of all relevant authorities, including, but not limited to, DOE rulings, regulations,

interpretations and decisions on appeals and exceptions relied upon to support the particular interpretation sought therein.

§ 205.84 DOE evaluation.

(a) *Processing.* (1) The DOE may initiate an investigation of any statement in a request and utilize in its evaluation any relevant facts obtained by such investigation. The DOE may accept submissions from third persons relevant to any request for interpretation provided that the person making the request is afforded an opportunity to respond to all third person submissions. In evaluating a request for interpretation, the DOE may consider any other source of information. The DOE on its own initiative may convene a conference, if, in its discretion, it considers that such conference will advance its evaluation of the request.

(2) The DOE shall issue its interpretation on the basis of the information provided in the request, unless that information is supplemented by other information brought to the attention of the General Counsel or a Regional Counsel during the proceeding. The interpretation shall, therefore, depend for its authority on the accuracy of the factual statement and may be relied upon only to the extent that the facts of the actual situation correspond to those upon which the interpretation was based.

(3) If the DOE determines that there is insufficient information upon which to base a decision and if upon request additional information is not submitted by the person requesting the interpretation, the DOE may refuse to issue an interpretation.

(b) *Criteria.* (1) The DOE shall base an interpretation on the FEA and EPAA and the regulations and published rulings of the DOE as applied to the specific factual situation.

(2) The DOE shall take into consideration previously issued interpretations dealing with the same or a related issue.

§ 205.85 Decision and effect.

(a) An interpretation may be issued after consideration of the request for interpretation and other relevant information received or obtained during the proceeding.

(b) The interpretation shall contain a statement of the information upon which it is based and a legal analysis of and conclusions regarding the application of rulings, regulations and other precedent to the situation presented in the request.

(c) Only those persons to whom an interpretation is specifically addressed and other persons upon whom the DOE serves the interpretation and who are directly involved in the same transaction or act may rely upon it. No person entitled to rely upon an interpretation shall be subject to civil or criminal penalties stated in subpart P of this part for any act taken in reliance upon the interpretation, notwithstanding that the interpretation shall thereafter be declared by judicial or other competent authority to be invalid.

(d) An interpretation may be rescinded or modified at any time. Rescission or modification may be effected by notifying persons entitled to rely on the interpretation that it is rescinded or modified. This notification shall include a statement of the reasons for the recision or modification and, in the case of a modification, a restatement of the interpretation as modified.

(e) An interpretation is modified by a subsequent amendment to the regulations or ruling to the extent that it is inconsistent with the amended regulation or ruling.

(f)(1) Any person aggrieved by an interpretation may submit a petition for reconsideration to the General Counsel within 30 days of service of the interpretation from which the reconsideration is sought. There has not been an exhaustion of administrative remedies until a period of 30 days from the date of service of the interpretation has elapsed without receipt by the General Counsel of a petition for reconsideration or, if a petition for reconsideration of the interpretation has been filed in a timely manner, until that petition has been acted on by the General Counsel. However, a petition to which the General Counsel does not respond within 60 days of the date of receipt thereof, or within such extended time

as the General Counsel may prescribe by written notice to the petitioner concerned within that 60 day period, shall be considered denied.

(2) A petition for reconsideration may be summarily denied if—

(i) It is not filed in a timely manner, unless good cause is shown; or

(ii) It is defective on its face for failure to state, and to present facts and legal argument in support thereof, that the interpretation was erroneous in fact or in law, or that it was arbitrary or capricious.

(3) The General Counsel may deny any petition for reconsideration if the petitioner does not establish that—

(i) The petition was filed by a person aggrieved by an interpretation;

(ii) The interpretation was erroneous in fact or in law; or

(iii) The interpretation was arbitrary or capricious. The denial of a petition shall be a final order of which the petitioner may seek judicial review.

(Emergency Petroleum Allocation Act of 1973, Pub. L. 93–159, as amended, Pub. L. 93–511, Pub. L. 94–99, Pub. L. 94–133, Pub. L. 94–163, and Pub. L. 94–385, Federal Energy Administration Act of 1974, Pub. L. 93–275, as amended, Pub. L. 94–385, Energy Policy and Conservation Act, Pub. L. 94–163, as amended, Pub. L. 94–385; E.O. 11790, 39 FR 23185; Department of Energy Organization Act, Pub. L. 95–91; E.O. 12009, 42 FR 46267)

[39 FR 35489, Oct. 1, 1974, as amended at 43 FR 14437, Apr. 6, 1978]

§ 205.86 Appeal.

There is no administrative appeal of an interpretation.

(Emergency Petroleum Allocation Act of 1973, Pub. L. 93–159, as amended, Pub. L. 93–511, Pub. L. 94–99, Pub. L. 94–133, Pub. L. 94–163, and Pub. L. 94–385, Federal Energy Administration Act of 1974, Pub. L. 93–275, as amended, Pub. L. 94–385, Energy Policy and Conservation Act, Pub. L. 94–163, as amended, Pub. L. 94–385; E.O. 11790, 39 FR 23185; Department of Energy Organization Act, Pub. L. 95–91; E.O. 12009, 42 FR 46267)

[43 FR 14437, Apr. 6, 1978]

Subparts G–J [Reserved]

Subpart K—Rulings

§ 205.150 Purpose and scope.

This subpart establishes the criteria for the issuance of interpretative rulings by the General Counsel. All rulings shall be published in the FEDERAL REGISTER. Any person is entitled to rely upon such ruling, to the extent provided in this subpart.

§ 205.151 Criteria for issuance.

(a) A ruling may be issued, in the discretion of the General Counsel, whenever there have been a substantial number of inquiries with regard to similar factual situations or a particular section of the regulations.

(b) The General Counsel may issue a ruling whenever it is determined that it will be of assistance to the public in applying the regulations to a specific situation.

§ 205.152 Modification or rescission.

(a) A ruling may be modified or rescinded by:

(1) Publication of the modification or rescission in the FEDERAL REGISTER; or

(2) A rulemaking proceeding in accordance with subpart L of this part.

(b) Unless and until a ruling is modified or rescinded as provided in paragraph (a) of this section, no person shall be subject to the sanctions or penalties stated in subpart P of this part for actions taken in reliance upon the ruling, notwithstanding that the ruling shall thereafter be declared by judicial or other competent authority to be invalid. Upon such declaration, no person shall be entitled to rely upon the ruling.

§ 205.153 Comments.

A written comment on or objection to a published ruling may be filed at any time with the General Counsel at the address specified in § 205.12.

§ 205.154 Appeal.

There is no administrative appeal of a ruling.

Subpart L [Reserved]

Subpart M—Conferences, Hearings, and Public Hearings

§ 205.170 Purpose and scope.

This subpart establishes the procedures for requesting and conducting a DOE conference, hearing, or public hearing. Such proceedings shall be convened in the discretion of the DOE, consistent with the requirements of the FEAA.

§ 205.171 Conferences.

(a) The DOE in its discretion may direct that a conference be convened, on its own initiative or upon request by a person, when it appears that such conference will materially advance the proceeding. The determination as to who may attend a conference convened under this subpart shall be in the discretion of the DOE, but a conference will usually not be open to the public.

(b) A conference may be requested in connection with any proceeding of the DOE by any person who might be aggrieved by that proceeding. The request may be made in writing or verbally, but must include a specific showing as to why such conference will materially advance the proceeding. The request shall be addressed to the DOE office that is conducting the proceeding.

(c) A conference may only be convened after actual notice of the time, place, and nature of the conference is provided to the person who requested the conference.

(d) When a conference is convened in accordance with this section, each person may present views as to the issue or issues involved. Documentary evidence may be presented at the conference, but will be treated as if submitted in the regular course of the proceedings. A transcript of the conference will not usually be prepared. However, the DOE in its discretion may have a verbatim transcript prepared.

(e) Because a conference is solely for the exchange of views incident to a proceeding, there will be no formal reports or findings unless the DOE in its discretion determines that such would be advisable.

§ 205.172 Hearings.

(a) The DOE in its discretion may direct that a hearing be convened on its own initiative or upon request by a person, when it appears that such hearing will materially advance the proceedings. The determination as to who may attend a hearing convened under this subpart shall be in the discretion of DOE, but a hearing will usually not be open to the public. Where the hearing involves a matter arising under part 213, the Director of Oil Imports shall be notified as to its time and place, in order that he or his representative may present views as to the issue or issues involved.

(b) A hearing may only be requested in connection with an application for an exception or an appeal. Such request may be by the applicant, appellant, or any other person who might be aggrieved by the DOE action sought. The request shall be in writing and shall include a specific showing as to why such hearing will materially advance the proceeding. The request shall be addressed to the DOE office that is considering the application for an exception or the appeal.

(c) The DOE will designate an agency official to conduct the hearing, and will specify the time and place for the hearing.

(d) A hearing may only be convened after actual notice of the time, place, and nature of the hearing is provided both to the applicant or appellant and to any other person readily identifiable by the DOE as one who will be aggrieved by the DOE action involved. The notice shall include, as appropriate:

(1) A statement that such person may participate in the hearing; or

(2) A statement that such person may request a separate conference or hearing regarding the application or appeal.

(e) When a hearing is convened in accordance with this section, each person may present views as to the issue or issues involved. Documentary evidence may be presented at the hearing, but will be treated as if submitted in the regular course of the proceedings. A transcript of the hearing will not usually be prepared. However, the DOE in its discretion may have a verbatim transcript prepared.

(f) The official conducting the hearing may administer oaths and affirmations, rule on the presentation of information, receive relevant information, dispose of procedural requests, determine the format of the hearing, and otherwise regulate the course of the hearing.

(g) Because a hearing is solely for the exchange of views incident to a proceeding, there will be no formal reports or findings unless the DOE in its discretion determines that such would be advisable.

[39 FR 35489, Oct. 1, 1974, as amended at 40 FR 36557, Aug. 21, 1975]

§ 205.173 Public hearings.

(a) A public hearing shall be convened incident to a rulemaking:

(1) When the proposed rule or regulation is likely to have a substantial impact on the Nation's economy or large numbers of individuals or businesses; or

(2) When the DOE determines that a public hearing would materially advance the consideration of the issue. A public hearing may be requested by any interested person in connection with a rulemaking proceeding, but shall only be convened on the initiative of the DOE unless otherwise required by statute.

(b) A public hearing may be convened incident to any proceeding when the DOE in its discretion determines that such public hearing would materially advance the consideration of the issue.

(c) A public hearing may only be convened after publication of a notice in the FEDERAL REGISTER, which shall include a statement of the time, place, and nature of the public hearing.

(d) Interested persons may file a request to participate in the public hearing in accordance with the instructions in the notice published in the FEDERAL REGISTER. The request shall be in writing and signed by the person making the request. It shall include a description of the person's interest in the issue or issues involved and of the anticipated content of the presentation. It shall also contain a statement explaining why the person would be an appropriate spokesperson for the particular view expressed.

(e) The DOE shall appoint a presiding officer to conduct the public hearing. An agenda shall be prepared that shall provide, to the extent practicable, for the presentation of all relevant views by competent spokespersons.

(f) A verbatim transcript shall be made of the hearing. The transcript, together with any written comments submitted in the course of the proceeding, shall be made available for public inspection and copying in the public docket room, as provided in § 205.15.

(g) The information presented at the public hearing, together with the written comments submitted and other relevant information developed during the course of the proceeding, shall provide the basis for the DOE decision.

Subpart N [Reserved]

Subpart O—Notice of Probable Violation, Remedial Order, Notice of Proposed Disallowance, and Order of Disallowance

AUTHORITY: Emergency Petroleum Allocation Act of 1973, Pub. L. 93–159, as amended, Pub. L. 93–511, Pub. L. 94–99, Pub. L. 94–133, Pub. L. 94–163, and Pub. L. 94–385, Federal Energy Administration Act of 1974, Pub. L. 93–275, as amended, Pub. L. 94–332, Pub. L. 94–385, Pub. L. 95–70, Pub. L. 95–91; Energy Policy and Conservation Act, Pub. L. 94–163, as amended, Pub. L. 94–385, Pub. L. 95–70, Department of Energy Organization Act, Pub. L. 95–91, as amended, Pub. L. 95–620; E.O. 11790, 39 FR 23185; E.O. 12009, 42 FR 46267.

SOURCE: 44 FR 7924, Feb. 7, 1979, unless otherwise noted.

§ 205.190 Purpose and scope.

(a) This subpart establishes the procedures for determining the nature and extent of violations of the DOE regulations in parts 210, 211, and 212 and the procedures for issuance of a Notice of Probable Violation, a Proposed Remedial Order, a Remedial Order, an Interim Remedial Order for Immediate Compliance, a Remedial Order for Immediate Compliance, a Notice of Probable Disallowance, a Proposed Order of Disallowance, an Order of Disallowance, or a Consent Order. Nothing in

these regulations shall affect the authority of DOE enforcement officials in coordination with the Department of Justice to initiate appropriate civil or criminal enforcement actions in court at any time.

(b) When any report required by the ERA or any audit or investigation discloses, or the ERA otherwise discovers, that there is reason to believe a violation of any provision of this chapter, or any order issued thereunder, has occurred, is continuing or is about to occur, the ERA may conduct an inquiry to determine the nature and extent of the violation. A Remedial Order or Order of Disallowance may be issued thereafter by the Office of Hearings and Appeals. The ERA may commence enforcement proceedings by serving a Notice of Probable Violation, a Notice of Probable Disallowance, a Proposed Remedial Order, a Proposed Order of Disallowance, or an Interim Remedial Order for Immediate Compliance.

§ 205.191 [Reserved]

§ 205.192 Proposed remedial order.

(a) If the ERA finds, after the 30-day or other period authorized for reply to the Notice of Probable Violation, that a violation has occurred, is continuing, or is about to occur, it may issue a Proposed Remedial Order, which shall set forth the relevant facts and law.

(b) The ERA may issue a Proposed Remedial Order at any time it finds that a violation has occurred, is continuing, or is about to occur even if it has not previously issued a Notice of Probable Violation.

(c) The ERA shall serve a copy of the Proposed Remedial Order upon the person to whom it is directed. The ERA shall promptly publish a notice in the FEDERAL REGISTER which states the person to whom the Proposed Remedial Order is directed, his address, and the products, dollar amounts, time period, and geographical area specified in the Proposed Remedial Order. The notice shall indicate that a copy of the Proposed Remedial Order with confidential information, if any, deleted may be obtained from the ERA and that within 15 days after the date of publication any aggrieved person may file a Notice of Objection with the Office of Hearings and Appeals of accordance with § 205.193. The ERA shall mail copies of the FEDERAL REGISTER notice to all readily identifiable persons who are likely to be aggrieved by issuance of the Proposed Remedial Order as a final order.

(d) The Proposed Remedial Order shall set forth the proposed findings of fact and conclusions of law upon which it is based. It shall also include a discussion of the relevant authorities which support the position asserted, including rules, regulations, rulings, interpretations and previous decisions issued by DOE or its predecessor agencies. The Proposed Remedial Order shall be accompaned by a declaration executed by the DOE employee primarily knowledgeable about the facts of the case stating that, to the best of declarant's knowledge and belief, the findings of fact are correct.

(e) The ERA may amend or withdraw a Proposed Remedial Order at its discretion prior to the date of service of a Statement of Objections in that proceeding. The date of service of the amended documents shall be considered the date of service of the Proposed Remedial Order in calculating the time periods specified in this part 205.

§ 205.192A Burden of proof.

(a) In a Proposed Remedial Order proceeding the ERA has the burden of establishing a prima facie case as to the validity of the findings of fact and conclusions of law asserted therein. The ERA shall be deemed to meet this burden by the service of a Proposed Remedial Order that meets the requirements of § 205.192(d) and any supplemental information that may be made available under § 205.193A.

(b) Once a prima facie case has been established, a person who objects to a finding of fact or conclusion of law in the Proposed Remedial Order has the burden of going forward with the evidence. Furthermore, the proponent of additional factual representations has the burden of going forward with the evidence.

(c) Unless otherwise specified by the Director of the Office of Hearings and Appeals or his designee, the proponent of an order or a motion or additional

factual representations has the ultimate burden of persuasion.

§ 205.193 Notice of Objection.

(a) Within 15 days after publication of the notice of a Proposed Remedial Order in the FEDERAL REGISTER any aggrieved person may file a Notice of Objection to the Proposed Remedial Order with the Office of Hearings and Appeals. The Notice shall be filed in duplicate, shall briefly describe how the person would be aggrieved by issuance of the Proposed Remedial Order as a final order and shall state the person's intention to file a Statement of Objections. No confidential information shall be included in a Notice of Objection. The DOE shall place one copy of the Notice in the Office of Hearings and Appeals Public Docket Room.

(b) A person who fails to file a timely Notice of Objection shall be deemed to have admitted the findings of fact and conclusions of law as stated in the Proposed Remedial Order. If a Notice of Objection is not filed as provided by paragraph (a) of this section, the Proposed Remedial Order may be issued as a final order.

(c) A person who files a Notice of Objection shall on the same day serve a copy of the Notice upon the person to whom the Proposed Remedial Order is directed, the DOE Office that issued the Proposed Remedial Order, and the DOE Assistant General Counsel for Administrative Litigation.

(d) The Notice shall include a certification of compliance with the provisions of this section, the names and addresses of each person served with a copy of the Notice, and the date and manner of service.

(e) If no person files a timely Notice of Objection, ERA may request the Office of Hearings and Appeals to issue the Proposed Remedial Order as a final Remedial Order.

(f) In order to exhaust administrative remedies with respect to a Remedial Order proceeding, a person must file a timely Notice of Objection and Statement of Objections with the Office of Hearings and Appeals.

§ 205.193A Submission of ERA supplemental information.

Within 20 days after service of a Notice of Objection to a Proposed Remedial Order the ERA may serve, upon the person to whom the Proposed Remedial Order was directed, supplemental information relating to the calculations and determinations which support the findings of fact set forth in the Proposed Remedial Order.

§ 205.194 Participants; official service list.

(a) Upon receipt of a Notice of Objection, the Office of Hearings and Appeals shall publish a notice in the FEDERAL REGISTER which states the person to whom the Proposed Remedial Order is directed, his address and the products, dollar amounts, time period, and geographical area specified in the Proposed Remedial Order. The notice shall state that any person who wishes to participate in the proceeding must file an appropriate request with the Office of Hearings and Appeals.

(b) The Office that issued the Proposed Remedial Order and the person to whom the Order is directed shall be considered participants before the Office of Hearings and Appeals at all stages of an enforcement proceeding. Any other person whose interest may be affected by the proceeding may file a request to participate in the proceeding with the Office of Hearings and Appeals within 20 days after publication of the notice referred to in paragraph (a) of this section. The request shall contain

(1) The person's name, address, and telephone number and similar information concerning his duly authorized representative, if any;

(2) A detailed description of the person's interest in the proceeding;

(3) The specific reasons why the person's active involvement in the proceeding will substantially contribute to a complete resolution of the issues to be considered in the proceeding;

(4) A statement of the position which the person intends to adopt in the proceeding; and

(5) A statement of the particular aspects of the proceeding, e.g. oral argument, submission of briefs, or discovery, in which the person wishes to actively participate.

(c) After considering the requests submitted pursuant to paragraph (b) of this section, the Office of Hearings and Appeals shall determine those persons who may participate on an active basis in the proceeding and the nature of their participation. Participants with similar interests may be required to consolidate their submissions and to appear in the proceeding through a common representative.

(d) Within 30 days after publication of the notice referred to in paragraph (a) of this section, the Office of Hearings and Appeals shall prepare an official service list for the proceeding. Within the same 30 day period the Office of Hearings and Appeals shall mail the official service list to all persons who filed requests to participate. For good cause shown a person may be placed on the official service list as a non-participant, for the receipt of documents only. An opportunity shall be afforded to participants to oppose the placement of a non-participant on the official service list.

(e) A person requesting to participate after the period for submitting requests has expired must show good cause for failure to file a request within the prescribed time period.

(f) The Office of Hearings and Appeals may limit the nature of a person's participation in the proceeding, if it finds that the facts upon which the person's request was based have changed or were incorrect when stated or that the person has not been actively participating or has engaged in disruptive or dilatory conduct. The action referred to in this provision shall be taken only after notice and an opportunity to be heard are afforded.

§ 205.195 Filing and service of all submissions.

(a)(1) Statements of Objections, Responses to such Statements, and any motions or other documents filed in connection with a proceeding shall meet the requirements of § 205.9 and shall be filed with the Office of Hearings and Appeals in accordance with § 205.4. Unless otherwise specified, any participant may file a response to a motion within five days of service.

(2) All documents shall be filed in duplicate, unless they contain confidential information, in which case they must be filed in triplicate.

(3) If a person claims that any portion of a document which he is filing contains confidential information, such information should be deleted from two of the three copies which are filed. One copy from which confidential information has been deleted will be placed in the Office of Hearings and Appeals Public Docket Room.

(b)(1) Persons other than DOE offices shall on the date a submission is filed serve each person on the official service list. Service shall be made in accordance with § 205.7 and may also be made by deposit in the regular United States mail, properly stamped and addressed, when accompanied by proof of service consisting of a certificate of counsel or an affidavit of the person making the service. If any filing arguably contains confidential information, a person may serve copies with the confidential information deleted upon all persons on the official service list except DOE offices, which shall be served both an original filing and one with deletions.

(2) A DOE office shall on the date it files a submission serve all persons on the official service list, unless the filing arguably contains confidential information. In that case the DOE office shall notify the person to whom the information relates of the opportunity to identify and delete the confidential information. The DOE Office may delay the service of a submission containing arguably confidential information upon all persons other than the possessor of the confidential information and other DOE offices up to 14 days. The possessor of the confidential information shall serve the filing with any deletions upon all persons on the official service list within such time period.

(c) Any filing made under this section shall include a certification of compliance by the filer with the provisions of this subpart. The person serving a document shall file a certificate of service, which includes the date and

manner of service for each person on the official service list.

§ 205.196 Statement of objections.

(a) A person who has filed a Notice of Objection shall file a Statement of Objections to a Proposed Remedial Order within 40 days after service of the Notice of Objection. A request for an extension of time for filing must be submitted in writing and may be granted for good cause shown.

(b) The Statement of Objections shall set forth the bases for the objections to the issuance of the Proposed Remedial Order as a final order, including a specification of the issues of fact or law which the person intends to contest in any further proceeding involving the compliance matter which is the subject of the Proposed Remedial Order. The Statement shall set forth the findings of fact contained in the Proposed Remedial Order which are alleged to be erroneous, the factual basis for such allegations, and any alternative findings which are sought. The Statement shall include a discussion of all relevant authorities which support the position asserted. The Statement may include additional factual representations which are not referred to in the Proposed Remedial Order and which the person contends are material and relevant to the compliance proceeding. For each additional factual representation which the person asserts should be made, the Statement shall include reasons why the factual representation is relevant and material, and the manner in which its validity is or will be established. The person shall also specify the manner in which each additional issue of fact was raised in any prior administrative proceeding which led to issuance of the Proposed Remedial Order, or the reasons why it was not raised.

(c) A Statement of Objections that is filed by the person to whom a Proposed Remedial Order is directed shall include a copy of any relevant Notice of Probable Violation, each Response thereto, the Proposed Remedial Order, and any relevant work papers or supplemental information previously provided by ERA. Copies of this material must also be included with the copy of the Statement of Objections served upon the DOE Assistant General Counsel for Administrative Litigation. All other persons on the official service list must be notified that such materials are available from the notifier upon written request.

§ 205.197 Response to statement of objections; reply.

(a) Within 30 days after service of a Statement of Objections each participant may file a Response. If any motions are served with the Statement of Objections, a participant shall have 30 days from the date of service to respond to such submissions, notwithstanding any shorter time periods otherwise required in this subpart. The Response shall contain a full discussion of the position asserted and a discussion of the legal and factual bases which support that position. The Response may also contain a request that any issue of fact or law advanced in a Statement of Objections be dismissed. Any such request shall be accompanied by a full discussion of the reasons supporting the dismissal.

(b) A participant may submit a Reply to any Response within 10 days after the date of service of the Response.

§ 205.198 Discovery.

(a) If a person intends to file a Motion for Discovery, he must file it at the same time that he files his Statement of Objections or at the same time he files his Response to a Statement of Objections, whichever is earlier. All Motions for Discovery and related filings must be served upon the person to whom the discovery is directed. If the person to whom the discovery is directed is not on the official service list, the documents served upon him shall include a copy of this section, the address of the Office of Hearings and Appeals and a statement that objections to the Motion may be filed with the Office of Hearings and Appeals.

(b) A Motion for Discovery may request that:

(1) A person produce for inspection and photocopying non-privileged written material in his possession;

(2) A person respond to written interrogatories;

(3) A person admit to the genuineness of any relevant document or the truth of any relevant fact; or

(4) The deposition of a material witness be taken.

(c) A Motion for Discovery shall set forth the reasons why the particular discovery is necessary in order to obtain relevant and material evidence and shall explain why such discovery would not unduly delay the proceeding.

(d) Within 20 days after a Motion for Discovery is served, a participant or a person to whom the discovery is directed may file a request that the Motion be denied in whole or in part, stating the reasons which support the request.

(e) Discovery may be conducted only pursuant to an Order issued by the Office of Hearings and Appeals. A Motion for Discovery will be granted if it is concluded that discovery is necessary for the party to obtain relevant and material evidence and that discovery will not unduly delay the proceeding. Depositions will be permitted if a convincing showing is made that the participant cannot obtain the material sought through one of the other discovery means specified in paragraph (b) of this section.

(f) The Director of the Office of Hearings and Appeals or his designee may issue subpoenas in accordance with §205.8 in support of Discovery Orders, except that §205.8 (h)(2), (3), and (4) shall not apply to such subpoenas.

(g) The Office of Hearings and Appeals may order that any direct expenses incurred by a person to produce evidence pursuant to a Motion for Discovery be charged to the person who filed the Motion.

(h)(1) If a person fails to comply with an order relating to discovery, the Office of Hearings and Appeals may order appropriate sanctions.

(2) It shall be the duty of aggrieved participants to request that appropriate relief be fashioned in such situations.

(i) Any order issued by the Office of Hearings and Appeals with respect to discovery shall be subject to further administrative review or appeal only upon issuance of the determination referred to in §205.199B.

§205.198A Protective order.

A participant who has unsuccessfully attempted in writing to obtain information that another participant claims is confidential may file a Motion for Discovery and Protective Order. This motion shall meet the requirements of §205.198 and shall specify the particular confidential information that the movant seeks and the reasons why the information is necessary to adequately present the movant's position in the proceeding. A copy of the written request for information, a certification concerning when and to whom it was served and a copy of the response, if any, shall be appended to the motion. The motion must give the possessor of the information notice that a Response to the Motion must be filed within ten days. The Response shall specify the safeguards, if any, that should be imposed if the information is ordered to be released. The Office of Hearings and Appeals may issue a Protective Order upon consideration of the Motion and the Response.

§205.199 Evidentiary hearing.

(a) *Filing Requirements.* At the time a person files a Statement of Objections he may also file a motion requesting an evidentiary hearing be convened. A motion requesting an evidentiary hearing may be filed by any other participant within 30 days after that participant is served with a Statement of Objections.

(b) *Contents of Motion for Evidentiary Hearing.* A Motion for Evidentiary Hearing shall specify each disputed issue of fact and the bases for the alternative findings the movant asserts. The movant shall also describe the manner in which each disputed issue of fact was raised in any prior administrative proceeding which led to issuance of the Proposed Remedial Order, or why it was not raised. The movant shall with respect to each disputed or alternative finding of fact:

(1) As specifically as possible, identify the witnesses whose testimony is required;

(2) State the reasons why the testimony of the witnesses is necessary; and

(3) State the reasons why the asserted position can be effectively established only through the direct questioning of witnesses at an evidentiary hearing.

(c) *Response to Motion for Evidentiary Hearing.* Within 20 days after service of any Motion for Evidentiary Hearing, the Office that issued the Proposed Remedial Order shall, and any other participant may file a Response with the Office of Hearings and Appeals. The Response shall specify:

(1) Each particular factual representation which is accepted as correct for purposes of the proceeding;

(2) Each particular factual representation which is denied;

(3) Each particular factual representation which the participant is not in a position to accept or deny;

(4) Each particular factual representation which is not accepted and the participant wishes proven by the submission of evidence;

(5) Each particular factual representation which the participant is prepared to dispute through the testimony of witnesses or the submission of verified documents; and

(6) Each particular factual representation which the participant asserts should be dismissed as immaterial or irrelevant.

(d) *Prehearing Conferences.* After all submissions with respect to a Motion for Evidentiary Hearing are filed, the Office of Hearings and Appeals may conduct conferences or hearings to resolve differences of view among the participants.

(e) *Decision on Motion for Evidentiary Hearing.* After considering all relevant information received in connection with the Motion, the Office of Hearings and Appeals shall enter an Order. In the Order the Office of Hearings and Appeals shall direct that an evidentiary hearing be convened if it concludes that a genuine dispute exists as to relevant and material issues of fact and an evidentiary hearing would substantially assist it in making findings of fact in an effective manner. If the Motion for Evidentiary Hearing is granted in whole or in part, the Order shall specify the parties to the hearing, any limitations on the participation of a party, and the issues of fact set forth for the evidentiary hearing. The Order may also require parties that have adopted similar positions to consolidate their presentations and to appear at the evidentiary hearing through a common representative. If the Motion is denied, the Order may allow the movant to file affidavits and other documents in support of his asserted findings of fact.

(f) *Review of Decision.* The Order of the Office of Hearings and Appeals with respect to a Motion for Evidentiary Hearing shall be subject to further administrative review or appeal only upon issuance of the determination referred to in § 205.199B.

(g) *Conduct of Evidentiary Hearing.* All evidentiary hearings convened pursuant to this section shall be conducted by the Director of the Office of Hearings and Appeals or his designee. At any evidentiary hearing the parties shall have the opportunity to present material evidence which directly relates to a particular issue of fact set forth for hearing. The presiding officer shall afford the parties an opportunity to cross examine all witnesses. The presiding officer may administer oaths and affirmations, rule on objections to the presentation of evidence, receive relevant material, rule on any motion to conform the Proposed Remedial Order to the evidence presented, rule on motions for continuance, dispose of procedural requests, determine the format of the hearing, modify any order granting a Motion for Evidentiary Hearing, direct that written motions or briefs be provided with respect to issues raised during the course of the hearing, issue subpoenas, and otherwise regulate the conduct of the hearing. The presiding officer may take reasonable measures to exclude duplicative material from the hearing, and may place appropriate limitations on the number of witnesses that may be called by a party. The presiding officer may also require that evidence be submitted through affidavits or other documents if the direct testimony of witnesses will unduly delay the orderly progress of the hearing and would not contribute to resolving the issues involved in the hearing. The provisions of § 205.8 which relate to subpoenas and

witness fees shall apply to any evidentiary hearing, except that subsection § 205.8(h) (2), (3), and (4) shall not apply.

§ 205.199A Hearing for the purpose of oral argument only.

(a) A participant is entitled upon timely request to a hearing to present oral argument with respect to the Proposed Remedial Order, whether or not an evidentiary hearing is requested or convened. A participant's request shall normally be considered untimely, if made more than 10 days after service of a determination regarding any motion filed by the requestor or, if no motions were filed by him, if made after the date for filing his Reply or his Response to a Statement of Objections.

(b) If an evidentiary hearing is convened, and a hearing for oral argument is requested, the Office of Hearings and Appeals shall determine whether the hearing for oral argument shall be held in conjunction with the evidentiary hearing or at a separate time.

(c) A hearing for the purpose of receiving oral argument will generally be conducted only after the issues involved in the proceeding have been delineated, and any written material which the Office of Hearings and Appeals has requested to supplement a Statement of Objections or Responses has been submitted. The presiding officer may require further written submissions in support of any position advanced or issued at the hearing, and shall allow responses any such submissions.

§ 205.199B Remedial order.

(a) After considering all information received during the proceeding, the Director of the Office of Hearings and Appeals or his designee may issue a final Remedial Order. The Remedial Order may adopt the findings and conclusions contained in the Proposed Remedial Order or may modify or rescind any such finding or conclusion to conform the Order to the evidence or on the basis of a determination that the finding or conclusion is erroneous in fact or law or is arbitrary or capricious. In the alternative, the Office of Hearings and Appeals may determine that no Remedial Order should be issued or may remand all or a portion of the Proposed Remedial Order to the issuing DOE office for further consideration or modification. Every determination made pursuant to this section shall state the relevant facts and legal bases supporting the determination.

(b) The DOE shall serve a copy of any determination issued pursuant to paragraph (a) of this section upon the person to whom it is directed, any person who was served with a copy of the Proposed Remedial Order, the DOE office that issued the Proposed Remedial Order, the DOE Assistant General Counsel for Administrative Litigation and any other person on the official service list. Appropriate deletions may be made in the determinations to ensure that confidentiality of information protected from disclosure under 18 U.S.C. 1905 and 5 U.S.C. 552. A copy of the determination with appropriate deletions to protect confidential and proprietary data shall be placed in the Office of Hearings and Appeals Public Docket Room.

§ 205.199C Appeals of remedial order to FERC.

(a) The person to whom a Remedial Order is issued by the Office of Hearings and Appeals may file an administrative appeal if the Remedial Order proceeding was initiated by a Notice of Probable Violation issued after October 1, 1977, or, in those situations in which no Notice of Probable Violation was issued, if the proceeding was initiated by a Proposed Remedial Order issued after October 1, 1977.

(b) Any such appeal must be initiated within 30 days after service of the Order by giving written notice to the Office of Hearings and Appeals that the person to whom a Remedial Order is issued wishes to contest the Order.

(c) The Office of Hearings and Appeals shall promptly advise the Federal Energy Regulatory Commission of its receipt of a notice described in paragraph (b) of this section.

(d) The Office of Hearings and Appeals may, on a case by case basis, set reasonable time limits for the Federal Energy Regulatory Commission to complete its action on such an appeal proceeding.

(e) In order to exhaust administrative remedies, a person who is entitled to appeal a Remedial Order issued by the Office of Hearings and Appeals must file a timely appeal and await a decision on the merits. Any Remedial Order that is not appealed within the 30-day period shall become effective as a final Order of the DOE and is not subject to review by any court.

§§205.199D—205.199E [Reserved]

§205.199F Ex parte communications.

(a) No person who is not employed or otherwise supervised by the Office of Hearings and Appeals shall submit ex parte communications to the Director or any person employed or otherwise supervised by the Office with respect to any matter involved in Remedial Order or Order of Disallowance proceedings.

(1) Ex parte communications include any ex parte oral or written communications relative to the merits of a Proposed Remedial Order, Interim Remedial Order for Immediate Compliance, or Proposed Order of Disallowance proceeding pending before the Office of Hearings and Appeals. The term shall not, however, include requests for status reports, inquiries as to procedures, or the submission of proprietary or confidential information. Notice that proprietary or confidential submissions have been made shall be given to all persons on the official service list.

(b) If any communication occurs that violates the provisions of this section, the Office of Hearings and Appeals shall promptly make the substance of the communication available to the public and serve a copy of a written communication or a memorandum summarizing an oral communication to all participants in the affected proceeding. The Office of Hearings and Appeals may also take any other appropriate action to mitigate the adverse impact to any person whose interest may be affected by the ex parte contact.

§205.199G Extension of time; Interim and Ancillary Orders.

The Director of the Office of Hearings and Appeals or his designee may permit upon motion any document or submission referred to in this subpart other than appeals to FERC to be amended or withdrawn after it has been filed or to be filed within a time period different from that specified in this subpart. The Director or his designee may upon motion or on his own initiative issue any interim or ancillary Orders, reconsider any determinations, or make any rulings or determinations that are deemed necessary to ensure that the proceedings specified in this subpart are conducted in an appropriate manner and are not unduly delayed.

§205.199H Actions not subject to administrative appeal.

A Notice of Probable Violation, Notice of Proposed Disallowance, Proposed Remedial Order or Interim Remedial Order for Immediate Compliance issued pursuant to this subpart shall not be an action from which there may be an administrative appeal pursuant to subpart H. In addition, a determination by the Office of Hearings and Appeals that a Remedial Order, an Order of Disallowance, or a Remedial Order for Immediate Compliance should not be issued shall not be appealable pursuant to subpart H.

§205.199I Remedies.

(a) A Remedial Order, a Remedial Order for Immediate Compliance, an Order of Disallowance, or a Consent Order may require the person to whom it is directed to roll back prices, to make refunds equal to the amount (plus interest) charged in excess of those amounts permitted under DOE Regulations, to make appropriate compensation to third persons for administrative expenses of effectuating appropriate remedies, and to take such other action as the DOE determines is necessary to eliminate or to compensate for the effects of a violation or any cost disallowance pursuant to §212.83 or §212.84. Such action may include a direction to the person to whom the Order is issued to establish an escrow account or take other measures to make refunds directly to purchasers of the products involved, notwithstanding the fact that those purchasers obtained such products from an intermediate distributor of such person's products,

and may require as part of the remedy that the person to whom the Order is issued maintain his prices at certain designated levels, notwithstanding the presence or absence of other regulatory controls on such person's prices. In cases where purchasers cannot be reasonably identified or paid or where the amount of each purchaser's overcharge is incapable of reasonable determination, the DOE may refund the amounts received in such cases directly to the Treasury of the United States on behalf of such purchasers.

(b) The DOE may, when appropriate, issue final Orders ancillary to a Remedial Order, Remedial Order for Immediate Compliance, Order of Disallowance, or Consent Order requiring that a direct or indirect recipient of a refund pass through, by such means as the DOE deems appropriate, including those described in paragraph (a) of this section, all or a portion of the refund, on a pro rata basis, to those customers of the recipient who were adversely affected by the initial overcharge. Ancillary Orders may be appealed to the Office of Hearings and Appeals only pursuant to subpart H.

§ 205.199J Consent order.

(a) Notwithstanding any other provision of this subpart, the DOE may at any time resolve an outstanding compliance investigation or proceeding, or a proceeding involving the disallowance of costs pursuant to § 205.199E with a Consent Order. A Consent Order must be signed by the person to whom it is issued, or a duly authorized representative, and must indicate agreement to the terms contained therein. A Consent Order need not constitute an admission by any person that DOE regulations have been violated, nor need it constitute a finding by the DOE that such person has violated DOE regulations. A Consent Order shall, however, set forth the relevant facts which form the basis for the Order.

(b) A Consent Order is a final Order of the DOE having the same force and effect as a Remedial Order issued pursuant to § 205.199B or an Order of Disallowance issued pursuant to § 205.199E, and may require one or more of the remedies authorized by § 205.199I and § 212.84(d)(3). A Consent Order becomes effective no sooner than 30 days after publication under paragraph (c) of this section, unless (1) the DOE makes a Consent Order effective immediately, because it expressly deems it necessary in the public interest, or (2) the Consent Order involves a sum of less than $500,000 in the aggregate, excluding penalties and interest, in which case it will be effective when signed both by the person to whom it is issued and the DOE, and will not be subject to the provisions of paragraph (c) of this section unless the DOE determines otherwise. A Consent Order shall not be appealable pursuant to the provisions of § 205.199C or § 205.199D and subpart H, and shall contain an express waiver of such appeal or judicial review rights as might otherwise attach to a final Order of the DOE.

(c) When a Consent Order has been signed, both by the person to whom it is issued and the DOE, the DOE will publish notice of such Consent Order in the FEDERAL REGISTER and in a press release to be issued simultaneously therewith. The FEDERAL REGISTER notice and the press release will state at a minimum the name of the company concerned, a brief summary of the Consent Order and other facts or allegations relevant thereto, the address and telephone number of the DOE office at which copies of the Consent Order will be available free of charge, the address to which comments on the Consent Order will be received by the DOE, and the date by which such comments should be submitted, which date will not be less than 30 days after publication of the FEDERAL REGISTER notice. After the expiration of the comment period the DOE may withdraw its agreement to the Consent Order, attempt to negotiate a modification of the Consent Order, or issue the Consent Order as signed. The DOE will publish in the FEDERAL REGISTER, and by press release, notice of any action taken on a Consent Order and such explanation of the action taken as deemed appropriate. The provisions of this paragraph shall be applicable notwithstanding the fact that a Consent Order may have been made immediately effective pursuant to paragraph (b) of this section (except in cases where the Consent Order involves sums of less

than $500,000 in the aggregate, excluding penalties and interest).

(d) At any time and in accordance with the procedures of subpart J, a Consent Order may be modified or rescinded, upon petition by the person to whom the Consent Order was issued, and may be rescinded by the DOE upon discovery of new evidence which is materially inconsistent with evidence upon which the DOE's acceptance of the Consent Order was based. Modifications of a Consent Order which is subject to public comment under the provisions of paragraph (c) of this section, which in the opinion of the DOE significantly change the terms or the impact of the original Order, shall be republished under the provisions of that paragraph.

(e) Notwithstanding the issuance of a Consent Order, the DOE may seek civil or criminal penalties or compromise civil penalties pursuant to subpart P concerning matters encompassed by the Consent Order, unless the Consent Order by its terms expressly precludes the DOE from so doing.

(f) If at any time after a Consent Order becomes effective it appears to the DOE that the terms of the Consent Order have been violated, the DOE may refer such violations to the Department of Justice for appropriate action in accordance with subpart P.

Subpart P–T [Reserved]

Subpart U—Procedures for Electricity Export Cases

AUTHORITY: Federal Power Act, 41 Stat. 1063, as amended; Executive Order 10485, as amended by Executive Order 12038; Federal Energy Administration Act of 1974, Pub. L. 93–275, as amended; Pub. L. 94–332, Pub. L. 94–385, Pub. L. 95–70, and Pub. L. 95–91; Energy Policy and Conservation Act, Pub. L. 95–70; Department of Energy Organization Act, Pub. L. 95–91; E.O. 11790, 39 FR 23185; E.O. 12009, 42 FR 46267.

SOURCE: 49 FR 35315, Sept. 6, 1984, unless otherwise noted.

§ 205.260 Purpose and scope.

(a) The purpose of this section is to state the procedures that will be followed by the Economic Regulatory Administration of the Department of Energy in electricity export adjudications.

(b) *Definitions.*

As used in this subpart—

Administrator means the Administrator of the Economic Regulatory Administration.

Decisional employees means the Administrator, presiding officers at adjudicatory hearings, and other employees of the Department, including consultants and contractors, who are, or may reasonably be expected to be, involved in the decision-making process, which includes advising the Administrator in resolving the issues in an adjudication. The term does not include those employees of the Department performing investigative or trial functions in an adjudication, unless they are specifically requested by the Administrator or his delegate to participate in the decision-making process.

Department means the Department of Energy.

Off-the-record communication means an *ex parte* communication, which is an oral or written communication relevant to the merits of an adjudication and not on the record and with respect to which reasonable prior notice to all participants and opportunity to be present at, or respond to, the communication is not given, but does not include a communication relating solely to procedures which are not relevant to the merits of the adjudication.

Interested person means a person outside the Department whose interest in the adjudication goes beyond the general interest of the public as a whole and includes applicants, intervenors, competitors of applicants, non-profit and public interest organizations, and other individuals and organizations, including state, local and other public officials, with a proprietary, financial or other special interest in the outcome of the adjudication. The term does not include other federal agencies, unless an agency is a participant in the adjudication.

Participant means any applicant or intervenor participating in the adjudication.

Adjudication means a formal proceeding employing procedures identical or similar to those required by the Administrative Procedure Act, as codified

in 5 U.S.C. 551, 556, and 557, to consider an application to export electricity.

Reasonable prior notice means 7 days' written notice stating the nature and purpose of the communication.

Relevant to the merits means a communication directly related to the merits of a specific adjudication but does not include general background discussions about an entire industry or communications of a general nature made in the course of developing agency policy for future general application.

§§ 205.261—205.269 [Reserved]

§ 205.270 Off-the-record communications.

(a) In any proceeding which is subject to this subpart—

(1) No interested person shall make an off-the-record communication or knowingly cause an off-the-record communication to be made to any decisional employee.

(2) No decisional employee shall make an off-the-record communication or knowingly cause an off-the-record communication to be made to any interested person.

(3) A decisional employee who receives, makes, or knowingly causes to be made an oral communication prohibited by this section shall prepare a memorandum stating the substance of the communication and any responses made to it.

(4) With 48 hours of receiving, making or knowingly causing to be made a communication prohibited by this section, a decisional employee shall deliver all written off-the-record communications and all memoranda prepared in compliance with paragraph (a)(3) of this section to the Director of the Coal and Electricity Division, ERA, who will immediately place the materials described above in the public record associated with the adjudication, available for public inspection.

(5) Upon receipt of a communication knowingly made or knowingly caused to be made by a participant in violation of this section, the Administrator or presiding officer may, to the extent consistent with the interests of justice and the applicable statutory policy, require the participant to show cause why his or her claim or interest in the adjudication should not be dismissed, denied, disregarded, or otherwise adversely affected on account of the violation.

(6) The prohibitions of this section shall apply beginning at the time an adjudication is noticed for hearing (or the person responsible for the communication acquires knowledge that it will be noticed), a protest is filed, or a petition or notice to intervene in opposition to the requested Department action is filed, whichever occurs first.

(b) The prohibition, cited at 18 CFR 1.30(f), against participation in the decision-making process by Department employees who perform investigative or trial functions in an adjudication, shall no longer be applicable to ERA.

Subpart V—Special Procedures for Distribution of Refunds

AUTHORITY: Economic Stabilization Act of 1970, Pub. L. 92–210; Emergency Petroleum Allocation Act of 1973, Pub. L. 93–159, as amended, Pub. L. 93–511, Pub. L. 94–99, Pub. L. 94–133, Pub. L. 94–163, and Pub. L. 94–385, Federal Energy Administration Act of 1974, Pub. L. 93–275, as amended, Pub. L. 94–332, Pub. L. 94–332, Pub. L. 94–385, Pub. L. 95–70, Pub. L. 95–91, Energy Policy and Conservation Act, Pub. L. 94–163, as amended, Pub. L. 94–385, Pub. L. 95–70; Department of Energy Organization Act, Pub. L. 95–91; E.O. 11790, 39 FR 23185; E.O. 12009, 42 FR 46267.

SOURCE: 44 FR 8566, Feb. 9, 1979, unless otherwise noted.

§ 205.280 Purpose and scope.

This subpart establishes special procedures pursuant to which refunds may be made to injured persons in order to remedy the effects of a violation of the regulations of the Department of Energy. This subpart shall be applicable to those situations in which the Department of Energy is unable to readily identify persons who are entitled to refunds specified in a Remedial Order, a Remedial Order for Immediate Compliance, an Order of Disallowance or a Consent Order, or to readily ascertain the amounts that such persons are entitled to receive.

§ 205.281 Petition for implementation of special refund procedures.

(a) At any time after the issuance of a Remedial Order (including for purposes of this subpart a Remedial Order for Immediate Compliance and an Order of Disallowance), or a Consent Order, the Special Counsel of the Department of Energy, the ERA Office of Enforcement, or any other enforcement official of the Department of Energy may file with the Office of Hearings and Appeals a Petition for the Implementation of Special Refund Procedures.

(b) The Petition shall state that the person filing it has been unable readily either to identify the persons who are entitled to refunds to be remitted pursuant to a Remedial Order or a Consent Order or to ascertain the amounts of refunds that such persons are entitled to receive. The Petition shall request that the Office of Hearings and Appeals institute appropriate proceedings under this Subpart to distribute the funds referred to in the enforcement documents.

(c) The Petition shall contain a copy of each relevant enforcement document, shall be filed in duplicate, and shall meet the requirements of § 205.9 of this part.

§ 205.282 Evaluation of petition by the Office of Hearings and Appeals.

(a) After considering the Petition, the Director of the Office of Hearings and Appeals or his designee shall issue a Proposed Decision and Order. The Proposed Decision and Order shall generally describe the nature of the particular refund proceeding and shall set forth the standards and procedures that the Office of Hearings and Appeals intends to apply in evaluating refund claims.

(b) The Proposed Decision and Order shall be published in the FEDERAL REGISTER together with a statement that any member of the public may submit written comments to the Office of Hearings and Appeals with respect to the matter. At least 30 days following publication in the FEDERAL REGISTER shall be provided for the submission of comments.

(c) After considering the comments submitted, the Director of the Office of Hearings and Appeals or his designee shall issue a final Decision and Order which shall govern the disposition of the refunds. The final Decision and Order shall also be published in the FEDERAL REGISTER.

(d) The final Decision and Order shall set forth the standards and procedures that will be used in evaluating individual Applications for Refunds and distributing the refund amount. Those standards and procedures shall be consistent with the provisions of this subpart.

(e) In establishing standards and procedures for implementing refund distributions, the Office of Hearings and Appeals shall take into account the desirability of distributing the refunds in an efficient, effective and equitable manner and resolving to the maximum extent practicable all outstanding claims. In order to do so, the standards for evaluation of individual claims may be based upon appropriate presumptions.

§ 205.283 Applications for refund.

(a) Any person entitled to a refund pursuant to a final Decision and Order issued pursuant to § 205.282 may file an Application for Refund. All Applications must be signed by the applicant and specify the DOE order to which they pertain. Any Application for a refund in excess of $100 must be file in duplicate, and a copy of that Application will be available for public inspection in the DOE Public Docket Room at 2000 M Street, NW., Washington, DC. Any applicant who believes that his Application contains confidential information must so indicate on the first page of his Application and submit two additional copies of his Application from which the information that the applicant claims is confidential has been deleted, together with a statement specifying why any such information is privileged or confidential.

(b) The contents of an Application for Refund shall be specified in the final Decision and Order referred to in § 205.282(c). A filing deadline for Applications shall also be specified in the final Decision and Order, and shall be no less than 90 days after the publication of the Order in the FEDERAL REGISTER.

(c) Each Application shall be in writing and signed by the applicant, and shall indicate whether the applicant or any person acting on his instructions has filed or intends to file any other Application or claim of whatever nature regarding the matters at issue in the underlying enforcement proceeding. Each Application shall also include a sworn statement by the applicant that all information in his Application is true and correct to the best of his knowledge and belief.

§ 205.284 Processing of applications.

(a) The Director of the Office of Hearings and Appeals may appoint an administrator to evaluate Applications under guidelines established by the Office of Hearings and Appeals. The administrator, if he is not a Federal Government employee, may be compensated from the funds referred to in the Remedial Order or Consent Order. The administrator may design and distribute an optional application form for the convenience of the applicants.

(b) The Office of Hearings and Appeals or its designee may initiate an investigation of any statement made in an Application and may require verification of any document submitted in support of a claim. In evaluating an Application, the Office of Hearings and Appeals or its designee may solicit and consider information obtained from any source and may on its own initiative convene a hearing or conference, if it determines that a hearing or conference will advance its evaluation of an Application.

(c) The Director of the Office of Hearings and Appeals or his designee shall conduct any hearing or conference convened with respect to an Application for Refund and shall specify the time and place for the hearing or conference and notify the applicant. The official conducting the hearing may administer oaths and affirmations, rule on the presentation of information, receive relevant information, dispose of procedural requests, determine the format of the hearing and otherwise regulate the course of the hearing. The provisions of § 205.8 of this part which relate to subpoenas and witness fees shall apply to any hearing convened with respect to an application for refund, except that § 205.8(h) (2), (3) and (4) shall not apply.

(d) Upon consideration of an Application and other relevant information received during the course of a refund proceeding, the Director of the Office of Hearings and Appeals or his designee shall issue an order granting or denying the Application. The order shall contain a concise statement of the relevant facts and the legal basis for the order. A copy of the order, with such modification as is necessary to ensure the confidentiality of information protected from public disclosure by 18 U.S.C. 1905, may be obtained upon request by an applicant or any other person who participated in the proceeding.

§ 205.285 Effect of failure to file a timely application.

An Application for Refund must be filed no later than the date that the Office of Hearings and Appeals establishes pursuant to § 205.283(b). Any Application that is not filed on a timely basis may be summarily dismissed. The Office of Hearings and Appeals or its designee may, however, grant extensions of time for good cause shown. Any request for an extension of time must generally be submitted in writing prior to the deadline.

§ 205.286 Limitations on amount of refunds.

(a) The aggregate amount of all refunds approved by the Office of Hearings and Appeals or its designee in a given case shall not exceed the amount to be remitted pursuant to the relevant DOE enforcement order, plus any accumulated interest, reduced by the amount of any administrative costs approved by the Office of Hearings and Appeals. In the event that the aggregate amount of approved claims exceeds the aggregate amount of funds specified above, the Office of Hearings and Appeals may make refunds on a pro rata basis. The Office of Hearings and Appeals may delay payment of any refunds until all Applications have been processed.

(b) The Office of Hearings and Appeals may decline to consider Applications for refund amounts that, in view

of the direct administrative costs involved, are too small to warrant individual consideration.

§ 205.287 Escrow accounts, segregated funds and other guarantees.

(a) In implementing the refund procedures specified in this subpart, the Director of the Office of Hearings and Appeals or his designee shall issue an order providing for the custody of the funds to be tendered pursuant to the Remedial Order or Consent Order. This Order may require placement of the funds in an appropriate interest-bearing escrow account, retention of the funds by the firm in a segregated account under such terms and conditions as are specified by the DOE, or the posting of a sufficient bond or other guarantee to ensure payment.

(b) All costs and charges approved by the Office of Hearings and Appeals and incurred in connection with the processing of Applications for Refund or incurred by an escrow agent shall be paid from the amount of funds, including any accumulated interest, to be remitted pursuant to the Remedial Order or Consent Order.

(c) After the expenses referred to in paragraph (b) of this section have been satisfied and refunds distributed to successful applicants, any remaining funds remitted pursuant to the Remedial Order or Consent Order shall be deposited in the United States Treasury or distributed in any other manner specified in the Decision and Order referred to in § 205.282(c).

(d) Funds contained in an escrow account, segregated fund, or guaranteed by other approved means shall be disbursed only upon written order of the Office of Hearings and Appeals.

§ 205.288 Interim and ancillary orders.

The Director of the Office of Hearings and Appeals or his designee may issue any interim or ancillary orders, or make any rulings or determinations to ensure that refund proceedings, including the actions of the administrator and the custodian of the funds involved in a refund proceeding, are conducted in an appropriate manner and are not unduly delayed.

Subpart W—Electric Power System Permits and Reports; Applications; Administrative Procedures and Sanctions

AUTHORITY: Department of Energy Organization Act, Pub. L. No. 95–91, 91 Stat. 565 (42 U.S.C. Section 7101). Federal Power Act, Pub. L. 66–280, 41 Stat. 1063 (16 U.S.C. Section 792) *et seq.*, Department of Energy Delegation Order No. 0204–4 (42 FR 60726). E.O. 10485, 18 FR 5397, 3 CFR, 1949–1953, Comp., p. 970 as amended by E.O. 12038, 43 FR 4957, 3 CFR 1978 Comp., p. 136.

SOURCE: 45 FR 71560, Oct. 28, 1980; 46 FR 63209, Dec. 31, 1981, unless otherwise noted.

(Approved by the Office of Management and Budget under Control No. 1901–0245)

APPLICATION FOR AUTHORIZATION TO TRANSMIT ELECTRIC ENERGY TO A FOREIGN COUNTRY

§ 205.300 Who shall apply.

(a) An electric utility or other entity subject to DOE jurisdiction under part II of the Federal Power Act who proposes to transmit any electricity from the United States to a foreign country must submit an application or be a party to an application submitted by another entity. The application shall be submitted to the Office of Utility Systems of the Economic Regulatory Administration (EPA).

(b) In connection with an application under §§ 205.300 through 205.309, attention is directed to the provisions of §§ 205.320 through 205.327, below, concerning applications for Presidential Permits for the construction, connection, operation, or maintenance, at the borders of the United States, of facilities for the transmission of electric energy between the United States and a foreign country in compliance with Executive Order 10485, as amended by Executive Order 12038.

§ 205.301 Time of filing.

Each application should be made at least six months in advance of the initiation of the proposed electricity export, except when otherwise permitted by the ERA to resolve an emergency situation.

§ 205.302 Contents of application.

Every application shall contain the following information set forth in the order indicated below:

(a) The exact legal name of the applicant.

(b) The exact legal name of all partners.

(c) The name, title, post office address, and telephone number of the person to whom correspondence in regard to the application shall be addressed.

(d) The state or territory under the laws of which the applicant is organized or incorporated, or authorized to operate. If the applicant is authorized to operate in more than one state, all pertinent facts shall be included.

(e) The name and address of any known Federal, State or local government agency which may have any jurisdiction over the action to be taken in this application and a brief description of that authority.

(f) A description of the transmission facilities through which the electric energy will be delivered to the foreign country, including the name of the owners and the location of any remote facilities.

(g) A technical discussion of the proposed electricity export's reliability, fuel use and system stability impact on the applicant's present and prospective electric power supply system. Applicant must explain why the proposed electricity export will not impair the sufficiency of electric supply on its system and why the export will not impede or tend to impede the regional coordination of electric utility planning or operation.

(h) The original application shall be signed and verified under oath by an officer of the applicant having knowledge of the matters set forth therein.

§ 205.303 Required exhibits.

There shall be filed with the application and as a part thereof the following exhibits:

(a) *Exhibit A.* A copy of the agreement or proposed agreement under which the electricity is to be transmitted including a listing of the terms and conditions. If this agreement contains proprietary information that should not be released to the general public, the applicant must identify such data and include a statement explaining why proprietary treatment is appropriate.

(b) *Exhibit B.* A showing, including a signed opinion of counsel, that the proposed export of electricity is within the corporate power of the applicant, and that the applicant has complied or will comply with all pertinent Federal and State laws.

(c) *Exhibit C.* A general map showing the applicant's overall electric system and a detailed map highlighting the location of the facilities or the proposed facilities to be used for the generation and transmission of the electric energy to be exported. The detailed map shall identify the location of the proposed border crossing point(s) or power transfer point(s) by Presidential Permit number whenever possible.

(d) *Exhibit D.* If an applicant resides or has its principal office outside the United States, such applicant shall designate, by irrevocable power of attorney, an agent residing within the United States. A verified copy of such power of attorney shall be furnished with the application.

(e) *Exhibit E.* A statement of any corporate relationship or existing contract between the applicant and any other person, corporation, or foreign government, which in any way relates to the control or fixing of rates for the purchase, sale or transmission of electric energy.

(f) *Exhibit F.* An explanation of the methodology (Operating Procedures) to inform neighboring electric utilities in the United States of the available capacity and energy which may be in excess of the applicant's requirements before delivery of such capacity to the foreign purchaser. Approved firm export, diversity exchange and emergency exports are exempted from this requirement. Those materials required by this section which have been filed previously with the ERA may be incorporated by reference.

§ 205.304 Other information.

Where the application is for authority to export less than 1,000,000 kilowatt hours annually, applicants need not furnish the information called for in §§205.302(g) and 205.303 (Exhibit C). Applicants, regardless of the amount of

electric energy to be exported, may be required to furnish such supplemental information as the ERA may deem pertinent.

§ 205.305 Transferability.

(a) An authorization to transmit electric energy from the United States to a foreign country granted by order of the ERA under section 202(e) of the Federal Power Act shall not be transferable or assignable. Provided written notice is given to the ERA within 30 days, the authorization may continue in effect temporarily in the event of the involuntary transfer of this authority by operation of law (including transfers to receivers, trustees, or purchasers under foreclosure or judicial sale). This continuance is contingent on the filing of an application for permanent authorization and may be effective until a decision is made thereon.

(b) In the event of a proposed voluntary transfer of this authority to export electricity, the transferee and the transferor shall file jointly an application pursuant to this subsection, setting forth such information as required by §§ 205.300 through 205.304, together with a statement of reasons for the transfer.

(c) The ERA may at any time subsequent to the original order of authorization, after opportunity for hearing, issue such supplemental orders as it may find necessary or appropriate.

§ 205.306 Authorization not exclusive.

No authorization granted pursuant to section 202(e) of the Act shall be deemed to prevent an authorization from being granted to any other person or entity to export electric energy or to prevent any other person or entity from making application for an export authorization.

§ 205.307 Form and style; number of copies

An original and two conformed copies of an application containing the information required under §§ 205.300 through 205.309 must be filed.

§ 205.308 Filing schedule and annual reports.

(a) Persons authorized to transmit electric energy from the United States shall promptly file all supplements, notices of succession in ownership or operation, notices of cancellation, and certificates of concurrence. In general, these documents should be filed at least 30 days prior to the effective date of any change.

(b) A change in the tariff arrangement does not require an amendment to the authorization. However, any entity with an authorization to export electric energy shall file with the ERA, and the appropriate state regulatory agency, a certified copy of any changed rate schedule and terms. Such changes may take effect upon the date of filing of informational data with the ERA.

(c) Persons receiving authorization to transmit electric energy from the United States shall submit to the ERA, by February 15 each year, a report covering each month of the preceding calendar year detailing the gross amount of kilowatt-hours of energy, by authorized category, received or delivered, and the cost and revenue associated with each category.

(Approved by the Office of Management and Budget under Control No. 1901–0245)

[45 FR 71560, Oct. 28, 1980, as amended at 46 FR 63209, Dec. 31, 1981]

§ 205.309 Filing procedures and fees.

Applications shall be addressed to the Office of Utility Systems of the Economic Regulatory Administration. Every application shall be accompanied by a fee of $500.00. Fee payment shall be by check, draft, or money order payable to the Treasurer of the United States. Copies of applications and notifications of rate changes shall be furnished to the Federal Energy Regulatory Commission and all affected State public utility regulatory agencies.

APPLICATION FOR PRESIDENTIAL PERMIT AUTHORIZING THE CONSTRUCTION, CONNECTION, OPERATION, AND MAINTENANCE OF FACILITIES FOR TRANSMISSION OF ELECTRIC ENERGY AT INTERNATIONAL BOUNDARIES

§ 205.320 Who shall apply.

(a) Any person, firm, co-operative, corporation or other entity who operates an electric power transmission or distribution facility crossing the border of the United States, for the transmission of electric energy between the United States and a foreign country, shall have a Presidential Permit, in compliance with Executive Order 10485, as amended by Executive Order 12038. Such applications should be filed with the Office of Utility Systems of the Economic Regulatory Administration.

NOTE: E.O. 12038, dated February 3, 1978, amended E.O. 10485, dated September 3, 1953, to delete the words ''Federal Power Commission'' and ''Commission'' and substitute for each ''Secretary of Energy.'' E.O. 10485 revoked and superseded E.O. 8202, dated July 13, 1939.

(b) In connection with applications hereunder, attention is directed to the provisions of §§ 205.300 to 205.309, above, concerning applications for authorization to transmit electric energy from the United States to a foreign country pursuant to section 202(e) of the Federal Power Act.

§ 205.321 Time of filing.

Pursuant to the DOE's responsibility under the National Environmental Policy Act, the DOE must make an environmental determination of the proposed action. If, as a result of this determination, an environmental impact statement (EIS) must be prepared, the permit processing time normally will be 18–24 months. If no environmental impact statement is required, then a six-month processing time normally would be sufficient.

§ 205.322 Contents of application.

Every application shall be accompanied by a fee prescribed in § 205.326 of this subpart and shall provide, in the order indicated, the following:

(a) *Information regarding the applicant.*

(1) The legal name of the applicant;

(2) The legal name of all partners;

(3) The name, title, post office address, and telephone number of the person to whom correspondence in regard to the application shall be addressed;

(4) Whether the applicant or its transmission lines are owned wholly or in part by a foreign government or directly or indirectly assisted by a foreign government or instrumentality thereof; or whether the applicant has any agreement pertaining to such ownership by or assistance from any foreign government or instrumentality thereof.

(5) List all existing contracts that the applicant has with any foreign government, or any foreign private concerns, relating to any purchase, sale or delivery of electric energy.

(6) A showing, including a signed opinion of counsel, that the construction, connection, operation, or maintenance of the proposed facility is within the corporate power of the applicant, and that the applicant has complied with or will comply with all pertinent Federal and State laws;

(b) *Information regarding the transmission lines to be covered by the Presidential Permit.* (1)(i) A technical description providing the following information: (A) Number of circuits, with identification as to whether the circuit is overhead or underground; (B) the operating voltage and frequency; and (C) conductor size, type and number of conductors per phase.

(ii) If the proposed interconnection is an overhead line the following additional information must also be provided: (A) The wind and ice loading design parameters; (B) a full description and drawing of a typical supporting structure including strength specifications; (C) structure spacing with typical ruling and maximum spans; (D) conductor (phase) spacing; and (E) the designed line to ground and conductor side clearances.

(iii) If an underground or underwater interconnection is proposed, the following additional information must also be provided: (A) Burial depth; (B) type of cable and a description of any required supporting equipment, such as insulation medium pressurizing or forced cooling; and (C) cathodic protection scheme. Technical diagrams which

provide clarification of any of the above items should be included.

(2) A general area map with a scale not greater than 1 inch=40 kilometers (1 inch=25 miles) showing the overall system, and a detailed map at a scale of 1 inch=8 kilometers (1 inch=5 miles) showing the physical location, longitude and latitude of the facility on the international border. The map shall indicate ownership of the facilities at or on each side of the border between the United States and the foreign country. The maps, plans, and description of the facilities shall distinguish the facilities or parts thereof already constructed from those to be constructed.

(3) Applications for the bulk power supply facility which is proposed to be operated at 138 kilovolts or higher shall contain the following bulk power system information:

(i) Data regarding the expected power transfer capability, using normal and short time emergency conductor ratings;

(ii) System power flow plots for the applicant's service area for heavy summer and light spring load periods, with and without the proposed international interconnection, for the year the line is scheduled to be placed in service and for the fifth year thereafter. The power flow plots submitted can be in the format customarily used by the utility, but the ERA requires a detailed legend to be included with the power flow plots;

(iii) Data on the line design features for minimizing television and/or radio interference caused by operation of the subject transmission facilities;

(iv) A description of the relay protection scheme, including equipment and proposed functional devices;

(v) After receipt of the system power flow plots, the ERA may require the applicant to furnish system stability analysis for the applicant's system.

(c) Information regarding the environmental impacts shall be provided as follows for each routing alternative:

(1) Statement of the environmental impacts of the proposed facilities including a list of each flood plain, wetland, critical wildlife habitat, navigable waterway crossing, Indian land, or historic site which may be impacted by the proposed facility with a description of proposed activities therein.

(2) A list of any known Historic Places, as specified in 36 CFR part 800, which may be eligible for the National Register of Historic Places.

(3) Details regarding the minimum right-of-way width for construction, operation and maintenance of the transmission lines and the rationale for selecting that right-of-way width.

(4) A list of threatened or endangered wildlife or plant life which may be located in the proposed alternative.

(d) A brief description of all practical alternatives to the proposed facility and a discussion of the general environmental impacts of each alternative.

(e) The original of each application shall be signed and verified under oath by an officer of the applicant, having knowledge of the matters therein set forth.

§ 205.323 Transferability.

(a) Neither a permit issued by the ERA pursuant to Executive Order 10485, as amended, nor the facility shall be transferable or assignable. Provided written notice is given to the ERA within 30 days, the authorization may continue in effect temporarily in the event of the involuntary transfer of the facility by operation of law (including transfers to receivers, trustees, or purchases under foreclosure or judicial sale). This continuance is contingent on the filing of an application for a new permit and may be effective until a decision is made thereon.

(b) In the event of a proposed voluntary transfer of the facility, the permittee and the party to whom the transfer would be made shall file a joint application with the ERA pursuant to this paragraph, setting forth information as required by § 205.320 *et seq.*, together with a statement of reasons for the transfer. The application shall be accompanied by a filing fee pursuant to § 205.326.

(c) No substantial change shall be made in any facility authorized by permit or in the operation thereof unless or until such change has been approved by the ERA.

(d) Permits may be modified or revoked without notice by the President

of the United States, or by the Administrator of the ERA after public notice.

§ 205.324 Form and style; number of copies.

All applicants shall file an original and two conformed copies of the application and all accompanying documents required under §§ 205.320 through 205.327.

§ 205.325 Annual report.

Persons receiving permits to construct, connect, operate or maintain electric transmission facilities at international boundaries shall submit to the ERA, by February 15 each year, a report covering each month of the preceding calendar year, detailing by category the gross amount of kilowatthours of energy received or delivered and the cost and revenue associated with each category.

§ 205.326 Filing procedures and fees.

Applications shall be forwarded to the Office of Utility Systems of the Economic Regulatory Administration and shall be accompanied by a filing fee of $150. The application fee will be charged irrespective of the ERA's disposition of the application. Fee payment shall be by check, draft, or money order payable to the Treasurer of the United States. Copies of applications shall be furnished to the Federal Energy Regulatory Commission and all affected State public utility regulatory agencies.

§ 205.327 Other information.

The applicant may be required after filing the application to furnish such supplemental information as the ERA may deem pertinent. Such requests shall be written and a prompt response will be expected. Protest regarding the supplying of such information should be directed to the Administrator of the ERA.

§ 205.328 Environmental requirements for Presidential Permits—Alternative 1.

(a) *NEPA Compliance.* Except as provided in paragraphs (c) and (e) of this section, when an applicant seeks a Presidential Permit, such applicant will be responsible for the costs of preparing any necessary environmental document, including an Environmental Impact Statement (EIS), arising from ERA's obligation to comply with the National Environmental Policy Act of 1969 (NEPA). ERA will determine whether an environmental assessment (EA) or EIS is required within 45 days of the receipt of the Presidential Permit application and of environmental information submitted pursuant to 10 CFR 205.322 (c) and (d). ERA will use these and other sources of information as the basis for making the environmental determination:

(1) If an EIS is determined to be necessary, the applicant shall enter into a contract with an independent third party, which may be a Government-owned, contractor-operated National Laboratory, or a qualified private entity selected by ERA. The third party contractor must be qualified to conduct an environmental review and prepare an EIS, as appropriate, under the supervision of ERA, and may not have a financial or other interest in the outcome of the proceedings. The NEPA process must be completed and approved before ERA will issue a Presidential Permit.

(2) If an EA is determined to be necessary, the applicant may be permitted to prepare an environmental assessment pursuant to 10 CFR 1506.5(b) for review and adoption by ERA, or the applicant may enter into a third party contract as set forth in this section.

(b) *Environmental Review Procedure.* Except as provided in paragraphs (c) and (e) of this section, environmental documents, including the EIS, where necessary, will be prepared utilizing the process set forth above. ERA, the applicant, and the independent third party, which may be a Government-owned, contractor-operated National Laboratory or a private entity, shall enter into an agreement in which the applicant will engage and pay directly for the services of the qualified third party to prepare the necessary environmental documents. The agreement shall outline the responsibilities of each party and its relationship to the other two parties regarding the work to be done or supervised. ERA shall approve the information to be developed and supervise the gathering, analysis

and presentation of the information. In addition, ERA will have the authority to approve and modify any statement, analysis, and conclusion contained in the environmental documents prepared by the third party. Before commencing preparation of the environmental document the third party will execute an ERA-prepared disclosure document stating that it does not have any conflict of interest, financial or otherwise, in the outcome of either the environmental process or the Permit application.

(c) *Financial Hardship.* Whenever ERA determines that a project is no longer economically feasible, or that a substantial financial burden would be imposed by the applicant bearing all of the costs of the NEPA studies, ERA may waive the requirement set forth in paragraphs (a) and (b) of this section and perform the necessary environmental review, completely or in part, with its own resources.

(d) *Discussions Prior to Filing.* Prior to the preparation of any Presidential Permit application and environmental report, a potential applicant is encouraged to contact ERA and each affected State public utility regulatory agency to discuss the scope of the proposed project and the potential for joint State and Federal environmental review.

(e) *Federal Exemption.* Upon a showing by the applicant that it is engaged in the transaction of official business of the Federal Government in filing the application pursuant to 10 CFR 205.320 *et seq.,* it will be exempt from the requirements of this section.

[48 FR 33819, July 25, 1983]

§ 205.329 Environmental requirements for Presidential Permits—Alternative 2.

(a) *NEPA Compliance.* Except as provided in paragraph (b) and (e) of this section, applicants seeking Presidential Permits will be financially responsible for the expenses of any contractor chosen by ERA to prepare any necessary environmental document arising from ERA's obligation to comply with the National Environmental Policy Act of 1969 (NEPA) in issuing such Presidential Permits:

(1) ERA will determine whether an Environmental Impact Statement (EIS) or an Environmental Assessment (EA) is required within 45 days of receipt of the Presidential Permit application and of the environmental information submitted pursuant to 10 CFR 205.322 (c) and (d). ERA will use these and other sources of information as the basis for making the environmental determination.

(2) If an EIS is determined to be necessary, ERA will notify the applicant of the fee for completing the EIS within 90 days after the submission of the application and environmental information. The fee shall be based on the expenses estimated to be incurred by DOE in contracting to prepare the EIS (*i.e.,* the estimated fee charges to ERA by the contractor). DOE employee salaries and other fixed costs, as set forth in OMB Circular A–25, shall not be included in the applicant's fee. Fee payment shall be by check, draft, or money order payable to the Treasurer of the United States, and shall be submitted to ERA. Upon submission of fifty percent of the environmental fee, ERA will provide to the applicant a tentative schedule for completion of the EIS.

(3) If an EA is determined to be necessary, the applicant may be permitted to prepare an environmental assessment pursuant to 40 CFR 1506.5(b) for review and adoption by ERA, or the applicant may choose to have ERA prepare the EA pursuant to the fee procedures set forth above.

(4) The NEPA process must be completed and approved before ERA will issue a Presidential Permit.

(b) *Financial Hardship.* Whenever ERA determines that a project is no longer economically feasible, or that a substantial financial burden would be imposed by the applicant bearing all of the costs of the NEPA studies, ERA may waive the requirement set forth in paragraphs (a) and (b) of this section and perform the necessary environmental review, completely or in part, with its own resources.

(c) *Discussions Prior to Filing.* Prior to the preparation of any Presidential Permit application and environmental

assessment, a potential applicant is encouraged to contact ERA and each affected State public utility regulatory agency to discuss the scope of the proposed project and the potential for joint State and Federal environmental review.

(d) *Fee Payment*. The applicant shall make fee payment for completing the EIS to ERA in the following manner:

(1) 50 percent of the total amount due to be paid within 30 days of receipt of the fee information from DOE;

(2) 25 percent to be paid upon publication of the draft EIS; and

(3) 25 percent to be paid upon publication of the final EIS.

If costs are less than the amount collected, ERA will refund to the applicant the excess fee collected. If costs exceed the initial fee, ERA will fund the balance, unless the increase in costs is caused by actions or inactions of the applicant, such as the applicant's failure to submit necessary environmental information in a timely fashion. If the application is withdrawn at any stage prior to issuance of the final EIS, the fee will be adjusted to reflect the costs actually incurred; payment shall be made by the applicant within 30 days of above referenced events.

(e) *Federal Exemption*. Upon a showing by the applicant that it is engaged in the transaction of official business of the Federal Government in filing an application pursuant to 10 CFR 205.320 *et seq.*, it will be exempt from the requirements of this section.

[48 FR 33820, July 25, 1983]

REPORT OF MAJOR ELECTRIC UTILITY SYSTEM EMERGENCIES

AUTHORITY: Department of Energy Organization Act, Pub. L. 95–91 (42 U.S.C. 7101); Federal Power Act, Pub. L. 66–280 (16 U.S.C. 791 *et seq.*)

SOURCE: Sections 205.350 through 205.353 appear at 51 FR 39745, Oct. 31, 1986, unlesss otherwise noted.

§ 205.350 General purpose.

The purpose of this rule is to establish a procedure for the Office of International Affairs and Energy Emergencies (IE) to obtain current information regarding emergency situations on the electric energy supply systems in the United States so that appropriate Federal emergency response measures can be implemented in a timely and effective manner. The data also may be utilized in developing legislative recommendations and reports to the Congress.

(Approved by the Office of Management and Budget under control number 1901–0288)

§ 205.351 Reporting requirements.

For the purpose of this section, a report or a part of a report may be made jointly by two or more entities. Every electric utility or other entity engaged in the generation, transmission or distribution of electric energy for delivery and/or sale to the public shall report promptly, through the DOE Emergency Operations Center, by telephone, the occurrence of any event such as described in paragraphs (a) through (d) of this section. These reporting procedures are mandatory. Entities that fail to comply within 24 hours will be contacted and reminded of their reporting obligation.

(a) *Loss of Firm System Loads,* caused by:

(1) Any load shedding actions resulting in the reduction of over 100 megawatts (MW) of *firm* customer load for reasons of maintaining the *continuity* of the bulk electric power supply system.

(2) Equipment failures/system operational actions attributable to the loss of *firm* system loads for a period in excess of 15 minutes, as described below:

(i) Reports from entities with a previous year recorded peak load of over 3000 MW are required for all such losses of *firm* loads which total over 300 MW.

(ii) Reports from all other entities are required for all such losses of *firm* loads which total over 200 MW or 50 percent of the system load being supplied immediately prior to the incident, whichever is less.

(3) Other events or occurrences which result in a continuous interruption for 3 hours or longer to over 50,000 customers, or more than 50 percent of the total customers being served immediately prior to the interruption, whichever is less.

(b) *Voltage Reductions or Public Appeals:*

(1) Reports are required for any anticipated or actual system voltage reductions of 3 percent or greater for purposes of maintaining the *continuity* of the bulk electric power supply system.

(2) Reports are required for any issuance of a public appeal to reduce the use of electricity for purposes of maintaining the *continuity* of the bulk electric power system.

(c) *Vulnerabilities that could Impact System Reliability:*

(1) Reports are required for any actual or suspected act(s) of physical sabotage (not vandalism) or terrorism directed at an electric power supply system, local or regional, in an attempt to either:

(i) Disrupt or degrade the service reliability of the local or regional bulk electric power supply system, or

(ii) Disrupt, degrade, or deny bulk electric power service to:

(A) A specific facility (industrial, military, governmental, private), or

(B) A specific service (transportation, communications), or

(C) A specific locality (town, city, county).

(2) Reports are required for any abnormal emergency system operating condition(s) or other event(s) which in the judgment of the reporting entity could or would constitute a hazard to maintaining the *continuity* of the bulk electric power supply system. Examples will be provided in the DOE pamphlet on reporting procedures.

(d) *Fuel Supply Emergencies:*

(1) Reports are required for any anticipated or existing fuel supply emergency situation which would threaten the *continuity* of the bulk electric power supply system, such as:

(i) Fuel stocks or hydro project water storage levels are at 50 percent (or less) of normal for that time of the year, and a continued downward trend is projected.

(ii) Unscheduled emergency generation is dispatched causing an abnormal use of a particular fuel type, such that the future supply or stocks of that fuel could reach a level which threatens the reliability or adequacy of electric service.

(Approved by the Office of Management and Budget under control number 1901–0288)

§ 205.352 Information to be reported.

The emergency situation data shall be supplied to the DOE Emergency Operations Center in accordance with the current DOE pamphlet on reporting procedures. The initial report shall include the utility name; the area affected; the time of occurrence of the initiating event; the duration or an estimate of the likely duration; an estimate of the number of customers and amount of load involved; and whether any known critical services such as hospitals, military installations, pumping stations or air traffic control systems, were or are interrupted. To the extent known or reasonably suspected, the report shall include a description of the events initiating the disturbance. The DOE may require further clarification during or after restoration of service.

(Approved by the Office of Management and Budget under control number 1901–0288)

§ 205.353 Special investigation and reports.

If directed by the Director, Office of Energy Emergency Operations in writing and noticed in the FEDERAL REGISTER, a utility or other subject entity experiencing a condition described in § 205.351 above shall submit a full report of the technical circumstances surrounding a specific power system disturbance, including the restoration procedures utilized. The report shall be filed at such times as may be directed by the Director, Office of Energy Emergency Operations.

(Approved by the Office of Management and Budget under control number 1901–0288)

EMERGENCY INTERCONNECTION OF ELECTRIC FACILITIES AND THE TRANSFER OF ELECTRICITY TO ALLEVIATE AN EMERGENCY SHORTAGE OF ELECTRIC POWER

AUTHORITY: Department of Energy Organization Act, Pub. L. 95–91, 91 Stat. 565 (42 U.S.C. 7101). Federal Power Act, Pub. L. 66–280, 41 Stat. 1063 (16 U.S.C. 791(a))

SOURCE: Sections 205.370 through 205.379 appear at 46 FR 39987, Aug. 6, 1981, unless otherwise noted.

§ 205.370 Applicability.

Sections 202(c) and 202(d) of the Federal Power Act are applicable to any ''entity'' which owns or operates electric power generation, transmission or distribution facilities. An ''entity'' is a private or public corporation (utility), a governmental agency, a municipality, a cooperative or a lawful association of the foregoing. Under this section, the DOE has the authority to order the temporary connection of facilities, or the generation or delivery of electricity, which it deems necessary to alleviate an emergency. Such orders shall be effective for the time specified and will be subject to the terms and conditions the DOE specifies. The DOE retains the right to cancel, modify or otherwise change any order, with or without notice, hearing, or report. Requests for action under these regulations will be accepted from any ''entity,'' State Public Utility Commission, State Energy Agency, or State Governor. Actions under these regulations also may be initiated by the DOE on its own motion. Orders under this authority may be made effective without prior notice.

§ 205.371 Definition of emergency.

''Emergency,'' as used herein, is defined as an unexpected inadequate supply of electric energy which may result from the unexpected outage or breakdown of facilities for the generation, transmission or distribution of electric power. Such events may be the result of weather conditions, acts of God, or unforeseen occurrences not reasonably within the power of the affected ''entity'' to prevent. An emergency also can result from a sudden increase in customer demand, an inability to obtain adequate amounts of the necessary fuels to generate electricity, or a regulatory action which prohibits the use of certain electric power supply facilities. Actions under this authority are envisioned as meeting a specific inadequate power supply situation. Extended periods of insufficient power supply as a result of inadequate planning or the failure to construct necessary facilities can result in an emergency as contemplated in these regulations. In such cases, the impacted ''entity'' will be expected to make firm arrangements to resolve the problem until new facilities become available, so that a continuing emergency order is not needed. Situations where a shortage of electric energy is projected due solely to the failure of parties to agree to terms, conditions or other economic factors relating to service, generally will not be considered as emergencies unless the inability to supply electric service is imminent. Where an electricity outage or service inadequacy qualifies for a section 202(c) order, contractual difficulties alone will not be sufficient to preclude the issuance of an emergency order.

§ 205.372 Filing procedures; number of copies.

An original and two conformed copies of the applications and reports required under §§ 205.370 through 205.379 shall be filed with the Division of Power Supply and Reliability, Department of Energy. Copies of all documents also shall be served on:

(a) The Federal Energy Regulatory Commission;

(b) Any State Regulatory Agency having responsibility for service standards, or rates of the ''entities'' that are affected by the requested order;

(c) Each ''entity'' suggested as a potential source for the requested emergency assistance;

(d) Any ''entity'' that may be a potential supplier of transmission services;

(e) All other ''entities'' not covered under paragraphs (c) and (d) of this section which may be directly affected by the requested order; and

(f) The appropriate Regional Reliability Council.

§ 205.373 Application procedures.

Every application for an emergency order shall set forth the following information as required. This information shall be considered by the DOE in determining that an emergency exists and in deciding to issue an order pursuant to sections 202(c) and 202(d) of the Federal Power Act.

(a) The exact legal name of the applicant and of all other ''entities'' named in the application.

(b) The name, title, post office address, and telephone number of the person to whom correspondence in regard to the application shall be addressed.

(c) The political subdivision in which each ''entity'' named in the application operates, together with a brief description of the area served and the business conducted in each location.

(d) Each application for a section 202(c) order shall include the following baseline data:

(1) Daily peak load and energy requirements for each of the past 30 days and projections for each day of the expected duration of the emergency;

(2) All capacity and energy receipts or deliveries to other electric utilities for each of the past 30 days, indicating the classification for each transaction;

(3) The status of all interruptible customers for each of the past 30 days and the anticipated status of these customers for each day of the expected duration of the emergency, assuming both the granting and the denial of the relief requested herein;

(4) All scheduled capacity and energy receipts or deliveries to other electric utilities for each day of the expected duration of the emergency.

(e) A description of the situation and a discussion of why this is an emergency, including any necessary background information. This should include any contingency plan of the applicant and the current level of implementation.

(f) A showing that adequate electric service to firm customers cannot be maintained without additional power transfers.

(g) A description of any conservation or load reduction actions that have been implemented. A discussion of the achieved or expected results or these actions should be included.

(h) A description of efforts made to obtain additional power through voluntary means and the results of such efforts; and a showing that the potential sources of power and/or transmission services designated pursuant to paragraphs (i) through (k) of this section informed that the applicant believed that an emergency existed within the meaning of § 205.371.

(i) A listing of proposed sources and amounts of power necessary from each source to alleviate the emergency and a listing of any other ''entities'' that may be directly affected by the requested order.

(j) Specific proposals to compensate the supplying ''entities'' for the emergency services requested and to compensate any transmitting ''entities'' for services necessary to deliver such power.

(k) A showing that, to the best of the applicant's knowledge, the requested relief will not unreasonably impair the reliability of any ''entity'' directly affected by the requested order to render adequate service to its customers.

(l) Description of the facilities to be used to transfer the requested emergency service to the applicant's system.

(1) If a temporary interconnection under the provisions of section 202(c) is proposed independently, the following additional information shall be supplied for each such interconnection:

(i) Proposed location;

(ii) Required thermal capacity or power transfer capability of the interconnection;

(iii) Type of emergency services requested, including anticipated duration;

(iv) An electrical one line diagram;

(v) A description of all necessary materials and equipment; and

(vi) The projected length of time necessary to complete the interconnection.

(2) If the requested emergency assistance is to be supplied over existing facilities, the following information shall be supplied for each existing interconnection:

(i) Location;

(ii) Thermal capacity of power transfer capability of interconnection facilities; and

(iii) Type and duration of emergency services requested.

(m) A general or key map on a scale not greater than 100 kilometers to the centimeter showing, in separate colors, the territory serviced by each ''entity'' named in the application; the location of the facilities to be used for the generation and transmission of the requested emergency service; and all connection points between systems.

(n) An estimate of the construction costs of any proposed temporary facilities and a statement estimating the expected operation and maintenance costs on an annualized basis. (Not required on section 202(d) applications.)

(o) Applicants may be required to furnish such supplemental information as the DOE may deem pertinent.

§ 205.374 Responses from "entities" designated in the application.

Each ''entity'' designated as a potential source of emergency assistance or as a potential supplier of transmission services and which has received a copy of the application under § 205.373, shall have three (3) calendar days from the time of receipt of the application to file the information designated below with the DOE. The DOE will grant extensions of the filing period when appropriate. The designated ''entities'' shall provide an analysis of the impact the requested action would have on its system reliability and its ability to supply its own interruptible and firm customers. The effects of the requested action on the ability to serve firm loads shall be clearly distinguished from the ability to serve contractually interruptible loads. The designated ''entity'' also may provide other information relevant to the requested action, which is not included in the reliability analysis. Copies of any response shall be provided to the applicant, the Federal Energy Regulatory Commission, any State Regulatory Agency having responsibility for service standards or rates of any ''entity'' that may be directly involved in the proposed action, and the appropriate Regional Electric Reliability Council. Pursuant to section 202(c) of the Federal Power Act, DOE may issue an emergency order even though a designated ''entity'' has failed to file a timely response.

§ 205.375 Guidelines defining inadequate fuel or energy supply.

An inadequate utility system fuel inventory or energy supply is a matter of managerial and engineering judgment based on such factors as fuels in stock, fuels en route, transportation time, and constraints on available storage facilities. A system may be considered to have an inadequate fuel or energy supply capability when, combined with other conditions, the projected energy deficiency upon the applicant's system without emergency action by the DOE, will equal or exceed 10 percent of the applicant's then normal daily net energy for load, or will cause the applicant to be unable to meet its normal peak load requirements based upon use of all of its otherwise available resources so that it is unable to supply adequate electric service to its ultimate customers. The following conditions will be considered in determining that a system has inadequate fuel or energy supply capability:

(1) System coal stocks are reduced to 30 days (or less) of normal burn days and a continued downward trend in stock is projected;

(2) System residual oil stocks are reduced to 15 days (or less) of normal burn days and a continued downward trend in stocks is projected;

(3) System distillate oil stocks which cannot be replaced by alternate fuels are reduced to 15 days (or less) of normal burn days and a continued downward trend in stocks is projected;

(4) System natural gas deliveries which cannot be replaced by alternate fuels have been or will be reduced 20 percent below normal requirements and no improvement in natural gas deliveries is projected within 30 days;

(5) Delays in nuclear fuel deliveries will extend a scheduled refueling shutdown by more than 30 days; and

(6) Water supplies required for power generation have been reduced to the level where the future adequacy of the power supply may be endangered and no near term improvement in water supplies is projected.

The use of the prescribed criteria does not preclude an applicant from claiming the existence of an emergency when its stocks of fuel or water exceed the amounts and time frames specified above.

§ 205.376 Rates and charges.

The applicant and the generating or transmitting systems from which emergency service is requested are encouraged to utilize the rates and charges contained in approved existing rate schedules or to negotiate mutually satisfactory rates for the proposed

transactions. In the event that the DOE determines that an emergency exists under section 202(c), and the ''entities'' are unable to agree on the rates to be charged, the DOE shall prescribe the conditions of service and refer the rate issues to the Federal Energy Regulatory Commission for determination by that agency in accordance with its standards and procedures.

§ 205.377 Reports.

In addition to the information specified below, the DOE may require additional reports as it deems necessary.

(a) Where the DOE has authorized the temporary connection of transmission facilities, all ''entities'' whose transmission facilities are thus temporarily interconnected shall report the following information to the DOE within 15 days following completion of the interconnection:

(1) The date the temporary interconnection was completed;

(2) The location of the interconnection;

(3) A description of the interconnection; and

(4) A one-line electric diagram of the interconnection.

(b) Where the DOE orders the transfer of power, the ''entity'' receiving such service shall report the following information to the DOE by the 10th of each month for the preceding month's activity for as long as such order shall remain in effect:

(1) Amounts of capacity and/or energy received each day;

(2) The name of the supplier;

(3) The name of any ''entity'' supplying transmission services; and

(4) Preliminary estimates of the associated costs.

(c) Where the DOE has approved the installation of permanent facilities that will be used only during emergencies, any use of such facilities shall be reported to the DOE within 24 hours. Details of such usage shall be furnished as deemed appropriate by the DOE after such notification.

(d) Any substantial change in the information provided under § 205.373 shall be promptly reported to the DOE.

(Approved by the Office of Management and Budget under Control No. 1904–0066)

[46 FR 39989, Aug. 6, 1981, as amended at 46 FR 63209, Dec. 31, 1981]

§ 205.378 Disconnection of temporary facilities.

Upon the termination of any emergency for the mitigation of which the DOE ordered the construction of temporary facilities, such facilities shall be disconnected and any temporary construction removed or otherwise disposed of, unless application is made as provided in § 205.379 for permanent connection for emergency use. This disconnection and removal of temporary facilities shall be accomplished within 30 days of the termination of the emergency unless an extension is granted by the DOE. The DOE shall be notified promply when such removal of facilities is completed.

§ 205.379 Application for approval of the installation of permanent facilities for emergency use only.

Application for DOE approval of a permanent connection for emergency use only shall conform with the requirements in § 205.373. However, the baseline data specified in § 205.373(d) need not be included in an application made under this section. In addition, the application shall state in full the reasons why such permanent connection for emergency use is in the public interest.

PART 207—COLLECTION OF INFORMATION

Subpart A—Collection of Information Under the Energy Supply and Environmental Coordination Act of 1974

Sec.

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AUTHORITY: 15 U.S.C. 787 *et seq.*; 15 U.S.C. 791 *et seq.*; E.O. 11790, 39 FR 23185; 28 U.S.C. 2461 note.

SOURCE: 40 FR 18409, Apr. 28, 1975, unless otherwise noted.

Subpart A—Collection of Information Under the Energy Supply and Environmental Coordination Act of 1974

§ 207.1 Purpose.

The purpose of this subpart is to set forth the manner in which energy information which the Administrator is authorized to obtain by sections 11 (a) and (b) of ESECA will be collected.

§ 207.2 Definitions.

As used in this subpart:

Administrator means the Federal Energy Administrator of his delegate.

Energy information includes all information in whatever form on (1) fuel reserves, exploration, extraction, and energy resources (including petrochemical feedstocks) wherever located; (2) production, distribution, and consumption of energy and fuels, wherever carried on; and (3) matters relating to energy and fuels such as corporate structure and proprietary relationships, costs, prices, capital investment, and assets, and other matters directly related thereto, wherever they exist.

ESECA means the Energy Supply and Environmental Coordination Act of 1974 (Pub. L. 93–319).

EPAA means the Emergency Petroleum Allocation Act of 1973 (Pub. L. 93–159).

DOE means the Department of Energy.

Person means any natural person, corporation, partnership, association, consortium, or any entity organized for a common business purpose, wherever situated, domiciled, or doing business, who directly or through other persons subject to their control does business in any part of the United States.

United States, when used in the geographical sense, means the States, the District of Columbia, Puerto Rico, and the territories and possessions of the United States.

§ 207.3 Method of collecting energy information under ESECA.

(a) Whenever the Administrator determines that:

(1) Certain energy information is necessary to assist in the formulation of energy policy or to carry out the purposes of the ESECA of the EPAA; and

(2) Such energy information is not available to DOE under the authority of statutes other than ESECA or that such energy information should, as a matter of discretion, be collected under the authority of ESECA;

He shall require reports of such information to be submitted to DOE at least every ninety calendar days.

(b) The Administrator may require such reports of any person who is engaged in the production, processing, refining, transportation by pipeline, or distribution (at other than the retail level) of energy resources.

(c) The Administrator may require such reports by rule, order, questionnaire, or such other means as he determines appropriate.

(d) Whenever reports of energy information are requested under this subpart, the rule, order, questionnaire, or other means requesting such reports shall contain (or be accompanied by) a recital that such reports are being requested under the authority of ESECA.

(e) In addition to requiring reports, the Administrator may, at his discretion, in order to obtain energy information under the authority of ESECA:

(1) Sign and issue subpoenas in accordance with the provisions of § 205.8 of this chapter for the attendance and testimony of witnesses and the production of books, records, papers, and other documents;

(2) Require any person, by rule or order, to submit answers in writing to interrogatories, requests for reports or for other information, with such answers or other submissions made within such reasonable period as is specified in the rule or order, and under oath; and

(3) Administer oaths.

Any such subpoena or rule or order shall contain (or be accompanied by) a

recital that energy information is requested under the authority of ESECA.

(f) For the purpose of verifying the accuracy of any energy information requested, acquired, or collected by the DOE, the Administrator, or any officer or employee duly designated by him, upon presenting appropriate credentials and a written notice from the Administrator to the owner, operator, or agent in charge, may—

(1) Enter, at reasonable times, any business premise of facility; and

(2) Inspect, at reasonable times and in a reasonable manner, any such premise or facility, inventory and sample any stock of energy resources therein, and examine and copy books, records, papers, or other documents, relating to any such energy information.

Such written notice shall reasonably describe the premise or facility to be inspected, the stock to be inventoried or sampled, or the books, records, papers or other documents to be examined or copied.

§ 207.4 Confidentiality of energy information.

(a) Information obtained by the DOE under authority of ESECA shall be available to the public in accordance with the provisions of part 202 of this chapter. Upon a showing satisfactory to the Administrator by any person that any energy information obtained under this subpart from such person would, if made public, divulge methods or processes entitled to protection as trade secrets or other proprietary information of such person, such information, or portion thereof, shall be deemed confidential in accordance with the provisions of section 1905 of title 18, United States Code; except that such information, or part thereof, shall not be deemed confidential pursuant to that section for purposes of disclosure, upon request, to (1) any delegate of the DOE for the purpose of carrying out ESECA or the EPAA, (2) the Attorney General, the Secretary of the Interior, the Federal Trade Commission, the Federal Power Commission, or the General Accounting Office, when necessary to carry out those agencies' duties and responsibilities under ESECA and other statutes, and (3) the Congress, or any Committee of Congress upon request of the Chairman.

(b) Whenever the Administrator requests reports of energy information under this subpart, he may specify (in the rule, order or questionnaire or other means by which he has requested such reports) the nature of the showing required to be made in order to satisfy DOE that certain energy information contained in such reports warrants confidential treatment in accordance with this section. He shall, to the maximum extent practicable, either before or after requesting reports, by ruling or otherwise, inform respondents providing energy information pursuant to this subpart of whether such information will be made available to the public pursuant to requests under the Freedom of Information Act (5 U.S.C. 552).

§ 207.5 Violations.

Any practice that circumvents or contravenes or results in a circumvention or contravention of the requirements of any provision of this subpart or any order issued pursuant thereto is a violation of the DOE regulations stated in this subpart.

§ 207.6 Notice of probable violation and remedial order.

(a) *Purpose and scope.* (1) This section establishes the procedures for determining the nature and extent of violations of this subpart and the procedures for issuance of a notice of probable violation, a remedial order or a remedial order for immediate compliance.

(2) When the DOE discovers that there is reason to believe a violation of any provision of this subpart, or any order issued thereunder, has occurred, is continuing or is about to occur, the DOE may conduct proceedings to determine the nature and extent of the violation and may issue a remedial order thereafter. The DOE may commence such proceeding by serving a notice of probable violation or by issuing a remedial order for immediate compliance.

(b) *Notice of probable violation.* (1) The DOE may begin a proceeding under this subpart by issuing a notice of probable

violation if the DOE has reason to believe that a violation has occurred, is continuing, or is about to occur.

(2) Within 10 days of the service of a notice of probable violation, the person upon whom the notice is served may file a reply with the DOE office that issued the notice of probable violation at the address provided in §205.12 of this chapter. The DOE may extend the 10-day period for good cause shown.

(3) The reply shall be in writing and signed by the person filing it. The reply shall contain a full and complete statement of all relevant facts pertaining to the act or transaction that is the subject of the notice of probable violation. Such facts shall include a complete statement of the business or other reasons that justify the act or transaction, it appropriate; a detailed description of the act or transaction; and a full discussion of the pertinent provisions and relevant facts reflected in any documents submitted with the reply. Copies of all relevant documents shall be submitted with the reply.

(4) The reply shall include a discussion of all relevant authorities, including, but not limited to, DOE rulings, regulations, interpretations, and decisions on appeals and exceptions relied upon to support the particular position taken.

(5) The reply should indicate whether the person requests or intends to request a conference regarding the notice. Any request not made at the time of the reply shall be made as soon thereafter as possible to insure that the conference is held when it will be most beneficial. A request for a conference must conform to the requirements of subpart M of part 205 of this chapter.

(6) If a person has not filed a reply with the DOE within the 10-day period provided, and the DOE has not extended the 10-day period, the person shall be deemed to have conceded the accuracy of the factual allegations and legal conclusions stated in the notice of probable violation.

(7) If the DOE finds, after the 10-day period provided in §207.6(b)(2), that no violation has occurred, is continuing, or is about to occur, or that for any reason the issuance of a remedial order would not be appropriate, it shall notify, in writing, the person to whom a notice of probable violation has been issued that the notice is rescinded.

(c) *Remedial order.* (1) If the DOE finds, after the 10-day period provided in §207.6(b)(2), that a violation has occurred, is continuing, or is about to occur, the DOE may issue a remedial order. The order shall include a written opinion setting forth the relevant facts and the legal basis of the remedial order.

(2) A remedial order issued under this subpart shall be effective upon issuance, in accordance with its terms, until stayed, suspended, modified or rescinded. The DOE may stay, suspend, modify or rescind a remedial order on its own initiative or upon application by the person to whom the remedial order is issued. Such action and application shall be in accordance with the procedures for such proceedings provided for in part 205 of this chapter.

(3) A remedial order may be referred at any time to the Department of Justice for appropriate action in accordance with §207.7.

(d) *Remedial order for immediate compliance.* (1) Notwithstanding paragraphs (b) and (c) of this section, the DOE may issue a remedial order for immediate compliance, which shall be effective upon issuance and until rescinded or suspended, if it finds:

(i) There is a strong probability that a violation has occurred, is continuing or is about to occur;

(ii) Irreparable harm will occur unless the violation is remedied immediately; and

(iii) The public interest requires the avoidance of such irreparable harm through immediate compliance and waiver of the procedures afforded under paragraphs (b) and (c) of this section.

(2) A remedial order for immediate compliance shall be served promptly upon the person against whom such order is issued by telex or telegram, with a copy served by registered or certified mail. The copy shall contain a written statement of the relevant facts and the legal basis for the remedial order for immediate compliance, including the findings required by paragraph (d)(1) of this section.

(3) The DOE may rescind or suspend a remedial order for immediate compliance if it appears that the criteria set forth in paragraph (d)(1) of this section are no longer satisfied. When appropriate, however, such a suspension or rescission may be accompanied by a notice of probable violation issued under paragraph (b) of this section.

(4) If at any time in the course of a proceeding commenced by a notice of probable violation the criteria set forth in paragraph (d)(1) of this section are satisfied, the DOE may issue a remedial order for immediate compliance, even if the 10-day period for reply specified in § 207.6(b)(2) of this part has not expired.

(5) At any time after a remedial order for immediate compliance has become effective the DOE may refer such order to the Department of Justice for appropriate action in accordance with § 207.7 of this part.

(e) *Remedies.* A remedial order or a remedial order for immediate compliance may require the person to whom it is directed to take such action as the DOE determines is necessary to eliminate or to compensate for the effects of a violation.

(f) *Appeal.* (1) No notice of probable violation issued pursuant to this subpart shall be deemed to be an action of which there may be an administrative appeal.

(2) Any person to whom a remedial order or a remedial order for immediate compliance is issued under this subpart may file an appeal with the DOE Office of Exceptions and Appeals in accordance with the procedures for such appeal provided in subpart H of part 205 of this chapter. The appeal must be filed within 10 days of service of the order from which the appeal is taken.

§ 207.7 Sanctions.

(a) *General.* (1) Penalties and sanctions shall be deemed cumulative and not mutually exclusive.

(2) Each day that a violation of the provisions of this subpart or any order issued pursuant thereto continues shall be deemed to constitute a separate violation within the meaning of the provisions of this subpart relating to criminal fines and civil penalties.

(b) *Criminal penalties.* Any person who willfully violates any provision of this subpart or any order issued pursuant thereto shall be subject to a fine of not more than $5,000 for each violation. Criminal violations are prosecuted by the Department of Justice upon referral by the DOE.

(c) *Civil Penalties.* (1) Any person who violates any provision of this subpart or any order issued pursuant thereto shall be subject to a civil penalty of not more than $2,750 for each violation. Actions for civil penalties are prosecuted by the Department of Justice upon referral by the DOE.

(2) When the DOE considers it to be appropriate or advisable, the DOE may compromise and settle, and collect civil penalties.

[40 FR 18409, Apr. 28, 1975, as amended at 62 FR 46183, Sept. 2, 1997]

§ 207.8 Judicial actions.

(a) *Enforcement of subpoenas; contempt.* Any United States district court within the jurisdiction of which any inquiry is carried on may, upon petition by the Attorney General at the request of the Administrator, in the case of refusal to obey a subpoena or order of the Administrator issued under this subpart, issue an order requiring compliance. Any failure to obey such an order of the court may be punished by the court as contempt.

(b) *Injunctions.* Whenever it appears to the Administrator that any person has engaged, is engaged, or is about to engage in any act or practice constituting a violation of any regulation or order issued under this subpart, the Administrator may request the Attorney General to bring a civil action in the appropriate district court of the United States to enjoin such acts or practices and, upon a proper showing, a temporary restraining order or preliminary or permanent injunction shall be granted without bond. The relief sought may include a mandatory injunction commanding any person to comply with any provision of such order or regulation, the violation of which is prohibited by section 12(a) of ESECA, as implemented by this subpart.

§ 207.9 Exceptions, exemptions, interpretations, rulings and rulemaking.

Applications for exceptions, exemptions or requests for interpretations relating to this subpart shall be filed in accordance with the procedures provided in subparts D, E and F, respectively, of part 205 of this chapter. Rulings shall be issued in accordance with the procedures of subpart K of part 205 of this chapter. Rulemakings shall be undertaken in accordance with the procedures provided in subpart L of part 205 of this chapter.

PART 209—INTERNATIONAL VOLUNTARY AGREEMENTS

Subpart A—General Provisions

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Subpart D—Availability of Information Relating to Meetings and Communications

209.41 Availability of information relating to meetings and communications.

AUTHORITY: Federal Energy Administration Act of 1974, Pub. L. 93–275; E.O. 11790, 39 FR 23185; Energy Policy and Conservation Act, Pub. L. 94–163.

SOURCE: 41 FR 6754, Feb. 13, 1976, unless otherwise noted.

Subpart A—General Provisions

§ 209.1 Purpose and scope.

This part implements the provisions of the Energy Policy and Conservation Act (EPCA) authorizing the Administrator to prescribe standards and procedures by which persons engaged in the business of producing, transporting, refining, distributing, or storing petroleum may develop and carry out voluntary agreements, and plans of action which are required to implement the information and allocation provisions of the International Energy Program (IEP). The requirements of this part do not apply to activities other than those for which section 252 of EPCA makes available a defense to the antitrust laws.

§ 209.2 Delegation.

To the extent otherwise permitted by law, any authority, duty, or responsibility vested in DOE or the Administrator under these regulations may be delegated to any regular full-time employee of the Department of Energy, and, by agreement, to any regular full-time employee of the Department of Justice or the Department of State.

§ 209.3 Definitions.

For purposes of this part—

(a) *Administrator* means the Administrator of the Department of Energy.

(b) *Information and allocation provisions of the International Energy Program* means the provisions of chapter V of the Program relating to the Information System, and the provisions at chapters III and IV thereof relating to the international allocation of petroleum.

(c) *International Energy Agency* (IEA) means the International Energy Agency established by Decision of the Council of the Organization for Economic Cooperation and Development, dated November 15, 1974.

(d) *International Energy Program* (IEP) means the program established pursuant to the Agreement on an International Energy Program signed at Paris on November 18, 1974, including (1) the Annex entitled ''Emergency Reserves'', (2) any amendment to such Agreement which includes another nation as a Party to such Agreement, and (3) any technical or clerical amendment to such Agreement.

(e) *International energy supply emergency* means any period (1) beginning on any date which the President determines allocation of petroleum products to nations participating in the international energy program is required by

chapters III and IV of such program, and (2) ending on a date on which he determines such allocation is no longer required. Such a period shall not exceed 90 days, except where the President establishes one or more additional periods by making the determination under paragraph (e)(1) of this section.

(f) *Potential participant* means any person engaged in the business of producing, transporting, refining, distributing, or storing petroleum products; ''participant'' means any such person who agrees to participate in a voluntary agreement pursuant to a request to do so by the Administrator.

(g) *Petroleum* or *petroleum products* means crude oil, residual fuel oil, or any refined petroleum product (including any natural gas liquid and any natural gas liquid product).

Subpart B—Development of Voluntary Agreements

§ 209.21 Purpose and scope.

(a) This subpart establishes the standards and procedures by which persons engaged in the business of producing, transporting, refining, distributing. or storing petroleum products shall develop voluntary agreements which are required to implement the allocation and information provisions of the International Energy Program.

(b) This subpart does not apply to meetings of bodies created by the International Energy Agency.

§ 209.22 Initiation of meetings.

(a) Any meeting held for the purpose of developing a voluntary agreement involving two or more potential participants shall be initiated and chaired by the Administrator or other regular full-time Federal employee designated by him.

(b) DOE shall provide notice of meetings held pursuant to this subpart, in writing, to the Attorney General, the Federal Trade Commission, and to the Speaker of the House and the President of the Senate for delivery to the appropriate committees of Congress, and to the public through publication in the FEDERAL REGISTER. Such notice shall identify the time, place, and agenda of the meeting, and such other matters as the Administrator deems appropriate. Notice in the FEDERAL REGISTER shall be published at least seven days prior to the date of the meeting.

§ 209.23 Conduct of meetings.

(a) Meetings to develop a voluntary agreement held pursuant to this subpart shall be open to all interested persons. Interested persons desiring to attend meetings under this subpart may be required pursuant to notice to advise the Administrator in advance.

(b) Interested persons may, as set out in notice provided by the Administrator, present data, views, and arguments orally and in writing, subject to such reasonable limitations with respect to the manner of presentation as the Administrator may impose.

§ 209.24 Maintenance of records.

(a) The Administrator shall keep a verbatim transcript of any meeting held pursuant to this subpart.

(b)(1) Except as provided in paragraphs (b) (2) through (4) of this section, potential participants shall keep a full and complete record of any communications (other than in a meeting held pursuant to this subpart) between or among themselves for the purpose of developing a voluntary agreement under this part. When two or more potential participants are involved in such a communication, they may agree among themselves who shall keep such record. Such record shall include the names of the parties to the communication and the organizations, if any, which they represent; the date of the communication; the means of communication; and a description of the communication in sufficient detail to convey adequately its substance.

(2) Where any communication is written (including, but not limited to, telex, telegraphic, telecopied, microfilmed and computer printout material), and where such communication demonstrates on it face that the originator or some other source furnished a copy of the communication to the Office of International Affairs, Department of Energy with the notation ''Voluntary Agreement'' marked on the first page of the document, no participant need record such a communication or send a further copy to the Department of Energy. The Department

of Energy may, upon written notice to potential participants, from time to time, or with reference to particular types of documents, require deposit with other offices or officials of the Department of Energy. Where such communication demonstrates that it was sent to the Office of International Affairs, Department of Energy with the notation ''Voluntary Agreement'' marked on the first page of the document, or such other offices or officials in the Department of Energy has designated pursuant to this section it shall satisfy paragraph (c) of this section, for the purpose of deposit with the Department of Energy.

(3) To the extent that any communication is procedural, administrative or ministerial (for example, if it involves the location of a record, the place of a meeting, travel arrangements, or similar matters), only a brief notation of the date, time, persons involved and description of the communication need be recorded.

(4) To the extent that any communication involves matters which recapitulate matters already contained in a full and complete record, the substance of such matters shall be identified, but need not be recorded in detail, provided that reference is made to the record and the portion thereof in which the substance is fully set out.

(c) Except where the Department of Energy otherwise provides, all records and transcripts prepared pursuant to paragraphs (a) and (b) of this section, shall be deposited within fifteen (15) days after the close of the month of their preparation together with any agreement resulting therefrom, with the Department of Energy, and shall be available to the Department of Justice, the Federal Trade Commission, and the Department of State. Such records and transcripts shall be available for public inspection and copying to the extent set forth in subpart D. Any person depositing material pursuant to this section shall indicate with particularity what portions, if any, the person believes are subject to disclosure to the public pursuant to subpart D and the reasons for such belief.

(d) Any meeting between a potential participant and an official of DOE for the purpose of developing a voluntary agreement shall, if not otherwise required to be recorded pursuant to this section, be recorded by such official as provided in § 204.5.

(Approved by the Office of Management and Budget under Control No. 1905–0079)

(Federal Energy Administration Act of 1974, Pub. L. 93–275, as amended, E.O. 11790, 39 FR 23185; E. O. 11930, 41 FR 32397; Energy Policy and Conservation Act, Pub. L. 94–163; E.O. 11912, 41 FR 15825; Department of Energy Organization Act, Pub. L. 95–91; 91 Stat. 565; E.O. 12009, 42 FR 46267)

[41 FR 6754, Feb. 13, 1976, as amended at 43 FR 12854, Mar. 28, 1978; 46 FR 63209, Dec. 31, 1981]

Subpart C—Carrying Out of Voluntary Agreements and Developing and Carrying Out of Plans of Actions

§ 209.31 Purpose and scope.

This subpart establishes the standards and procedures by which persons engaged in the business of producing, transporting, refining, distributing, or storing petroleum products shall carry out voluntary agreements and develop and carry out plans of action which are required to implement the allocation and information provisions of the International Energy Program.

§ 209.32 Initiation of meetings.

(a) Except for meetings of bodies created by the International Energy Agency, any meeting among participants in a voluntary agreement pursuant to this subpart, for the purpose of carrying out such voluntary agreement or developing or carrying out a plan of action pursuant thereto, shall be initiated and chaired by a full-time Federal employee designated by the Administrator.

(b) Except as provided in paragraph (c) of this section, the Administrator shall provide notice of meetings held pursuant to this subpart, in writing, to the Attorney General, the Federal Trade Commission, and to the Speaker of the House and the President of the Senate for delivery to the appropriate committees of Congress. Except during an international energy supply emergency, notice shall also be provided to the public through publication in the

FEDERAL REGISTER. Such notice shall identify the time, place, and agenda of the meeting. Notice in the FEDERAL REGISTER shall be published at least seven days prior to the date of the meeting unless emergency circumstances, IEP requirements or other unanticipated circumstances require the period to be shortened.

(c) During an international energy supply emergency, advance notice shall be given to the Attorney General, the Federal Trade Commission and to the Speaker of the House and the President of the Senate for delivery to the appropriate committees of Congress. Such notice may be telephonic or by such other means as practicable, and shall be confirmed in writing.

§ 209.33 Conduct of meetings.

(a) Subject to the provisions of paragraph (c) of this section, meetings held to carry out a voluntary agreement, or to develop or carry out a plan of action pursuant to this subpart, shall be open to all interested persons, subject to limitations of space. Interested persons desiring to attend meetings under this subpart may be required to advise the Administrator in advance.

(b) Interested persons permitted to attend meetings under this section may present data, views, and arguments orally and in writing, subject to such limitations with respect to the manner of presentation as the Administrator may impose.

(c) Meetings held pursuant to this subpart shall not be open to the public to the extent that the President or his delegate finds that disclosure of the proceedings beyond those authorized to attend would be detrimental to the foreign policy interests of the United States, and determines, in consultation with the Administrator, the Secretary of State, and the Attorney General, that a meeting shall not be open to interested persons or that attendance by interested persons shall be limited.

(d) The requirements of this section do not apply to meetings of bodies created by the International Energy Agency except that no participant in a voluntary agreement may attend any meeting of any such body held to carry out a voluntary agreement or to develop or to carry out a plan of action unless a full-time Federal employee is present.

§ 209.34 Maintenance of records.

(a) The Administrator or his delegate shall keep a verbatim transcript of any meeting held pursuant to this subpart except where (1) due to considerations of time or other overriding circumstances, the keeping of a verbatim transcript is not practicable, or (2) principal participants in the meeting are representatives of foreign governments. If any such record other than a verbatim transcript, is kept by a designee who is not a full-time Federal employee, that record shall be submitted to the full-time Federal employee in attendance at the meeting who shall review the record, promptly make any changes he deems necessary to make the record full and complete, and shall notify the designee of such changes.

(b)(1) Except as provided in paragraphs (b) (2) through (4) of this section, participants shall keep a full and complete record of any communication (other than in a meeting held pursuant to this subpart) between or among themselves or with any other member of a petroleum industry group created by the International Energy Agency, or subgroup thereof for the purpose of carrying out a voluntary agreement or developing or carrying out a plan of action under this subpart, except that where there are several communications within the same day involving the same participants, they may keep a cumulative record for the day. The parties to a communication may agree among themselves who shall keep such record. Such record shall include the names of the parties to the communication and the organizations, if any, which they represent; the date of communication; the means of communication, and a description of the communication in sufficient detail to convey adequately its substance.

(2) Where any communication is written (including, but not limited to, telex, telegraphic, telecopied, microfilmed and computer printout material), and where such communication demonstrates on its face that the originator or some other source furnished a

copy of the communication to the Office of International Affairs, Department of Energy with the notation ''Voluntary Agreement'' on the first page of the document, no participants need record such a communication or send a further copy to the Department of Energy. The Department of Energy may, upon written notice to participants, from time to time, or with reference to particular types of documents, require deposit with other offices or officials of the Department of Energy. Where such communication demonstrates that it was sent to the Office of International Affairs, Department of Energy with the notation ''Voluntary Agreement'' on the first page of the document, or such other offices or officials as the Department of Energy has designated pursuant to this section, it shall satisfy paragraph (c) of this section, for the purpose of deposit with the Department of Energy.

(3) To the extent that any communication is procedural, administrative or ministerial (for example, if it involves the location of a record, the place of a meeting, travel arrangements, or similar matters) only a brief notation of the date, time, persons involved and description of the communication need be recorded; except that during an IEA emergency allocation exercise or an allocation systems test such a non-substantive communication between members of the Industry Supply Advisory Group (ISAG) which occur within IEA headquarters need not be recorded.

(4) To the extent that any communication involves matters which recapitulate matters already contained in a full and complete record, the substance of such matters shall be identified, but need not be recorded in detail, provided that reference is made to the record and the portion thereof in which the substance is fully set out.

(c) Except where the Department of Energy otherwise provides, all records and transcripts prepared pursuant to paragraphs (a) and (b) of this section, shall be deposited within seven (7) days after the close of the week (ending Saturday) of their preparation during an international energy supply emergency or a test of the IEA emergency allocation system, and within fifteen (15) days after the close of the month of their preparation during periods of non-emergency, together with any agreement resulting therefrom, with the Department of Energy and shall be available to the Department of Justice, the Federal Trade Commission, and the Department of State. Such records and transcripts shall be available for public inspection and copying to the extent set forth in subpart D. Any person depositing materials pursuant to this section shall indicate with particularity what portions, if any, the person believes are not subject to disclosure to the public pursuant to subpart D and the reasons for such belief.

(d) Any meeting between a participant and an official of DOE for the purpose of carrying out a voluntary agreement or developing or carrying out a plan of action shall, if not otherwise required to be recorded pursuant to this section, be recorded by such official as provided in § 204.5.

(e) During international oil allocation under chapters III and IV of the IEP or during an IEA allocation systems test, the Department of Energy may issue such additional guidelines amplifying the requirements of these regulations as the Department of Energy determines to be necessary and appropriate.

(Approved by the Office of Management and Budget under Control No. 1905–0067)

(Federal Energy Administration Act of 1974, Pub. L. 93–275, as amended; E.O. 11790, 39 FR 23185; E.O. 11930, 41 FR 32397; Energy Policy and Conservation Act, Pub. L. 94–163; E.O. 11912, 41 FR 15825; Department of Energy Organization Act, Pub. L. 95–91, 91 Stat. 565, E.O. 12009, 42 FR 46267)

[41 FR 6754, Feb. 13, 1976, as amended at 43 FR 12854, Mar. 28, 1978; 46 FR 63209, Dec. 31, 1981]

Subpart D—Availability of Information Relating to Meetings and Communications

§ 209.41 Availability of information relating to meetings and communications.

(a) Except as provided in paragraph (b) of this section, records or transcripts prepared pursuant to this subpart shall be available for public inspection and copying in accordance

with section 552 of title 5, United States Code and part 202 of this title.

(b) Matter may be withheld from disclosure under section 552(b) of title 5 only on the grounds specified in:

(1) Section 552(b)(1), applicable to matter specifically required by Executive Order to be kept secret in the interest of the national defense or foreign policy. This section shall be interpreted to include matter protected under Executive Order No. 11652 of March 8, 1972, establishing categories and criteria for classification, as well as any other such orders dealing specifically with disclosure of IEP related materials;

(2) Section 552(b)(3), applicable to matter specifically exempted from disclosure by statute; and

(3) So much of section 552(b)(4) as relates to trade secrets.

PART 210—GENERAL ALLOCATION AND PRICE RULES

Subpart A—Recordkeeping

Sec.
210.1 Records.

Subparts B–D [Reserved]

AUTHORITY: Emergency Petroleum Allocation Act of 1973, Pub. L. 93–159, E.O. 11748, 38 FR 33577; Economic Stabilization Act of 1970, as amended, Pub. L. 92–210, 85 Stat. 743; Pub. L. 93–28, 87 Stat. 27; E.O. 11748, 38 FR 33575; Cost of Living Council Order Number 47, 39 FR 24.

Subpart A—Recordkeeping

§210.1 Records.

(a) The recordkeeping requirements that were in effect on January 27, 1981, in parts 210, 211, and 212 will remain in effect for (1) all transactions prior to February 1, 1981; and (2) all allowed expenses incurred and paid prior to April 1, 1981 under §212.78 of part 212. These requirements include, but are not limited to, the requirements that were in effect on January 27, 1981, in §210.92 of this part; in §§211.67(a)(5)(ii); 211.89; 211.109, 211.127; and 211.223 of part 211; and in §§212.78(h)(5)(ii); 212.78(h)(6); 212.83(c)(2)(iii)(E)(I); 212.83(c)(2)(iii)(E)(II); 212.83(c)(2)(iii); ''F_i t''; 212.83(i); 212.93(a); 212.93(b)(4)(iii)(B)(I); 212.93(i)(4); 212.94(b)(2)(iii); 212.128; 212.132; 212.172; and §212.187 of part 212.

(b) Effective February 5, 1985, paragraph (a) of this section shall apply, to the extent indicated, only to firms in the following categories. A firm may be included in more than one category, and a firm may move from one category to another. The fact that a firm becomes no longer subject to the recordkeeping requirements of one category shall not relieve that firm of compliance with the recordkeeping requirements of any other category in which the firm is still included.

(1) Those firms which are or become parties in litigation with DOE, as defined in paragraph (c)(1) of this section. Any such firm shall remain subject to paragraph (a) of this section. DOE shall notify the firm in writing of the final resolution of the litigation and whether or not any of its records must be maintained for a further period. DOE shall notify a firm which must maintain any records for a further period when such records are no longer needed.

(2)(i) Those firms which as of November 30 1984, have completed making all restitutionary payments required by an administrative or judicial order, consent order, or other settlement or order but which payments are on February 5, 1985, still subject to distribution by DOE. This requirement is applicable to only those firms listed in appendix B. Any such firm shall maintain all records for the time period covered by the administrative or judicial order, consent order, or other settlement or order requiring the payments, evidencing sales volume data for each product subject to controls and customers' names and addresses, until one of the following: June 30, 1985, unless this period is extended on a firm-by-firm basis; the end of the individual firm's extension; or the firm is notified in writing that its records are no longer needed.

(ii) Those firms which as of November 30, 1984, are required to make restitutionary or other payments pursuant to an administrative or judicial order, consent order, or other settlement or order. Any such firm shall remain subject to paragraph (a) of this

section until the firm completes all restitutionary payments required by the administrative or judicial order, consent order, or other settlement or order. However, after completing all such payments, a firm shall maintain all records described in paragraph (b)(2)(i) of this section until one of the following: Six months after the firm completes all such payments, unless this period is extended on a firm-by-firm basis; the end of the individual firm's extension; or the firm is notified in writing that its records are no longer needed.

(3)(i) Those firms with completed audits in which DOE has not yet made a determination to initiate a formal enforcement action and firms under audit which do not have outstanding subpoenas. Any such firm shall maintain all records for the period covered by the audit including all records necessary to establish historical prices or volumes which serve as the basis for determining the lawful prices or volumes for any subsequent regulated transaction which is subject to audit, until one of the following: June 30, 1985, unless this period is extended on a firm-by-firm basis; the end of the individual firm's extension; or the firm is notified in writing by DOE that its records are no longer needed. However, if a firm in this group shall become a party in litigation, the firm shall then be subject to the recordkeeping requirements for firms in litigation set forth in paragraph (b)(1) of this section.

(ii) Those firms under audit which have outstanding subpoenas on February 5, 1985, or which receive subpoenas at any time thereafter or which have supplied records for an audit as the result of a subpoena enforced after November 1, 1983. Any such firm shall remain subject to paragraph (a) of this section until two years after ERA has notified the firm in writing that is in full compliance with the subpoena or until ERA has received from the firm a sworn certification of compliance with the subpoena as required by 10 CFR 205.8. However, if a firm in this group shall become a party in litigation, the firm shall then be subject to the recordkeeping requirements for firms in litigation set forth in paragraph (b)(1) of this section.

(4) Those firms which are subject to requests for data necessary to verify that crude oil qualifies as ''newly discovered'' crude oil under 10 CFR 212.79. Any such firm shall maintain the records evidencing such data until one of the following: June 30, 1985, unless this period is extended on a firm-by-firm basis; the end of an individual firm's extension; or the firm is notified in writing by DOE that its records are no longer needed. However, if a firm in this group shall become a party in litigation, the firm shall then be subject to the recordkeeping requirements for firms in litigation set forth in paragraph (b)(1) of this section.

(5) Those firms whose records are determined by DOE as necessary to complete the enforcement activity relating to another firm which is also subject to paragraph (a) of this section unless such firms required to keep records have received certified notice letters specifically describing the records determined as necessary. At that time, the specific notice will control the recordkeeping requirements. These firms have been identified in appendix A. Any such firm shall maintain these records until one of the following: June 30, 1985, unless this period is extended on a firm-by-firm basis; the end of the individual firm's extension; or the firm is notified in writing by DOE that its records are no longer needed.

(6) Those firms which participated in the Entitlements program. Any such firm shall maintain its Entitlements-related records until six months after the final judicial resolution (including any and all appeals) of *Texaco* v. *DOE*, Nos. 84–391, 84–410, and 84–456 (D. Del.), or the firm is notified by DOE that its records are no longer needed, whichever occurs first.

(c) For purposes of this section:

(1) A firm is ''a party in litigation'' if:

(i)(A) The firm has received a Notice of Probable Violation, a Notice of Probable Disallowance, a Proposed Remedial Order, or a Proposed Order of Disallowance; or

(B) The firm and DOE are parties in a lawsuit arising under the Emergency Petroleum Allocation Act of 1973, as amended (15 U.S.C. 751 *et seq.*) or 10 CFR parts 205, 210, 211, or 212; and

(ii)(A) There has been no final (that is, non-appealable) administrative or judicial resolution, or

(B) DOE has not informed the firm in writing that the Department has completed its review of the matter.

(2) A firm means any association, company, corporation, estate, individual, joint-venture, partnership, or sole proprietorship, or any other entity, however organized, including charitable, educational, or other eleemosynary institutions, and state and local governments. A firm includes a parent and the consolidated and unconsolidated entities (if any) which it directly or indirectly controls.

APPENDIX A TO 10 CFR 210.1—THIRD PARTY FIRMS

Name of Firm

A & R, Inc.
A. J. Petroleum
ADA Resources, Inc.
ATC Petroleum
Abbco Petroleum, Inc.
Ada Oil Company
Adams Grocery
Advanced Petroleum Distributing Co.
Agway Inc.
Allegheny Petroleum Corp.
Alliance Oil and Refining Company
Allied Chemical Corp.
Allied Transport
Amerada Hess Corp.
American Natural Crude Oil Assoc.
Amoco Production Company
Amorient Petroleum, Inc.
An-Son Transportation Co.
Anadarko Products Co.
Andrus Energy Corp.
Antler Petroleum
Arco Pipeline Company
Armada Petroleum Corp.
Armour Oil Company
Arnold Brooks Const. Inc.
Ashland Oil
Asiatic Petroleum Co.
Aspen Energy, Inc.
Athens General Hospital
Atlantic Pacific Energy, Inc.
Atlas Processing Company
B & B Trading Company
BLT, Inc.
BPM, Ltd.
Baker Services, Inc.
Basin Inc.
Basin Petroleum, Inc.
Beacon Hill Mobil
Belcher Oil Company
Bighart Pipeline Company
Bigheart Pipeline Corp
Bowdoin Square Exxon
Bowdoin Super Service (Sunoco)
Brio Petroleum, Inc.
Brixon
C.E. Norman
CPI Oil & Refining
CRA-Farmland Industries, Inc.
Calcaseiu Refining, Ltd.
Carbonit Houston, Inc.
Carr Oil Company, Inc.
Castle Coal & Oil Co.
Central Crude Corporation
Century Trading Co.
Charter Crude Oil
Chastain Vineyard
Chevron USA, Inc.
Cibro Petroleum, Inc.
Cirillo Brothers
Cities Service (Citgo) Station
Cities Service Company
Cities Service Midland
City of Athens
Clarke County Board of Education
Claude E. Silvey
Coastal Corporation (The)
Coastal Petroleum and Supply Inc.
Coastal States Trading Company
Commonwealth Oil Refining Co., Inc.
Coral Petroleum Canada, Inc.
Coral Petroleum, Inc.
Corex of Georgia
Cothran Interstate Exxon
Couch's Standard Chevron
Cougar Oil Marketers Inc.
Crude Company (The)
Crystal Energy Corporation
Crystal Refining
D & E Logging
DDC Corporation of America
Darrell Williamson
Davis Ellis
Days Inn of America, Inc.
Delta Petroleum & Energy Corp.
Derby & Company, Inc.
Derby Refining Company
Dewveall Petroleum
Dixie Oil Company
Dixon Oil Co.
Don Hardy
Donald Childs
Dow Chemical Company
Dr. Joe L. Griffeth
Driver Construction Co.
Drummond Brothers, Inc.
Duffie Monroe & Sons Co., Inc.
ECI (A/K/A Energy Cooperative Inc.)
Earnest Dalton
Earth Resources Trading
Eastern Seaboard Petroleum, Inc.
Elmer Hammon
Elvin Knight
Empire Marketing, Inc.
Encorp.
Energy Cooperative, Inc.
Energy Distribution Co.
Englehard Corporation
Englehard Oil Corporation
Entex

Evans Oil Co.
Exxon Company
F & S Trading Company, Inc.
Farmers Union Central Exchange, Inc.
Farmland Industries Inc.
Fasgo, Inc.
Fedco Oil Company
Federal Employees Distributing Co.
Fitzpatrick Spreader
Flutz Oil Company
Flying J. Inc.
Foremost Petroleum
Four Corners Pipe Line
Frank Katz
Frank W. Abrahamsen
Frank's Butane, Inc.
Friendswood Refinery
Frontier Manor Collection
Fuel Oil Supply & Terminaling, Inc.
G. C. Clark Company
GPC Marketing Company
Gary Refining Co.
Geer Tank Trucks, Inc.
Gene Clary
Gene McDonald
General Crude Oil Company
Geodynamics Oil & Gas Inc.
George Kennedy
George Smith Chevron
Gleason Oil Company
Glenn Company
Globe Oil Co.
Godfrey's Standard Service
Good Hope Industries, Inc.
Good Hope Refineries, Inc.
Granite Oil Company
Guam Oil & Refining Co., Inc.
Gulf States Oil & Refining Company
H. D. Adkinson
H. H. Dunson
H.S. & L, Inc.
HNG Oil Company
Harbor Petroleum, Inc.
Harbor Trading
Harmony Grove Mills, Inc.
Harry Rosser
Hast Oil, Inc.
Heet Gas Company
Henry Alva Mercer
Herndon Oil & Gas Company
Horizon Petroleum Company
Houston Oil & Minerals Products Co.
Houston Oil & Refining
Howell Corporation
Hurricane Trading Company, Inc.
Hydrocarbon Trading and Transport Co.
Inco Trading
Independent Refining Corp.
Independent Trading Corporation
Indiana Refining, Inc.
Intercontinental Petroleum Corp.
International Crude Corporation
International Petro
International Petroleum Trading, Inc.
International Processors
Isthmus Trading Corporation
J & M Transport
J. & J.'s Fast Stop
J. A. Rackerby Corporation
J. H. Baccus
J. H. Baccus & Co.
J. J. Williamson
J. M. Petroleum Corporation
JPK Industries
Jack W. Grigsby
Jaguar Petroleum, Inc.
James L. Bush
Jay Petroleum Company
Jay-Ed Petroleum Company
John W. McGowan
Kalama Chemical, Inc.
Kelly Trading Corp.
Kenco Refining
Kerr-McGee Corporation
Koch Fuel
Koch Industries, Inc.
Kocolene Oil
Kocolene Station
L & L Resources, Inc.
L.S. Parker
LaGloria Oil & Gas
LaJet, Inc.
Lamar Refining Co.
Langham Petroleum Corp.
Larry Roberts
Laurel Oil, Inc.
Lee Allen
Lincoln Land Sales Company
Listo Petroleum Inc.
Longview Refining Corp.
Love's Standard
Lucky Stores Inc.
M.L. Morrow
Magna Energy Corporation
Magnolia Oil Company
Mansfield Oil Co.
Mapco Petroleum, Inc.
Mapco, Inc.
Marion Trading Co.
Marlex Oil & Refining, Inc.
Marlin Petroleum, Inc.
Martin Oil Company
Mathew's Grocery
McAuleep Oil Co.
McAuley Oil Company
Meadows Gathering, Inc.
Mellon Energy Products Co.
Merit Petroleum, Inc.
Metro Wash, Inc.
Miller Oil Purchasing Co.
Minor Oil, Inc.
Minro Oil, Inc.
Mitchell Oil Co.
Mitsui & Co. (USA) Inc.
Mobil Bay Refining Company
Montgomery Well Drilling
Mundy Food Market
Munford, Inc.
Mutual Petroleum
NRG Oil Company
National Convenience Stores
National Cooperative Refinery
Nicholson Grocery and Gas
North American Petroleum

Northeast Petroleum Corp.
Northeast Petroleum Corporation
Northgate Auto Center
Northwest Crude, Inc.
Nova Refining Corp.
Occidental Petroleum Corp. (includes Permia)
Ocean Drilling and Exploration Co.
Oil Exchange, Inc.
Oilco
Omega Petroleum Corp.
Otoe Corporation
Oxxo Energy Group, Inc.
P & O Falco, Inc.
P. L. Heatley Co.
PEH, Inc.
PIB, Inc.
PSW Distributors Company
Pacific Refinery, Inc.
Pacific Resources, Inc.
Pan American Products Corp.
Par Brothers Food Store
Pauley Petroleum Inc.
Pennzoil Co.
Permian Corporation (The)
Pescar International Corp.
Pescar International Trading Co.
Petraco (U.S.A.) Inc.
Petrade International
Petrol Products, Inc.
Phillips Petroleum Company
Phoenis Petroleum Co.
Phoenix Petroleum Co.
Pine Mountains
Poole Petroleum
Port Petroleum
Presley Oil Co.
Procoil Inc.
Publiker Industries, Inc.
Pyramid Dist. Co., Inc.
Questor Crude Oil Company
Quitman Refining Co.
R. H. Garrett Paving
Ra-Gan Fuel, Inc.
Reeder Distributing Co.
Reeder Distributors
Reese Exploration Co.
Research Fuels Inc.
Revere Petroleum Co.
Richardson-Ayres, Inc.
Robert Bishop
Robert Patrick
Roberts Grocery
Rock Island Refining Corporation
Rogers Oil Company
Roy Baerne
Russell Oil Company
S. G. Coplen
SECO (Scruggs Energy)
Saber Crude Oil, Inc.
Saber Refining Company
Salem Ventures, Inc.
Samson Resources Company
Santa Fe Energy Products Co.
Saye's Truck Stop
Scandix Oil Limited
Score, Inc.
Scruggs Energy Company
Scurlock Oil Company
Scurry Oil Company
Seamount Petroleum Company
Seaview Petroleum Company
Sector Refining, Inc.
Selfton Miller
Shepherd Trading Corporation
Shulze Processing
Sigmor Corporation
Skelly Oil Company
South Hampton Refining Company
South Texas LP Gas Co.
Southern Crude Oil Resources
Southern Terminal & Transport, Ltd.
Southern Union Company
Southwest Petro. Energy
Southwest Petrochem
Standard Oil Co. (Ohio)
Standard Oil Co. of California
Standard Oil Company (Indiana)
Standard Oil Company (Ohio)
Sterling Energy Company
Steve Childs
Stix Gas Company, Inc.
Sunset Grocery
Sunset Oil & Refining, Inc.
Swanee Petroleum Company
T & P Enterprises
T. B. Eley
T. E. Jawell
Tauber Oil Company
Tenneco, Inc.
Tesoro Crude Oil Company
Texana Oil & Gas Corp.
Texas American Petrochemicals (TAP)
Texas City Refining
Texas Eastern Transmission Corp.
Texas Energy Reserve Corporation
Texas Pacific Oil Company
Thomas Cockvell
Thomas Petroleum Products, Inc.
Thorton Oil Company
Thyssen Incorporated
Tiger Petroleum Company
Time Oil Co.
Tipperary Refining Company
Tom Banks
Tom Smith
Tomlinson Petroleum, Inc.
Tosco Corporation
Total Petroleum, Inc.
Trans-Texas Petroleum Corp.
Transco Trading Company
Turboil Oil and Refining
Two Rivers Oil & Gas Co., Inc.
U-Fill 'er Up
USA Gas, Inc.
Uni Oil Company
Union Oil of California
Doram Energy
United Petroleum Marketing
United Refining Company
United Refining, Inc.
Universal Rundle
Val-Cap, Inc.
Vedetta Oil Trading, Inc.

Vedette Oil Trading, Inc.
Vickers Energy Corp.
W. C. Colquitt
W. T. Strickland
W. W. Blanton
W.A. Nunnally, Jr., Construction Co.
W.D. Porterfiled
Wellven, Inc.
West Texas Marketing Corp.
Western Crude Oil, Inc.
Western Fuels, Inc.
Wight Nurseries of Oglethorpe Co.
William Seabolt
Wilson's Used Tractors
Windsor Gas Corp.
Wyoming Refining

APPENDIX B TO 10 CFR 210.1—FIRMS WITH COMPLETED PAYMENTS SUBJECT TO DISTRIBUTION

The following firms have completed making restitutionary payments to DOE but their payments are still subject to distribution by DOE. Each such firm must maintain relevant records until June 30, 1985, unless this period is extended on a firm-by-firm basis. Relevant records are all records of the firm, including any affiliates, subsidiaries or predecessors in interest, for the time period covered by the judicial or administrative order, consent order, or other settlement or order requiring the payments, evidencing sales volume data for each product subject to controls and customers' names and addresses.

Name of firm	Location
A. Tarricone Inc	Yonkers, NY.
Adolph Coors Company	Golden, CO.
Allied Materials Corp & Excel	Oklahoma City, OK.
Aminoil USA, Inc	Houston, TX.
Amtel, Inc	Providence, RI.
Apache Corporation	Minneapolis, MN.
APCO Oil Corporation	Oklahoma City, OK.
Arapaho Petroleum, Inc	Breckenridge, TX.
Arkansas Louisiana Gas Company.	Shreveport, LA.
Arkla Chemical Corporation	Shreveport, LA.
Armour Oil Company	San Diego, CA.
Associated Programs Inc	Boca Raton, FL.
Atlanta Petroleum Production	Fort Worth, TX.
Automatic Heat, Inc	
Ayers Oil Company	Canton, MD.
Aztex Energy Corporation	Knoxville, TN.
Bak Ltd	Narbeth, PA.
Bayou State Oil/IDA Gasoline	Shreveport, LA.
Bayside Fuel Oil Depot Corp	Brooklyn, NY.
Belridge Oil Company	Los Angeles, CA.
Blaylock Oil Co., Inc	Homestead, FL.
Blex Oil Company	Minneapolis, MN.
Boswell Oil Company	Cincinnati, OH.
Box, Cloyce K	Dallas, TX.
Breckenridge Gasoline Company	Kansas City, KS.
Brownlie, Wallace, Armstrong	Denver, CO.
Bucks Butane & Propane Service	San Jose, CA.
Budget Airport Associates	Los Angeles, CA.
Busler Enterprises Inc	Evansville, IN.
Butler Petroleum Corp	Butler, PA.
C.K. Smith & Company, Inc	Worcester, MA.
Cap Oil Company	Tulsa, OK.
Champlain Oil Co., Inc	South Burlington, VT.
Chapman, H.A	Tulsa, OK.
Cibro Gasoline Corporation	Bronx, NY.
City Service Inc	Kalispell, MT.
Coastal Corporation	Houston, TX.
Coline Gasoline Corporation	Santa Fe Springs, CA.
Collins Oil Co	Aurora, IL.
Columbia Oil Co	Hamilton, OH.
Conlo Service Inc	East Farmingdale, NY.
Conoco, Inc	Houston, TX.
Consolidated Gas Supply Corp	Hastings, WV.
Consolidated Leasing Corp	Los Angeles, CA.
Consumers Oil Co	Rosemead, CA.
Continental Resources Company	Winter Park, FL.
Cordele Operating Co	Corsicana, TX.
Cosby Oil Co., Inc	Whittier, CA.
Cougar Oil Co	Selma, AL.
Cross Oil Co., Inc	Wellstone, MO.
Crystal Oil Company (formerly Vallery Corp.).	Shreveport, LA.
Crystal Petroleum Co	Corpus Christi, TX.
Devon Corporation	Oklahoma City, OK.
Dorchester Gas Corp	Dallas, TX.
E.B. Lynn Oil Company	Allentown, PA.
E.M. Bailey Distributing Co	Paducah, KY.
Eagle Petroleum Co	Wichita Falls, TX.
Earls Broadmoor	Houma, LA.
Earth Resources Co	Dallas, TX.
Eastern Petroleum Corp	Annapolis, MD.
Edington Oil Co	Los Angeles, CA.
Elias Oil Company	West Palm Beach, FL.
Elm City Filling Stations, Inc	New Haven, CT.
Empire Oil Co	Bloomington, CA.
Endicott, Eugene	Redmond, OR.
Enserch Corp	Dallas, TX.
Enterprise Oil & Gas Company	Detroit, MI.
F.O. Fletcher, Inc	Tacoma, WA.
Fagadau Energy Corporation	Dallas, TX.
Farstad Oil Company	Minot, ND.
Field Oil Co., Inc	Ogden, UT.
Fine Petroleum Co., Inc	Norfolk, VA.
Foster Oil Co	Richmond, MI.
Franks Petroleum Inc	Shreveport, LA.
Froesel Oil Co	
Gas Systems Inc	Ft. Worth, TX.
Gate Petroleum Co., Inc	Jacksonville, FL.
GCO Minerals Company	Houston, TX.
Getty Oil Company	Los Angeles, CA.
Gibbs Industries, Inc	Revere, MA.
Glaser Gas Inc	Calhoun, CO.
Glover, Lawrence H	Patchogue, NY.
Goodman Oil Company	Boise, ID.
Grant Rent a Car Corporation	Los Angeles, CA.
Grimes Gasoline Co	Tulsa, OK.
Gulf Energy & Development Corp. (also known as Gulf Energy Development Corp.).	San Antonio, TX.
Gulf Oil Corp	Houston, TX.
Gull Industries, Inc	Seattle, WA.
H.C. Lewis Oil Co	Welch, WV.
Hamilton Brothers Petroleum Co	Denver, CO.
Harris Enterprise Inc	Portland, OR.
Heller, Glenn Martin	Boston, MA.
Hendel's Inc	Waterford, CT.
Henry H. Gungoll Associates	Enid, OK.
Hertz Corporation, The	New York, NY.
Hines Oil Co	Murphysboro, IL.
Horner & Smith, A Partnership	Houston, TX.
Houston Natural Gas Corp	Houston, TX.
Howell Corporation/Quintana Refinery Co.	Houston, TX.
Hunt Industries	Dallas, TX.
Hunt Petroleum Corp	Dallas, TX.

Name of firm	Location
Husky Oil Company of Delaware	Cody, WY.
Ideal Gas Co., Inc	Nyassa, OR.
Independent Oil & Tire Company	Elyria, OH.
Inland USA, Inc	St. Louis, MO.
Inman Oil Co	Salem, MO.
Internorth, Inc	Omaha, NE.
J.E. DeWitt, Inc	South El Monte, CA.
J.M. Huber Corp	Houston, TX.
James Petroleum Corp	Bakersfield, CA.
Jay Oil Company	Fort Smith, AR.
Jimmys Gas Stations Inc	Auburn, ME.
Jones Drilling Corporation	Duncan, OK.
Juniper Petroleum Corporation	Denver, CO.
Kansas-Nebraska Natural Gas Co	Hastings, NE.
Keller Oil Company, Inc	Effingham, IL.
Kenny Larson Oil Co., Inc	
Kent Oil & Trading Company	Houston, TX.
Key Oil Co., Inc	Tuscaloosa, AL.
Key Oil Company	Bowling Green, KY.
Kiesel Co	St. Louis, MO.
King & King Enterprise	Kansas City, MO.
Kingston Oil Supply Corp	Port Ewen, NY.
Kirby Oil Company	
L & L Oil Co., Inc	Belle Chasse, LA.
L.P. Rech Distributing Co	Roundup, MT.
La Gloria Oil and Gas Co	Houston, TX.
Lakes Gas Co., Inc	Forest Lake, MN.
Lakeside Refining Co./Crystal	Southfield, MI.
Landsea Oil Company	Irvine, CA.
Leathers Oil Co., Inc	Portland, OR.
Leese Oil Company	Pocatello, ID.
Leonard E. Belcher, Inc	Springfield, MA.
Lincoln Land Oil Co	Springfield, IL.
Liquid Products Recovery	Houston, TX.
Little America Refining Co	Salt Lake City, UT.
Lockheed Air Terminal Inc	Burbank, CA.
Lowe Oil Company	Clinton, MO.
Lucia Lodge Arco	Big Sur, CA.
Luke Brothers Inc	Calera, OK.
Lunday Thargard Oil	South Gate, CA.
Malco Industries Inc	Cleveland, OH.
Mapco, Inc	Tulsa, OK.
Marine Petroleum Co	St. Louis, MO.
Marlen L. Knutson Dist. Inc	Stanwood, WA.
Martin Oil Service, Inc	Blue Island, IL.
Martinoil Company	Fresno, CA.
Marvel Fuel Oil and Gas Co	
McCarty Oil Co	Wapakoneta, OH.
McCleary Oil Co., Inc	Chambersburg, OH.
McClure's Service Station	Salisbury, PA.
McTan Corporation	Abilene, TX.
Mesa Petroleum Company	Amarillo, TX.
Midway Oil Co	Rock Island, IL.
Midwest Industrial Fuels, Inc	La Crosse, WI.
Mississippi River Transmission	St. Louis, MO.
Mitchell Energy Corp	Woodlands, TX.
Montana Power Co	Butte, MT.
Moore Terminal and Barge Co	Monroe, LA.
Mountain Fuel Supply Company	Salt Lake City, UT.
Moyle Petroleum Co	Rapid City, SD.
Mustang Fuel Corporation	Oklahoma City, OK.
Naphsol Refining Company	Muskegon, MI.
National Helium Corporation	Liberal, KS.
National Propane Corp	Wyandanch, NY.
Navajo Refining Company	Dallas, TX.
Nielson Oil & Propane, Inc	West Point, NE.
Northeast Petroleum Industries	Chelsea, MA.
Northeastern Oil Co., Inc	Gillette, WY.
Northwest Pipeline Corp	Salt Lake City, UT.
O'Connell Oil Co	Pittsfield, MA.
Oceana Terminal Corp. et al	Bronx, NY.
OKC Corporation	Dallas, TX.
Olin Corporation	Stamford, CT.
Oneok Incorporation	Tulsa, OK.
Ozona Gas Processing Plant	Tyler, TX.
Pacer Oil Co. of Florida, Inc	Ormond Beach, FL.
Pacific Northern Oil	Seattle, WA.
Panhandle Eastern (Century)	Houston, TX.
Parade Company	Shreveport, LA.
Parham Oil Corporation	Nashville, TN.
Pasco Petroleum Co., Inc	Phoenix, AZ.
Pedersen Oil, Inc	Silverdale, WA.
Pennzoil Company	Houston, TX.
Perry Gas Processors, Inc	Odessa, TX.
Peoples Energy Corp	Chicago, IL.
Perta Oil Marketing Corp	Beverly Hills, CA.
Peterson Petroleum Inc	Hudson, NY.
Petro-Lewis Corp	Denver, CO.
Petrolane-Lomita Gasoline Co	Long Beach, CA.
Petroleum Heat & Power Co. Inc	Stamford, CT.
Petroleum Sales/Services Inc	Buffalo, NY.
Pioneer Corp	Amarillo, TX.
Planet Engineers Inc	Denver, CO.
Plateau, Inc	Albuquerque, NM.
Plaquemines Oil Sales	Belle Chasse, LA.
Point Landing Inc	Hanrahan, LA.
Port Oil Company, Inc	Mobile, AL.
Post Petroleum Co	West Sacramento, CA.
Power Pak Co., Inc	Houston, TX.
Pride Refining, Inc	Abilene, TX.
Pronto Gas Co	Abilene, TX.
Propane Gas & Appliance Co	New Brockton, AL.
Prosper Energy Corporation	Dallas, TX.
Pyro Energy Corporation	Evansville, IN.
Pyrofax Gas Corporation	Houston, TX.
Quaker State Oil	Oil City, PA.
Quarles Petroleum, Inc	Fredericksburg, VA.
Resources Extraction Process	Houston, TX.
Reynolds Oil Co	Kremling, CO.
Richardson Ayers Jobbers, Inc	Alexandria, LA.
Riverside Oil, Inc	Evansville, IN.
Roberts Oil Co. Inc	Albuquerque, NM.
Rookwood Oil Terminals Inc	Cincinnati, OH.
Saber Energy, Inc	Houston, TX.
Sanesco Oil Co	Escondido, CA.
Schroeder Oil Company	Carroll, IA.
Seminole Refining Inc	St. Marks, FL.
Sid Richardson Carbon & Gas	Ft. Worth, TX.
Sigmore Corporation	San Antonio, TX.
Southwestern Refining Co., Inc	Salt Lake City, UT.
Speedway Petroleum Co., Inc	Fitchburg, MA.
St. James Resources Corp	Boston, MA.
Standard Oil Co. (Indiana)	Chicago, IL.
Stinnes Inter Oil Inc	New York, NY.
Tenneco Oil Company	Houston, TX.
Texas/Arkansas/Colorado/Oklahoma/Oil Purchasing.	Dallas, TX.
Texas Gas & Exploration	Dallas, TX.
Texas Oil & Gas Corporation	Dallas, TX.
Texas Pacific Oil Company, Inc	Dallas, TX.
The True Companies	Casper, WY.
Thompson Oil Inc	Purcellville, VA.
Tiger Oil Co	Yakima, WA.
Time Oil Company	Seattle, WA.
Tipperary Corp	Midland, TX.
Tippins Oil & Gas Co	Richmond, MO.
Triton Oil & Gas Corp	Dallas, TX.
U.S. Compressed Gas Company	King of Prussia, PA.
U.S. Oil Company	Combined Locks, WI.
U.S.A. Petroleum, Inc	Santa Monica, CA.
Union Texas Petroleum Corp	Houston, TX.
United Oil Company	Hillside, NJ.
Upham Oil & Gas Co	Mineral Wells, TX.
Vangas Inc	Fresno, CA.
VGS Corporation	Jackson, MS.
Waller Petroleum Company, Inc	Towson, MD.
Warren Holding Company	Providence, RI.
Warrior Asphalt Co. of Alabama	Tuscaloosa, AL.

Name of firm	Location
Webco Southern Oil Inc	Smyrna, CA.
Wellen Oil Co	Jersey City, NJ
Wiesehan Oil Co	
Willis Distributing Company	Erie, PA.
Winston Refining Company	Fort Worth, TX.
Witco Chemical Corporation	New York, NY.
World Oil Company	Los Angeles, CA.
Worldwide Energy Corp	Denver, CO.
Young Refining Corporation	Douglasville, GA.
Zia Fuels (G.G.C. Corp.)	Hobbs, NM.

(Approved by the Office of Management and Budget under control number 1903–0073)

[50 FR 4962, Feb. 5, 1985]

Subparts B–D [Reserved]

PART 212—MANDATORY PETROLEUM PRICE REGULATIONS

Subpart A—C [Reserved]

Subpart D—Producers of Crude Oil

Sec.
212.78 Tertiary incentive crude oil.

Subparts E–I [Reserved]

AUTHORITY: Emergency Petroleum Allocation Act of 1973, Pub. L. 93–159, E.O. 11748, 38 FR 33577; Economic Stabilization Act of 1970, as amended, Pub. L. 92–210, 85 Stat. 743; Pub. L. 93–28, 87 Stat. 27; E.O. 11748, 38 FR 33575; Cost of Living Council Order Number 47, FR 24.

Subparts A–C [Reserved]

Subpart D—Producers of Crude Oil

§ 212.78 Tertiary incentive crude oil.

Annual prepaid expenses report. By January 31 of each year after 1980, the project operator with respect to any enhanced oil recovery project for which a report had been filed previously with DOE pursuant to paragraph (h)(2)(i) of this section as that paragraph was in effect on January 27, 1981, shall file with DOE a report in which the operator shall certify to DOE (a) which of the expenses that had been reported previously to DOE pursuant to paragraph (h)(2)(i) of this section as that paragraph was in effect on January 27, 1981, were prepaid expenses; (b) the goods or services for which such expenses had been incurred and paid; (c) the dates on which such goods or services are intended to be used; (d) the dates on which such goods or services actually are used; (e) the identity of each qualified producer to which such prepaid expenses had been attributed; and (f) the percentage of such prepaid expenses attributed to each such qualified producer. An operator shall file an annual prepaid expenses report each year until it has reported the actual use of all the goods and services for which a prepaid expense had been incurred and paid. For purposes of this paragraph, a prepaid expense is an expense for any injectant or fuel used after September 30, 1981, or an expense for any other item to the extent that IRS would allocate the deductions (including depreciation) for that item to the period after September 30, 1981.

(Approved by the Office of Management and Budget under OMB Control No.: 1903–0069)

[46 FR 43654, Aug. 31, 1981, as amended at 46 FR 63209, Dec. 31, 1981]

Subparts E–I [Reserved]

PART 215—COLLECTION OF FOREIGN OIL SUPPLY AGREEMENT INFORMATION

Sec.
215.1 Purpose.
215.2 Definitions.
215.3 Supply reports.
215.4 Production of contracts and documents.
215.5 Pricing and volume reports.
215.6 Notice of negotiations.

AUTHORITY: Emergency Petroleum Allocation Act of 1973, Pub. L. 93–519, as amended, Pub. L. 93–511, Pub. L. 94–99, Pub. L. 94–133 and Pub. L. 94–163, and Pub. L. 94–385; Federal Energy Administration Act of 1974, Pub. L. 93–275, as amended, Pub. L. 94–385; Energy Policy and Conservation Act, Pub. L. 94–163, as amended, Pub. L. 94–385; E.O. 11790, 39 FR 23185.

SOURCE: 42 FR 48330, Sept. 23, 1977, unless otherwise noted.

§ 215.1 Purpose.

The purpose of this part is to set forth certain requirements pursuant to section 13 of the Federal Energy Administration Act to furnish information concerning foreign crude oil supply arrangements. The authority set out in this section is not exclusive.

§ 215.2 Definitions.

As used in this subpart:

Administrator means the Federal Energy Administrator or his delegate.

DOE means the Department of Energy.

Host government means the government of the country in which crude oil is produced and includes any entity which it controls, directly or indirectly.

Person means any natural person, corporation, partnership, association, consortium, or any other entity doing business or domiciled in the U.S. and includes (a) any entity controlled directly or indirectly by such a person and (b) the interest of such a person in any joint venture, consortium or other entity to the extent of entitlement to crude oil by reason of such interest.

§ 215.3 Supply reports.

(a) Any person having the right to lift for export by virtue of any equity interest, reimbursement for services, exchange or purchase, from any country, from fields actually in production, (1) an average of 150,000 barrels per day or more of crude oil for a period of at least one year, or (2) a total of 55,000,000 barrels of crude oil for a period of less than one year, or (3) a total of 150,000,000 barrels of crude oil for the period specified in the agreement, pursuant to supply arrangements with the host government, shall report the following information.

(1) Parties (including partners and percentage interest, where applicable).

(2) Grade or grades available; loading terminal or terminals.

(3) Government imposed production limits, if any.

(4) Minimum lifting obligation and maximum lifting rights.

(5) Details of lifting options within the above limits.

(6) Expiration and renegotiation dates.

(7) Price terms including terms of rebates, discounts, and number of days of credit calculated from the date of loading.

(8) Other payments to or interests retained by the host government (i.e. taxes, royalties, and any other payment to the host government) expressed in terms of the applicable rates or payment or preemption terms, or the base to which those rates or terms are applied.

(9) Related service or other fees and cost of providing services.

(10) Restrictions on shipping or disposition.

(11) Other material contract terms.

(b) Reports under this section shall be made no later than (1) 60 days after final issuance of reporting forms implementing this regulation, as announced in the FEDERAL REGISTER, (2) fourteen days after the date when supply arrangements are entered into, or (3) fourteen days after the initial lifting under an agreement in which the parties have tentatively concurred but not signed, whichever occurs first. Reporting shall be based on actual practice between the parties. Material changes in any item which must be reported pursuant to this section shall be reported no later than 30 days after a person receives actual notice of such changes.

(c) Where reports under this section by each participant in a joint operation would be impracticable, or would result in the submission of inaccurate or misleading information, the participants acting together may designate a single participant to report on any of the rights, obligations, or limitations affecting the operation as a whole. Any such designation shall be signed by a duly authorized representative of each participant, and shall specify:

(1) The precise rights, obligations, or limitations to be covered by the designation; and

(2) The reasons for the designation. Such designations shall be submitted to the Assistant Administrator for International Energy Affairs, and shall take effect only upon his written approval, which may at any time be revoked.

§ 215.4 Production of contracts and documents.

Whenever the Administrator determines that certain foreign crude oil supply information is necessary to assist in the formulation of energy policy or to carry out any other function of the Administrator, he may require the production by any person of any agreement or document relating to foreign

oil supply arrangements or reports related thereto. Such material shall be provided pursuant to the conditions prescribed by the Administrator at the time of such order or subsequently. As used in this section, the term ''agreement'' includes proposed or draft agreements, and agreements in which the parties have tentatively concurred but have not yet signed, between or among persons and a host country.

§ 215.5 Pricing and volume reports.

To the extent not reported pursuant to § 215.3, any person lifting for export crude oil from a country shall report to the DOE within 30 days of the date on which he receives actual notice:

(a) Any change (including changes in the timing of collection) by the host government in official selling prices, royalties, host government taxes, service fees, quality or port differentials, or any other payments made directly or indirectly for crude oil; changes in participation ratios; changes in concessionary arrangements; and

(b) Any changes in restrictions on lifting, production, or disposition.

§ 215.6 Notice of negotiations.

Any person conducting negotiations with a host government which may reasonably lead to the establishment of any supply arrangement subject to reporting pursuant to § 215.3(a), or may reasonably have a significant effect on the terms and conditions of an arrangement subject to § 215.3(a), shall notify DOE of such negotiations. Such notice shall be made no later than the later of 30 days after the effective date of this regulation or within 14 days after such negotiations meet the conditions of this section, and shall specify all persons involved and the host government affected. Notice must be in writing to the Assistant Administrator for International Energy Affairs. Where this notice pertains to negotiations to modify a supply agreement previously reported to the Department of Energy under this part, such notice shall include the agreement serial number assigned to the basic agreement.

PART 216—MATERIALS ALLOCATION AND PRIORITY PERFORMANCE UNDER CONTRACTS OR ORDERS TO MAXIMIZE DOMESTIC ENERGY SUPPLIES

Sec.

216.1 Introduction.
216.2 Definitions.
216.3 Requests for assistance.
216.4 Evaluation by DOE of applications.
216.5 Notification of findings.
216.6 Petition for reconsideration.
216.7 Conflict in priority orders.
216.8 Communications.
216.9 Violations.

AUTHORITY: Section 104 of the Energy Policy and Conservation Act (EPCA) Pub. L. 94–163, 89 Stat. 871; and section 101(c) of the Defense Production Act of 1950 (DPA) (50 U.S.C. App. 2071(c)), as amended; section 7, E.O. 11912, April 13, 1976; Defense Mobilization Order No. 13, Sept. 22, 1976; 44 CFR Part 330; Defense Priorities and Allocations System Delegation No. 2, 49 FR 30430.

SOURCE: 43 FR 6212, Feb. 14, 1978, unless otherwise noted.

§ 216.1 Introduction.

(a) This part describes and establishes the procedures to be used by the Department of Energy (''DOE'') in considering and making certain findings required by section 101(c)(3) of the Defense Production Act of 1950, as amended, 50 U.S.C. App. 2071(c)(3) (''DPA''). Section 101(c) authorizes the allocation of, or priority performance under contracts or orders (other than contracts of employment) relating to, supplies of materials and equipment in order to maximize domestic energy supplies if the findings described in section 101(c)(3) are made. Among these findings are that such supplies of materials and equipment are critical and essential to maintain or further exploration, production, refining, transportation or the conservation of energy supplies or for the construction and maintenance of energy facilities. The function of finding if such supplies are critical and essential was delegated to the Administrator of the Department of Energy (''DOE'') pursuant to Executive Order

11912 of April 13, 1976, Defense Mobilization Order (''DMO'') No. 13 dated September 22, 1976, 41 FR 43720, and Department of Commerce, Bureau of Domestic Commerce, Delegation No. 4, effective date December 1, 1976, 41 FR 52331. Delegation No. 4 was superseded by Defense Priorities and Allocations System Delegation No. 2, effective date August 29, 1984, 49 FR 30430. On October 1, 1977, pursuant to section 301(a) of the Department of Energy Organization Act (Pub. L. 95–91), all of the functions of DOE and all of the functions of the DOE Administrator were transferred to the Secretary of Energy.

(b) The purpose of these regulations is to establish the procedures and the criteria to be used by DOE in determining whether programs or projects maximize domestic energy supplies and finding whether or not supplies of material and equipment are critical and essential, as required by DPA section 101(c)(3). The critical and essential finding will be made only for supplies of materials and equipment related to those programs or projects determined by DOE to maximize domestic energy supplies. These regulations do not require or imply that the findings, on which the exercise of such authority is conditioned, will be made in any particular case.

(c) If DOE determines that a program or project maximizes domestic energy supplies and finds that supplies of materials and equipment are critical and essential to maintain or further the exploration, production, refining, transportation or conservation of energy supplies or for the construction and maintenance of energy facilities, such determination and finding will be communicated to the Department of Commerce. If not, the applicant will be so informed. If the determination and finding described above are made, the Department of Commerce, pursuant to DPA section 101(c), Executive Order 11912 and DMO No. 13, will find whether or not (1) the supplies of materials and equipment in question are scarce and (2) maintenance or furtherance of exploration, production, refining, transportation, or conservation of energy supplies or the construction and maintenance of energy facilities cannot be reasonably accomplished without exercising the authority specified in section 101(c). If these additional two findings are made, the Department of Commerce will notify DOE, and DOE will inform the applicant that it has been granted the right to use priority ratings under the Defense Priorities and Allocations System (''DPAS'') regulation established by the Department of Commerce, 15 CFR 350.

[43 FR 6212, Feb. 14, 1978, as amended at 51 FR 8311, Mar. 11, 1986]

§ 216.2 Definitions.

As used in these regulations:

(a) *Secretary* means the Secretary of the Department of Energy.

(b) *Applicant* means a person requesting priorities or allocation assistance in connection with an energy program or project.

(c) *Application* means the written request of an applicant for assistance.

(d) *Assistance* means use of the authority vested in the President by DPA section 101(c) to implement priorities and allocation support.

(e) *DOC* means the Department of Commerce, acting through the Secretary or the delegate of the Secretary.

(f) *DOE* means the Department of Energy, acting through the Secretary or the delegate of the Secretary.

(g) *Eligible energy program or project* means a designated activity which maximizes domestic energy supplies by furthering the domestic exploration, production, refining, transportation or conservation of energy supplies or construction and maintenance of energy facilities within the meaning of DPA section 101(c), as determined by DOE.

(h) *FEMA* means the Federal Emergency Management Agency.

(i) *Materials and equipment* means any raw, in-process, or manufactured commodity, equipment, component, accessory, part, assembly or product of any kind.

(j) *Person* means an individual, corporation, partnership, association, or any other organized group of persons (or legal successor or representative thereof), and includes the United States or any other government and any political subdivisions (or any agency) thereof.

[43 FR 6212, Feb. 14, 1978, as amended at 51 FR 8311, Mar. 11, 1986]

§ 216.3 Requests for assistance.

(a) Persons who believe that they perform work associated with a program or project which may qualify as an eligible energy program or project and wishing to receive assistance as authorized by DPA section 101(c)(1) may submit an application to DOE requesting DOE to determine whether a program or project maximizes domestic energy supplies and to find whether or not specific supplies of materials or equipment identified in the application are critical and essential for a purpose identified in section 101(c). The application should be sent to: Department of Energy, Procurement and Assistance Management Directorate, Attn: MA–422, Forrestal Building, 1000 Independence Avenue SW., Washington, DC 20585. The application shall contain the following information:

(1) The name and address of the applicant and of its duly authorized representative.

(2) A description of the energy program or project for which assistance is requested and an assessment of its impact on the maximization of domestic energy supplies.

(3) The amount of energy to be produced by the program or project which is directly affected by the supplies of the materials or equipment in question.

(4) A statement explaining why the materials or equipment for which assistance is requested are critical and essential to the construction or operation of the energy project or program.

(5) A detailed description of the specific supplies of materials and equipment in connection with which assistance is requested, including: Components, performance data (capacity, life duration, etc.), standards, acceptable tolerances in dimensions and specifications, current inventory, present and expected rates of use, anticipated deliveries and substitution possibilities (feasibility of using other materials or equipment).

(6) A detailed description of the sources of supply, including: Name of the regular supplying company or companies, other companies capable of supplying the materials and equipment, location of supplying plants or plants capable of supplying the needed materials and equipment, possible suppliers for identical or substitutable materials and equipment and possible foreign sources of supply.

(7) A detailed description of the delivery stituation, including: Normal delivery times, promised delivery time without priorities assistance, and delivery time required for expeditious fulfillment or completion of the program or project.

(8) Evidence of the applicant's unsuccessful efforts to obtain on a timely basis the materials and equipment in question through normal business channels from current or other known suppliers.

(9) A detailed estimate of the delay in fulfilling or completing the energy program or project which will be caused by inability to obtain the specified materials and equipment in the usual course of business.

(10) Any known conflicts with rated or authorized controlled material orders already issued pursuant to the DPA for supplies of the described materials and equipment.

(11) Quarterly estimates of requirements for controlled materials, if applicable, by shapes and forms as prescribed by the DPAS regulation, § 350.31(e)(2).

(b) DOE, on consultation with the DOC, may prescribe standard forms of application or letters of instruction for use by all persons seeking assistance.

(c) In addition to the information described above, DOE may from time to time request whatever additional information it reasonably believes is relevant to the discharge of its functions pursuant to DPA section 101(c).

[43 FR 6212, Feb. 14, 1978, as amended at 51 FR 8311, Mar. 11, 1986]

§ 216.4 Evaluation by DOE of applications.

(a) Based on the information provided by the applicant and other available information, DOE will assess the application and (1) determine whether or not the energy program or project in connection with which the application is made maximizes domestic energy supplies and should be designated an eligible energy program or project and (2) find whether the described supplies of materials and equipment are critical

and essential to the eligible energy program or project.

(b) In determining whether the program or project referred to in the application should be designated an eligible energy program or project, DOE will consider all factors which it considers relevant including, but not limited to, the following:

(1) Quantity of energy involved;

(2) Benefits of timely energy program furtherance or project completion;

(3) Socioeconomic impact;

(4) The need for the end product for which the materials and equipment are allegedly required; and

(5) Established national energy policies.

(c) In findings whether the supplies of materials or equipment described in the application are critical and essential to an eligible energy program or project, DOE will consider all factors which it considers relevant including, but not limited to, the following:

(1) Availability and utility of substitute materials or equipment; and

(2) Impact of the nonavailability of the specific supplies of materials and equipment on the furtherance or timely completion of the approved energy program or project.

(d) Increased costs which may be associated with obtaining materials or equipment without assistance shall not be considered a valid reason for finding the materials and equipment to be critical and essential.

(e) After DOE has determined a program or project to be an eligible energy program or project, this determination shall be deemed made with regard to subsequent applications involving the same program or project unless and until DOE announces otherwise.

§216.5 Notification of findings.

(a) DOE will notify the DOC if it finds that supplies of materials and equipment, for which an applicant requested assistance, are critical and essential to an eligible energy program or project, and in such cases will forward to the DOC the application and whatever information or comments DOE believes appropriate. If DOE believes at any time that findings previously made may no longer be valid, it will immediately notify the DOC and the affected applicant(s) and afford such applicant(s) an opportunity to show cause why such findings should not be withdrawn.

(b) If DOC notifies DOE that DOC has found that supplies of materials and equipment, for which the applicant requested assistance, are scarce and that the related eligible energy program or project cannot reasonably be accomplished without exercising the authority specified in DPA section 101(c)(1), DOE will notify the applicant that the applicant is authorized to place rated orders and/or authorized controlled material orders for specific supplies of materials and equipment pursuant to the provisions of the DPAS Regulation, as promulgated by the Department of Commerce.

[43 FR 6212, Feb. 14, 1978, as amended at 51 FR 8312, Mar. 11, 1986]

§216.6 Petition for reconsideration.

If DOE, after evaluating an application in accordance with §216.4, does not determine that the energy program or project maximizes domestic energy supplies or does not find that the supplies of materials and equipment described in the application are critical and essential to an eligible energy program or project, it will so notify the applicant and the applicant may petition DOE for reconsideration. If DOE concludes at any time that findings previously made are no longer valid and should be withdrawn, DOE will so notify the affected applicant(s), and such applicant(s) may petition DOE for reconsideration of the withdrawal decision. Such a petition is deemed accepted when received by DOE at the address stated in §216.8. DOE will consider the petition for reconsideration and either grant or deny the relief requested. Written notice of the decision and of the reasons for the decision will be provided to the applicant. There has not been an exhaustion of administrative remedies until a petition for reconsideration has been submitted and the review procedure completed by grant or denial of the relief requested.

The denial of relief requested in a petition for reconsideration is a final administrative decision.

[43 FR 6212, Feb. 14, 1978, as amended at 51 FR 8312, Mar. 11, 1986]

§ 216.7 Conflict in priority orders.

If it appears that the use of assistance pursuant to DPA section 101(c) creates or threatens to create a conflict with priorities and allocation support provided in connection with the national defense pursuant to DPA section 101(a), DOE will work with the DOC and other claimant agencies affected by such conflict in an attempt to reschedule deliveries or otherwise accommodate such competing demands. If acceptable solutions cannot be agreed upon by the claimant agencies the FEMA will resolve such conflicts.

[43 FR 6212, Feb. 14, 1978, as amended at 51 FR 8312, Mar. 11, 1986]

§ 216.8 Communications.

All written communications concerning these regulations shall be addressed to:

Department of Energy, Procurement and Assistance Management Directorate, Attn: MA–422, Forrestal Building, 1000 Independence Avenue, SW., Washington, DC 20585.

[43 FR 6212, Feb. 14, 1978, as amended at 51 FR 8312, Mar. 11, 1986]

§ 216.9 Violations.

Any person who willfully furnishes false information or conceals any material fact in the course of the application process or in a petition for reconsideration is guilty of a crime, and upon conviction may be punished by fine or imprisonment or both.

PART 218—STANDBY MANDATORY INTERNATIONAL OIL ALLOCATION

Subpart A—General Provisions

Sec.
218.1 Purpose and scope.
218.2 Activation/Deactivation.
218.3 Definitions.

Subpart B—Supply Orders

218.10 Rule.
218.11 Supply orders.
218.12 Pricing.

Subpart C [Reserved]

Subpart D—Procedures

218.30 Purpose and scope.
218.31 Incorporated procedures.
218.32 Review.
218.33 Stay.
218.34 Addresses.

Subpart E—Investigations, Violations, Sanctions and Judicial Actions

218.40 Investigations.
218.41 Violations.
218.42 Sanctions.
218.43 Injunctions.

AUTHORITY: 15 U.S.C. 751 *et seq.*; 15 U.S.C. 787 *et seq.*; 42 U.S.C. 6201 *et seq.*; 42 U.S.C. 7101 *et seq.*; E.O. 11790, 39 FR 23185; E.O. 12009, 42 FR 46267; 28 U.S.C. 2461 note.

SOURCE: 44 FR 27972, May 14, 1979, unless otherwise noted.

Subpart A—General Provisions

§ 218.1 Purpose and scope.

(a) This part implements section 251 of the Energy Policy and Conservation Act (Pub. L. 94–163) (42 U.S.C. 6271), as amended, which authorizes the President to take such action as he determines to be necessary for performance of the obligations of the United States under chapters III and IV of the Agreement on an International Energy Program (TIAS 8278), insofar as such obligations relate to the mandatory international allocation of oil by International Energy Program participating countries.

(b) *Applicability*. This part applies to any firm engaged in producing, transporting, refining, distributing or storing oil which is subject to the jurisdiction of the United States.

§ 218.2 Activation/Deactivation.

(a) This rule shall take effect providing:

(1) The International Energy Program has been activated; and,

(2) The President has transmitted this rule to Congress, has found putting such rule into effect is required in order to fulfill obligations of the United States under the International Energy Program and has transmitted such a finding to the Congress together

with a statement of the effective date and manner for exercise of such rule.

(b) This rule shall revert to standby status no later than 60 days after the deactivation of the emergency allocation system activated to implement the International Energy Program.

§ 218.3 Definitions.

DOE means the Department of Energy established by the Department of Energy Organization Act (Pub. L. 95–91), and includes the Secretary of Energy or his delegate.

EPCA means the Energy Policy and Conservation Act (Pub. L. 94–163), as amended.

Firm means any association, company, corporation, estate, individual, joint-venture, partnership, or sole proprietorship or any other entity however organized including charitable, educational, or other eleemosynary institutions, and the Federal Government including corporations, departments, Federal agencies, and other instrumentalities, and State and local governments. The ERA may, in regulations and forms issued in this part, treat as a firm: (a) A parent and the consolidated and unconsolidated entities (if any) which it directly or indirectly controls, (b) a parent and its consolidated entities, (c) an unconsolidated entity, or (d) any part of a firm.

IEA means the International Energy Agency established to implement the IEP.

IEP means the International Energy Program established pursuant to the Agreement on an International Energy Program signed at Paris, France, on November 18, 1974, including (a) the Annex entitled ''Emergency Reserves'', (b) any amendment to such Agreement that includes another nation as a Party to such Agreement, and (c) any technical or clerical amendment to such Agreement.

International energy supply emergency means any period (a) beginning on any date that the President determines allocation of petroleum products to nations participating in the IEP is required by chapters III and IV of the IEP and (b) ending on a date on which he determines such allocation is no longer required.

Oil means crude oil, residual fuel oil, unfinished oil, refined petroleum product and natural gas liquids, which is owned or controlled by a firm, including any petroleum product destined, directly or indirectly, for import into the United States or any foreign country, or produced in the United States but excludes any oil stored in or owned and controlled by the United States Government in connection with the Strategic Petroleum Reserve authorized in section 151, *et seq.*, of the Energy Policy and Conservation Act (Pub. L. 94–163).

Person means any individual, firm, estate, trust, sole proprietorship, partnership, association, company, joint-venture, corporation, governmental unit or instrumentality thereof, or a charitable, educational or other institution, and includes any officer, director, owner or duly authorized representative thereof.

Supply order means a written directive or a verbal communication of a written directive, if promptly confirmed in writing, issued by the DOE pursuant to subpart B of this part.

United States when used in the geographic sense means the several States, the District of Columbia, Puerto Rico, and the territories and possessions of the United States, and the outer continental shelf as defined in 43 U.S.C. 1331.

Subpart B—Supply Orders

§ 218.10 Rule.

(a) Upon the determination by the President that an international energy supply emergency exists, firms engaged in producing, transporting, refining, distributing, or storing oil shall take such actions as are determined by the DOE to be necessary for implementation of the obligations of the United States under chapters III and IV of the IEP that relate to the mandatory international allocation of oil by IEP participating countries.

(b) Any actions required in accordance with paragraph (a) of this section shall be stated in supply orders issued by DOE.

(c) No firm to which a supply order is issued shall be required to comply with such order unless the firm to which the oil is to be provided in accordance with

such supply order has agreed to a procedure for the resolution of any dispute related to the terms and conditions of the sale undertaken pursuant to the supply order. The means for resolving any such disputes may include any procedures that are mutally acceptable to the parties, including arbitration before the IEA if the IEA has established arbitration procedures, arbitration or adjudication before an appropriate body, or any other similar procedure.

§ 218.11 Supply orders.

(a) A supply order shall require that the firm to which it is issued take actions specified therein relating to supplying the stated volume of oil to a specified recipient including, but not limited to, distributing, producing, storing, transporting or refining oil. A supply order shall include a concise statement of the pertinent facts and of the legal basis on which it is issued, and shall describe the action to be taken.

(b) The DOE shall serve a copy of the supply order on the firm directed to act as stated therein.

(c) The DOE may modify or rescind a supply order on its own motion or pursuant to an application filed in accordance with §218.32 of this part.

(d) A supply order shall be effective in accordance with its terms, and when served upon a firm directed to act thereunder, except that a supply order shall not remain in effect (1) upon reversion of this rule to standby status or (2) twelve months after the rule has been transmitted to Congress (whichever occurs first) or (3) to the extent that DOE or a court of competent jurisdiction directs that it be stayed, modified, or rescinded.

(e) Any firm issued a supply order pursuant to this subpart may seek modification or rescission of the supply order in accordance with procedures provided in §218.32 of this part.

§ 218.12 Pricing.

The price for oil subject to a supply order issued pursuant to this subpart shall be based on the price conditions prevailing for comparable commercial transactions at the time the supply order is served.

Subpart C [Reserved]

Subpart D—Procedures

§ 218.30 Purpose and scope.

This subpart establishes the administrative procedures applicable to supply orders. They shall be exclusive of any other procedures contained in this chapter, unless such other procedures are specifically made applicable hereto by this subpart.

§ 218.31 Incorporated procedures.

The following subparts of part 205 of this chapter are, as appropriate, hereby made applicable to this part:

(a) *Subpart A*— General Provisions; *Provided,* that §205.11 shall not apply; *and Provided further,* that in addition to the methods of service specified in §205.7 of this chapter, service shall be effective if a supply order is transmitted by telex, telecopies or other similar means of electronic transmission of a writing and received by the firm to which the supply order is addressed.

(b) *Subpart F*— Interpretation.

(c) *Subpart K*— Rulings.

(d) *Subpart M*— Conferences, Hearings and Public Hearings.

§ 218.32 Review.

(a) *Purpose and scope.* This subpart establishes the procedures for the filing of an application for review of a supply order. An application for review is a summary proceeding which will be initiated only if the critieria described in paragraph (g)(2) of this section are satisfied.

(b) *What to file.* (1) A firm filing under this subpart shall file an ''Application for Review'' which should be clearly labeled as such both on the application and on the outside of the envelope in which the application is transmitted, and shall be in writing and signed by the firm filing the application. The applicant shall comply with the general filing requirements stated in 10 CFR 205.9 in addition to the requirements stated in this section.

(2) If the applicant wishes to claim confidential treatment for any information contained in the application or other documents submitted under this

subpart, the procedures set out in 10 CFR 205.9(f) shall apply.

(c) *When to file.* An application for review should be filed no later than 5 days after the receipt by the applicant of the supply order that is the subject of the application, or no later than 2 days after the occurrence of an event that results in a substantial change in the facts or circumstances affecting the applicant.

(d) *Where to file.* The application for review shall be filed with DOE Office of Hearings and Appeals (OHA), 2000 M Street, NW., Washington, DC 20461.

(e) *Notice.* The applicant shall send by United States mail or deliver by hand a copy of the application and any subsequent amendments or other documents relating to the application to the Administrator of the Economic Regulatory Administration of DOE, 2000 M Street, NW., Washington, DC 20461. Service shall be made on the ERA at same time the document is filed with OHA and each document filed with the OHA shall include certification that the applicant has complied with the requirements of this paragraph.

(f) *Contents.* (1) The application shall contain a full and complete statement of all relevant facts pertaining to the application and to the DOE action sought. Such facts shall include a complete statement of the business or other reasons that justify review of the supply order and a full description of the pertinent provisions and relevant facts contained in any relevant documents. Copies of all contracts, agreements, leases, instruments, and other documents relevant to the application shall be submitted with the application. A copy of the order of which review is sought shall be included with the application. When the application pertains to only one step of a larger integrated transaction, the facts, circumstances, and other relevant information pertaining to the entire transaction shall be submitted.

(2) The application shall include a discussion of all relevant authorities, including, but not limited to, DOE and DOE rulings, regulations, interpretations and decisions on appeal and exception relied upon to support the action sought therein.

(g) *DOE evaluation*—(1) *Processing.* (i) The DOE may initiate an investigation of any statement in an application and utilize in its evaluation any relevant facts obtained by such investigation. The DOE may solicit and accept submissions from third parties relevant to any application for review provided that the applicant is afforded an opportunity to respond to all third party submissions. In evaluating an application for review, the DOE may convene a conference, on its own initiative, if, in its discretion, it considers that a conference will advance its evaluation of the application.

(ii) If the DOE determines that there is insufficient information upon which to base a decision and if upon request the necessary additional information is not submitted, the DOE may dismiss the application without prejudice. If the failure to supply additional information is repeated or willful, the DOE may dismiss the application with prejudice. If the applicant fails to provide the notice required by paragraph (e) of this section, the DOE may dismiss the application without prejudice.

(iii) An order dismissing an application for any of the reasons specified in paragraph (g)(1)(ii) of this section shall contain a statement of the grounds for the dismissal. The order shall become final within 5 days of its service upon the applicant, unless within such 5-day period the applicant files an amendment correcting the deficiencies identified in the order. Within 5 days of the filing of such amendment, the DOE shall notify the applicant whether the amendment corrects the specified deficiencies. If the amendment does not correct the deficiencies specified in the order, the order shall become a final order of the DOE of which the applicant may seek judicial review.

(2) An application for review of an order shall be processed only if the applicant demonstrates that—

(i) There is probable cause to believe that the supply order is erroneous, inequitable, or unduly burdensome; or

(ii) There has been discovered a law, regulation, interpretation, ruling, order or decision that was in effect at the time of the application which, if it had been made known to the DOE, would have been relevant to the supply

order and would have substantially altered the supply order; or

(iii) There has been a substantial change in the facts or circumstances affecting the applicant, which change has occurred during the interval between issuance of the supply order and the date of the application and was caused by forces or circumstances beyond the control of the applicant.

(h) *Decision.* (1) Upon consideration of the application and other relevant information received or obtained during the proceeding, the DOE shall issue an order granting or denying the modification or rescission of the supply order requested in the application for review.

(2) The DOE shall process applications for review as expeditiously as possible. When administratively feasible, the DOE shall issue an order granting or denying the application within 20 business days after receipt of the application.

(3) The order shall include a written statement setting forth the relevant facts and the legal basis of the order. The order shall state that it is a final order of which the applicant may seek judicial review.

(4) The DOE shall serve a copy of the order upon the applicant and any other party who participated in the proceeding.

§ 218.33 Stay.

(a) The DOE may issue an order granting a stay if the DOE determines that an applicant has made a compelling showing that it would incur serious and irreparable injury unless immediate stay relief is granted pending determination of an application for review pursuant to this subpart. An application for a stay shall be labeled as such on the application and on the outside of the envelope in which the application is transmitted, and shall be in writing and signed by the firm filing the application. It shall include a description of the proceeding incident to which the stay is being sought and of the facts and circumstances which support the applicant's claim that it will incur irreparable injury unless immediate stay relief is granted. The applicant shall comply with the general filing requirements stated in 10 CFR 205.9 in addition to the requirements stated in this section. The DOE on its own initiative may also issue an order granting a stay upon a finding that a firm will incur irreparable injury if such an order is not granted.

(b) An order granting a stay shall expire by its terms within such time after issuance, not to exceed 30 days as the DOE specifies in the order, except that it shall expire automatically 5 days following its issuance if the applicant fails within that period to file an application for review unless within that period the DOE for good cause shown, extends the time during which the applicant may file an application for review.

(c) The order granting or denying a stay is not an order of the DOE subject to administrative review.

§ 218.34 Addresses.

All correspondence, petitions, and any information required by this part shall be submitted to: Administrator, Economic Regulatory Administration, Department of Energy, 2000 M Street, NW., Washington, DC 20461, and to the Director, Office of Hearings and Appeals, Department of Energy, 2000 M Street, NW., Washington, DC 20461.

Subpart E—Investigations, Violations, Sanctions and Judicial Actions

§ 218.40 Investigations.

(a) The DOE may initiate and conduct investigations relating to the scope, nature and extent of compliance by any person with the rules, regulations or statutes of the DOE or any order promulgated by the DOE under the authority of section 251 of EPCA, or any court decree.

(b) Any duly designated and authorized representative of DOE has the authority to conduct an investigation and to take such action as he deems necessary and appropriate to the conduct of the investigation including any action pursuant to § 205.8.

(c) There are no parties, as that term is used in adjudicative proceedings, in an investigation under this subpart, and no person may intervene or participate as a matter of right in any investigation under this subpart.

(d) Any person may request the DOE to initiate an investigation pursuant to paragraph (a) of this section. A request for an investigation shall set forth the subject matter to be investigated as fully as possible and include supporting documentation and information. No particular forms or procedures are required.

(e) Any person who is requested to furnish documentary evidence or testimony in an investigation, upon written request, shall be informed of the general purpose of the investigation.

(f) DOE shall not disclose information or documents that are obtained during any investigation unless (1) DOE directs or authorizes the public disclosure of the investigation; (2) the information or documents are a matter of public record; or (3) disclosure is not precluded by the Freedom of Information Act, 5 U.S.C. 552 and 10 CFR part 1004.

(g) During the course of an investigation any person may submit at any time any document, statement of facts or memorandum of law for the purpose of explaining the person's position or furnish evidence which the person considers relevant to a matter under investigation.

(h) If facts disclosed by an investigation indicate that further action is unnecessary or unwarranted, the investigative file may be closed without prejudice to further investigation by the DOE at any time that circumstances so warrant.

§ 218.41 Violations.

Any practice that circumvents, contravenes or results in the circumvention or contravention of the requirements of any provision of this part 218 or any order issued pursuant thereto is a violation of the DOE regulations stated in this part and is unlawful.

§ 218.42 Sanctions.

(a) *General.* Any person who violates any provisions of this part 218 or any order issued pursuant thereto shall be subject to penalties and sanctions as provided herein.

(1) The provisions herein for penalties and sanctions shall be deemed cumulative and not mutually exclusive.

(2) Each day that a violation of the provisions of this part 218 or any order issued pursuant thereto continues shall be deemed to constitute a separate violation within the meaning of the provisions of this part relating to fines and civil penalties.

(b) *Penalties.* (1) Any person who violates any provision of part 218 of this chapter or any order issued pursuant thereto shall be subject to a civil penalty of not more than $5,500 for each violation.

(2) Any person who willfully violates any provision of this part 218 or any order issued pursuant thereto shall be subject to a fine of not more than $10,000 for each violation.

(3) Any person who knowingly and willfully violates any provision of this part 218 or any order issued pursuant thereto with respect to the sale, offer of sale, or distribution in commerce of oil in commerce after having been subject to a sanction under paragraph (b)(1) or (2) of this section for a prior violation of the provisions of this part 218 or any order issued pursuant thereto with respect to the sale, offer of sale, or distribution in commerce of oil shall be subject to a fine of not more than $50,000 or imprisonment for not more than six months, or both, for each violation.

(4) Actions for penalties under this section are prosecuted by the Department of Justice upon referral by the DOE.

(5) When the DOE considers it to be appropriate or advisable, the DOE may compromise and settle any action under this paragraph, and collect civil penalties.

(c) *Other Penalties.* Willful concealment of material facts, or making of false, fictitious or fraudulent statements or representations, or submission of a document containing false, fictitious or fraudulent statements pertaining to matters within the scope of this part 218 by any person shall subject such persons to the criminal penalties provided in 18 U.S.C. 1001 (1970).

[44 FR 27972, May 14, 1979, as amended at 62 FR 46183, Sept. 2, 1997]

§ 218.43 Injunctions.

Whenever it appears to the DOE that any firm has engaged, is engaging, or is

about to engage in any act or practice constituting a violation of any regulation or order issued under this part 218, the DOE may request the Attorney General to bring a civil action in the appropriate district court of the United States to enjoin such acts or practices and, upon a proper showing, a temporary restraining order or a preliminary or permanent injunction shall be granted without bond. The relief sought may include a mandatory injunction commanding any firm to comply with any provision of such order or regulation, the violation of which is prohibited by section 524 of the EPCA.

PART 220—[RESERVED]

PART 221—PRIORITY SUPPLY OF CRUDE OIL AND PETROLEUM PRODUCTS TO THE DEPARTMENT OF DEFENSE UNDER THE DEFENSE PRODUCTION ACT

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221.32 Evaluation of DOD request.
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221.35 Contractual requirements.
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AUTHORITY: Defense Production Act, 50 U.S.C. App. 2061 *et seq.*, E.O. 10480 (18 FR 4939, Aug. 18, 1953) as amended by E.O. 12038 (43 FR 4957, Feb. 7, 1978), and E.O. 11790 (39 FR 23785, June 27, 1974).

SOURCE: 45 FR 76433, Nov. 19, 1980, unless otherwise noted.

Subpart A—General

§ 221.1 Scope.

This part sets forth the procedures to be utilized by the Economic Regulatory Administration of the Department of Energy and the Department of Defense whenever the priority supply of crude oil and petroleum products is necessary or appropriate to meet national defense needs. The procedures available in this part are intended to supplement but not to supplant other regulations of the ERA regarding the allocation of crude oil, residual fuel oil and refined petroleum products.

§ 221.2 Applicability.

This part applies to the mandatory supply of crude oil, refined petroleum products (including liquefied petroleum gases) and lubricants to the Department of Defense for its own use or for purchases made by the Department of Defense on behalf of other Federal Government agencies.

Subpart B—Exclusions

§ 221.11 Natural gas and ethane.

The supply of natural gas and ethane are excluded from this part.

Subpart C—Definitions

§ 221.21 Definitions.

For purposes of this part—

Directive means an official action taken by ERA which requires a named person to take an action in accordance with its provisions.

DOD means the Department of Defense, including Military Departments and Defense Agencies, acting through either the Secretary of Defense or the designee of the Secretary.

ERA means the Economic Regulatory Administration of the Department of Energy.

National defense means programs for military and atomic energy production or construction, military assistance to any foreign nation, stockpiling and space, or activities directly related to any of the above.

Person means any individual, corporation, partnership, association or any other organized group of persons, and includes any agency of the United States Government or any other government.

Priority-rated supply order means any delivery order for crude oil or petroleum products issued by DOD bearing a priority rating issued by ERA under this part.

Supplier means any person other than the DOD which supplies, sells, transfers, or otherwise furnishes (as by consignment) crude oil or petroleum product to any other person.

Subpart D—Administrative Procedures and Sanctions

§ 221.31 Requests by DOD.

(a) When DOD finds that (1) a fuel supply shortage for DOD exists or is anticipated which would have a substantial negative impact on the national defense, and (2) the defense activity for which fuel is required cannot be postponed until after the fuel supply shortage is likely to terminate, DOD may submit a written request to ERA for the issuance to it of a priority rating for the supply of crude oil and petroleum products.

(b) Not later than the transmittal date of its request to ERA, DOD shall notify the Federal Emergency Management Agency that it has requested a priority rating from ERA.

(c) Requests from DOD shall set forth the following:

(1) The quantity and quality of crude oil or petroleum products determined by DOD to be required to meet national defense requirements;

(2) The required delivery dates;

(3) The defense-related activity and the supply location for which the crude oil or petroleum product is to be delivered;

(4) The current or most recent suppliers of the crude oil or petroleum product and the reasons, if known, why the suppliers will not supply the requested crude oil or petroleum product;

(5) The degree to which it is feasible for DOD to use an alternate product in lieu of that requested and, if such an alternative product can be used, the efforts which have been made to obtain the alternate product;

(6) The period during which the shortage of crude oil or petroleum products is expected to exist;

(7) The proposed supply source for the additional crude oil or petroleum products required, which shall, if practicable, be the historical supplier of such crude oil or product to DOD; and

(8) Certification that DOD has made each of the findings required by paragraph (a) of this section.

§ 221.32 Evaluation of DOD request.

(a) Upon receipt of a request from DOD for a priority rating as provided in § 221.31, it shall be reviewed promptly by ERA. The ERA will assess the request in terms of:

(1) The information provided under § 221.31;

(2) Whether DOD's national defense needs for crude oil or petroleum products can reasonably be satisfied without exercising the authority specified in this part;

(3) The capability of the proposed supplier to supply the crude oil or petroleum product in the amounts required;

(4) The known capabilities of alternative suppliers;

(5) The feasibility to DOD of converting to and using a product other than that requested; and

(6) Any other relevant information.

(b) The ERA promptly shall notify the proposed supplier of DOD's request for a priority rating specified under this part. The proposed supplier shall have a period specified in the notice, not to exceed fifteen (15) days from the date it is notified of DOD's request, to show cause in writing why it cannot supply the requested quantity and quality of crude oil or petroleum products. ERA shall consider this information in determining whether to issue the priority rating.

(c) If acceptance by a supplier of a rated order would create a conflict with another rated order of the supplier, it shall include all pertinent information regarding such conflict in its response to the show cause order provided for in subsection (b), and ERA, in consultation with DOD and the Federal Emergency Management Agency shall

determine the priorities for meeting all such requirements.

(d) ERA may waive some or all of the requirements of § 221.31 or this section where the Secretary of Defense or his designee certifies, and has so notified the Federal Emergency Management Agency, that a fuel shortage for DOD exists or is imminent and that compliance with such requirements would have a substantial negative impact on the national defense.

§ 221.33 Order.

(a) *Issuance.* If ERA determines that issuance of a priority rating for a crude oil or refined petroleum product is necessary to provide the crude oil or petroleum products needed to meet the national defense requirement established by DOD, it shall issue such a rating to DOD for delivery of specified qualities and quantities of the crude oil or refined petroleum products on or during specified delivery dates or periods. In accordance with the terms of the order, DOD may then place such priority rating on a supply order.

(b) *Compliance.* Each person who receives a priority-rated supply order pursuant to this part shall supply the specified crude oil or petroleum products to DOD in accordance with the terms of that order.

(c) *ERA directives.* Notwithstanding any other provisions of this part, where necessary or appropriate to promote the national defense ERA is authorized to issue a directive to a supplier of crude oil or petroleum product requiring delivery of specified qualities and quantities of such crude oil or petroleum products to DOD at or during specified delivery dates or periods.

(d) *Use of ratings by suppliers.* No supplier who receives a priority-rated supply order or directive issued under the authority of this section may use such priority order or directive in order to obtain materials necessary to meet its supply obligations thereunder.

§ 221.34 Effect of order.

Defense against claims for damages. No person shall be liable for damages or penalties for any act or failure to act resulting directly or indirectly from compliance with any ERA authorized priority-rated supply order or ERA directive issued pursuant to this part, notwithstanding that such priority-rated supply order or directive thereafter be declared by judicial or other competent authority to be invalid.

§ 221.35 Contractual requirements.

(a) No supplier may discriminate against an order or contract on which a priority rating has been placed under this part by charging higher prices, by imposing terms and conditions for such orders or contracts different from other generally comparable orders or contracts, or by any other means.

(b) Contracts with priority ratings shall be subject to all applicable laws and regulations which govern the making of such contracts, including those specified in 10 CFR 211.26(e).

§ 221.36 Records and reports.

(a) Each person receiving an order or directive under this part shall keep for at least two years from the date of full compliance with such order or directive accurate and complete records of crude oil and petroleum product deliveries made in accordance with such order or directive.

(b) All records required to be maintained shall be made available upon request for inspection and audit by duly authorized representatives of the ERA.

(Approved by the Office of Management and Budget under control number 1903–0073)

[45 FR 76433, Nov. 19, 1980, as amended at 46 FR 63209, Dec. 31, 1981]

§ 221.37 Violations and sanctions.

(a) Any practice that circumvents or contravenes the requirements of this part or any order or directive issued under this part is a violation of the regulations provided in this part.

(b) Criminal penalties. Any person who willfully performs any act prohibited, or willfully fails to perform any act required by this part or any order or directive issued under this part shall be subject to a fine of not more than $10,000 for each violation or imprisoned for not more than one year for each violation, or both.

(c) Whenever in the judgment of the Administrator of ERA any person has engaged or is about to engage in any acts or practices which constitute or

will constitute a violation of any provision of these regulations, the Administrator may make application to the appropriate court for an order enjoining such acts or practices, or for an order enforcing compliance with such provision.

SUBCHAPTERS B—C [RESERVED]
SUBCHAPTER D—ENERGY CONSERVATION

PARTS 400–417 [RESERVED]

PART 420—STATE ENERGY PROGRAM

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AUTHORITY: Title III, part D, as amended, of the Energy Policy and Conservation Act (42 U.S.C. 6321 *et seq.*); Department of Energy Organization Act (42 U.S.C. 7101 *et seq.*)

SOURCE: 61 FR 35895, July 8, 1996, unless otherwise noted.

EDITORIAL NOTE: Nomenclature changes to part 420 appear at 64 FR 46114, Aug. 24, 1999.

Subpart A—General Provisions for State Energy Program Financial Assistance

§ 420.1 Purpose and scope.

It is the purpose of this part to promote the conservation of energy, to reduce the rate of growth of energy demand, and to reduce dependence on imported oil through the development and implementation of a comprehensive State Energy Program and the provision of Federal financial and technical assistance to States in support of such program.

§ 420.2 Definitions.

As used in this part:

Act means title III, part D, as amended, of the Energy Policy and Conservation Act, 42 U.S.C. 6321 et seq.

Alternative transportation fuel means methanol, denatured ethanol, and other alcohols; mixtures containing 85 percent or more by volume of methanol, denatured ethanol, and other alcohols with gasoline or other fuels; natural gas; liquified petroleum gas; hydrogen; coal-derived liquid fuels; fuels (other than alcohol) derived from biological materials (including neat biodiesel); and electricity (including electricity from solar energy).

ASHRAE/IESNA 90.1–1989, as amended means the building design standard published in December 1989 by the American Society of Heating, Refrigerating and Air-Conditioning Engineers, and the Illuminating Engineering Society of North America titled ''Energy Efficient Design of New Buildings Except Low-Rise Residential Buildings,'' with Addenda 90.1b–1992; Addenda 90.1d–1992; Addenda 90.1e–1992; Addenda 90.1g–1993; and Addenda 90.1i–1993, which is incorporated by reference in accordance with 5 U.S.C. 552(a) and 1 CFR part 51. The availability of this incorporation by reference is given in § 420.6(b).

Assistant Secretary means the Assistant Secretary for Energy Efficiency and Renewable Energy or any official to whom the Assistant Secretary's

functions may be redelegated by the Secretary.

British thermal unit (Btu) means the quantity of heat necessary to raise the temperature of one pound of water one degree Fahrenheit at 39.2 degrees Fahrenheit and at one atmosphere of pressure.

Building means any structure which includes provision for a heating or cooling system, or both, or for a hot water system.

Carpool means the sharing of a ride by two or more people in an automobile.

Carpool matching and promotion campaign means a campaign to coordinate riders with drivers to form carpools and/or vanpools.

Commercial building means any building other than a residential building, including any building constructed for industrial or public purposes.

Commercially available means available for purchase by the general public or target audience in the State.

Deputy Assistant Secretary means the Deputy Assistant Secretary for Building Technology, State and Community Programs or any official to whom the Deputy Assistant Secretary's functions may be redelegated by the Assistant Secretary.

Director, Office of State and Community Programs means the official responsible for DOE's formula grant programs to States, or any official to whom the Director's functions may be redelegated by the Assistant Secretary.

DOE means the Department of Energy.

Energy audit means any process which identifies and specifies the energy and cost savings which are likely to be realized through the purchase and installation of particular energy efficiency measures or renewable energy measures.

Energy efficiency measure means any capital investment that reduces energy costs in an amount sufficient to recover the total cost of purchasing and installing such measure over an appropriate period of time and maintains or reduces non-renewable energy consumption.

Environmental residual means any pollutant or pollution causing factor which results from any activity.

Exterior envelope physical characteristics means the physical nature of those elements of a building which enclose conditioned spaces through which thermal energy may be transferred to or from the exterior.

Governor means the chief executive officer of a State, the District of Columbia, Puerto Rico, or any territory or possession of the United States, or a person duly designated in writing by the Governor to act upon his or her behalf.

Grantee means the State or other entity named in the notice of grant award as the recipient.

HVAC means heating, ventilating and air-conditioning.

IBR means incorporation by reference.

Industrial facility means any fixed equipment or facility which is used in connection with, or as part of, any process or system for industrial production or output.

Institution of higher education has the same meaning as such term is defined in section 1201(a) of the Higher Education Act of 1965 (20 U.S.C. 1141(a)).

Manufactured home means any dwelling covered by the Federal Manufactured Home Construction and Safety Standards, 24 CFR part 3280.

Metropolitan Planning Organization means that organization required by the Department of Transportation, and designated by the Governor as being responsible for coordination within the State, to carry out transportation planning provisions in a Standard Metropolitan Statistical Area.

Model Energy Code, 1993, including Errata, means the model building code published by the Council of American Building Officials, which is incorporated by reference in accordance with 5 U.S.C. 552(a) and 1 CFR part 51. The availability of this incorporation by reference is given in § 420.6(b).

Park-and-ride lot means a parking facility generally located at or near the trip origin of carpools, vanpools and/or mass transit.

Petroleum violation escrow funds. For purposes both of exempting petroleum violation escrow funds from the matching requirements of § 420.12 and of applying the limitations specified under § 420.18(b), this term means any funds

distributed to the States by the Department of Energy or any court and identified as Alleged Crude Oil Violation funds, together with any interest earned thereon by the States, but excludes any funds designated as ''excess funds'' under section 3003(d) of the Petroleum Overcharge Distribution and Restitution Act, subtitle A of title III of the Omnibus Budget Reconciliation Act of 1986, Public Law 99–509, and the funds distributed under the ''Warner Amendment,'' section 155 of Public Law 97–377.

Plan means a State Energy Program plan including required program activities in accordance with §420.15 and otherwise meeting the applicable provisions of this part.

Political subdivision means a unit of government within a State, including a county, municipality, city, town, township, parish, village, local public authority, school district, special district, council of governments, or any other regional or intrastate governmental entity or instrumentality of a local government exclusive of institutions of higher learning and hospitals.

Preferential traffic control means any one of a variety of traffic control techniques used to give carpools, vanpools and public transportation vehicles priority treatment over single occupant vehicles other than bicycles and other two-wheeled motorized vehicles.

Program activity means one or more State actions, in a particular area, designed to promote energy efficiency, renewable energy and alternative transportation fuel.

Public building means any building which is open to the public during normal business hours, including:

(1) Any building which provides facilities or shelter for public assembly, or which is used for educational office or institutional purposes;

(2) Any inn, hotel, motel, sports arena, supermarket, transportation terminal, retail store, restaurant, or other commercial establishment which provides services or retail merchandise;

(3) Any general office space and any portion of an industrial facility used primarily as office space;

(4) Any building owned by a State or political subdivision thereof, including libraries, museums, schools, hospitals, auditoriums, sport arenas, and university buildings; and

(5) Any public or private non-profit school or hospital.

Public transportation means any scheduled or nonscheduled transportation service for public use.

Regional Office Director means the director of a DOE Regional Office with responsibility for grants administration or any official to whom that function may be redelegated.

Renewable energy means a non-depletable source of energy.

Renewable energy measure means any capital investment that reduces energy costs in an amount sufficient to recover the total cost of purchasing and installing such measure over an appropriate period of time and that results in the use of renewable energy to replace the use of non-renewable energy.

Residential building means any building which is constructed for residential occupancy.

Secretary mean the Secretary of DOE.

SEP means the State Energy Program under this part.

Small business means a private firm that does not exceed the numerical size standard promulgated by the Small Business Administration under section 3(a) of the Small Business Act (15 U.S.C. 632) for the Standard Industrial Classification (SIC) codes designated by the Secretary of Energy.

Start-up business means a small business which has been in existence for 5 years or less.

State means a State, the District of Columbia, Puerto Rico, or any territory or possession of the United States.

State or local government building means any building owned and primarily occupied by offices or agencies of a State; and any building of a unit of local government or a public care institution which could be covered by part H, title III, of the Energy Policy and Conservation Act, 42 U.S.C. 6372–6372i.

Transit level of service means characteristics of transit service provided which indicate its quantity, geographic area of coverage, frequency and quality (comfort, travel, time, fare and image).

Urban area traffic restriction means a setting aside of certain portions of an urban area as restricted zones where

varying degrees of limitation are placed on general traffic usage and/or parking.

Vanpool means a group of riders using a vehicle, with a seating capacity of not less than eight individuals and not more than fifteen individuals, for transportation to and from their residence or other designated locations and their place of employment, provided the vehicle is driven by one of the pool members.

Variable working schedule means a flexible working schedule to facilitate activities such as carpools, vanpools, public transportation usage, and/or telecommuting.

[61 FR 35895, July 8, 1996, as amended at 62 FR 26726, May 14, 1997]

§ 420.3 Administration of financial assistance.

(a) Financial assistance under this part shall comply with applicable laws and regulations including, but without limitation, the requirements of:

(1) Executive Order 12372, Intergovernmental Review of Federal Programs, as implemented by 10 CFR part 1005.

(2) DOE Financial Assistance Rules (10 CFR part 600); and

(3) Other procedures which DOE may from time to time prescribe for the administration of financial assistance under this part.

(b) The budget period(s) covered by the financial assistance provided to a State according to §420.11(b) or §420.33 shall be consistent with 10 CFR part 600.

(c) Subawards are authorized under this part and are subject to the requirements of this part and 10 CFR part 600.

§ 420.4 Technical assistance.

At the request of the Governor of any State to DOE and subject to the availability of personnel and funds, DOE will provide information and technical assistance to the State in connection with effectuating the purposes of this part.

§ 420.5 Reports.

(a) Each State receiving financial assistance under this part shall submit to the cognizant Regional Office Director a quarterly program performance report and a quarterly financial status report.

(b) Reports under this section shall contain such information as the Secretary may prescribe in order to monitor effectively the implementation of a State's activities under this part.

(c) The reports shall be submitted within 30 days following the end of each calendar year quarter.

§ 420.6 Reference standards.

(a) The following standards which are not otherwise set forth in this part are incorporated by reference and made a part of this part. The following standards have been approved for incorporation by reference by the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR part 51. A notice of any change in these materials will be published in the Federal Register. The standards incorporated by reference are available for inspection at the Office of the Federal Register, 800 North Capitol Street, NW., suite 700, Washington, DC.

(b) The following standards are incorporated by reference in this part:

(1) The American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE), 1791 Tullie Circle, N.E., Atlanta, Georgia 30329, (404) 636–8400/The Illuminating Engineering Society of North America (IESNA), 345 East 47th Street, New York, New York 10017, (212) 705–7913: (i) ASHRAE/IESNA 90.1–1989, entitled ''Energy Efficient Design of New Buildings Except Low-Rise Residential Buildings,'' with Addenda 90.1b-1992; Addenda 90.1d-1992; Addenda 90.1e-1992; Addenda 90.1g-1993; and Addenda 90.1i-1993, IBR approved for §420.2 and §420.15.

(2) The Council of American Building Officials (CABO), 5203 Leesburg Pike, Suite 708, Falls Church, Virginia 22041, (703) 931–4533: (i) The Model Energy Code, 1993, including Errata, IBR approved for §420.2 and §420.15.

Subpart B—Formula Grant Procedures

§ 420.10 Purpose.

This subpart specifies the procedures that apply to the Formula Grant part

of the State Energy Program, which allows States to apply for financial assistance to undertake a wide range of required and optional energy-related activities provided for under § 420.15 and § 420.17. Funding for these activities is allocated to the States based on funds available for any fiscal year, as described under § 420.11.

§ 420.11 Allocation of funds among the States.

(a) The cognizant Regional Office Director shall provide financial assistance to each State having an approved annual application from funds available for any fiscal year to develop, modify, or implement a plan.

(b) DOE shall allocate financial assistance to develop, implement or modify plans among the States from funds available for any fiscal year, as follows:

(1) If the available funds equal $25.5 million, such funds shall be allocated to the States according to Table 1 of this section.

(2) The base allocation for each State is listed in Table 1.

TABLE 1.—BASE ALLOCATION BY STATE

State/Territory	
Alabama	$381,000
Alaska	180,000
Arizona	344,000
Arkansas	307,000
California	1,602,000
Colorado	399,000
Connecticut	397,000
Delaware	164,000
District of Columbia	158,000
Florida	831,000
Georgia	534,000
Hawaii	170,000
Idaho	190,000
Illinois	1,150,000
Indiana	631,000
Iowa	373,000
Kansas	327,000
Kentucky	411,000
Louisiana	446,000
Maine	231,000
Maryland	486,000
Massachusetts	617,000
Michigan	973,000
Minnesota	584,000
Mississippi	279,000
Missouri	518,000
Montana	182,000
Nebraska	246,000
Nevada	196,000
New Hampshire	216,000
New Jersey	783,000
New Mexico	219,000
New York	1,633,000
North Carolina	564,000
North Dakota	172,000
Ohio	1,073,000
Oklahoma	352,000
Oregon	325,000
Pennsylvania	1,090,000
Rhode Island	199,000
South Carolina	340,000
South Dakota	168,000
Tennessee	476,000
Texas	1,322,000
Utah	242,000
Vermont	172,000
Virginia	571,000
Washington	438,000
West Virginia	286,000
Wisconsin	604,000
Wyoming	155,000
American Samoa	115,000
Guam	120,000
Northern Marianas	114,000
Puerto Rico	322,000
U.S. Virgin Islands	122,000
Total	25,500,000

(3) If the available funds for any fiscal year are less than $25.5 million, then the base allocation for each State shall be reduced proportionally.

(4) If the available funds exceed $25.5 million, $25.5 million shall be allocated as specified in Table 1 and any in excess of $25.5 million shall be allocated as follows:

(i) One-third of the available funds is divided among the States equally;

(ii) One-third of the available funds is divided on the basis of the population of the participating States as contained in the most recent reliable census data available from the Bureau of the Census, Department of Commerce, for all participating States at the time DOE needs to compute State formula shares; and

(iii) One-third of the available funds is divided on the basis of the energy consumption of the participating States as contained in the most recent State Energy Data Report available from DOE's Energy Information Administration.

(c) The budget period covered by the financial assistance provided to a State according to § 420.11(b) shall be consistent with 10 CFR part 600.

§ 420.12 State matching contribution.

(a) Each State shall provide cash, in kind contributions, or both for SEP activities in an amount totalling not less

than 20 percent of the financial assistance allocated to the State under § 420.11(b).

(b) Cash and in-kind contributions used to meet this State matching requirement are subject to the limitations on expenditures described in § 420.18(a), but are not subject to the 20 percent limitation in § 420.18(b).

(c) Nothing in this section shall be read to require a match for petroleum violation escrow funds used under this subpart.

[61 FR 35895, July 8, 1996, as amended at 64 FR 46114, Aug. 24, 1999]

§ 420.13 Annual State applications and amendments to State plans.

(a) To be eligible for financial assistance under this subpart, a State shall submit to the cognizant Regional Office Director an original and two copies of the annual application executed by the Governor, including an amended State plan or any amendments to the State plan needed to reflect changes in the activities the State is planning to undertake for the fiscal year concerned. The date for submission of the annual State application shall be set by DOE.

(b) An application shall include:

(1) A face sheet containing basic identifying information, on Standard Form (SF) 424;

(2) A description of the energy efficiency, renewable energy, and alternative transportation fuel goals to be achieved, including wherever practicable:

(i) An estimate of the energy to be saved by implementation of the State plan;

(ii) Why the goals were selected;

(iii) How the attainment of the goals will be measured by the State; and

(iv) How the program activities included in the State plan represent a strategy to achieve these goals;

(3) With respect to financial assistance under this subpart, a goal, consisting of an improvement of 10 percent or more in the efficiency of use of energy in the State concerned in the calendar year 2000, as compared to the calendar year 1990, and may contain interim goals;

(4) For the budget period for which financial assistance will be provided:

(i) A total program budget with supporting justification, broken out by object category and by source of funding;

(ii) The source and amount of State matching contribution;

(iii) A narrative statement detailing the nature of State plan amendments and of new program activities.

(iv) For each program activity, a budget and listing of milestones; and

(v) An explanation of how the minimum criteria for required program activities prescribed in § 420.15 have been implemented and are being maintained.

(5) If any of the activities being undertaken by the State in its plan have environmental impacts, a detailed description of the increase or decrease in environmental residuals expected from implementation of a plan defined insofar as possible through the use of information to be provided by DOE and an indication of how these environmental factors were considered in the selection of program activities.

(6) If a State is undertaking program activities involving purchase or installation of materials or equipment for weatherization of low-income housing, an explanation of how these activities would supplement and not supplant the existing DOE program under 10 CFR part 440.

(7) A reasonable assurance to DOE that it has established policies and procedures designed to assure that Federal financial assistance under this subpart will be used to supplement, and not to supplant, State and local funds, and to the extent practicable, to increase the amount of such funds that otherwise would be available, in the absence of such Federal financial assistance, for those activities set forth in the State Energy Program plan approved pursuant to this subpart;

(8) An assurance that the State shall comply with all applicable statutes and regulations in effect with respect to the periods for which it receives grant funding; and

(9) For informational purposes only, and not subject to DOE review, an energy emergency plan for an energy supply disruption, as designed by the

State consistent with applicable Federal and State law including an implementation strategy or strategies (including regional coordination) for dealing with energy emergencies.

(c) The Governor may request an extension of the annual submission date by submitting a written request to the cognizant Regional Office Director not less than 15 days prior to the annual submission date. The extension shall be granted only if, in the cognizant Regional Office Director's judgment, acceptable and substantial justification is shown, and the extension would further objectives of the Act.

[61 FR 35895, July 8, 1996, as amended at 62 FR 26727, May 14, 1997; 64 FR 46114, Aug. 24, 1999]

§ 420.14 Review and approval of annual State applications and amendments to State plans.

(a) After receipt of an application for financial assistance under this subpart and for approval of an amendment, if any, to a State plan, the cognizant Regional Office Director may request the State to submit within a reasonable period of time any revisions necessary to make the application complete and to bring the application into compliance with the requirements of subparts A and B of this part. The cognizant Regional Office Director shall attempt to resolve any dispute over the application informally and to seek voluntary compliance. If a State fails to submit timely appropriate revisions to complete an application or to bring it into compliance, the cognizant Regional Office Director may reject the application in a written decision, including a statement of reasons, which shall be subject to administrative review under § 420.19 of subparts A and B of this part.

(b) On or before 60 days from the date that a timely filed application is complete, the cognizant Regional Office Director shall—

(1) Approve the application in whole or in part to the extent that—

(i) The application conforms to the requirements of subparts A and B of this part;

(ii) The proposed program activities are consistent with a State's achievement of its energy conservation goals in accordance with § 420.13; and

(iii) The provisions of the application regarding program activities satisfy the minimum requirements prescribed by § 420.15 and § 420.17 as applicable;

(2) Approve the application in whole or in part subject to special conditions designed to ensure compliance with the requirements of subparts A and B of this part; or

(3) Disapprove the application if it does not conform to the requirements of subparts A and B of this part.

[61 FR 35895, July 8, 1996, as amended at 62 FR 26727, May 14, 1997; 64 FR 46114, Aug. 24, 1999]

§ 420.15 Minimum criteria for required program activities for plans.

A plan shall satisfy all of the following minimum criteria for required program activities.

(a) Mandatory lighting efficiency standards for public buildings shall:

(1) Be implemented throughout the State, except that the standards shall be adopted by the State as a model code for those local governments of the State for which the State's constitution reserves the exclusive authority to adopt and implement building standards within their jurisdictions;

(2) Apply to all public buildings (except for public buildings owned or leased by the United States), above a certain size, as determined by the State;

(3) For new public buildings, be no less stringent than the provisions of ASHRAE/IESNA 90.1–1989, and should be updated by enactment of, or support for the enactment into local codes or standards, which, at a minimum, are comparable to provisions of ASHRAE/IESNA 90.1–1989 which is incorporated by reference in accordance with 5 U.S.C. 552 (a) and 1 CFR part 51. The availability of this incorporation by reference is given in § 420.6; and

(4) For existing public buildings, contain the elements deemed appropriate by the State.

(b) Program activities to promote the availability and use of carpools, vanpools, and public transportation shall:

(1) Have at least one of the following actions under implementation in at least one urbanized area with a population of 50,000 or more within the State or in the largest urbanized area

within the State if that State does not have an urbanized area with a population of 50,000 or more:

(i) A carpool/vanpool matching and promotion campaign;

(ii) Park-and-ride lots;

(iii) Preferential traffic control for carpoolers and public transportation patrons;

(iv) Preferential parking for carpools and vanpools;

(v) Variable working schedules;

(vi) Improvement in transit level of service for public transportation;

(vii) Exemption of carpools and vanpools from regulated carrier status;

(viii) Parking taxes, parking fee regulations or surcharge on parking costs;

(ix) Full-cost parking fees for State and/or local government employees;

(x) Urban area traffic restrictions;

(xi) Geographical or time restrictions on automobile use; or

(xii) Area or facility tolls; and

(2) Be coordinated with the relevant Metropolitan Planning Organization, unless no Metropolitan Planning Organization exists in the urbanized area, and not be inconsistent with any applicable Federal requirements.

(c) Mandatory standards and policies affecting the procurement practices of the State and its political subdivisions to improve energy efficiency shall—

(1) With respect to all State procurement and with respect to procurement of political subdivisions to the extent determined feasible by the State, be under implementation; and

(2) Contain the elements deemed appropriate by the State to improve energy efficiency through the procurement practices of the State and its political subdivisions.

(d) Mandatory thermal efficiency standards for new and renovated buildings shall—

(1) Be implemented throughout the State, with respect to all buildings (other than buildings owned or leased by the United States, buildings whose peak design rate of energy usage for all purposes is less than one watt (3.4 Btu's per hour) per square foot of floor space for all purposes, or manufactured homes), except that the standards shall be adopted by the State as a model code for those local governments of the State for which the State's law reserves the exclusive authority to adopt and implement building standards within their jurisdictions;

(2) Take into account the exterior envelope physical characteristics, HVAC system selection and configuration, HVAC equipment performance and service water heating design and equipment selection;

(3) For all new commercial and multifamily high-rise buildings, be no less stringent than provisions of sections 7–12 of ASHRAE/IESNA 90.1–1989, and should be updated by enactment of, or support for the enactment into local codes or standards, which, at a minimum, are comparable to provisions of ASHRAE/IESNA 90.1–1989; and

(4) For all new single-family and multifamily low-rise residential buildings, be no less stringent than the Model Energy Code, 1993, and should be updated by enactment of, or support for the enactment into local codes or standards, which, at a minimum, are comparable to the Model Energy Code, 1993, which is incorporated by reference in accordance with 5 U.S.C. 552(a) and 1 CFR part 51. The availability of this incorporation by reference is given in § 420.6;

(5) For renovated buildings:

(i) Apply to those buildings determined by the State to be renovated buildings; and

(ii) Contain the elements deemed appropriate by the State regarding thermal efficiency standards for renovated buildings.

(e) A traffic law or regulation which permits the operator of a motor vehicle to make a turn at a red light after stopping shall:

(1) Be in a State's motor vehicle code and under implementation throughout all political subdivisions of the State;

(2) Permit the operator of a motor vehicle to make a right turn (left turn with respect to the Virgin Islands) at a red traffic light after stopping except where specifically prohibited by a traffic sign for reasons of safety or except where generally prohibited in an urban enclave for reasons of safety; and

(3) Permit the operator of a motor vehicle to make a left turn from a one-way street to a one-way street (right turn with respect to the Virgin Islands)

at a red traffic light after stopping except where specifically prohibited by a traffic sign for reasons of safety or except where generally prohibited in an urban enclave for reasons of safety.

(f) Procedures must exist for ensuring effective coordination among various local, State, and Federal energy efficiency, renewable energy and alternative transportation fuel programs within the State, including any program administered within the Office of Building Technology, State and Community Programs of the Department of Energy and the Low Income Home Energy Assistance Program administered by the Department of Health and Human Services.

[61 FR 35895, July 8, 1996, as amended at 62 FR 26727, May 14, 1997]

§ 420.16 Extensions for compliance with required program activities.

An extension of time by which a required program activity must be ready for implementation may be granted if DOE determines that the extension is justified. A written request for an extension, with accompanying justification and an action plan acceptable to DOE for achieving compliance in the shortest reasonable time, shall be made to the cognizant Regional Office Director. Any extension shall be only for the shortest reasonable time that DOE determines necessary to achieve compliance. The action plan shall contain a schedule for full compliance and shall identify and make the most reasonable commitment possible to provision of the resources necessary for achieving the scheduled compliance.

§ 420.17 Optional elements of State Energy Program plans.

(a) Other appropriate activities or programs may be included in the State plan. These activities may include, but are not limited to, the following:

(1) Program activities of public education to promote energy efficiency, renewable energy, and alternative transportation fuels;

(2) Program activities to increase transportation energy efficiency, including programs to accelerate the use of alternative transportation fuels for government vehicles, fleet vehicles, taxis, mass transit, and privately owned vehicles;

(3) Program activities for financing energy efficiency measures and renewable energy measures—

(i) Which may include loan programs and performance contracting programs for leveraging of additional public and private sector funds and program activities which allow rebates, grants, or other incentives for the purchase of energy efficiency measures and renewable energy measures; or

(ii) In addition to or in lieu of program activities described in paragraph (a)(3)(i) of this section, which may be used in connection with public or nonprofit buildings owned and operated by a State, a political subdivision of a State or an agency or instrumentality of a State, or an organization exempt from taxation under section 501(c)(3) of the Internal Revenue Code of 1986 including public and private non-profit schools and hospitals, and local government buildings;

(4) Program activities for encouraging and for carrying out energy audits with respect to buildings and industrial facilities (including industrial processes) within the State;

(5) Program activities to promote the adoption of integrated energy plans which provide for:

(i) Periodic evaluation of a State's energy needs, available energy resources (including greater energy efficiency), and energy costs; and

(ii) Utilization of adequate and reliable energy supplies, including greater energy efficiency, that meet applicable safety, environmental, and policy requirements at the lowest cost;

(6) Program activities to promote energy efficiency in residential housing, such as:

(i) Program activities for development and promotion of energy efficiency rating systems for newly constructed housing and existing housing so that consumers can compare the energy efficiency of different housing; and

(ii) Program activities for the adoption of incentives for builders, utilities, and mortgage lenders to build, service, or finance energy efficient housing;

(7) Program activities to identify unfair or deceptive acts or practices which relate to the implementation of energy efficiency measures and renewable energy measures and to educate consumers concerning such acts or practices;

(8) Program activities to modify patterns of energy consumption so as to reduce peak demands for energy and improve the efficiency of energy supply systems, including electricity supply systems;

(9) Program activities to promote energy efficiency as an integral component of economic development planning conducted by State, local, or other governmental entities or by energy utilities;

(10) Program activities (enlisting appropriate trade and professional organizations in the development and financing of such programs) to provide training and education (including, if appropriate, training workshops, practice manuals, and testing for each area of energy efficiency technology) to building designers and contractors involved in building design and construction or in the sale, installation, and maintenance of energy systems and equipment to promote building energy efficiency;

(11) Program activities for the development of building retrofit standards and regulations, including retrofit ordinances enforced at the time of the sale of a building;

(12) Program activities to provide support for prefeasibility and feasibility studies for projects that utilize renewable energy and energy efficiency resource technologies in order to facilitate access to capital and credit for such projects;

(13) Program activities to facilitate and encourage the voluntary use of renewable energy technologies for eligible participants in Federal agency programs, including the Rural Electrification Administration and the Farmers Home Administration; and

(14) In accordance with paragraph (b) of this section, program activities to implement the Energy Technology Commercialization Services Program.

(b) This section prescribes requirements for establishing State-level Energy Technology Commercialization Services Program as an optional element of State plans.

(1) The program activities to implement the functions of the Energy Technology Commercialization Services Program shall:

(i) Aid small and start-up businesses in discovering useful and practical information relating to manufacturing and commercial production techniques and costs associated with new energy technologies;

(ii) Encourage the application of such information in order to solve energy technology product development and manufacturing problems;

(iii) Establish an Energy Technology Commercialization Services Program affiliated with an existing entity in each State;

(iv) Coordinate engineers and manufacturers to aid small and start-up businesses in solving specific technical problems and improving the cost effectiveness of methods for manufacturing new energy technologies;

(v) Assist small and start-up businesses in preparing the technical portions of proposals seeking financial assistance for new energy technology commercialization; and

(vi) Facilitate contract research between university faculty and students and small start-up businesses, in order to improve energy technology product development and independent quality control testing.

(2) Each State Energy Technology Commercialization Services Program shall develop and maintain a data base of engineering and scientific experts in energy technologies and product commercialization interested in participating in the service. Such data base shall, at a minimum, include faculty of institutions of higher education, retired manufacturing experts, and National Laboratory personnel.

(3) The services provided by the Energy Technology Commercialization Services Program established under this subpart shall be available to any small or start-up business. Such service programs shall charge fees which are affordable to a party eligible for assistance, which shall be determined by examining factors, including the following: the costs of the services received; the need of the recipient for the

services; and the ability of the recipient to pay for the services.

[61 FR 35895, July 8, 1996, as amended at 62 FR 26727, May 14, 1997; 64 FR 46114, Aug. 24, 1999]

§ 420.18 Expenditure prohibitions and limitations.

(a) No financial assistance provided to a State under this subpart shall be used:

(1) For construction, such as construction of mass transit systems and exclusive bus lanes, or for construction or repair of buildings or structures;

(2) To purchase land, a building or structure or any interest therein;

(3) To subsidize fares for public transportation;

(4) To subsidize utility rate demonstrations or State tax credits for energy conservation measures or renewable energy measures; or

(5) To conduct, or purchase equipment to conduct, research, development or demonstration of energy efficiency or renewable energy techniques and technologies not commercially available.

(b) No more than 20 percent of the financial assistance awarded to the State for this program shall be used to purchase office supplies, library materials, or other equipment whose purchase is not otherwise prohibited by this section. Nothing in this paragraph shall be read to apply this 20 percent limitation to petroleum violation escrow funds used under this subpart.

(c) Demonstrations of commercially available energy efficiency or renewable energy techniques and technologies are permitted, and are not subject to the prohibitions of §420.18(a)(1), or to the limitation on equipment purchases of §420.18(b).

(d) A State may use regular or revolving loan mechanisms to fund SEP services which are consistent with this subpart and which are included in the State's approved SEP plan. The State may use loan repayments and any interest on the loan funds only for activities which are consistent with this subpart and which are included in the State's approved SEP plan.

(e) A State may use funds under this subpart for the purchase and installation of equipment and materials for energy efficiency measures and renewable energy measures, including reasonable design costs, subject to the following terms and conditions:

(1) Such use must be included in the State's approved plan and, if funded by petroleum violation escrow funds, must be consistent with any judicial or administrative terms and conditions imposed upon State use of such funds;

(2) A State may use for these purposes no more than 50 percent of all funds allocated by the State to SEP in a given year, regardless of source, except that this limitation shall not include regular and revolving loan programs funded with petroleum violation escrow funds, and is subject to waiver by DOE for good cause. Loan documents shall ensure repayment of principal and interest within a reasonable period of time, and shall not include provisions of loan forgiveness.

(3) Buildings owned or leased by the United States are not eligible for energy efficiency measures or renewable energy measures under paragraph (e) of this section;

(4) Funds must be used to supplement and no funds may be used to supplant weatherization activities under the Weatherization Assistance Program for Low-Income Persons, under 10 CFR part 440;

(5) Subject to paragraph (f) of this section, a State may use a variety of financial incentives to fund purchases and installation of materials and equipment under paragraph (e) of this section including, but not limited to, regular loans, revolving loans, loan buy-downs, performance contracting, rebates and grants.

(f) The following mechanisms are not allowed for funding the purchase and installation of materials and equipment under paragraph (e) of this section:

(1) Rebates for more than 50 percent of the total cost of purchasing and installing materials and equipment (States shall set appropriate restrictions and limits to insure the most efficient use of rebates); and

(2) Loan guarantees.

[61 FR 35895, July 8, 1996, as amended at 62 FR 26727, May 14, 1997; 64 FR 46114, Aug. 24, 1999]

§ 420.19 Administrative review.

(a) A State shall have 20 days from the date of receipt of a decision under § 420.14 to file a notice requesting administrative review in accordance with paragraph (b) of this section. If an applicant does not timely file such a notice, the decision under § 420.14 shall become final for DOE.

(b) A notice requesting administrative review shall be filed with the cognizant Regional Office Director and shall be accompanied by a written statement containing supporting arguments. If the cognizant Regional Office Director has disapproved an entire application for financial assistance, the State may request a public hearing.

(c) A notice or any other document shall be deemed filed under this section upon receipt.

(d) On or before 15 days from receipt of a notice requesting administrative review which is timely filed, the cognizant Regional Office Director shall forward to the Deputy Assistant Secretary, the notice requesting administrative review, the decision under § 420.14 as to which administrative review is sought, a draft recommended final decision for concurrence, and any other relevant material.

(e) If the State requests a public hearing on the disapproval of an entire application for financial assistance under this subpart, the Deputy Assistant Secretary, within 15 days, shall give actual notice to the State and FEDERAL REGISTER notice of the date, place, time, and procedures which shall apply to the public hearing. Any public hearing under this section shall be informal and legislative in nature.

(f) On or before 45 days from receipt of documents under paragraph (d) of this section or the conclusion of the public hearing, whichever is later, the Deputy Assistant Secretary shall concur in, concur in as modified, or issue a substitute for the recommended decision of the cognizant Regional Office Director.

(g) On or before 15 days from the date of receipt of the determination under paragraph (f) of this section, the Governor may file an application for discretionary review by the Assistant Secretary. On or before 15 days from filing, the Assistant Secretary shall send a notice to the Governor stating whether the Deputy Assistant Secretary's determination will be reviewed. If the Assistant Secretary grants a review, a decision shall be issued no later than 60 days from the date review is granted. The Assistant Secretary may not issue a notice or decision under this paragraph without the concurrence of the DOE Office of General Counsel.

(h) A decision under paragraph (f) of this section shall be final for DOE if there is no review under paragraph (g) of this section. If there is review under paragraph (g) of this section, the decision thereunder shall be final for DOE and no appeal shall lie elsewhere in DOE.

(i) Prior to the effective date of the termination or suspension of a grant award for failure to implement an approved State plan in compliance with the requirements of this subpart, a grantee shall have the right to written notice of the basis for the enforcement action and of the opportunity for public hearing before the DOE Financial Assistance Appeals Board notwithstanding any provisions to the contrary of 10 CFR 600.22, 600.24, 600.25, and 600.243. To obtain a public hearing, the grantee must request an evidentiary hearing, with prior FEDERAL REGISTER notice, in the election letter submitted under Rule 2 of 10 CFR 1024.4 and the request shall be granted notwithstanding any provisions to the contrary of Rule 2.

[61 FR 35895, July 8, 1996, as amended at 64 FR 46114, Aug. 24, 1999]

Subpart C—Implementation of Special Projects Financial Assistance

§ 420.30 Purpose and scope.

(a) This subpart sets forth DOE's policies and procedures for implementing special projects financial assistance under this part.

(b) For years in which such funding is available, States may apply for financial assistance to undertake a variety of State-oriented energy-related special projects activities in addition to the funds provided under the regular SEP grants.

(c) The types of funded activities may vary from year to year, and from State to State, depending upon funds available for each type of activity and DOE and State priorities.

(d) A number of end-use sector programs in the Office of Energy Efficiency and Renewable Energy participate in the funding of these activities, and the projects must meet the requirements of those programs.

(e) The purposes of the special project activities are:

(1) To utilize States to accelerate deployment of energy efficiency, renewable energy, and alternative transportation fuel technologies;

(2) To facilitate the commercialization of emerging and underutilized energy efficiency and renewable energy technologies; and

(3) To increase the responsiveness of Federally funded technology development efforts to the needs of the marketplace.

§ 420.31 Notice of availability.

(a) If in any fiscal year DOE has funds available for special projects, DOE shall publish in the FEDERAL REGISTER one or more notice(s) of availability of SEP special projects financial assistance.

(b) Each notice of availability shall cite this part and shall include:

(1) Brief descriptions of the activities for which funding is available;

(2) The amount of money DOE has available or estimates it will have available for award for each type of activity, and the total amount available;

(3) The program official to contact for additional information, application forms, and the program guidance/solicitation document; and

(4) The dates when:

(i) The program guidance/solicitation will be available; and

(ii) The applications for financial assistance must be received by DOE.

§ 420.32 Program guidance/solicitation.

After the publication of the notice of availability in the FEDERAL REGISTER, DOE shall, upon request, provide States interested in applying for one or more project(s) under the special projects financial assistance with a detailed program guidance/solicitation that will include:

(a) The control number of the program;

(b) The expected duration of DOE support or period of performance;

(c) An application form or the format to be used, location for application submission, and number of copies required;

(d) The name of the DOE program office contact from whom to seek additional information;

(e) Detailed descriptions of each type of program activity for which financial assistance is being offered;

(f) The amount of money available for award, together with any limitations as to maximum or minimum amounts expected to be awarded;

(g) Deadlines for submitting applications;

(h) Evaluation criteria that DOE will apply in the selection and ranking process for applications for each program activity;

(i) The evaluation process to be applied to each type of program activity;

(j) A listing of program policy factors if any that DOE may use in the final selection process, in addition to the results of the evaluations, including:

(1) The importance and relevance of the proposed applications to SEP and the participating programs in the Office of Energy Efficiency and Renewable Energy; and

(2) Geographical diversity;

(k) Reporting requirements;

(l) References to:

(1) Statutory authority for the program;

(2) Applicable rules; and

(3) Other terms and conditions applicable to awards made under the program guidance/solicitation; and

(m) A statement that DOE reserves the right to fund in whole or in part, any, all, or none of the applications submitted.

§ 420.33 Application requirements.

(a) Consistent with §420.32 of this part, DOE shall set forth general and special project activity-specific requirements for applications for special projects financial assistance in the program guidance/solicitation.

(b) In addition to any other requirements, all applications shall provide:

(1) A detailed description of the proposed project, including the objectives of the project in relationship to DOE's program and the State's plan for carrying it out;

(2) A detailed budget for the entire proposed period of support, with written justification sufficient to evaluate the itemized list of costs provided on the entire project; and

(3) An implementation schedule for carrying out the project.

(c) DOE may, subsequent to receipt of an application, request additional budgetary information from a State when necessary for clarification or to make informed preaward determinations.

(d) DOE may return an application which does not include all information and documentation required by this subpart, 10 CFR part 600, or the program guidance/solicitation, when the nature of the omission precludes review of the application.

[61 FR 35895, July 8, 1996, as amended at 64 FR 46114, Aug. 24, 1999]

§ 420.34 Matching contributions or cost-sharing.

DOE may require (as set forth in the program guidance/solicitation) States to provide either:

(a) A matching contribution of at least a specified percentage of the Federal financial assistance award; or

(b) A specified share of the total cost of the project for which financial assistance is provided.

§ 420.35 Application evaluation.

(a) DOE staff at the cognizant Regional Office shall perform an initial review of all applications to ensure that the State has provided the information required by this subpart, 10 CFR part 600, and the program guidance/solicitation.

(b) DOE shall group, and technically evaluate according to program activity, all applications determined to be complete and satisfactory.

(c) DOE shall select evaluators on the basis of their professional qualifications and expertise relating to the particular program activity being evaluated.

(1) DOE anticipates that evaluators will primarily be DOE employees; but

(2) If DOE uses non-DOE evaluators, DOE shall require them to comply with all applicable DOE rules or directives concerning the use of outside evaluators.

[61 FR 35895, July 8, 1996, as amended at 64 FR 46114, Aug. 24, 1999]

§ 420.36 Evaluation criteria.

The evaluation criteria, including program activity-specific criteria, will be set forth in the program guidance/solicitation document.

§ 420.37 Selection.

(a) DOE may make selection of applications for award based on:

(1) The findings of the technical evaluations;

(2) The priorities of DOE, SEP, and the participating program offices;

(3) The availability of funds for the various special project activities; and

(4) Any program policy factors set forth in the program guidance/solicitation.

(b) The Director, Office of State and Community Programs makes the final selections of projects to be awarded financial assistance.

§ 420.38 Special projects expenditure prohibitions and limitations.

(a) Expenditures under the special projects are subject to 10 CFR part 600 and to any prohibitions and limitations required by the DOE programs that are providing the special projects funding.

(b) DOE must state any expenditure prohibitions or limitations specific to a particular category of special projects in the annual SEP special projects solicitation/guidance.

[64 FR 46114, Aug. 24, 1999]

PART 430—ENERGY CONSERVATION PROGRAM FOR CONSUMER PRODUCTS

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AUTHORITY: 42 U.S.C. 6291–6309; 28 U.S.C. 2461 note.

SOURCE: 42 FR 27898, June 1, 1977, unless otherwise noted.

Subpart A—General Provisions

430.1 Purpose and scope.

This part establishes the regulations for the implementation of part B of title III (42 U.S.C. 6291–6309) of the Energy Policy and Conservation Act (Pub. L. 94–163), as amended by Pub. L. 95–619, Pub. L. 100–12, Pub. L. 100–357, and Pub. L. 102–486 which establishes an energy conservation program for consumer products other than automobiles.

[62 FR 29237, May 29, 1997]

§ 430.2 Definitions.

For purposes of this part, words shall be defined as provided for in section 321 of the Act and as follows—

Act means the Energy Policy and Conservation Act (Pub. L. 94–163), as amended by the National Energy Policy Conservation Act (Pub. L. 95–619), the National Appliance Energy Conservation Act of 1987 (Pub. L. 100–12), the National Appliance Energy Conservation Amendments of 1988 (Pub. L. 100–357), and the Energy Policy Act of 1992 (Pub. L. 102–486).

Annual fuel utilization efficiency means the efficiency descriptor for furnaces and boilers, determined using test procedures prescribed under section 323 and based on the assumption that all—

(a) Weatherized warm air furnaces or boilers are located out-of-doors;

(b) Warm air furnaces which are not weatherized are located indoors and all combustion and ventilation air is admitted through grill or ducts from the outdoors and does not communicate with air in the conditioned space;

(c) Boilers which are not weatherized are located within the heated space.

ANSI means the American National Standards Institute.

ASME means the American Society of Mechanical Engineers.

Automatic clothes washer means a class of clothes washer which has a control system which is capable of scheduling a preselected combination of operations, such as regulation of water temperature, regulation of the water fill level, and performance of wash, rinse, drain, and spin functions without the need for user intervention subsequent to the initiation of machine operation. Some models may require user intervention to initiate these different segments of the cycle after the machine has begun operation, but they do not require the user to intervene to regulate the water temperature by adjusting the external water faucet valves.

Ballast efficacy factor means the relative light output divided by the power imput of a fluorescent lamp ballast, as measured under test conditions specified in ANSI Standard C82.2–1984.

Baseboard electric heater means an electric heater which is intended to be recessed in or surface mounted on walls at floor level, which is characterized by long, low physical dimensions, and which transfers heat by natural convection and/or radiation.

Basic model means all units of a given type of covered product (or class thereof) manufactured by one manufacturer and—

(1) With respect to refrigerators and refrigerator-freezers, which have the same primary energy source, which have electrical characteristics that are essentially identical, and which do not have any differing physical or functional characteristics that affect energy consumption.

(2) With respect to freezers, which have the same primary energy source, which have electrical characteristics that are essentially identical, and which do not have any differing physical or functional characteristics that affect energy consumption.

(3) With respect to dishwashers, which have electrical characteristics

which are essentially identical and which do not have any differing physical or functional characteristics which affect energy consumption.

(4) With respect to clothes dryers, which have the same primary energy source, which have electrical characteristics that are essentially identical, and which do not have any differing physical or functional characteristics that affect energy consumption.

(5) With respect to water heaters, which have the same primary energy source and which, with the exception of immersed heating elements, do not have any differing electrical, physical, or functional characteristics that affect energy consumption.

(6) With respect to room air conditioners, having essentially identical functional physical and electrical characteristics.

(7) With respect to unvented home heating equipment, having essentially identical functional physical and electrical characteristics.

(8) With respect to television sets, which have identical screen size, which have electrical characteristics that are essentially identical, and which do not have any differing physical or functional characteristics that affect energy consumption.

(9) With respect to kitchen ranges and ovens, whose major cooking components have the same primary energy source, which have electrical characteristics that are essentially identical, and which do not have any differing physical or functional characteristics that affect energy consumption.

(10) With respect to clothes washers, which have the same primary energy source, which have electrical characteristics that are essentially identical, and which do not have any differing physical or functional characteristics that affect energy consumption.

(11) With respect to central air conditioners, which have electrical characteristics which are essentially identical and which do not have any differing physical or functional characteristics that affect energy consumption.

(12) With respect to furnaces, having the same primary energy source and essentially identical functional, physical and electrical characteristics.

(13) With respect to vented home heating equipment, having the same primary energy source and essentially identical functional, physical and electrical characteristics.

(14) With respect to fluorescent lamp ballasts, which have electrical characteristics, including a Power Factor (P.F.) of equal value, which are essentially identical, and which do not have any differing physical or functional characteristics that affect energy consumption.

(15) With respect to general service fluorescent lamps, means lamps that have essentially identical light output and electrical characteristics—including lumens per watt and color rendering index (CRI)—and that do not have any differing physical or functional characteristics that affect energy consumption or efficacy.

(16) With respect to incandescent reflector lamps, means lamps that have essentially identical light output and electrical characteristics—including lumens per watt—and that do not have any differing physical or functional characteristics that affect energy consumption or efficacy.

(17) With respect to faucets, which have the identical flow control mechanism attached to or installed within the fixture fittings, or the identical water-passage design features that use the same path of water in the highest-flow mode.

(18) With respect to showerheads, which have the identical flow control mechanism attached to or installed within the fixture fittings, or the identical water-passage design features that use the same path of water in the highest-flow mode.

(19) With respect to water closets, which have hydraulic characteristics that are essentially identical, and which do not have any differing physical or functional characteristics that affect water consumption.

(20) With respect to urinals, which have hydraulic characteristics that are essentially identical, and which do not have any differing physical or functional characteristics that affect water consumption.

Batch means a collection of production units of a basic model from which a batch sample is selected.

Batch sample means the collection of units of the same basic model from which test units are selected.

Batch sample size means the number of units in a batch sample.

Batch size means the number of units in a batch.

Blowout has the meaning given such a term in ASME A112.19.2M–1995. (see § 430.22)

BR incandescent reflector lamp means a reflector lamp that has a bulged section below the bulb's major diameter and above its approximate base line as shown in Figure 1 (RB) on page 7 of ANSI C79.1–1994. A BR30 lamp has a lamp wattage of 85 or less than 66 and a BR40 lamp has a lamp wattage of 120 or less.

Btu means British thermal unit, which is the quantity of heat required to raise the temperature of one pound of water one degree Fahrenheit.

Casement-only means a room air conditioner designed for mounting in a casement window with an encased assembly with a width of 14.8 inches or less and a height of 11.2 inches or less.

Casement-slider means a room air conditioner with an encased assembly designed for mounting in a sliding or casement window with a width of 15.5 inches or less.

Ceiling electric heater means an electric heater which is intended to be recessed in, surface mounted on, or hung from a ceiling, and which transfers heat by radiation and/or convection (either natural or forced).

Central air conditioner means a product, other than a packaged terminal air conditioner, which is powered by single phase electric current, air cooled, rated below 65,000 Btu per hour, not contained within the same cabinet as a furnace, the rated capacity of which is above 225,000 Btu per hour, and is a heat pump or a cooling unit only.

Central system humidifier means a class of humidifier designed to add moisture into the air stream of a heating system.

Clothes washer means a consumer product designed to clean clothes, utilizing a water solution of soap and/or detergent and mechanical agitation or other movement, and must be one of the following classes: automatic clothes washers, semi-automatic clothes washers, and other clothes washers.

Coil family means a group of coils with the same basic design features that affect the heat exchanger performance. These features are the basic configuration, i.e., A-shape, V-shape, slanted or flat top, the heat transfer surfaces on refrigerant and air sides (flat tubes vs. grooved tubes, fin shapes), the tube and fin materials, and the coil circuitry. When a group of coils has all these features in common, it constitutes a ''coil family.''

Cold temperature fluorescent lamp means a fluorescent lamp specifically designed to start at −20°F when used with a ballast conforming to the requirements of ANSI Standard C78.1–1991, and is expressly designated as a cold temperature lamp both in markings on the lamp and in marketing materials, including but not limited to catalogs, sales literature, and promotional material.

Colored fluorescent lamp means a fluorescent lamp designated and marketed as a colored lamp, and with either of the following characteristics: a CRI less than 40, as determined according to the method given in CIE Publication 13.2 (see 10 CFR 430.22), or a lamp correlated color temperature less than 2,500K or greater than 6,600K.

Colored incandescent lamp means an incandescent lamp designated and marketed as a colored lamp that has a CRI less than 50, as determined according to the method given in CIE Publication 13.2 (see 10 CFR 430.22); has a correlated color temperature less than 2,500K or greater than 4,600K; has a lens containing 5 percent or more neodymium oxide; or contains a filter to suppress yellow and green portions of the spectrum and is specifically designed, designated and marketed as a plant light.

Color Rendering Index or CRI means the measured degree of color shift objects undergo when illuminated by a light source as compared with the color of those same objects when illuminated by a reference source of comparable color temperature.

Color television set means an electrical device designed to convert incoming broadcast signals into color television pictures and associated sound.

Compact refrigerator/refrigerator-freezer/freezer means any refrigerator, refrigerator-freezer or freezer with total volume less than 7.75 cubic feet (220 liters)(rated volume as determined in Appendix A1 and B1 of subpart B of this part) and 36 inches (0.91 meters) or less in height.

Condenser-evaporator coil combination means a condensing unit made by one manufacturer and one of several evaporator coils, either manufactured by the same manufacturer or another manufacturer, intended to be combined with that particular condensing unit.

Condensing unit means a component of a central air conditioner which is designed to remove the heat absorbed by the refrigerant and to transfer it to the outside environment, and which consists of an outdoor coil, compressor(s), and air moving device.

Consumer product means any article (other than an automobile, as defined in Section 501(1) of the Motor Vehicle Information and Cost Savings Act):

(1) Of a type—

(i) Which in operation consumes, or is designed to consume, energy or, with respect to showerheads, faucets, water closets, and urinals, water; and

(ii) Which, to any significant extent, is distributed in commerce for personal use or consumption by individuals;

(2) Without regard to whether such article of such type is in fact distributed in commerce for personal use or consumption by an individual, except that such term includes fluorescent lamp ballasts, general service fluorescent lamps, incandescent reflector lamps, showerheads, faucets, water closets, and urinals distributed in commerce for personal or commercial use or consumption.

Conventional cooking top means a class of kitchen ranges and ovens which is a household cooking appliance consisting of a horizontal surface containing one or more surface units which include either a gas flame or electric resistance heating.

Conventional oven means a class of kitchen ranges and ovens which is a household cooking appliance consisting of one or more compartments intended for the cooking or heating of food by means of either a gas flame or electric resistance heating. It does not include portable or countertop ovens which use electric resistance heating for the cooking or heating of food and are designed for an electrical supply of approximately 120 volts.

Conventional range means a class of kitchen ranges and ovens which is a household cooking appliance consisting of a conventional cooking top and one or more conventional ovens.

Convertible cooking appliance means any kitchen range and oven which is a household cooking appliance designed by the manufacturer to be changed in service from use with natural gas to use with LP-gas, and vice versa, by incorporating in the appliance convertible orifices for the main gas burners and a convertible gas pressure regulator.

Cooking products means consumer products that are used as the major household cooking appliances. They are designed to cook or heat different types of food by one or more of the following sources of heat: gas, electricity, or microwave energy. Each product may consist of a horizontal cooking top containing one or more surface units and/or one or more heating compartments. They must be one of the following classes: conventional ranges, conventional cooking tops, conventional ovens, microwave ovens, microwave/conventional ranges and other cooking products.

Correlated color temperature means the absolute temperature of a blackbody whose chromaticity most nearly resembles that of the light source.

Covered product means a consumer product of a type specified in section 322 of the Act.

Design voltage with respect to an incandescent lamp means:

(1) The voltage marked as the intended operating voltage;

(2) The mid-point of the voltage range if the lamp is marked with a voltage range; or

(3) 120 V if the lamp is not marked with a voltage or voltage range.

Direct vent system means a system supplied by a manufacturer which provides outdoor air or air from an unheated space (such as an attic or crawl space) directly to a furnace or vented heater for combustion and for

draft relief if the unit is equipped with a draft control device.

Dishwasher means a cabinet-like appliance which with the aid of water and detergent, washes, rinses, and dries (when a drying process is included) dishware, glassware, eating utensils, and most cooking utensils by chemical, mechanical and/or electrical means and discharges to the plumbing drainage system.

DOE means the Department of Energy.

Electric boiler means an electrically powered furnace designed to supply low pressure steam or hot water for space heating application. A low pressure steam boiler operates at or below 15 pounds per square inch gauge (psig) steam pressure; a hot water boiler operates at or below 160 psig water pressure and 250° F. water temperature.

Electric central furnace means a furnace designed to supply heat through a system of ducts with air as the heating medium, in which heat is generated by one or more electric resistance heating elements and the heated air is circulated by means of a fan or blower.

Electric clothes dryer means a cabinet-like appliance designed to dry fabrics in a tumble-type drum with forced air circulation. The heat source is electricity and the drum and blower(s) are driven by an electric motor(s).

Electric heater means an electric appliance in which heat is generated from electrical energy and dissipated by convection and radiation and includes baseboard electric heaters, ceiling electric heaters, floor electric heaters, portable electric heaters, and wall electric heaters.

Electric refrigerator means a cabinet designed for the refrigerated storage of food at temperatures above 32° F., and having a source of refrigeration requiring single phase, alternating current electric energy input only. An electric refrigerator may include a compartment for the freezing and storage of food at temperatures below 32° F., but does not provide a separate low temperature compartment designed for the freezing and storage of food at temperatures below 8° F.

Electric refrigerator-freezer means a cabinet which consists of two or more compartments with at least one of the compartments designed for the refrigerated storage of food at temperatures above 32° F. and with at least one of the compartments designed for the freezing and storage of food at temperatures below 8° F. which may be adjusted by the user to a temperature of 0° F. or below. The source of refrigeration requires single phase, alternating current electric energy input only.

Electromechanical hydraulic toilet means any water closet that utilizes electrically operated devices, such as, but not limited to, air compressors, pumps, solenoids, motors, or macerators in place of or to aid gravity in evacuating waste from the toilet bowl.

Energy conservation standard means:

(1) A performance standard which prescribes a minimum level of energy efficiency or a maximum quantity of energy use, or, in the case of showerheads, faucets, water closets, and urinals, water use, for a covered product, determined in accordance with test procedures prescribed under Section 323 of EPCA (42 U.S.C. 6293); or

(2) A design requirement for the products specified in paragraphs (6), (7), (8), (10), (15), (16), (17), and (19) of Section 322(a) of EPCA (42 U.S.C. 6292(a)); and

(3) Includes any other requirements which the Secretary may prescribe under Section 325(r) of EPCA (42 U.S.C. 6295(r)).

ER incandescent reflector lamp means a reflector lamp with an elliptical section below the bulb's major diameter and above its approximate baseline as shown in Figure 1 (RE) on page 7 of ANSI C79.1–1994 (see 10 CFR 430.22) and a finished size and shape shown in ANSI C78.21-1989 including the referenced reflective characteristics in part 7 of ANSI C78.21–1989 (see 10 CFR 430.22).

Estimated annual operating cost means the aggregate retail cost of the energy which is likely to be consumed annually, and in the case of showerheads, faucets, water closets, and urinals, the aggregate retail cost of water and wastewater treatment services likely to be incurred annually, in representative use of a consumer product, determined in accordance with Section 323 of EPCA (42 U.S.C. 6293).

Evaporator coil means a component of a central air conditioner which is designed to absorb heat from an enclosed space and transfer the heat to a refrigerant.

Faucet means a lavatory faucet, kitchen faucet, metering faucet, or replacement aerator for a lavatory or kitchen faucet.

Floor electric heater means an electric heater which is intended to be recessed in a floor, and which transfers by radiation and/or convection (either natural or forced).

Fluorescent lamp means a low pressure mercury electric-discharge source in which a fluorescing coating transforms some of the ultraviolet energy generated by the mercury discharge into light, including only the following:

(1) Any straight-shaped lamp (commonly referred to as 4-foot medium bi-pin lamps) with medium bi-pin bases of nominal overall length of 48 inches and rated wattage of 28 or more.

(2) Any U-shaped lamp (commonly referred to as 2-foot U-shaped lamps) with medium bi-pin bases of nominal overall length between 22 and 25 inches and rated wattage of 28 or more.

(3) Any rapid start lamp (commonly referred to as 8-foot high output lamps) with recessed double contact bases of nominal overall length of 96 inches and 0.800 nominal amperes, as defined in ANSI C78.1–1991.

(4) Any instant start lamp (commonly referred to as 8-foot slimline lamps) with single pin bases of nominal overall length of 96 inches and rated wattage of 52 or more, as defined in ANSI C78.3–1991.

Fluorescent lamp ballast means a device which is used to start and operate fluorescent lamps by providing a starting voltage and current and limiting the current during normal operation.

Flushometer tank means a device whose function is defined in flushometer valve, but integrated within an accumulator vessel affixed and adjacent to the fixture inlet so as to cause an effective enlargement of the supply line immediately before the unit.

Flushometer valve means a valve attached to a pressurized water supply pipe and so designed that when actuated, it opens the line for direct flow into the fixture at a rate and quantity to properly operate the fixture, and then gradually closes to provide trap reseal in the fixture in order to avoid water hammer. The pipe to which this device is connected is in itself of sufficient size, that when open, will allow the device to deliver water at a sufficient rate of flow for flushing purposes.

Forced air central furnace means a gas or oil burning furnace designed to supply heat through a system of ducts with air as the heating medium. The heat generated by combustion of gas or oil is transferred to the air within a casing by conduction through heat exchange surfaces and is circulated through the duct system by means of a fan or blower.

Freezer means a cabinet designed as a unit for the freezing and storage of food at temperatures of 0° F. or below, and having a source of refrigeration requiring single phase, alternating current electric energy input only.

Furnace means a product which utilizes only single-phase electric current, or single-phase electric current or DC current in conjunction with natural gas, propane, or home heating oil, and which—

(a) Is designed to be the principal heating source for the living space of a residence;

(b) Is not contained within the same cabinet with a central air conditioner whose rated cooling capacity is above 65,000 Btu per hour;

(c) Is an electric central furnace, electric boiler, forced-air central furnace, gravity central furnace, or low pressure steam or hot water boiler; and

(d) Has a heat input rate of less than 300,000 Btu per hour for electric boilers and low pressure steam or hot water boilers and less than 225,000 Btu per hour for forced-air central furnaces, gravity central furnaces, and electric central furnaces, gravity central furnaces, and electric central furnaces.

Gas means either natural gas or propane.

Gas clothes dryer means a cabinet-like appliance designed to dry fabrics in a tumble-type drum with forced air circulation. The heat source is gas and the drum and blower(s) are driven by an electric motor(s).

General Service Fluorescent Lamp means any fluorescent lamp which can be used to satisfy the majority of fluorescent lighting applications, but does not include any lamp designed and marketed for the following nongeneral applications:

(1) Fluorescent lamps designed to promote plant growth.

(2) Fluorescent lamps specifically designed for cold temperature applications.

(3) Colored fluorescent lamps.

(4) Impact-resistant fluorescent lamps.

(5) Reflectorized or aperture lamps.

(6) Fluorescent lamps designed for use in reprographic equipment.

(7) Lamps primarily designed to produce radiation in the ultra-violet region of the spectrum.

(8) Lamps with a Color Rendering Index of 82 or greater.

General Service Incandescent Lamp means any incandescent lamp (other than a miniature or photographic lamp) that has an E26 medium screw base, a rated voltage range at least partially within 115 to 130 volts, and which can be used to satisfy the majority of lighting applications, but does not include any lamps specifically designed for:

(1) Traffic signal, or street lighting service;

(2) Airway, airport, aircraft, or other aviation service;

(3) Marine, or marine signal service;

(4) Photo, projection, sound reproduction, or film viewer service;

(5) Stage, studio, or television service;

(6) Mill, saw mill, or other industrial process service;

(7) Mine service;

(8) Headlight, locomotive, street railway, or other transportation service;

(9) Heating service;

(10) Code beacon, marine signal, lighthouse, reprographic, or other communication service;

(11) Medical or dental service;

(12) Microscope, map, microfilm, or other specialized equipment service;

(13) Swimming pool, or other underwater service;

(14) Decorative or showcase service;

(15) Producing colored light;

(16) Shatter resistance which has an external protective coating; or

(17) Appliance service.

Gravity central furnace means a gas fueled furnace which depends primarily on natural convection for circulation of heated air and which is designed to be used in conjunction with a system of ducts.

Heat pump means a product, other than a packaged terminal heat pump, which consists of one or more assemblies, powered by single phase electric current, rated below 65,000 Btu per hour, utilizing an indoor conditioning coil, compressor, and refrigerant-to-outdoor air heat exchanger to provide air heating, and may also provide air cooling, dehumidifying, humidifying circulating, and air cleaning.

Home heating equipment, not including furnaces means vented home heating equipment and unvented home heating equipment.

Immersed heating element means an electrically powered heating device which is designed to operate while totally immersed in water in such a manner that the heat generated by the device is imparted directly to the water.

Incandescent lamp means a lamp in which light is produced by a filament heated to incandescence by an electric current, including only the following:

(1) Any lamp (commonly referred to as lower wattage non-reflector general service lamps, including any tungsten halogen lamp) that has a rated wattage between 30 and 199, has an E26 medium screw base, has a rated voltage or voltage range that lies at least partially in the range of 115 and 130 volts, and is not a reflector lamp.

(2) Any incandescent reflector lamp.

(3) Any general service incandescent lamp (commonly referred to as a high- or higher-wattage lamp) that has a rated wattage above 199 (above 205 for a high wattage reflector lamp).

Incandescent reflector lamp (commonly referred to as a reflector lamp) means any lamp in which light is produced by a filament heated to incandescence by an electric current, which: is not colored or designed for rough or vibration service applications that contains an inner reflective coating on the outer bulb to direct the light; has an R, PAR or similar bulb shape (excluding ER or

BR) with an E26 medium screw base; has a rated voltage or voltage range that lies at least partially in the range of 115 and 130 volts; has a diameter that exceeds 2.75 inches; and is either a low(er)-wattage reflector lamp that has a rated wattage between 40 and 205; or a high(er)-wattage reflector lamp that has a rated wattage above 205.

Kerosene means No. 1 fuel oil with a viscosity meeting the specifications as specified in UL–730–1974, section 36.9 and in tables 2 and 3 of ANSI Standard Z91.1–1972.

Lamp Efficacy (LE) means the measured lumen output of a lamp in lumens divided by the measured lamp electrical power input in watts expressed in units of lumens per watt (LPW).

Low consumption has the meaning given such a term in ASME A112.19.2M–1995. (see § 430.22)

Low pressure steam or hot water boiler means an electric, gas or oil burning furnace designed to supply low pressure steam or hot water for space heating application. A low pressure steam boiler operates at or below 15 pounds psig steam pressure; a hot water boiler operates at or below 160 psig water pressure and 250° F. water temperature.

LP-gas means liquified petroleum gas, and includes propane, butane, and propane/butane mixtures.

Major cooking component means either a conventional cooking top, a conventional oven or a microwave oven.

Manufacturer means any person who manufactures a consumer product.

Medium Base Compact Fluorescent Lamp means an integrally ballasted fluorescent lamp with a medium screw base, a rated input voltage range of 115 to 130 volts and which is designed as a direct replacement for a general service incandescent lamp.

Microwave/conventional range means a class of kitchen ranges and ovens which is a household cooking appliance consisting of a microwave oven, a conventional oven, and a conventional cooking top.

Microwave oven means a class of kitchen ranges and ovens which is a household cooking appliance consisting of a compartment designed to cook or heat food by means of microwave energy.

Mobile home furnace means a direct vent furnace that is designed for use only in mobile homes.

Monochrome television set means an electrical device designed to convert incoming broadcast signals into monochrome television pictures and associated sound.

Natural gas means natural gas as defined by the Federal Power Commission.

Oil means heating oil grade No. 2 as defined in American Society for Testing and Materials (ASTM) D396–71.

Other clothes washer means a class of clothes washer which is not an automatic or semi-automatic clothes washer.

Other cooking products means any class of cooking products other than the conventional range, conventional cooking top, conventional oven, microwave oven, and microwave/conventional range classes.

Outdoor furnace or boiler is a furnace or boiler normally intended for installation out-of-doors or in an unheated space (such as an attic or a crawl space).

Packaged terminal air conditioner means a wall sleeve and a separate unencased combination of heating and cooling assemblies specified by the builder and intended for mounting through the wall. It includes a prime source of refrigeration, separable outdoor louvers, forced ventilation, and heating availability energy.

Packaged terminal heat pump means a packaged terminal air conditioner that utilizes reverse cycle refrigeration as its prime heat source and should have supplementary heating availability by builder's choice of energy.

Person includes any individual, corporation, company, association, firm, partnership, society, trust, joint venture or joint stock company, the government, and any agency of the United States or any State or political subdivision thereof.

Pool heater means an appliance designed for heating nonpotable water contained at atmospheric pressure, including heating water in swimming pools, spas, hot tubs and similar applications.

Portable electric heater means an electric heater which is intended to stand

unsupported, and can be moved from place to place within a structure. It is connected to electric supply by means of a cord and plug, and transfers heat by radiation and/or convention (either natural or forced).

Primary heater means a heating device that is the principal source of heat for a structure and includes baseboard electric heaters, ceiling electric heaters, and wall electric heaters.

Propane means a hydrocarbon whose chemical composition is predominantly C^3H^8, whether recovered from natural gas or crude oil.

Rated voltage with respect to incandescent lamps means:

(1) The design voltage if the design voltage is 115 V, 130 V or between 115V and 130 V:

(2) 115 V if the design voltage is less than 115 V and greater than or equal to 100 V and the lamp can operate at 115 V; and

(3) 130 V if the design voltage is greater than 130 V and less than or equal to 150 V and the lamp can operate at 130 V.

Rated wattage, with respect to 4-foot medium bi-pin T8, T10 or T12 lamps, means:

(1) If the lamp is listed in ANSI C78.1–1991, the nominal wattage of a lamp determined by the lamp designation in Annex A.2 of ANSI C78.1–1991; or

(2) If the lamp is a residential straight-shaped lamp, the wattage a lamp consumes when operated on a reference ballast for which the lamp is designed; or

(3) If the lamp is neither listed in ANSI C78.1–1991 nor a residential straight-shaped lamp, the wattage a lamp consumes when using reference ballast characteristics of 236 volts, 0.43 amps and 439 ohms for T10 or T12 lamps or reference ballast characteristics of 300 volts, 0.265 amps and 910 ohms for T8 lamps.

Refrigerator means an electric refrigerator.

Refrigerator-freezer means an electric refrigerator-freezer.

Residential straight-shaped lamp means a low pressure mercury electric-discharge source in which a fluorescing coating transforms some of the ultraviolet energy generated by the mercury discharge into light, including a straight-shaped fluorescent lamp with medium bi-pin bases of nominal overall length of 48 inches and is either designed exclusively for residential applications; or designed primarily and marketed exclusively for residential applications.

(1) A lamp is designed exclusively for residential applications if it will not function for more than 100 hours with a commercial high-power-factor ballast.

(2) A lamp is designed primarily and marketed exclusively for residential applications if it:

(i) Is permanently and clearly marked as being for residential use only;

(ii) Has a life of 6,000 hours or less when used with a commercial high-power-factor ballast;

(iii) Is not labeled or represented as a replacement for a fluorescent lamp that is a covered product; and

(iv) Is marketed and distributed in a manner designed to minimize use of the lamp with commercial high-power-factor ballasts.

(3) A manufacturer may market and distribute a lamp in a manner designed to minimize use of the lamp with commercial high-power-factor ballasts by:

(i) Packaging and labeling the lamp in a manner that clearly indicates the lamp is for residential use only and includes appropriate instructions concerning proper and improper use; if the lamp is included in a catalog or price list that also includes commercial/industrial lamps, listing the lamp in a separate residential section accompanied by notes about proper use on the same page; and providing as part of any express warranty accompanying the lamp that improper use voids such warranty; or

(ii) Using other comparably effective measures to minimize use with commercial high-power-factor ballasts.

Room air conditioner means a consumer product, other than a ''packaged terminal air conditioner,'' which is powered by a single phase electric current and which is an encased assembly designed as a unit for mounting in a window or through the wall for the purpose of providing delivery of conditioned air to an enclosed space. It includes a prime source of refrigeration

and may include a means for ventilating and heating.

Rough or vibration service incandescent reflector lamp means a reflector lamp: in which a C–11 (5 support), C–17 (8 support), or C–22 (16 support) filament is mounted (the number of support excludes lead wires); in which the filament configuration is as shown in Chapter 6 of the 1993 *Illuminating Engineering Society of North America Lighting Handbook*, 8th Edition (see 10 CFR 430.22); and that is designated and marketed specifically for rough or vibration service applications.

Secretary means the Secretary of the Department of Energy.

Semi-automatic clothes washer means a class of clothes washer that is the same as an automatic clothes washer except that user intervention is required to regulate the water temperature by adjusting the external water faucet valves.

Showerhead means any showerhead (including a hand held showerhead), except a safety shower showerhead.

State means a State, the District of Columbia, Puerto Rico, or any territory or possession of the United States.

State regulation means a law or regulation of a State or political subdivision thereof.

Supplementary heater means a heating device that provides heat to a space in addition to that which is supplied by a primary heater. Supplementary heaters include portable electric heaters.

Surface unit means either a heating unit mounted in a cooking top, or a heating source and its associated heated area of the cooking top, on which vessels are placed for the cooking or heating of food.

Television set means a color television set or a monochrome television set.

Unvented gas heater means an unvented, self-contained, free-standing, nonrecessed gas-burning appliance which furnishes warm air by gravity or fan circulation.

Unvented home heating equipment means a class of home heating equipment, not including furnaces, used for the purpose of furnishing heat to a space proximate to such heater directly from the heater and without duct connections and includes electric heaters and unvented gas and oil heaters.

Unvented oil heater means an unvented, self-contained, free-standing, nonrecessed oil-burning appliance which furnishes warm air by gravity or fan circulation.

Urinal means a plumbing fixture which receives only liquid body waste and, on demand, conveys the waste through a trap seal into a gravity drainage system, except such term does not include fixtures designed for installations in prisons.

Vented floor furnace means a self-contained vented heater suspended from the floor of the space being heated, taking air for combustion from outside this space. The vented floor furnace supplies heated air circulated by gravity or by a fan directly into the space to be heated through openings in the casing.

Vented home heating equipment or *vented heater* means a class of home heating equipment, not including furnaces, designed to furnish warmed air to the living space of a residence, directly from the device, without duct connections (except that boots not to exceed 10 inches beyond the casing may be permitted) and includes: vented wall furnace, vented floor furnace, and vented room heater.

Vented room heater means a self-contained, free standing, nonrecessed, vented heater for furnishing warmed air to the space in which it is installed. The vented room heater supplies heated air circulated by gravity or by a fan directly into the space to be heated through openings in the casing.

Vented wall furnace means a self-contained vented heater complete with grilles or the equivalent, designed for incorporation in, or permanent attachment to, a wall of a residence and furnishing heated air circulated by gravity or by a fan directly into the space to be heated through openings in the casing.

Voltage range means a band of operating voltages as marked on an incandescent lamp, indicating that the lamp is designed to operate at any voltage within the band.

Wall electric heater means an electric heater (excluding baseboard electric

heaters) which is intended to be recessed in or surface mounted on walls, which transfers heat by radiation and/or convection (either natural or forced) and which includes forced convectors, natural convectors, radiant heaters, high wall or valance heaters.

Water closet means a plumbing fixture that has a water-containing receptor which receives liquid and solid body waste, and upon actuation, conveys the waste through an exposed integral trap seal into a gravity drainage system, except such term does not include fixtures designed for installation in prisons.

Water heater means a product which utilizes oil, gas, or electricity to heat potable water for use outside the heater upon demand, including—

(a) Storage type units which heat and store water at a thermostatically controlled temperature, including gas storage water heaters with an input of 75,000 Btu per hour or less, oil storage water heaters with an input of 105,000 Btu per hour or less, and electric storage water heaters with an input of 12 kilowatts or less;

(b) Instantaneous type units which heat water but contain no more than one gallon of water per 4,000 Btu per hour of input, including gas instantaneous water heaters with an input of 200,000 Btu per hour or less, oil instantaneous water heaters with an input of 210,000 Btu per hour or less, and electric instantaneous water heaters with an input of 12 kilowatts or less; and

(c) Heat pump type units, with a maximum current rating of 24 amperes at a voltage no greater than 250 volts, which are products designed to transfer thermal energy from one temperature level to a higher temperature level for the purpose of heating water, including all ancillary equipment such as fans, storage tanks, pumps, or controls necessary for the device to perform its function.

Water use means the quantity of water flowing through a showerhead, faucet, water closet, or urinal at point of use, determined in accordance with test procedures under Appendices S and T of subpart B of this part.

Weatherized warm air furnace or boiler means a furnace or boiler designed for installation outdoors, approved for resistance to wind, rain, and snow, and supplied with its own venting system.

[42 FR 27898, June 1, 1977]

EDITORIAL NOTE: For Federal Register citations affecting §430.2, see the List of CFR Sections Affected in the Finding Aids section of this volume.

EFFECTIVE DATE NOTE: At 62 FR 23115, Apr. 28, 1997, §430.2 was amended by adding a definition for *Compact refrigerator/refrigerator-freezer/freezer* effective July 1, 2001.

EFFECTIVE DATE NOTE: At 62 FR 50148, Sept. 24, 1997, §430.2 was amended by adding definitions for *Casement-only* and *Casement-slider* effective Oct. 1, 2000.

Subpart B—Test Procedures

§ 430.21 Purpose and scope.

This subpart contains test procedures required to be prescribed by DOE pursuant to section 323 of the Act.

§ 430.22 Reference Sources.

(a) *Materials incorporated by reference.*—(1) *General.* The following standards which are not otherwise set forth in Part 430 are incorporated by reference and made a part of Part 430. The standards listed in this section have been approved for incorporation by reference by the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR Part 51. The specified versions of the standards are incorporated, and any subsequent amendment to a standard by the standard-setting organization will not affect the DOE test procedures unless and until those test procedures are amended by DOE.

(2) *Availability of standards.* The standards incorporated by reference are available for inspection at:

(i) Office of the Federal Register Information Center, 800 North Capitol Street, NW., Suite 700, Washington, DC.

(ii) U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, Hearings and Dockets, Forrestal Building, 1000 Independence Ave, SW, Washington, DC 20585.

(b) *List of Sources and Standards Incorporated by Reference.*

(1) American National Standards Institute (ANSI). The ANSI standards

listed in this paragraph may be obtained from the American National Standards Institute, 1430 Broadway, New York, NY 10018, (212) 642–4900.

1. ANSI C78.1–1991, ''for Fluorescent Lamps—Rapid-Start Types—Dimensional and Electrical Characteristics''
2. ANSI C78.2–1991, ''for Fluorescent Lamps—Preheat-Start Types—Dimensional and Electrical Characteristics of Fluorescent Lamps''
3. ANSI C78.3–1991, ''for Fluorescent Lamps—Instant-Start and Cold-Cathode Types—Dimensional and Electrical Characteristics''
4. ANSI C78.375–1991, ''for Fluorescent Lamps—Guide for Electrical Measurements''
5. ANSI C82.3–1983 ''for Reference Ballasts for Fluorescent Lamps''
6. ANSI C79.1–1994, ''Nomenclature for Glass Bulbs—Intended for Use with Electric Lamps''
7. ANSI C78.21–1989, ''Incandescent Lamps—PAR and R Shapes''

(2) Illuminating Engineering Society of North America (IESNA). The IESNA standards listed in this paragraph may be obtained from the Illuminating Engineering Society of North America, 120 Wall Street, Floor 17, New York, NY 10005–4001, (212) 248–5000.

1. Illuminating Engineering Society LM–9–88, ''IES Approved Method for the Electrical and Photometric Measurements of Fluorescent Lamps''
2. Illuminating Engineering Society of North America LM–16–1993, ''IESNA Practical Guide to Colorimetry of Light Sources''
3. Illuminating Engineering Society of North America LM–20–1994, ''IESNA Approved Method for Photometric Testing of Reflector-Type Lamps''
4. Illuminating Engineering Society of North America LM–45–91, ''IES Approved Method for Electrical and Photometric Measurements of General Service Incandescent Filament Lamps''
5. Illuminating Engineering Society of North America LM–58–1994, ''IESNA Guide to Spectroradiometric Measurements''
6. Illuminating Engineering Society of North America LM–66–1991, ''IES Approved Method for the Electrical and Photometric Measurements of Single-Ended Compact Fluorescent Lamps''
7. *Illuminating Engineering Society of North America Lighting Handbook, Reference and Application*, 8th Edition, 1993, Chapter 6, Light Sources

(3) International Commission on Illumination (CIE). The CIE standards listed in this paragraph may be obtained from the International Commission on Illumination, CIE Bureau Central, Kegelgasse 27, A–1030, Vienna, Austria. CIE publications are also available from TLA Lighting Consultants, 7 Pond Street, Salem, MA 10970, (508) 745–6870.

1. International Commission on Illumination (CIE) Publication No. 13.2 1974, corrected reprint 1993, ''Method of Measuring and Specifying Color Rendering Properties of Light Sources,'' ISBN 3 900 734 39 9

(4) International Electrotechnical Commission. Copies of the International Electrotechnical Commission Publications can be obtained from the American National Standards Institute, 11 West 42nd Street, New York, New York 10036, (212) 642–4936.

1. IEC 705, ''Methods for Measuring the Performance of Microwave Ovens for Household and Similar Purposes,'' Section 4, Methods of Measurement, Paragraph 13 ''Electrical Power Input Measurement,'' and Paragraph 14 ''Efficiency'' (1988).
2. IEC 705, Amendment 2, ''Methods for Measuring the Performance of Microwave Ovens for Household and Similar Purposes,'' Section 4, Methods of Measurement, Paragraph 12 ''Microwave Power Output Measurement'' (1993).

(5) American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc., Publication Sales, 1791 Tullie Circle, NE, Atlanta, GA 30329, (1–800–5–ASHRAE).

1. American National Standards Institute/American Society of Heating, Refrigerating, and Air-Conditioning Engineers Standard 103–1993, ''Methods of Testing for Annual Fuel Utilization Efficiency of Residential Central Furnaces and Boilers,'' (with Errata of October 24, 1996) except for sections 3.0, 7.2.2.5, 8.6.1.1, 9.1.2.2, 9.5.1.1, 9.5.1.2.1, 9.5.1.2.2, 9.5.2.1, 9.7.1, 10.0, 11.2.12, 11.3.12, 11.4.12, 11.5.12 and appendices B and C.
2. American National Standards Institute Standard Z21.56–1994, ''Gas-Fired Pool Heaters,'' section 2.9.

(6) American Society of Mechanical Engineers (ASME). The ASME standards listed in this paragraph may be obtained from the American Society of Mechanical Engineers, Service Center, 22 Law Drive, P.O. Box 2900, Fairfield, NJ 07007.

1. ASME/ANSI Standard A112.18.1M–1996, ''Plumbing Fixture Fittings.''

2. ASME/ANSI Standard A112.19.6–1995, ''Hydraulic Requirements for Water Closets and Urinals.''

(c) *Reference Standards.* (1) *General.* The standards listed in this paragraph are referred to in the DOE test procedures and elsewhere in 10 CFR part 430 but are not incorporated by reference. These sources are given here for information and guidance.

(2) *List of References.*

1. National Voluntary Laboratory Accreditation Program Handbook 150–01, ''Energy Efficient Lighting Products, Lamps and Luminaires, August 1993.'' National Voluntary Laboratory Accreditation Program, NIST, Gaithersburg, MD.

2. ''Illuminating Engineering Society Lighting Handbook,'' 8th Edition, New York, NY 1993.

[59 FR 49474, Sept. 28, 1994, as amended at 62 FR 29239, May 29, 1997; 62 FR 51981, Oct. 3, 1997; 63 FR 13316, Mar. 18, 1998]

§ 430.23 Test procedures for measures of energy and water consumption.

(a) *Refrigerators and refrigerator-freezers.* (1) The estimated annual operating cost for electric refrigerators and electric refrigerator-freezers without an anti-sweat heater switch shall be the product of the following three factors: (i) The representative average-use cycle of 365 cycles per year, (ii) the average per-cycle energy consumption for the standard cycle in kilowatt-hours per cycle, determined according to 6.2 (6.3.6 for externally vented units) of appendix A1 of this subpart, and (iii) the representative average unit cost of electricity in dollars per kilowatt-hour as provided by the Secretary, the resulting product then being rounded off to the nearest dollar per year.

(2) The estimated annual operating cost for electric refrigerators and electric refrigerator-freezers with an anti-sweat heater switch shall be the product of the following three factors: (i) The representative average-use cycle of 365 cycles per year, (ii) half the sum of the average per-cycle energy consumption for the standard cycle and the average per-cycle energy consumption for a test cycle type with the anti-sweat heater switch in the position set at the factory just prior to shipping, each in kilowatt-hours per cycle, determined according to 6.2 (6.3.6 for externally vented units) of appendix A1 of this subpart, and (iii) the representative average unit cost of electricity in dollars per kilowatt-hour as provided by the Secretary, the resulting product then being rounded off to the nearest dollar per year.

(3) The estimated annual operating cost for any other specified cycle type for electric refrigerators and electric refrigerator-freezers shall be the product of the following three factors: (i) The representative average-use cycle of 365 cycles per year, (ii) the average per-cycle energy consumption for the specified cycle type, determined according to 6.2 (6.3.6 for externally vented units) of appendix A1 to this subpart, and (iii) the representative average unit cost of electricity in dollars per kilowatt-hour as provided by the Secretary, the resulting product then being rounded off to the nearest dollar per year.

(4) The energy factor for electric refrigerators and electric refrigerator-freezers, expressed in cubic feet per kilowatt-hour per cycle, shall be—

(i) For electric refrigerators and electric refrigerator-freezers not having an anti-sweat heater switch, the quotient of (A) the adjusted total volume in cubic feet, determined according to 6.1 of appendix A1 of this subpart, divided by (B) the average per-cycle energy consumption for the standard cycle in kilowatt-hours per cycle, determined according to 6.2 (6.3.6 for externally vented units) of appendix A1 of this subpart, the resulting quotient then being rounded off to the second decimal place, and

(ii) For electric refrigerators and electric refrigerator-freezers having an anti-sweat heater switch, the quotient of (A) the adjusted total volume in cubic feet, determined according to 6.1 of appendix A1 of this subpart, divided by (B) half the sum of the average per-cycle energy consumption for the standard cycle and the average per-cycle energy consumption for a test cycle type with the anti-sweat heater switch in the position set at the factory just prior to shipping, each in kilowatt-hours per cycle, determined according to 6.2 (6.3.6 for externally vented units) of appendix A1 of this subpart, the resulting quotient then being

rounded off to the second decimal place.

(5) The annual energy use of electric refrigerators and electric refrigerator-freezers equals the representative average use cycle of 365 cycles per year times the average per-cycle energy consumption for the standard cycle in kilowatt-hours per cycle, determined according to 6.2 (6.3.6 for externally vented units) of appendix A1 of this subpart.

(6) Other useful measures of energy consumption for electric refrigerators and electric refrigerator-freezers shall be those measures of energy consumption for electric refrigerators and electric refrigerator-freezers which the Secretary determines are likely to assist consumers in making purchasing decisions which are derived from the application of appendix A1 of this subpart.

(7) The estimated regional annual operating cost for externally vented electric refrigerators and externally vented electric refrigerator-freezers without an anti-sweat heater switch shall be the product of the following three factors:

(i) The representative average-use cycle of 365 cycles per year,

(ii) The regional average per-cycle energy consumption for the standard cycle in kilowatt-hours per cycle, determined according to 6.3.7 of appendix A1 of this subpart and

(iii) The representative average unit cost of electricity in dollars per kilowatt-hour as provided by the Secretary, the resulting product then being rounded off to the nearest dollar per year.

(8) The estimated regional annual operating cost for externally vented electric refrigerators and externally vented electric refrigerator-freezers with an anti-sweat heater switch shall be the product of the following three factors:

(i) The representative average-use cycle of 365 cycles per year,

(ii) Half the sum of the average per-cycle energy consumption for the standard cycle and the regional average per-cycle energy consumption for a test cycle with the anti-sweat heater switch in the position set at the factory just prior to shipping, each in kilowatt-hours per cycle, determined according to 6.3.7 of appendix A1 of this subpart, and

(iii) The representative average unit cost of electricity in dollars per kilowatt-hour as provided by the Secretary, the resulting product then being rounded off to the nearest dollar per year.

(9) The estimated regional annual operating cost for any other specified cycle for externally vented electric refrigerators and externally vented electric refrigerator-freezers shall be the product of the following three factors:

(i) The representative average-use cycle of 365 cycles per year,

(ii) The regional average per-cycle energy consumption for the specified cycle, in kilowatt-hours per cycle, determined according to 6.3.7 of appendix A1 of this subpart, and

(iii) The representative average unit cost of electricity in dollars per kilowatt-hour as provided by the Secretary, the resulting product then being rounded off to the nearest dollar per year.

(b) *Freezers.* (1) The estimated annual operating cost for freezers without an anti-sweat heater switch shall be the product of the following three factors: (i) The representative average-use cycle of 365 cycles per year, (ii) the average per-cycle energy consumption for the standard cycle in kilowatt-hours per cycle, determined according to 6.2 of appendix B1 of this subpart, and (iii) the representative average unit cost of electricity in dollars per kilowatt-hour as provided by the Secretary, the resulting product then being rounded off to the nearest dollar per year.

(2) The estimated annual operating cost for freezers with an anti-sweat heater switch shall be the product of the following three factors: (i) The representative average-use cycle of 365 cycles per year, (ii) half the sum of the average per-cycle energy consumption for the standard cycle and the average per-cycle energy consumption for a test cycle type with the anti-sweat heater switch in the position set at the factory just prior to shipping, each in kilowatt-hours per cycle, determined according to 6.2 of appendix B1 of this subpart, and (iii) the representative average unit cost of electricity in dollars per kilowatt-hour as provided by the

Secretary, the resulting product then being rounded off to the nearest dollar per year.

(3) The estimated annual operating cost for an other specified cycle type for freezers shall be the product of the following three factors: (i) The representative average-use cycle of 365 cycles per year, (ii) the average per-cycle energy consumption for the specified cycle type, determined according to 6.2 of appendix B1 of this subpart and (iii) the representative average unit cost of electricity in dollars per kilowatt-hour as provided by the Secretary, the resulting product then being rounded off to the nearest dollar per year.

(4) The energy factor for freezers, expressed in cubic feet per kilowatt-hour per cycle, shall be—

(i) For freezers not having an anti-sweat heater switch, the quotient of (A) the adjusted net refrigerated volume in cubic feet, determined according to 6.1 of appendix B1 of this subpart, divided by (B) the average per-cycle energy consumption for the standard cycle in kilowatt-hours per cycle, determined according to or 6.2 of appendix B1 of this subpart, the resulting quotient then being rounded off to the second decimal place, and

(ii) For freezers having an anti-sweat heater switch, the quotient of (A) the adjusted net refrigerated volume in cubic feet, determined according to 6.1 of appendix B1 of this subpart, divided by (B) half the sum of the average per-cycle energy consumption for the standard cycle and the average per-cycle energy consumption for a test cycle type with the anti-sweat switch in the position set at the factory just prior to shipping, each in kilowatt-hours per cycle, determined according to or 6.2 of appendix B1 of this subpart, the resulting quotient then being rounded off to the second decimal place.

(5) The annual energy use of all freezers equals the representative average-use cycle of 365 cycles per year times the average per-cycle energy consumption for the standard cycle in kilowatt-hours per cycle, determined according to 6.2 of appendix B1 of this subpart.

(6) Other useful measures of energy consumption for freezers shall be those measures of energy consumption for freezers which the Secretary determines are likely to assist consumers in making purchasing decisions and which are derived from the application of appendix B1 of this subpart.

(c) *Dishwashers.* (1) The estimated annual operating cost for dishwashers not having a truncated normal cycle as defined in 1.5 of appendix C to this subpart shall be—

(i) When electrically-heated water is used, the product of the following three factors: (A) The representative average-use cycle of 322 cycles per year, (B) the total per-cycle energy consumption for the normal cycle as defined in 1.3 of appendix C to this subpart in kilowatt-hours per cycle, determined according to 4.4 of appendix C to this subpart, and (C) the representative average unit cost in dollars per kilowatt-hour as provided by the Secretary, the resulting product then being rounded off to the nearest dollar per year, and

(ii) When gas-heated or oil-heated water is used, the product of: The representative average use cycle of 322 cycles per year times the sum of (A) the product of the per-cycle machine electrical energy consumption for the normal cycle in kilowatt-hours per cycle, determined according to 4.3 of appendix C to this subpart, times the representative average unit cost in dollars per kilowatt-hours as provided by the Secretary plus (B) the product of the per-cycle water energy consumption for gas-heated or oil-heated water for the normal cycle, in Btu's per cycle, determined according to 4.2 of appendix C to this subpart, times the representative average unit cost in dollars per Btu for gas or oil, as appropriate, as provided by the Secretary, the resulting product then being rounded off to the nearest dollar per year.

(iii) When cold water (50 ° F) is used, the product of the following three factors:

(A) The representative average use cycle of 322 cycles per year times,

(B) The product of the per-cycle machine electrical energy consumption for the normal cycle in kilowatt-hours per cycle, determined according to 4.3 of appendix C to this subpart, and

(C) The representative average unit cost in dollars per kilowatt-hours as

provided by the Secretary, the resulting product then being rounded off to the nearest dollar per year.

(2) The estimated annual operating cost for dishwashers having a truncated normal cycle as defined in 1.5 of appendix C to this subpart shall be—

(i) When electrically-heated water is used, the product of the following three factors: (A) The representative average use cycle of 322 cycles per year, (B) one-half the sum of (*1*) the total per-cycle energy consumption for the normal cycle as defined in 1.3 of appendix C to this subpart plus (*2*) the total per-cycle energy consumption for the truncated normal cycle as defined in 1.5 of appendix C to this subpart, each in kilowatt-hours and determined according to 4.4 of appendix C to this subpart, and (C) the representative average unit cost in dollars per killowatt-hour as provided by the Secretary, the resulting product then being rounded off to the nearest dollar per year, and

(ii) When gas-heated or oil-heated water is used, the product of: The representative average use cycle of 322 cycles per year times the sum of (A) one-half the product of the per-cycle machine electrical energy consumption for the normal cycle as defined in 1.3 of appendix C to this subpart, determined according to 4.3 of appendix C to this subpart, times the representative average unit cost in dollars per kilowatt-hour as provided by the Secretary, plus one-half the product of the per-cycle machine electrical energy consumption for the truncated normal cycle as defined in 1.5 of appendix C to this subpart, determined according to 4.3 of appendix C to this subpart, times the representative average unit cost in dollars per kilowatt-hour as provided by the Secretary plus (B) one-half the product of the per-cycle water energy consumption for gas-heated or oil-heated water for the normal cycle as defined in 1.3 of appendix C to this subpart, in Btu's per cycle, determined according to 4.2 of appendix C to this subpart, times the representative average unit cost in dollars per Btu for gas or oil, as appropriate, as provided by the Secretary, plus one-half the product of the per-cycle water energy consumption for gas-heated or oil-heated water for the truncated normal cycle as defined in 1.5 of appendix C to this subpart, in Btu's per cycle, determined according to 4.2 of appendix C to this subpart, times the representative average unit cost in dollars per Btu for gas or oil, as appropriate, as provided by the Secretary, the resulting product then being rounded off to the nearest dollar per year.

(iii) When cold water (50° F) is used, the product of the following three factors:

(A) The representative average use cycle of 322 cycles per year,

(B) One-half the sum of (1) the total per-cycle energy consumption for the normal cycle as defined in 1.3 of appendix C to this subpart plus (2) the truncated normal cycle as defined in 1.5 of appendix C to this subpart, each in kilowatt-hours and determined according to 4.4 of appendix C to this subpart, and

(C) The representative average unit cost in dollars per kilowatt-hour as provided by the Secretary, the resulting product then being rounded off to the nearest dollar per year.

(3) The energy factor for dishwashers, expressed in cycles per kilowatt-hour shall be—

(i) For dishwashers not having a truncated normal cycle, as defined in 1.5 of appendix C to this subpart, capable of being preset, the reciprocal of the total per cycle energy consumption for the normal cycle in kilowatt-hours per cycle, determined according to 4.4 of appendix C to this subpart, and

(ii) For dishwashers having a truncated normal cycle, as defined in 1.5 of appendix C to this subpart, capable of being preset, the reciprocal of one-half the sum of (A) the total per-cycle energy consumption for the normal cycle plus (B) the total per-cycle energy consumption for the truncated normal cycle, each in kilowatt-hours per cycle and determined according to 4.4 of appendix C to this subpart.

(4) Other useful measures of energy consumption for dishwashers shall be those measures of energy consumption for dishwashers which the Secretary determines are likely to assist consumers in making purchasing decisions and which are derived from the application of appendix C to this subpart.

(d) *Clothes dryers.* (1) The estimated annual operating cost for clothes dryers shall be—

(i) For an electric clothes dryer, the product of the following three factors: (A) The representative average-use cycle of 416 cycles per year, (B) the total per-cycle energy consumption in kilowatt-hours per-cycle, determined according to 4.1 of appendix D to this subpart, and (C) the representative average unit cost in dollars per kilowatt-hour as provided by the Secretary, the resulting product then being rounded off to the nearest dollar per year, and

(ii) For a gas clothes dryer, the product of the representative average-use cycle of 416 cycles per year times the sum of (A) the product of the gas dryer electric per-cycle energy consumption in kilowatt-hours per cycle, determined according to 4.2 of appendix D to this subpart, times the representative average unit cost in dollars per kilowatt-hour as provided by the Secretary plus (B) the product of the total gas dryer gas energy consumption per cycle, in Btu's per cycle, determined according to 4.5 of appendix D of this subpart, times the representative average unit cost in dollars per Btu as provided by the Secretary, the resulting product then being rounded off to the nearest dollar per year.

(2) The energy factor, expressed in pounds of clothes per kilowatt-hour, for clothes dryers shall be either the quotient of a 3-pound bone-dry test load for compact dryers, as defined by 2.6.1 of appendix D to this subpart or the quotient of a 7 pound bone-dry test load for standard dryers, as defined by 2.6.2 of appendix D to this subpart, as applicable, divided by the clothes dryer energy consumption per cycle, as determined according to 4.1 for electric clothes dryers and 4.6 for gas clothes dryers of appendix D to this subpart, the resulting quotient then being rounded off to the nearest hundredth (.01).

(3) Other useful measures of energy consumption for clothes dryers shall be those measures of energy consumption for clothes dryers which the Secretary determines are likely to assist consumers in making purchasing decisions and which are derived from the application of appendix D to this subpart.

(e) *Water Heaters.* (1) The estimated annual operating cost for water heaters shall be—

(i) For a gas or oil water heater, the product of the annual energy consumption, determined according to section 6.1.8 or 6.2.5 of appendix E of this subpart, times the representative average unit cost of gas or oil, as appropriate, in dollars per Btu as provided by the Secretary, the resulting product then being rounded off to the nearest dollar per year.

(ii) For an electric water heater, the product of the annual energy consumption, determined according to section 6.1.8 or 6.2.5 of appendix E of this subpart, times the representative average unit cost of electricity in dollars per kilowatt-hour as provided by the Secretary, divided by 3412 Btu per kilowatt-hour, the resulting quotient then being rounded off to the nearest dollar per year.

(2) The energy factor for the water heaters shall be—

(i) For a gas or oil water heater, as determined by section 6.1.7 or 6.2.4 of appendix E of this subpart rounded off to the nearest 0.01.

(ii) For an electric water heater, as determined by section 6.1.7 or 6.2.4 of appendix E of this subpart rounded off to the nearest 0.01.

(3) Other useful measures of energy consumption for water heaters shall be those measures of energy consumption for water heaters which the Secretary determines are likely to assist consumers in making purchasing decisions and which are derived from the application of appendix E of this subpart.

(4) The alternative uniform test method for measuring the energy consumption of untested water heaters shall be that set forth in section 7.0 of appendix E of this subpart.

(f) *Room air conditioners.* (1) The estimated annual operating cost for room air conditioners, expressed in dollars per year, shall be determined by multiplying the following three factors: (i) Electrical input power in kilowatts as determined in accordance with 4.2 of appendix F to this subpart, (ii) The representative average-use cycle of 750 hours of compressor operation per year, and (iii) A representative average unit cost of electrical energy in dollars

per kilowatt-hour as provided by the Secretary, the resulting product then being rounded off to the nearest dollar per year.

(2) The energy efficiency ratio for room air conditioners, expressed in Btu's per watt-hour, shall be the quotient of: (i) The cooling capacity in Btu's per hour as determined in accordance with 4.1 of appendix F to this subpart divided by: (ii) The electrical input power in watts as determined in accordance with 4.2 of appendix F to this subpart the resulting quotient then being rounded off to the nearest 0.1 Btu per watt-hour.

(3) The average annual energy consumption for room air conditioners, expressed in kilowatt-hours per year, shall be determined by multiplying together the following two factors: (i) Electrical input power in kilowatts as determined in accordance with 4.2 of appendix F to this subpart, and (ii) A representative average use cycle of 750 hours of compressor operation per year, the resulting product then being rounded off to the nearest kilowatt-hour per year.

(4) Other useful measures of energy consumption for room air conditioners shall be those measures of energy consumption which the Secretary determines are likely to assist consumers in making purchasing decisions and which are derived from the application of appendix F to this subpart.

(g) *Unvented home heating equipment.* (1) The estimated annual operating cost for primary electric heaters, shall be the product of: (i) The average annual electric energy consumption in kilowatt-hours per year, determined according to section 3.1 of appendix G of this subpart and (ii) the representative average unit cost in dollars per kilowatt-hour as provided pursuant to section 323(b)(2) of the Act, the resulting product then being rounded off to the nearest dollar per year.

(2) The estimated regional annual operating cost for primary electric heaters, shall be the product of: (i) The regional annual electric energy consumption in kilowatt-hours per year for primary heaters determined according to section 3.2 of appendix G of this subpart and (ii) the representative average unit cost in dollars per kilowatt-hour as provided pursuant to section 323(b)(2) of the Act, the resulting product then being rounded off to the nearest dollar per year.

(3) The estimated operating cost per million Btu output shall be—

(i) For primary and supplementary electric heaters and unvented gas and oil heaters without an auxiliary electric system, the product of: (A) One million; and (B) the representative unit cost in dollars per Btu for natural gas, propane, or oil, as provided pursuant to section 323(b)(2) of the Act as appropriate, or the quotient of the representative unit cost in dollars per kilowatt-hour, as provided pursuant to section 323(b)(2) of the Act, divided by 3,412 Btu per kilowatt hour, the resulting product then being rounded off to the nearest 0.01 dollar per million Btu output; and

(ii) For unvented gas and oil heaters with an auxiliary electric system, the product of: (A) The quotient of one million divided by the rated output in Btu's per hour as determined in 3.4 of appendix G of this subpart; and (B) the sum of: (*1*) The product of the maximum fuel input in Btu's per hour as determined in 2.2. of this appendix times the representative unit cost in dollars per Btu for natural gas, propane, or oil, as appropriate, as provided pursuant to section 323(b)(2) of the Act, plus (*2*) the product of the maximum auxiliary electric power in kilowatts as determined in 2.1 of appendix G of this subpart times the representative unit cost in dollars per kilowatt-hour as provided pursuant to section 323(b)(2) of the Act, the resulting quantity shall be rounded off to the nearest 0.01 dollar per million Btu output.

(4) The rated output for unvented heaters is the rated output as determined according to either sections 3.3 or 3.4 of appendix G of this subpart, as appropriate, with the result being rounded to the nearest 100 Btu per hour.

(5) Other useful measures of energy consumption for unvented home heating equipment shall be those measures of energy consumption for unvented home heating equipment which the Secretary determines are likely to assist consumers in making purchasing decisions and which are derived from

the application of appendix G of this subpart.

(h) *Television sets.* (1) The estimated average annual operating cost for television sets shall be the product of:

(i) The average annual energy consumed by the television set in kilowatt-hours per year, determined according to 3.0 of appendix H of this subpart, and

(ii) The representative average unit cost of energy in dollars per kilowatt-hour as provided by the Secretary, the resulting product then being rounded off to the nearest dollar per year.

(2) The receiver energy efficiency factor for television sets shall be:

(i) For color television sets, the product of the estimated minimum power requirement (.130 kilowatts) and the average annual hours of use (2,200 hr/yr.), divided by the average annual energy consumed by the television set in kilowatt-hours per year, determined according to 3.0 of appendix H to this subpart. The resultant is then multiplied by 100 and expressed as a percent.

(ii) For monochrome television sets, the product of the estimated minimum power requirement (.040 kilowatts) and the average annual hours of use (2,200 hr/yr.), divided by the average annual energy consumed by the television set in kilowatt-hours per year determined according to 3.0 of appendix H of this subpart. The result is then multiplied by 100 and expressed as a percent.

(3) Other useful measures of energy consumption for televison sets shall be those measures of energy consumption for television sets which the Secretary determines are likely to assist consumers in making purchasing decisions and which are derived from the application of appendix H of this subpart.

(i) *Kitchen ranges and ovens.* (1) The estimated annual operating cost for conventional ranges, conventional cooking tops, conventional ovens, microwave ovens, and microwave/conventional ranges shall be the sum of the following products: (i) The total annual electrical energy consumption for any electrical energy usage, in kilowatt-hours (kWh's) per year, times the representative average unit cost for electricity, in dollars per kWh, as provided pursuant to section 323(b)(2) of the Act; plus (ii) the total annual gas energy consumption for any natural gas usage, in British thermal units (Btu's) per year, times the representative average unit cost for natural gas, in dollars per Btu, as provided pursuant to section 323(b)(2) of the Act; plus (iii) the total annual gas energy consumption for any propane usage, in Btu's per year, times the representative average unit cost for propane, in dollars per Btu, as provided pursuant to section 323(b)(2) of the Act. The total annual energy consumption for conventional ranges, conventional cooking tops, conventional ovens, microwave ovens, and microwave/conventional ranges shall be as determined according to 4.3, 4.2.2, 4.1.2, and 4.4.3, respectively, of appendix I to this subpart. The estimated annual operating cost shall be rounded off to the nearest dollar per year, except for microwave ovens, for which the estimated annual operating cost shall be rounded off to the nearest one-quarter of a dollar per year.

(2) The cooking efficiency for conventional cooking tops, conventional ovens, and microwave ovens shall be the ratio of the cooking energy output for the test to the cooking energy input for the test, as determined according to 4.2.1, 4.1.3, and 4.4.4, respectively, of appendix I to this subpart. The final cooking efficiency values shall be rounded off to three significant digits.

(3) [Reserved]

(4) The energy factor for conventional ranges, conventional cooking tops, conventional ovens, microwave ovens, and microwave/conventional ranges shall be the ratio of the annual useful cooking energy output to the total annual energy input, as determined according to 4.3, 4.2.3, 4.1.4, 4.4.5, respectively, of Appendix I to this subpart. The final energy factor values shall be rounded off to three significant digits.

(5) There shall be two estimated annual operating costs, two cooking efficiencies, and two energy factors for convertible cooking appliances—(i) an estimated annual operating cost, a cooking efficiency and an energy factor which represent values for those three measures of energy consumption for the operation of the appliance with

natural gas; and (ii) an estimated annual operating cost, a cooking efficiency and an energy factor which represent values for those three measures of energy consumption for the operation of the appliance with LP-gas.

(6) The estimated annual operating cost for convertible cooking appliances which represents natural gas usage, as described in paragraph (i)(5)(i) of this section, shall be determined according to paragraph (i)(1) of this section using the total annual gas energy consumption for natural gas times the representative average unit cost for natural gas.

(7) The estimated annual operating cost for convertible cooking appliances which represents LP-gas usage, as described in paragraph (i)(5)(ii) of this section, shall be determined according to paragraph (i)(1) of this section using the representative average unit cost for propane times the total annual energy consumption of the test gas, either propane or natural gas.

(8) The cooking efficiency for convertible cooking appliances which represents natural gas usage, as described in paragraph (i)(5)(i) of this section, shall be determined according to paragraph (i)(2) of this section when the appliance is tested with natural gas.

(9) The cooking efficiency for convertible cooking appliances which represents LP-gas usage, as described in paragraph (i)(5)(ii) of this section, shall be determined according to paragraph (i)(2) of this section, when the appliance is tested with either natural gas or propane.

(10) The energy factor for convertible cooking appliances which represents natural gas usage, as described in paragraph (i)(5)(i) of this section, shall be determined according to paragraph (i)(4) of this section when the appliance is tested with natural gas.

(11) The energy factor for convertible cooking appliances which represents LP-gas usage, as described in paragraph (i)(5)(ii) of this section, shall be determined according to paragraph (i)(4) of this section when the appliance is tested with either natural gas or propane.

(12) Other useful measures of energy consumption for conventional ranges, conventional cooking tops, conventional ovens, microwave ovens and microwave/conventional ranges shall be those measures of energy consumption which the Secretary determines are likely to assist consumers in making purchasing decisions and which are derived from the application of appendix I to this subpart.

(j) *Clothes washers.* (1) The estimated annual operating cost for automatic and semi-automatic clothes washers shall be—

(i) When electrically heated water is used, the product of the following three factors:

(A) The representative average-use of 392 cycles per year,

(B) The total per-cycle energy consumption in kilowatt-hours per cycle determined according to 4.1.6 of appendix J before appendix J1 becomes mandatory and 4.1.7 of appendix J1 when appendix J1 becomes mandatory, (see the note at the beginning of appendix J1), and

(C) The representative average unit cost in dollars per kilowatt-hour as provided by the Secretary, the resulting product then being rounded off to the nearest dollar per year, and

(ii) When gas-heated or oil-heated water is used, the product of: the representative average-use of 392 cycles per year and the sum of both:

(A) The product of the per-cycle machine electrical energy consumption in kilowatt-hours per cycle, determined according to 4.1.5 of appendix J before the date that appendix J1 to the subpart becomes mandatory or 4.1.6 of appendix J1 upon the date that appendix J1 to this subpart becomes mandatory, and the representative average unit cost in dollars per kilowatt-hours as provided by the Secretary, and

(B) The product of the per-cycle water energy consumption for gas-heated or oil-heated water in BTU per cycle, determined according to 4.1.4 of appendix J before the date that appendix J1 becomes mandatory or 4.1.4 of appendix J1 upon the date that appendix J1 to this subpart becomes mandatory, and the representative average unit cost in dollars per Btu for oil or gas, as appropriate, as provided by the Secretary, the resulting product then being rounded off to the nearest dollar per year.

(2)(i) The energy factor for automatic and semi-automatic clothes washers is determined in accordance with 4.5 of appendix J before the date that appendix J1 becomes mandatory or 4.5 of appendix J1 upon the date that appendix J1 to this subpart becomes mandatory. The result shall be rounded off to the nearest 0.01 cubic foot per kilowatt-hours.

(ii) The modified energy factor for automatic and semi-automatic clothes washers is determined in accordance with 4.4 of appendix J before the date that appendix J1 becomes mandatory or 4.4 of appendix J1 upon the date that appendix J1 to this subpart becomes mandatory. The result shall be rounded off to the nearest 0.01 cubic foot per kilowatt-hours.

(3) Other useful measures of energy consumption for automatic or semi-automatic clothes washers shall be those measures of energy consumption which the Secretary determines are likely to assist consumers in making purchasing decisions and which are derived from the application of appendix J before the date that appendix J1 becomes mandatory or appendix J1 upon the date that appendix J1 to this subpart becomes mandatory. In addition, the annual water consumption of a clothes washer can be determined by the product of:

(A) The representative average-use of 392 cycles per year, and

(B) The total weighted per-cycle water consumption in gallons per cycle determined according to 4.3.2 of appendix J before the date that appendix J1 becomes mandatory or 4.2.2 of appendix J1 upon the date that appendix J1 to this subpart becomes mandatory. The water consumption factor can be determined in accordance with 4.3.3 of appendix J before the date that appendix J1 becomes mandatory or 4.2.3 of appendix J1 upon the date that appendix J1 to this subpart becomes mandatory. The remaining moisture content can be determined in accordance with 3.3 of appendix J before the date that appendix J1 becomes mandatory or 3.8 of appendix J1 upon the date that appendix J1 to this subpart becomes mandatory.

(k)—(l) [Reserved]

(m) *Central Air Conditioners.* (1) The estimated annual operating cost for cooling-only units and air-source heat pumps shall be one of the following:

(i) For cooling-only units or the cooling portion of the estimated annual operating cost for air-source heat pumps which provide both heating and cooling, the product of: (A) The quotient of the cooling capacity, in Btu's per hour, determined from the steady-state wet-coil test (Test A) measured at the highest compressor speed, as described in section 3.1 of appendix M to this subpart, divided by the seasonal energy efficiency ratio, in Btu's per watt-hour, determined from section 5.1 of appendix M to this subpart; (B) the representative average use cycle for cooling of 1,000 hours per year; (C) a conversion factor of 0.001 kilowatt per watt; and (D) the representative average unit cost of electricity in dollars per kilowatt-hour as provided pursuant to section 323(b)(2) of the Act, the resulting product then being rounded off to the nearest dollar per year;

(ii) For air-source heat pumps which provide only heating or the heating portion of the estimated annual operating cost for air-source heat pumps which provide both heating and cooling, the product of: (A) The quotient of the standardized design heating requirement, in Btu's per hour, nearest to the capacity measured in the high temperature test, determined in sections 5.2 and 6.2.6 of appendix M to this subpart, divided by the heating seasonal performance factor, in Btu's per watt-hour, calculated for heating region IV corresponding to the above mentioned standardized design heating requirement determined from section 5.2 of appendix M to this subpart; (B) the representative average use cycle for heating of 2,080 hours per year; (C) the adjustment factor of 0.77 which serves to adjust the calculated design heating requirement and heating load hours to the actual load experienced by a heating system; (D) a conversion factor of 0.001 kilowatt per watt; and (E) the representative average unit cost of electricity in dollars per kilowatt-hour as provided pursuant to section 323(b)(2) of the Act, the resulting product then being rounded off to the nearest dollar per year; or

(iii) For air-source heat pumps which provide both heating and cooling, the

estimated annual operating cost is the sum of the quantity determined in paragraph (m)(1)(i) of this section added to the quantity determined in paragraph (m)(1)(ii) of this section.

(2) The estimated regional annual operating cost for cooling-only units and for air-source heat pumps shall be one of the following:

(i) For cooling-only units or the cooling portion of the estimated regional annual operating cost for air-source heat pumps which provide both heating and cooling, the product of: (A) The quotient of the cooling capacity, in Btu's per hour, determined from the steady-state wet-coil test (Test A) measured at the highest compressor speed, as described in section 3.1 of appendix M to this subpart, divided by the seasonal energy efficiency ratio, in Btu's per watt-hour, determined from section 5.1 of appendix M to this subpart; (B) the estimated number of regional cooling load hours per year determined from section 6.1.3 of appendix M to this subpart; (C) a conversion factor of 0.001 kilowatts per watt; and (D) the representative average unit cost of electricity in dollars per kilowatt-hour as provided pursuant to section 323(b)(2) of the Act, the resulting product then being rounded off to the nearest dollar per year;

(ii) For air-source heat pumps which provide only heating or the heating portion of the estimated regional annual operating cost for air-source heat pumps which provide both heating and cooling, the product of: (A) The quotient of the standardized design heating requirement, in Btu's per hour, nearest to the capacity measured in the high temperature test (Test A), determined in sections 5.2 and 6.2.6 of appendix M to this subpart, divided by the heating seasonal performance factor, in Btu's per watt-hour, calculated for the appropriate region of interest and corresponding to the above mentioned standardized design heating requirement determined from section 5.2 of appendix M to this subpart; (B) the estimated number of regional heating load hours per year determined from section 6.2.5 of appendix M to this subpart; (C) the adjustment factor of 0.77 which serves to adjust the calculated design heating requirement and heating load hours to the actual load experienced by a heating system; (D) a conversion factor of 0.001 kilowatts per watt; and (E) the representative average unit cost of electricity in dollars per kilowatt-hour as provided pursuant to section 323(b)(2) of the Act, the resulting product then being rounded off to the nearest dollar per year; or

(iii) For air-source heat pumps which provide both heating and cooling, the estimated regional annual operating cost is the sum of the quantity determined in paragraph (m)(3)(i) of this section added to the quantity determined in paragraph (m)(3)(ii) of this section.

(3) The measure(s) of efficiency for cooling-only units and air-source heat pumps shall be one or more of the following:

(i) The seasonal energy efficiency ratio for cooling-only units and air-source heat pumps which provide cooling shall be the seasonal energy efficiency ratio, in Btu's per watt-hour, determined according to section 5.1 of appendix M to this subpart, rounded off to the nearest 0.05.

(ii) The heating seasonal performance factors for air-source heat pumps shall be the heating seasonal performance factors, in Btu's per watt-hour, determined according to section 5.2 of appendix M to this subpart for each applicable standardized design heating requirement within each climatic region, rounded off to the nearest 0.05.

(iii) The annual performance factors for air-source heat pumps which provide heating and cooling, shall be the annual performance factors, in Btu's per watt-hour, determined according to section 5.3 of appendix M to this subpart for each standardized design heating requirement within each climatic region, rounded off to the nearest 0.05.

(4) Other useful measures of energy consumption for central air conditioners shall be those measures of energy consumption which the Secretary of Energy determines are likely to assist consumers in making purchasing decisions and which are derived from the application of appendix M to this subpart.

(5) After September 12, 1988, all measures of energy consumption shall be determined by the test method as set

forth in appendix M to this subpart; or by an alternate rating method set forth in § 430.23(m)(4) as approved by the Assistant Secretary for Conservation and Renewable Energy in accordance with § 430.23(m)(5).

(n) *Furnaces.* (1) The estimated annual operating cost for furnaces is the sum of: (i) The product of the average annual fuel energy consumption, in Btu's per year for gas or oil furnaces or in kilowatt-hours per year for electric furnaces, determined according to section 10.2.2 or 10.3 of appendix N of this subpart, respectively, and the representative average unit cost in dollars per Btu for gas or oil, or dollars per kilowatt-hour for electric, as appropriate, as provided pursuant to section 323(b)(2) of the Act, plus (ii) the product of the average annual auxiliary electric energy consumption in kilowatt-hours per year determined according to section 10.2.3 of appendix N of this subpart, and the representative average unit cost in dollars per kilowatt-hour as provided pursuant to section 323(b)(2) of the Act, the resulting sum then being rounded off to the nearest dollar per year. (For furnaces which operate with variable inputs, an estimated annual operating cost is to be calculated for each degree of oversizing specified in section 10 of appendix N of this subpart.)

(2) The annual fuel utilization efficiency for furnaces, expressed in percent, is the ratio of annual fuel output of useful energy delivered to the heated space to the annual fuel energy input to the furnace determined according to section 10.1 of appendix N of this subpart for gas and oil furnaces and determined in accordance with section 11.1 of American National Standards Institute/American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ANSI/ASHRAE) Standard 103–1993 for electric furnaces.

(3) The estimated regional annual operating cost for furnaces is the sum of: (i) The product of the regional annual fuel energy consumption in Btu's per year for gas or oil furnaces or in kilowatt-hours per year for electric furnaces, determined according to section 10.5.1 or 10.5.3 of appendix N of this subpart, respectively, and the representative average unit cost in dollars per Btu for gas or oil, or dollars per kilowatt-hour for electric, as appropriate, as provided pursuant to section 323(b)(2) of the Act, plus (ii) the product of the regional annual auxiliary electrical energy consumption in kilowatt-hours per year, determined according to section 10.5.2 of appendix N of this subpart, and the representative average unit cost in dollars per kilowatt-hour as provided pursuant to section 323(b)(2) of the Act, the resulting sum then being rounded off to the nearest dollar per year.

(4) The energy factor for furnaces, expressed in percent, is the ratio of annual fuel output of useful energy delivered to the heated space to the total annual energy input to the furnace determined according to section 10.4 of appendix N of this subpart.

(5) Other useful measures of energy consumption for furnaces shall be those measures of energy consumption which the Secretary determines are likely to assist consumers in making purchasing decisions and which are derived from the application of appendix N of this subpart.

(o) *Vented home heating equipment.*

(1) The annual fuel utilization efficiency for vented home heating equipment, expressed in percent, which is the ratio of the annual fuel output of useful energy delivered to the heated space to the annual fuel energy input to the vented heater, shall be determined either according to section 4.1.17 of appendix O of this subpart for vented heaters without either manual controls or thermal stack dampers; according to section 4.2.6 of appendix O of this subpart for vented heaters equipped with manual controls; or according to section 4.3.7 of appendix O of this subpart for vented heaters equipped with thermal stack dampers.

(2) The estimated annual operating cost for vented home heating equipment is the sum of: (i) The product of the average annual fuel energy consumption, in Btu's per year for natural gas, propane, or oil fueled vented home heating equipment, determined according to section 4.6.2 of appendix O of this subpart, and the representative average unit cost in dollars per Btu for natural gas, propane, or oil, as appropriate, as provided pursuant to section

323(b)(2) of the Act; plus (ii) The product of the average annual auxiliary electric energy consumption in kilowatt-hours per year determined according to section 4.6.3 of appendix O of this subpart, and the representative average unit cost in dollars per kilowatt-hours as provided pursuant to section 323(b)(2) of the Act, the resulting sum then being rounded off to the nearest dollar per year.

(3) The estimated operating cost per million Btu output for gas or oil vented home heating equipment with an auxiliary electric system shall be the product of: (A) The quotient of one million Btu divided by the sum of: (*1*) The product of the maximum fuel input in Btu's per hour as determined in 3.1.1 or 3.1.2 of appendix 0 of this subpart times the annual fuel utilization efficiency in percent as determined in 4.1.17, 4.2.6, or 4.3.7 of this appendix as appropriate divided by 100, plus (*2*) the product of the maximum electric power in watts as determined in 3.1.3 of appendix 0 of this subpart times the quantity 3.412; and (B) of the sum of: (*1*) the product of the maximum fuel input in Btu's per hour as determined in 3.1.1 of this appendix times the representative unit cost in dollars per Btu for natural gas, propane, or oil, as appropriate, as provided pursuant to section 323(b)(2) of the Act; plus (*2*) the product of the maximum auxiliary electric power in kilowatts as determined in 3.1.3 of appendix O of this subpart times the representative unit cost in dollars per kilowatt-hour as provided pursuant to section 323(b)(2) of the Act, the resulting quantity shall be rounded off to the nearest 0.01 dollar per million Btu output.

(4) Other useful measures of energy consumption for vented home heating equipment shall be those measures of energy consumption which the Secretary determines are likely to assist consumers in making purchasing decisions and which are derived from the application of appendix O of this subpart.

(p) *Pool heaters.* (1) The estimated annual operating cost for pool heaters is the sum of:

(i) The product of the average annual fuel energy consumption, in Btu's per year, of natural gas or oil fueled pool heaters, determined according to section 4.2 of appendix P of this subpart, and the representative average unit cost in dollars per Btu for natural gas or oil, as appropriate, as provided pursuant to section 323(b)(2) of the Act; plus

(ii) The product of the average annual auxiliary electric energy consumption in kilowatt-hours per year determined according to section 4.3 of appendix P of this subpart, and the representative average unit cost in dollars per kilowatt-hours as provided pursuant to section 323(b)(2) of the Act, the resulting sum then being rounded off to the nearest dollar per year.

(2) The thermal efficiency of pool heaters, expressed as a percent, shall be determined in accordance with section 4 of appendix P to this subpart.

(q) *Fluorescent Lamp Ballasts.* (1) The Estimated Annual Energy Consumption (EAEC) for fluorescent lamp ballasts, expressed in kilowatt-hours per year, shall be the product of: (i) The input power in kilowatts as determined in accordance with section 3.3.1 of appendix Q to this subpart and (ii) the representative average use cycle of 1,000 hours per year, the resulting product then being rounded off to the nearest kilowatt-hour per year.

(2) Ballast Efficacy Factor (BEF) shall be as determined in section 4.2 of appendix Q of this subpart.

(3) The Estimated Annual Operating Cost (EAOC) for fluorescent lamp ballasts, expressed in dollars per year, shall be the product of: (i) The representative average unit energy cost of electricity in dollars per kilowatt-hour as provided by the Secretary, (ii) the representative average use cycle of 1,000 hours per year, and (iii) the input power in kilowatts as determined in accordance with section 3.3.1 of appendix Q to this subpart, the resulting product then being rounded off to the nearest dollar per year.

(4) Other useful measures which may be applicable. [Reserved]

(r) *General Service Fluorescent Lamps and General Service Incandescent Lamps.*

(1) The estimated annual energy consumption for general service fluorescent lamps and incandescent reflector lamps, expressed in kilowatt-hours per year, shall be the product of the input

power in kilowatts as determined in accordance with section 4 of Appendix R to this subpart and an average annual use specified by the manufacturer, with the resulting product rounded off to the nearest kilowatt-hour per year. Manufacturers must provide a clear and accurate description of the assumptions used for the estimated annual energy consumption.

(2) The lamp efficacy for general service fluorescent lamps shall be equal to the average lumen output divided by the average lamp wattage as determined in section 4 of Appendix R of this subpart, with the resulting quotient rounded off to the nearest lumen per watt.

(3) The lamp efficacy for incandescent reflector lamps shall be equal to the average lumen output divided by the average lamp wattage as determined in section 4 of Appendix R of this subpart, with the resulting quotient rounded off to the nearest tenth of a lumen per watt.

(4) The color rendering index of a general service fluorescent lamp shall be tested and determined in accordance with section 4.5 of Appendix R of this subpart and rounded off to the nearest unit.

(s) *Faucets.* The maximum permissible water use allowed for lavatory faucets, lavatory replacement aerators, kitchen faucets, and kitchen replacement aerators, expressed in gallons and liters per minute (gpm and L/min), shall be measured in accordance to section 2(a) of Appendix S of this subpart. The maximum permissible water use allowed for metering faucets, expressed in gallons and liters per cycle (gal/cycle and L/cycle), shall be measured in accordance to section 2(a) of Appendix S of this subpart.

(t) *Showerheads.* The maximum permissible water use allowed for showerheads, expressed in gallons and liters per minute (gpm and L/min), shall be measured in accordance to section 2(b) of Appendix S of this subpart.

(u) *Water closets.* The maximum permissible water use allowed for water closets, expressed in gallons and liters per flush (gpf and Lpf), shall be measured in accordance to section 3(a) of Appendix T of this subpart.

(v) *Urinals.* The maximum permissible water use allowed for urinals, expressed in gallons and liters per flush (gpf and Lpf), shall be measured in accordance to section 3(b) of Appendix T of this subpart.

[42 FR 27898, June 1, 1977]

EDITORIAL NOTE: For FEDERAL REGISTER citations affecting § 430.23, see the List of CFR Sections Affected in the Finding Aids section of this volume.

§ 430.24 Units to be tested.

When testing of a covered product is required to comply with section 323(c) of the Act, or to comply with rules prescribed under sections 324 or 325 of the Act, a sample shall be selected and tested comprised of units which are production units, or are representative of production units of the basic model being tested, and shall meet the following applicable criteria.

(a)(1) For each basic model[1] of electric refrigerators and electric refrigerator-freezers, a sample of sufficient size shall be tested to insure that—

(i) Any represented value of estimated annual operating cost, energy consumption or other measure of energy consumption of a basic model for which consumers would favor lower values shall be no less than the higher of (A) the mean of the sample or (B) the upper 95 percent confidence limit of the true mean divided by 1.10, and

(ii) Any represented value of the energy factor or other measure of energy consumption of a basic model for which consumer would favor higher values shall be no greater than the lower of (A) the mean of the sample or (B) the lower 95 percent confidence limit of the true mean divided by .90.

(b)(1) For each basic model[1] of freezers, a sample of sufficient size shall be tested to insure that—

(i) Any represented value of estimated annual operating cost, energy consumption or other measure of energy consumption of a basic model for which consumers would favor lower values shall be no less than the higher

[1] Components of similar design may be substituted without requiring additional testing if the represented measures of energy consumption continue to satisfy the applicable sampling provision.

of (A) the mean of the sample or (B) the upper 95 percent confidence limit of the true mean divided by 1.10, and

(ii) Any represented value of the energy factor or other measure of energy consumption of a basic model for which consumers would favor higher values shall be no greater than the lower of (A) the mean of the sample or (B) the lower 95 percent confidence limit of the true mean divided by .90.

(c)(1) For each basic model[1] of dishwashers, a sample of sufficient size shall be tested to insure that—

(i) Any represented value of estimated annual operating cost, energy consumption or other measure of energy consumption of a basic model for which consumers would favor lower values shall be no less than the higher of (A) the mean of the sample or (B) the upper 97½ percent confidence limit of the true mean divided by 1.05, and

(ii) Any represented value of the energy factor or other measure of energy consumption of a basic model for which consumers would favor higher values shall be no greater than the lower of (A) the mean of the sample or (B) the lower 97½ percent confidence limit of the true mean divided by .95.

(d)(1) For each basic model[1] of clothes dryers a sample of sufficient size shall be tested to insure that—

(i) Any represented value of estimated annual operating cost, energy consumption or other measure of energy consumption of a basic model for which consumers would favor lower values shall be no less than the higher of (A) the mean of the sample or (B) the upper 97½ percent confidence limit of the true mean divided by 1.05, and

(ii) Any represented value of the energy factor or other measure of energy consumption of a basic model for which consumers would favor higher values shall be no greater than the lower of (A) the mean of the sample or (B) the lower 97½ percent confidence limit of the true mean divided by .95.

(e)(1) For each basic model[1] of water heaters, a sample of sufficient size shall be tested to insure that—

(i) Any represented value of estimated annual operating cost, energy consumption or other measure of energy consumption of a basic model for which consumers would favor lower values shall be no less than the higher of (A) the mean of the sample or (B) the upper 95 percent confidence limit of the true mean divided by 1.10, and

(ii) Any represented value of the energy factor or other measure of energy consumption of a basic model for which consumers would favor higher values shall be no greater than the lower of (A) the mean of the sample or (B) the lower 95 percent confidence limit of the true mean divided by .90.

(f)(1) For each basic model[1] of room air conditioners, a sample of sufficient size shall be tested to insure that—

(i) Any represented value of estimated annual operating cost, energy consumption or other measure of energy consumption of a basic model for which consumers would favor lower values shall be no less than the higher of (A) the mean of the sample or (B) the upper 97½ percent confidence limit of the true mean divided by 1.05, and

(ii) Any represented value of the energy efficiency ratio or other measure of energy consumption of a basic model for which consumers would favor higher values shall be no greater than the lower of (A) the mean of the sample or (B) the lower 97½ percent confidence limit of the true mean divided by .95.

(g)(1) For each basic model[1] of unvented home heating equipment (not including furnaces), a sample of sufficient size shall be tested to insure that—

(i) Any represented value of estimated annual operating cost, energy consumption or other measure of energy consumption of a basic model for which consumers would favor lower values shall be no less than the higher of (A) the mean of the sample or (B) the upper 97½ percent confidence limit of the true mean divided by 1.075, and

(ii) Any represented value of the annual fuel utilization efficiency or other measure of energy consumption of a basic model for which consumers would favor higher values shall be not greater than the lower of (A) the mean of the sample or (B) the lower 97½ percent

[1] Components of similar design may be substituted without requiring additional testing if the represented measures of energy consumption continue to satisfy the applicable sampling provision.

confidence limit of the true mean divided by .925.

(h)(1) For each basic model[1] of television sets, a sample of sufficient size shall be tested to insure that—

(i) Any represented value of estimated annual operating cost, energy consumption or other measure of energy consumption of a basic model for which consumers would favor lower values shall be no less than the higher of (A) the mean of the sample or (B) the upper 97½ percent confidence limit of the true mean divided by 1.05, and

(ii) Any represented value of the energy factor or other measure of energy consumption of a basic model for which consumers would favor higher values shall be no greater than the lower of (A) the mean of the sample or (B) the lower 97½ percent confidence limit of the true mean divided by .95.

(i)(1) Except as provided in paragraph (i)(2) of this section, for each basic model[1] of conventional cooking tops, conventional ovens and microwave ovens a sample of sufficient size shall be tested to insure that—

(i) Any represented value of estimated annual operating cost, energy consumption or other measure of energy consumption of a basic model for which consumers would favor lower values shall be no less than the higher of (A) the mean of the sample or (B) the upper 97½ percent confidence limit of the true mean divided by 1.05, and

(ii) Any represented value of the energy factor or other measure of energy consumption of a basic model for which consumers would favor higher values shall be no greater than the lower of (A) the mean of the sample or (B) the lower 97½ percent confidence limit of the true mean divided by .95.

(2) Basic models need not be tested which differ from other tested basic models by only the design of oven doors the use of which leads to improved efficiency and decreased energy consumption and estimated annual operating cost. Any represented values of measures of energy consumption for basic models not tested shall be the same as for the tested basic model.

(j)(1) For each basic model[1] of clothes washers, a sample of sufficient size shall be tested to insure that—

(i) Any represented value of estimated annual operating cost, energy consumption or other measure of energy consumption of a basic model for which consumers would favor lower values shall be no less than the higher of (A) the mean of the sample or (B) the upper 97½ percent confidence limit of the true mean divided by 1.05, and

(ii) Any represented value of the energy factor or other measure of energy consumption of a basic model for which consumers would favor higher values shall be no greater than the lower of (A) the mean of the sample or (B) the lower 97½ percent confidence limit of the true mean divided by .95.

(k)—(l) [Reserved]

(m)(1) For central air conditioners, each condensing unit shall have a condenser-evaporator coil combination selected and a sample of sufficient size tested in accordance with applicable provisions of this subpart such that—

(i) Any represented value of estimated annual operating cost, energy consumption or other measure of energy consumption of the condenser-evaporator coil combination for which consumers would favor lower values shall be no less than the higher of (A) the mean of the sample or (B) the upper 90 percent confidence limit of the true mean divided by 1.05, and

(ii) Any represented value of the energy efficiency or other measure of energy consumption of the condenser-evaporator coil combination for which consumers would favor higher values shall be no greater than the lower of (A) the mean of the sample or (B) the lower 90 percent confidence limit of the true mean divided by 0.95.

(2) The condenser-evaporator coil combination selected for tests pursuant to paragraph (m)(1) of this section shall be that combination manufactured by the condensing unit manufacturer likely to have the largest volume of retail sales. Components of similar design may be substituted without requiring additional testing if the represented measures of energy consumption continue to satisfy the applicable sampling provisions of paragraphs (m)(1)(i) and (m)(1)(ii) of this section. For every other condenser-evaporator coil combination manufactured by the same manufacturer or in part by a

component manufacturer using that same condensing unit, either—

(i) A sample of sufficient size, comprised of production units or representing production units, shall be tested to ensure that the requirements of paragraphs (m)(1)(i) and (m)(1)(ii) of this section are met for such other condenser-evaporator coil combinations; or

(ii) The representative values of the measures of energy consumption shall be based on an alternative rating method that has been approved by DOE in accordance with the provisions of paragraphs (m)(4) and (m)(5) of this section.

(3) Whenever the representative values of the measures of energy consumption, as determined by the provisions of paragraph (m)(2)(ii) of this section, do not agree within five percent of the representative values of the measures of energy consumption as determined by actual testing, the representative values determined by actual testing shall be used to comply with section 323(c) of the Act, or to comply with rules prescribed under section 324 of the Act.

(4) The basis of the alternative rating method referred to in paragraph (m)(2)(ii) of this section shall be a representation of the test data and calculations of a mechanical vapor compression refrigeration cycle. The major components in the refrigeration cycle shall be modeled as ''fits'' to manufacturer performance data or by graphic or tabular performance data. Heat transfer characteristics of coils may be modeled as a function of face area, number of rows, fins per inch, refrigerant circuitry, air flow rate and entering air enthalpy. Additional performance-related characteristics to be considered may include type of expansion device, refrigerant flow rate through the expansion device, power of the indoor fan and degradation coefficient.

(5) Manufacturers who elect to use an alternative rating method for determining measures of energy consumption under paragraphs (m)(2)(ii) and (m)(4) of this section must submit a request to DOE for reviewing the alternative rating method to the Assistant Secretary of Conservation and Renewable Energy, 1000 Independence Avenue, SW., Washington, DC 20585, and receive approval to use the alternative method by the Assistant Secretary before the alternative method may be used for rating central air conditioners.

(6) Each request to DOE for reviewing an alternative rating method shall include:

(i) The name, address and telephone number of the official representing the manufacturer.

(ii) Complete documentation of the alternative rating procedure, including the computer code when a computer model is used.

(iii) Test data for two coils from two different coil families for two different condensing units. The tested capacities for the matched systems for the two condensing units shall differ by at least a factor of two. Rating information for the mixed systems shall include the ratings from testing, and from the alternative rating method.

(iv) Complete test data, product information, and related information to allow DOE to verify the rating information submitted by the manufacturer.

(7) Manufacturers that elect to use an alternative rating method for determining measures of energy consumption under paragraphs (m)(2)(ii) and (m)(4) of this section must either subject a sample of their units to independent testing on a regular basis, e.g., voluntary certification program, or have the representations reviewed and certified by an independent state-registered professional engineer who is not an employee of the manufacturer. The registered professional engineer is to certify that the results of the alternative rating procedure accurately represent the energy consumption of the unit(s). The manufacturer is to keep the registered professional engineer's certifications on file for review by DOE for as long as said combination is made available for sale by the manufacturer. Any change to be made to the alternative rating method, must be approved by DOE prior to its use for rating.

(8) Manufacturers who choose to use computer simulation or engineering analysis for determining measures of energy consumption under paragraphs (m)(2)(ii) and (m)(5) of this section

shall permit representatives of the Department of Energy to inspect for verification purposes the simulation method or methods used. This inspection may include conducting simulations to predict the performance of particular condenser-evaporator coil combinations specified by DOE, analysis of previous simulations conducted by a manufacturer, or both.

(n)(1) For each basic model[1] of furnaces, other than basic models of those sectional cast-iron boilers which may be aggregated into groups having identical intermediate sections and combustion chambers, a sample of sufficient size shall be tested to insure that—

(i) Any represented value of estimated annual operating cost, energy consumption or other measure of energy consumption of a basic model for which consumers would favor lower values shall be no less than the higher of (A) the mean of the sample, or (B) the upper 97½ percent confidence limit of the true mean divided by 1.05, and

(ii) Any represented value of the annual fuel utilization efficiency or other measure of energy consumption of a basic model for which consumers would favor higher values shall be no greater than the lower of (A) the mean of the sample, or (B) the lower 97½ percent confidence limit of the true mean divided by .95.

(2) For the lowest capacity basic model[1] of a group of basic models of those sectional cast-iron boilers having identical intermediate sections and combustion chambers, a sample of sufficient size shall be tested to insure that—

(i) Any represented value of estimated annual operating cost, energy consumption or other measure of energy consumption of a basic model for which consumers would favor lower values shall be no less than the higher of (A) the mean of the sample, or (B) the upper 97½ percent confidence limit of the true mean divided by 1.05, and

(ii) Any represented value of the fuel utilization efficiency or other measure of energy consumption of a basic model for which consumers would favor higher values shall be no greater than the lower of (A) the mean of the sample, or (B) the lower 97½ percent confidence limit of the true mean divided by .95.

(3) For the highest capacity basic model[1] of a group of basic models of those sectional cast-iron boilers having identical intermediate sections and combustion chambers, a sample of sufficient size shall be tested to insure that—

(i) Any represented value of estimated annual operating cost, energy consumption or other measure of energy consumption of a basic model for which consumers would favor lower values be no less than the higher of (A) the mean of the sample, or (B) the upper 97½ percent confidence limit of the true mean divided by 1.05, and

(ii) Any represented value of the fuel utilization efficiency or other measure of energy consumption of a basic model for which consumers would favor higher values shall be no greater than the lower of (A) the mean of the sample, or (B) the lower 97½ percent confidence limit of the true mean divided by .05.

(4) For basic model[1] or capacity other than the highest or lowest of the group of basic models[1] of sectional cast-iron boilers having identical intermediate sections and combustion chambers, represented values of measures of energy consumption shall be determined by either—

(i) A linear interpolation of data obtained for the smallest and largest capacity units of the family, or

(ii) Testing a sample of sufficient size to insure that (A) any represented value of estimated annual operating cost, energy consumption or other measure of energy consumption of a basic model for which consumers would favor lower values shall be no less than the higher of (*1*) the mean of the sample, or (*2*) the upper 97½ percent confidence limit of the true mean divided by 1.05, and (B) any represented value of the energy factor or other measure of energy consumption of a basic model for which consumers would favor higher values shall be no greater than the lower of (*1*) the mean of the sample, or (*2*) the lower 97½ percent confidence limit of the true mean divided by .95.

[1] Components of similar design may be substituted without requiring additional testing if the represented measures of energy consumption continue to satisfy the applicable sampling provision.

(5) Whenever measures of energy consumption determined by linear interpolation do not agree with measures of energy consumption determined by actual testing, the values determined by testing will be assumed to be the more reliable values.

(6) In calculating the measures of energy consumption for each unit tested, use the design heating requirement corresponding to the mean of the capacities of the units of the sample.

(o)(1) For each basic model[1] of vented home heating equipment (not including furnaces) a sample of sufficient size shall be tested to insure that—

(i) Any represented value of estimated annual operating cost, energy consumption or other measure of energy consumption of a basic model for which consumers would favor lower values shall be no less than the higher of (A) the mean of the sample or (B) the upper 97½ percent confidence limit of the true mean divided by 1.05, and

(ii) Any represented value of the fuel utilization efficiency or other measure of energy consumption of a basic model for which consumers would favor higher values shall be no greater than the lower of (A) the mean of the sample or (B) the lower 97½ percent confidence limit of the true mean divided by .95.

(2) In calculating the measures of energy consumption for each unit tested use the design heating requirement corresponding to the mean of the capacities of the units of the sample.

(p)(1) For each basic model[1] of pool heater a sample of sufficient size shall be tested to insure that—

(i) [Reserved]

(ii) Any represented value of the fuel utilization efficiency or other measure of energy consumption of a basic model for which consumers would favor higher values shall be no greater than the lower of (A) the mean of the sample or (B) the lower 97½ percent confidence limit of the true mean divided by .95.

(q)(1) For each basic model of fluorescent lamp ballasts, as defined in paragraph (14) of §430.2, a sample of sufficient size, no less than four, shall be tested to insure that—

(i) Any represented value of estimated annual energy operating costs, energy consumption, or other measure of energy consumption of a basic model for which consumers would favor lower values shall be no less than the higher of (A) the mean of the sample or (B) the upper 99 percent confidence limit of the true mean divided by 1.01, and

(ii) Any represented value of the ballast efficacy factor or other measure of the energy consumption of a basic model for which consumers would favor a higher value shall be no greater than the lower of (A) the mean of the sample or (B) the lower 99 percent confidence limit of the true mean divided by 0.99.

(r)(1) For each basic model of general service fluorescent lamp and incandescent reflector lamp, samples of production lamps shall be tested and the results for all samples shall be averaged for a 12-month period. A minimum sample of 21 lamps shall be tested. The manufacturer shall randomly select a minimum of three lamps from each month of production for a minimum of 7 out of the 12-month period. In the instance where production occurs during fewer than 7 of such 12 months, the manufacturer shall randomly select a 3 or more lamps from each month of production, where the number of lamps selected for each month shall be distributed as evenly as practicable among the months of production to attain a minimum sample of 21 lamps. Any represented value of lamp efficacy of a basic model shall be based on the sample and shall be no greater than the lower of the mean of the sample or the lower 95-percent confidence limit of the true mean (X_L) divided by 0.97, i.e.,

$$\frac{\bar{x} - t_{0.95}\left(\frac{s}{\sqrt{n}}\right)}{0.97}$$

where:

$\bar{x}$=the mean luminous efficacy of the sample

s=the sample standard deviation

$t_{0.95}$=the t statistic for a 95-percent confidence limit for n-1 degrees of freedom (from statistical tables)

n=sample size

[1] Components of similar design may be substituted without requiring additional testing if the represented measures of energy consumption continue to satisfy the applicable sampling provision.

(2) For each basic model of general service fluorescent lamp, the color rendering index (CRI) shall be measured from the same lamps selected for the lumen output and watts input measurements in paragraph (r)(1) of this section, i.e., the manufacturer shall measure all lamps for lumens, watts input, and CRI. The CRI shall be represented as the average of a minimum sample of 21 lamps and shall be no greater than the lower of the mean of the sample or the lower 95-percent confidence limit of the true mean (X_L) divided by 0.97, i.e.,

$$\frac{\bar{x} - t_{0.95}\left(\frac{s}{\sqrt{n}}\right)}{0.97}$$

where:

$\bar{x}$=the mean color rendering index of the sample
s=the sample standard deviation
$t_{0.95}$=the t statistic for a 95-percent confidence limit for n-1 degrees of freedom (from statistical tables)
n=sample size

(s) For each basic model of faucet,[1] a sample of sufficient size shall be tested to ensure that any represented value of water consumption of a basic model for which consumers favor lower values shall be no less than the higher of:

(1) The mean of the sample or

(2) The upper 95 percent confidence limit of the true mean divided by 1.05.

(t) For each basic model[1] of showerhead, a sample of sufficient size shall be tested to ensure that any represented value of water consumption of a basic model for which consumers favor lower values shall be no less than the higher of:

(1) The mean of the sample or

(2) The upper 95 percent confidence limit of the true mean divided by 1.05.

(u) For each basic model[1] of water closet, a sample of sufficient size shall be tested to ensure that any represented value of water consumption of a basic model for which consumers favor lower values shall be no less than the higher of:

(1) The mean of the sample or

(2) The upper 90 percent confidence limit of the true mean divided by 1.1.

(v) For each basic model[1] of urinal, a sample of sufficient size shall be tested to ensure that any represented value of water consumption of a basic model for which consumers favor lower values shall be no less than the higher of:

(1) The mean of the sample or

(2) The upper 90 percent confidence limit of the true mean divided by 1.1.

(Energy Policy and Conservation Act, Pub. L. 94–163, as amended by Pub. L. 95–619; Department of Energy Organization Act, Pub. L. 95–91)

[44 FR 22416, Apr. 13, 1979, as amended at 44 FR 39153, July 5, 1979; 44 FR 76706, Dec. 27, 1979; 45 FR 53719, Aug. 12, 1980; 53 FR 8312, Mar. 14, 1988; 54 FR 6075, Feb. 7, 1989; 56 FR 18682, April 24, 1991. Redesignated and amended at 59 FR 49474, 49475, Sept. 28, 1994; 62 FR 29239, May 29, 1997; 63 FR 13316, Mar. 18, 1998]

§ 430.25 Laboratory Accreditation Program.

The testing for general service fluorescent lamps, general service incandescent lamps, incandescent reflector lamps, and medium base compact fluorescent lamps, shall be performed in accordance with Appendix R to this subpart and shall be conducted by test laboratories accredited by the National Voluntary Laboratory Accreditation Program (NVLAP) or by an accrediting organization recognized by NVLAP. NVLAP is a program of the National Institute of Standards and Technology, U. S. Department of Commerce. NVLAP standards for accreditation of laboratories that test for compliance with standards for lamp efficacy and CRI are given in 15 CFR part 285 as supplemented by *NVLAP Handbook 150–01,* ''Energy Efficient Lighting Products, Lamps and Luminaires.'' A manufacturer's or importer's own laboratory, if accredited, may conduct the applicable testing.

[62 FR 29240, May 29, 1997]

§ 430.27 Petitions for waiver and applications for interim waiver.

(a)(1) Any interested person may submit a petition to waive for a particular basic model any requirements of

[1] Components of similar design may be substituted without requiring additional testing if the represented measures of energy or water consumption continue to satisfy the applicable sampling provision.

§ 430.23, or of any appendix to this subpart, upon the grounds that the basic model contains one or more design characteristics which either prevent testing of the basic model according to the prescribed test procedures, or the prescribed test procedures may evaluate the basic model in a manner so unrepresentative of its true energy consumption characteristics, or water consumption characteristics (in the case of faucets, showerheads, water closets, and urinals) as to provide materially inaccurate comparative data.

(2) Any interested person who has submitted a Petition for Waiver as provided in this subpart may also file an Application for Interim Waiver of the applicable test procedure requirements.

(b)(1) A Petition for Waiver shall be submitted, in triplicate, to the Assistant Secretary for Conservation and Renewable Energy, United States Department of Energy. Each Petition for Waiver shall:

(i) Identify the particular basic model(s) for which a waiver is requested, the design characteristic(s) constituting the grounds for the petition, and the specific requirements sought to be waived and shall discuss in detail the need for the requested waiver;

(ii) Identify manufacturers of all other basic models marketed in the United States and known to the petitioner to incorporate similar design characteristic(s);

(iii) Include any alternate test procedures known to the petitioner to evaluate in a manner representative of the energy consumption characteristics, or water consumption characteristics (in the case of faucets, showerheads, water closets, and urinals) of the basic model; and

(iv) Be signed by the petitioner or by an authorized representative. In accordance with the provisions set forth in 10 CFR 1004.11, any request for confidential treatment of any information contained in a Petition for Waiver or in supporting documentation must be accompanied by a copy of the petition, application or supporting documentation from which the information claimed to be confidential has been deleted. DOE shall publish in the FEDERAL REGISTER the petition and supporting documents from which confidential information, as determined by DOE, has been deleted in accordance with 10 CFR 1004.11 and shall solicit comments, data and information with respect to the determination of the petition. Any person submitting written comments to DOE with the respect to a Petition for Waiver shall also send a copy of such comments to the petitioner. In accordance with paragraph (i) of this section, a petitioner may submit a rebuttal statement to the Assistant Secretary for Conservation and Renewable Energy.

(2) An Application for Interim Waiver shall be submitted in triplicate, with the required three copies of the Petition for Waiver, to the Assistant Secretary for Conservation and Renewable Energy, U.S. Department of Energy. Each Application for Interim Waiver shall reference the Petition for Waiver by identifying the particular basic model(s) for which a waiver and temporary exception are being sought. Each Application for Interim Waiver shall demonstrate likely success of the Petition for Waiver and shall address what economic hardship and/or competitive disadvantage is likely to result absent a favorable determination on the Application for Interim Waiver. Each Application for Interim Waiver shall be signed by the applicant or by an authorized representative.

(c)(1) Each petitioner, after filing a Petition for Waiver with DOE, and after the Petition for Waiver has been published in the FEDERAL REGISTER, shall, within five working days of such publication, notify in writing all known manufacturers of domestically marketed units of the same product type (as listed in section 322(a) of the Act) and shall include in the notice a statement that DOE has published in the FEDERAL REGISTER on a certain date the Petition for Waiver and supporting documents from which confidential information, if any, as determined by DOE, has been deleted in accordance with 10 CFR 1004.11. Each petitioner, in complying with the requirements of this paragraph, shall file with DOE a statement certifying the names and addresses of each person to

whom a notice of the Petition for Waiver has been sent.

(2) Each applicant for Interim Waiver, whether filing jointly with, or subsequent to, a Petition for Waiver with DOE, shall concurrently notify in writing all known manufacturers of domestically marketed units of the same product type (as listed in Section 322(a) of the Act) and shall include in the notice a copy of the Petition for Waiver and a copy of the Application for Interim Waiver. In complying with this section, each applicant shall in the written notification include a statement that the Assistant Secretary for Conservation and Renewable Energy will receive and consider timely written comments on the Application for Interim Waiver. Each applicant, upon filing an Application for Interim Waiver, shall in complying with the requirements of this paragraph certify to DOE that a copy of these documents have been sent to all known manufacturers of domestically marked units of the same product type (as listed in section 322(a) of the Act). Such certification shall include the names and addresses of such persons. Each applicant also shall comply with the provisions of paragraph (c)(1) of this section with respect to the petition for waiver.

(d) Any person submitting written comments to DOE with respect to an Application for Interim Waiver shall also send a copy of the comments to the applicant.

(e) If administratively feasible, applicant shall be notified in writing of the disposition of the Application for Interim Waiver within 15 business days of receipt of the application. Notice of DOE's determination on the Application for Interim Waiver shall be published in the FEDERAL REGISTER.

(f) The filing of an Application for Interim Waiver shall not constitute grounds for noncompliance with any requirements of this subpart, until an Interim Waiver has been granted.

(g) An Interim Waiver from test procedure requirements will be granted by the Assistant Secretary for Conservation and Renewable Energy if it is determined that the applicant will experience economic hardship if the Application for Interim Waiver is denied, if it appears likely that the Petition for Waiver will be granted, and/or the Assistant Secretary determines that it would be desirable for public policy reasons to grant immediate relief pending a determination on the Petition for Waiver.

(h) An interim waiver will terminate 180 days after issuance or upon the determination on the Petition for Waiver, whichever occurs first. An interim waiver may be extended by DOE for 180 days. Notice of such extension and/or any modification of the terms or duration of the interim waiver shall be published in the FEDERAL REGISTER, and shall be based on relevant information contained in the record and any comments received subsequent to issuance of the interim waiver.

(i) Following publication of the Petition for Waiver in the FEDERAL REGISTER, a petitioner may, within 10 working days of receipt of a copy of any comments submitted in accordance with paragraph (b)(1) of this section, submit a rebuttal statement to the Assistant Secretary for Conservation and Renewable Energy. A petitioner may rebut more than one response in a single rebuttal statement.

(j) The petitioner shall be notified in writing as soon as practicable of the disposition of each Petition for Waiver. The Assistant Secretary for Conservation and Renewable Energy shall issue a decision on the petition as soon as is practicable following receipt and review of the Petition for Waiver and other applicable documents, including, but not limited to, comments and rebuttal statements.

(k) The filing of a Petition for Waiver shall not constitute grounds for noncompliance with any requirements of this subpart, until a waiver or interim waiver has been granted.

(l) Waivers will be granted by the Assistant Secretary for Conservation and Renewable Energy, if it is determined that the basic model for which the waiver was requested contains a design characteristic which either prevents testing of the basic model according to the prescribed test procedures, or the prescribed test procedures may evaluate the basic model in a manner so unrepresentative of its true energy consumption characteristics, or water consumption characteristics (in the case of

faucets, showerheads, water closets, and urinals) as to provide materially inaccurate comparative data. Waivers may be granted subject to conditions, which may include adherence to alternate test procedures specified by the Assistant Secretary for Conservation and Renewable Energy. The Assistant Secretary shall consult with the Federal Trade Commission prior to granting any waiver, and shall promptly publish in the FEDERAL REGISTER notice of each waiver granted or denied, and any limiting conditions of each waiver granted.

(m) Within one year of the granting of any waiver, the Department of Energy will publish in the FEDERAL REGISTER a notice of proposed rulemaking to amend its regulations so as to eliminate any need for the continuation of such waiver. As soon thereafter as practicable, the Department of Energy will publish in the FEDERAL REGISTER a final rule. Such waiver will terminate on the effective date of such final rule.

(n) In order to exhaust administrative remedies, any person aggrieved by an action under this section must file an appeal with the DOE's Office of Hearings and Appeals as provided in 10 CFR part 1003, subpart C.

[51 FR 42826, Nov. 26, 1986, as amended at 60 FR 15017, Mar. 21, 1995; 63 FR 13316, Mar. 18, 1998]

APPENDIX A1 TO SUBPART B OF PART 430—UNIFORM TEST METHOD FOR MEASURING THE ENERGY CONSUMPTION OF ELECTRIC REFRIGERATORS AND ELECTRIC REFRIGERATOR-FREEZERS

1. Definitions

1.1 ''HRF–1–1979'' means the Association of Home Appliance Manufacturers standard for household refrigerators, combination refrigerator-freezers, and household freezers, also approved as an American National Standard as a revision of ANSI B 38.1–1970.

1.2 ''Adjusted total volume'' means the sum of (i) the fresh food compartment volume as defined in HRF–1–1979 in cubic feet, and (ii) the product of an adjustment factor and the net freezer compartment volume as defined in HRF–1–1979, in cubic feet.

1.3 ''Anti-sweat heater'' means a device incorporated into the design of a refrigerator or refrigerator-freezer to prevent the accumulation of moisture on exterior surfaces of the cabinet under conditions of high ambient humidity.

1.4 ''All-refrigerator'' means an electric refrigerator which does not include a compartment for the freezing and long time storage of food at temperatures below 32° F. (0.0° C.). It may include a compartment of 0.50 cubic feet capacity (14.2 liters) or less for the freezing and storage of ice.

1.5 ''Cycle'' means the period of 24 hours for which the energy use of an electric refrigerator or electric refrigerator-freezer is calculated as though the consumer activated compartment temperature controls were set so that the desired compartment temperatures were maintained.

1.6 ''Cycle type'' means the set of test conditions having the calculated effect of operating an electric refrigerator or electric refrigerator-freezer for a period of 24 hours, with the consumer activated controls other than those that control compartment temperatures set to establish various operating characteristics.

1.7 ''Standard cycle'' means the cycle type in which the anti-sweat heater control, when provided, is set in the highest energy consuming position.

1.8 ''Automatic defrost'' means a system in which the defrost cycle is automatically initiated and terminated, with resumption of normal refrigeration at the conclusion of the defrost operation. The system automatically prevents the permanent formation of frost on all refrigerated surfaces. Nominal refrigerated food temperatures are maintained during the operation of the automatic defrost system.

1.9 ''Long-time Automatic Defrost'' means an automatic defrost system where successive defrost cycles are separated by 14 hours or more of compressor-operating time.

1.10 ''Stabilization Period'' means the total period of time during which steady-state conditions are being attained or evaluated.

1.11 ''Variable defrost control'' means a long-time automatic defrost system (except the 14-hour defrost qualification does not apply) where successive defrost cycles are determined by an operating condition variable or variables other than solely compressor operating time. This includes any electrical or mechanical device. Demand defrost is a type of variable defrost control.

1.12 ''Externally vented refrigerator or refrigerator-freezer'' means an electric refrigerator or electric refrigerator-freezer that: has an enclosed condenser or an enclosed condenser/compressor compartment and a set of air ducts for transferring the exterior air from outside the building envelope into, through and out of the refrigerator or refrigerator-freezer cabinet; is capable of mixing

exterior air with the room air before discharging into, through, and out of the condenser or condenser/compressor compartment; includes thermostatically controlled dampers or controls that enable the mixing of the exterior and room air at low outdoor temperatures, and the exclusion of exterior air when the outdoor air temperature is above 80 °F or the room air temperature; and may have a thermostatically actuated exterior air fan.

2. Test Conditions

2.1 Ambient temperature. The ambient temperature shall be 90.0 ± 1° F. (32.3±0.6° C.) during the stabilization period and during the test period. The ambient temperature shall be 80±2°F dry bulb and 67°F wet bulb during the stabilization period and during the test period when the unit is tested in accordance with section 3.3.

2.2 Operational conditions. The electric refrigerator or electric refrigerator-freezer shall be installed and its operating conditions maintained in accordance with HRF–1–1979, section 7.2 through section 7.4.3.3, except that the vertical ambient temperature gradient at locations 10 inches (25.4 cm) out from the centers of the two sides of the unit being tested is to be maintained during the test. Unless the area is obstructed by shields or baffles, the gradient is to be maintained from 2 inches (5.1 cm) above the floor or supporting platform to a height one foot (30.5 cm) above the unit under test. Defrost controls are to be operative and the anti-sweat heater switch is to be ''on'' during one test and ''off'' during a second test. Other exceptions are noted in 2.3, 2.4, and 5.1 below.

2.3 Conditions for automatic defrost refrigerator-freezers. For automatic defrost refrigerator-freezers, the freezer compartments shall not be loaded with any frozen food packages. Cylindrical metallic masses of dimensions 1.12±0.25 inches (2.9±0.6 cm) in diameter and height shall be attached in good thermal contact with each temperature sensor within the refrigerated compartments. All temperature measuring sensor masses shall be supported by nonthermally conductive supports in such a manner that there will be at least one inch (2.5 cm) of air space separating the thermal mass from contact with any surface. In case of interference with hardware at the sensor locations specified in section 5.1, the sensors shall be placed at the nearest adjacent location such that there will be a one inch air space separating the sensor mass from the hardware.

2.4 Conditions for all-refrigerators. There shall be no load in the freezer compartment during the test.

2.5 Steady State Condition. Steady state conditions exist if the temperature measurements in all measured compartments taken at four minute intervals or less during a stabilization period are not changing at a rate greater than 0.042° F. (0.023° C.) per hour as determined by the applicable condition of A or B.

A. The average of the measurements during a two hour period if no cycling occurs or during a number of complete repetitive compressor cycles through a period of no less than two hours is compare to the average over an equivalent time period with three hours elapsed between the two measurement periods.

B. If A above cannot be used, the average of the measurements during a number of complete repetitive compressor cycles through a period of no less than two hours and including the last complete cycle prior to a defrost period, or if no cycling occurs, the average of the measurements during the last two hours prior to a defrost period; are compared to the same averaging period prior to the following defrost period.

2.6 Exterior air for externally vented refrigerator or refrigerator-freezer. An exterior air source shall be provided with adjustable temperature and pressure capabilities. The exterior air temperature shall be adjustable from 35±1 °F (1.7±0.6 °C) to 90±1 °F (32.2±0.6 °C).

2.6.1 Air duct. The exterior air shall pass from the exterior air source to the test unit through an insulated air duct.

2.6.2 Air temperature measurement. The air temperature entering the condenser or condenser/compressor compartment shall be maintained to ±3 °F (1.7 °C) during the stabilization and test periods and shall be measured at the inlet point of the condenser or condenser/compressor compartment (''condenser inlet''). Temperature measurements shall be taken from at least three temperature sensors or one sensor per 4 square inches of the air duct cross sectional area, whichever is greater, and shall be averaged. For a unit that has a condenser air fan, a minimum of three temperature sensors at the condenser fan discharge shall be required. Temperature sensors shall be arranged to be at the centers of equally divided cross sectional areas. The exterior air temperature, at its source, shall be measured and maintained to ±1 °F (0.6 °C) during the test period. The temperature measuring devices shall have an error not greater than ±0.5 °F (±0.3 °C). Measurements of the air temperature during the test period shall be taken at regular intervals not to exceed four minutes.

2.6.3 Exterior air static pressure. The exterior air static pressure at the inlet point of the unit shall be adjusted to maintain a negative pressure of 0.20″±0.05″ water column (62 Pa±12.5 Pa) for all air flow rates supplied to the unit. The pressure sensor shall be located on a straight duct with a distance of at least 7.5 times the diameter of the duct upstream and a distance of at least 3 times the diameter of the duct downstream. There shall be

four static pressure taps at 90° angles apart. The four pressures shall be averaged by interconnecting the four pressure taps. The air pressure measuring instrument shall have an error not greater than 0.01″ water column (2.5 Pa).

3. Test Control Settings

3.1 Model with no user operable temperature control. A test shall be performed during which the compartment temperatures and energy use shall be measured. A second test shall be performed with the temperature control electrically short circuited to cause the compressor to run continuously.

3.2 Model with user operable temperature control. Testing shall be performed in accordance with one of the following sections using the standardized temperatures of:

All-refrigerator: 38° F. (3.3° C.) fresh food compartment temperature

Refrigerator: 15° F. (−9.4° C.) freezer compartment temperature

Refrigerator-freezer: 5° F. (−15° C.) freezer compartment temperature

Variable defrost control models: 5° F (−15° C) freezer compartment temperature and 38±2° F fresh food compartment temperature during steady-state conditions with no door-openings. If both settings cannot be obtained, then test with the fresh food compartment temperature at 38±2° F and the freezer compartment as close to 5° F as possible.

3.2.1 A first test shall be performed with all compartment temperature controls set at their median position midway between their warmest and coldest settings. Knob detents shall be mechanically defeated if necessary to attain a median setting. A second test shall be performed with all controls set at either their warmest or their coldest setting (not electrically or mechanically bypassed), whichever is appropriate, to attempt to achieve compartment temperatures measured during the two tests which bound (i.e., one is above and one is below) the standardized temperature for the type of product being tested. If the compartment temperatures measured during these two tests bound the appropriate standardized temperature, then these test results shall be used to determine energy consumption. If the compartment temperature measured with all controls set at their coldest setting is above the standardized temperature, a third test shall be performed with all controls set at their warmest setting and the result of this test shall be used with the result of the test performed with all controls set at their coldest setting to determine energy consumption. If the compartment temperature measured with all controls set at their warmest setting is below the standardized temperature; and the fresh food compartment temperature is below 45° F. (7.22° C.) in the case of a refrigerator or a refrigerator-freezer, excluding an all-refrigerator, then the result of this test alone will be used to determine energy consumption.

3.2.2 Alternatively, a first test may be performed with all temperature controls set at their warmest setting. If the compartment temperature is below the appropriate standardized temperature, and the fresh food compartment temperature is below 45° F. (7.22° C.) in the case of a refrigerator or a refrigerator-freezer, excluding an all-refrigerator, then the result of this test alone will be used to determine energy consumption. If the above conditions are not met, then the unit shall be tested in accordance with 3.2.1 above.

3.2.3 Alternatively, a first test may be performed with all temperature controls set at their coldest setting. If the compartment temperature is above the appropriate standardized temperature, a second test shall be performed with all controls set at their warmest control setting and the results of these two tests shall be used to determine energy consumption. If the above condition is not met, then the unit shall be tested in accordance with 3.2.1 above.

3.3 Variable defrost control optional test. After a steady-state condition is achieved, the optional test requires door-openings for 12±2 seconds every 60 minutes on the fresh food compartment door and a simultaneous 12±2 second freezer compartment door-opening occurring every 4th time, to obtain 24 fresh food and six freezer compartment door-openings per 24-hour period. The first freezer door-opening shall be simultaneous with the fourth fresh food door-opening. The doors are to be opened 60° to 90° with an average velocity for the leading edge of the door of approximately 2 ft./sec. Prior to the initiation of the door-opening sequence, the refrigerator defrost control mechanism may be reinitiated in order to minimize the test duration.

4. Test Period

4.1 Test Period. Tests shall be performed by establishing the conditions set forth in Section 2, and using control settings as set forth in Section 3, above.

4.1.1 Nonautomatic Defrost. If the model being tested has no automatic defrost system, the test time period shall start after steady state conditions have been achieved and be of not less than three hours in duration. During the test period, the compressor motor shall complete two or more whole compressor cycles (a compressor cycle is a complete ''on'' and a complete ''off'' period of the motor). If no ''off'' cycling will occur, as determined during the stabilization period, the test period shall be three hours. If

incomplete cycling (less than two compressor cycles) occurs during a 24 hour period, the results of the 24 hour period shall be used.

4.1.2 Automatic Defrost. If the model being tested has an automatic defrost system, the test time period shall start after steady state conditions have been achieved and be from one point during a defrost period to the same point during the next defrost period. If the model being tested has a long-time automatic defrost system, the alternative provisions of 4.1.2.1 may be used.If the model being tested has a variable defrost control, the provisions of section 4.1.2.2 or 4.1.2.3 shall apply. If the model has a dual compressor system the provisions of 4.1.2.4 shall apply.

4.1.2.1 Long-time Automatic Defrost. If the model being tested has a long-time automatic defrost system, the test time period may consist of two parts. A first part would be the same as the test for a unit having no defrost provisions (section 4.1.1). The second part would start when a defrost period is initiated during a compressor ''on'' cycle and terminate at the second turn ''on'' of the compressor motor or after four hours, whichever comes first.

4.1.2.2 Variable defrost control. If the model being tested has a variable defrost control system, the test shall consist of three parts. Two parts shall be the same as the test for long-time automatic defrost (section 4.1.2.1). The third part is the optional test to determine the time between defrosts (section 5.2.1.3). The third part is used by manufacturers that choose not to accept the default value of F of 0.20, to calculate CT.

4.1.2.3 Variable defrost control optional test. After steady-state conditions with no door openings are achieved in accordance with section 3.3 above, the test is continued using the above daily door-opening sequence until stabilized operation is achieved. Stabilization is defined as a minimum of three consecutive defrost cycles with times between defrosts that will allow the calculation of a Mean Time Between Defrosts (MTBD1) that satisfies the statistical relationship of 90 percent confidence. The test is repeated on at least one more unit of the model and until the Mean Time Between Defrosts for the multiple unit tests (MTBD2) satisfies the statistical relationship. If the time between defrosts is greater than 96 hours (compressor ''on'' time) and this defrost period can be repeated on a second unit, the test may be terminated at 96 hours (CT) and the absolute time value used for MTBD for each unit.

4.1.2.4 Dual compressor systems with automatic defrost. If the model being tested has separate compressor systems for the refrigerator and freezer sections, each with its own automatic defrost system, then the two-part method in 4.1.2.1 shall be used. The second part of the method will be conducted separately for each automatic defrost system. The auxiliary components (fan motors, anti-sweat heaters, etc.) will be identified for each system and the energy consumption measured during each test.

5. Test Measurements

5.1 Temperature Measurements. Temperature measurements shall be made at the locations prescribed in Figures 7.1 and 7.2 of HRF–1–1979 and shall be accurate to within ± 0.5° F. (0.3° C.) of true value. No freezer temperature measurements need be taken in an all-refrigerator model.

If the interior arrangements of the cabinet do not conform with those shown in Figure 7.1 and 7.2 of HRF–1–1979, measurements shall be taken at selected locations chosen to represent approximately the entire refrigerated compartment. The locations selected shall be a matter of record.

5.1.1 Measured Temperature. The measured temperature of a compartment is to be the average of all sensor temperature readings taken in that compartment at a particular time. Measurements shall be taken at regular intervals not to exceed four minutes.

5.1.2 Compartment Temperature. The compartment temperature for each test period shall be an average of the measured temperatures taken in a compartment during a complete cycle or several complete cycles of the compressor motor (one compressor cycle is one complete motor ''on'' and one complete motor ''off'' period). For long-time automatic defrost models, compartment temperatures shall be those measured in the first part of the test period specified in 4.1.1. For models equipped with variable defrost controls, compartment temperatures shall be those measured in the first part of the test period specified in 4.1.2.2 above.

5.1.2.1 The number of complete compressor motor cycles over which the measured temperatures in a compartment are to be averaged to determine compartment temperature shall be equal to the number of minutes between measured temperature readings, rounded up to the next whole minute or a number of complete cycles over a time period exceeding one hour. One of the cycles shall be the last complete compressor motor cycle during the test period.

5.1.2.2 If no compressor motor cycling occurs, the compartment temperature shall be the average of the measured temperatures taken during the last thirty-two minutes of the test period.

5.1.2.3 If incomplete cycling occurs, the compartment temperatures shall be the average of the measured temperatures taken during the last three hours of the last complete ''on'' period.

5.2 Energy Measurements

5.2.1 Per-day Energy Consumption. The energy consumption in kilowatt-hours per day for each test period shall be the energy expended during the test period as specified in section 4.1 adjusted to a 24 hour period. The adjustment shall be determined as follows:

5.2.1.1 Nonautomatic and automatic defrost models. The energy consumption in kilowatt-hours per day shall be calculated equivalent to:

$ET = EP \times 1440/T$

where

ET=test cycle energy expended in kilowatt-hours per day,

EP=energy expended in kilowatt-hours during the test period,

T=length of time of the test period in minutes, and

1440=conversion factor to adjust to a 24 hour period in minutes per day.

5.2.1.2 Long-time Automatic Defrost. If the two part test method is used, the energy consumption in kilowatt-hours per day shall be calculated equivalent to:

$ET = (1440 \times EP1/T1) + ((EP2 - (EP1 \times T2/T1)) \times 12/CT)$

where

ET and 1440 are defined in 5.2.1.1,

EP1=energy expended in kilowatt-hours during the first part of the test,

EP2=energy expended in kilowatt-hours during the second part of the test,

T1 and T2=length of time in minutes of the first and second test parts respectively,

CT=Defrost timer run time in hours required to cause it to go through a complete cycle, to the nearest tenth hour per cycle, and

12=factor to adjust for a 50% run time of the compressor in hours per day.

5.2.1.3 Variable defrost control. The energy consumption in kilowatt-hours per day shall be calculated equivalent to:

$ET = (1440 \times EP1/T1) + (EP2 - (EP1 \times T2/T1)) \times (12/CT)$ where 1440 is defined in 5.2.1.1 and EP1, EP2, T1, T2 and 12 are defined in 5.2.1.2.

$CT = CT_L \times CT_M)/(F \times (CT_M - CT_L) + CT_L)$

CT_L=least or shortest time between defrosts in tenths of an hour (greater than or equal to six but less than or equal to 12 hours)

CT_M=maximum time between defrost cycles in tenths of an hour (greater than CT_L but not more than 96 hours)

F=ratio of per day energy consumption in excess of the least energy and the maximum difference in per day energy consumption and is equal to

$F = (1/CT - 1/CT_M)/(1/CT_L - 1/CT_M = (ET - ET_L)/ET_M - ET_L)$ or 0.20 in lieu of testing to find CT.

ET_L = least electrical energy used (kilowatt hours)

ET_M=maximum electrical energy used (kilowatt hours). For demand defrost models with no values for CT_L and CT_M in the algorithm the default values of 12 and 84 shall be used, respectively.

5.2.1.4 Optional test method for variable defrost controls.

CT = MTBD×0.5

where:

MTBD = mean time between defrosts

$$MTBD = \frac{\sum X}{N}$$

where:

X=in time between defrost cycles

N=number of defrost cycles

5.2.1.5 Dual compressor systems with dual automatic defrost. The two-part test method in section 4.1.2.2 must be used, the energy consumption in kilowatt per day shall be calculated equivalent to:

$ET = (1440 \times EP1/T1) + (EP2_F - (EP_F \times T2/T1)) \times 12/CT_F + (EP2_R - (EP_R \times T3/T1)) \times 12/CT_R$

Where 1440, EP1, T1, EP2, 12, and CT are defined in 5.2.1.2

EP_F = energy expended in kilowatt-hours during the second part of the test for the freezer system by the freezer system.

$EP2_F$ = total energy expended during the second part of the test for the freezer system.

EP_R = energy expended in kilowatt-hours during the second part of the test for the refrigerator system by the refrigerator system.

$EP2_R$ = total energy expended during the second part of the test for the refrigerator system.

T2 and T3 = length of time in minutes of the second test part for the freezer and refrigerator systems respectively.

CT_F = compressor ''on'' time between freezer defrosts (tenths of an hour).

CT_R = compressor ''on'' time between refrigerator defrosts (tenths of an hour).

5.3 Volume measurements. The electric refrigerator or electric refrigerator-freezer total refrigerated volume, VT, shall be measured in accordance with HRF–1–1979, section 3.20 and sections 4.2 through 4.3 and be calculated equivalent to:

$VT = VF + VFF$

where

VT=total refrigerated volume in cubic feet,

VF=freezer compartment volume in cubic feet, and

VFF=fresh food compartment volume in cubic feet.

5.4 Externally vented refrigerator or refrigerator-freezer units. All test measurements for the externally vented refrigerator or refrigerator-freezer shall be made in accordance with the requirements of other sections of this appendix, except as modified in

this section 5.4 or other sections expressly applicable to externally vented refrigerators or refrigerator-freezers.

5.4.1 Operability of thermostatic and mixing of air controls. Prior to conducting energy consumption tests, the operability of thermostatic controls that permit the mixing of exterior and ambient air when exterior air temperatures are less than 60 °F must be verified. The operability of such controls shall be verified by operating the unit under ambient air temperature of 90 °F and exterior air temperature of 45 °F. If the inlet air entering the condenser or condenser/compressor compartment is maintained at 60 °F, plus or minus three degrees, energy consumption of the unit shall be measured under 5.4.2.2 and 5.4.2.3. If the inlet air entering the condenser or condenser/compressor compartment is not maintained at 60 °F, plus or minus three degrees, energy consumption of the unit shall also be measured under 5.4.2.4.

5.4.2 Energy consumption tests.

5.4.2.1 Correction factor test. To enable calculation of a correction factor, K, two full cycle tests shall be conducted to measure energy consumption of the unit with air mixing controls disabled and the condenser inlet air temperatures set at 90 °F (32.2 °C) and 80 °F (26.7 °C). Both tests shall be conducted with all compartment temperature controls set at the position midway between their warmest and coldest settings and the anti-sweat heater switch off. Record the energy consumptions ec_{90} and $ec_{80,}$ in kWh/day.

5.4.2.2 Energy consumption at 90 °F. The unit shall be tested at 90 °F (32.2 °C) exterior air temperature to record the energy consumptions $(e_{90})_i$ in kWh/day. For a given setting of the anti-sweat heater, i corresponds to each of the two states of the compartment temperature control positions.

5.4.2.3 Energy consumption at 60 °F. The unit shall be tested at 60 °F (26.7 °C) exterior air temperature to record the energy consumptions $(e_{60})_i$ in kWh/day. For a given setting of the anti-sweat heater, i corresponds to each of the two states of the compartment temperature control positions.

5.4.2.4 Energy consumption if mixing controls do not operate properly. If the operability of temperature and mixing controls has not been verified as required under 5.4.1, the unit shall be tested at 50 °F (10.0 °C) and 30 °F (−1.1 °C) exterior air temperatures to record the energy consumptions $(e_{50})_i$ and $(e_{30})_i$. For a given setting of the anti-sweat heater, i corresponds to each of the two states of the compartment temperature control positions.

6. Calculation of Derived Results from Test Measurements

6.1 Adjusted Total Volume.

6.1.1 Electric refrigerators. The adjusted total volume, VA, for electric refrigerators under test shall be defined as:

$$VA=(VF\times CR)+VFF$$

where

VA=adjusted total volume in cubic feet,

VF and VFF are defined in 5.3, and

CR=adjustment factor of 1.44 for refrigerators other than all-refrigerators, or 1.0 for all-refrigerators, dimensionless,

6.1.2 Electric refrigerator-freezers. The adjusted total volume, VA, for electric refrigerator-freezers under test shall be calculated as follows:

$$VA=(VF\times CRF)+VFF$$

where

VF and VFF are defined in 5.3 and VA is defined in 6.1.1,

CRF=adjustment factor of 1.63, dimensionless,

6.2 Average Per-Cycle Energy consumption.

6.2.1 All-refrigerator Models. The average per-cycle energy consumption for a cycle type is expressed in kilowatt-hours per cycle to the nearest one hundredth (0.01) kilowatt-hour and shall depend upon the temperature attainable in the fresh food compartment as shown below.

6.2.1.1 If the fresh food compartment temperature is always below 38.0° F. (3.3° C.), the average per-cycle energy consumption shall be equivalent to:

$$E=ET1$$

where

E=Total per-cycle energy consumption in kilowatt-hours per day,

ET is defined in 5.2.1, and Number 1 indicates the test period during which the highest fresh food compartment temperature is measured.

6.2.1.2 If one of the fresh food compartment temperatures measured for a test period is greater than 38.0° F. (3.3° C.), the average per-cycle energy consumption shall be equivalent to:

$$E=ET1+((ET2-ET1)\times(38.0-TR1)/(TR2-TR1))$$

where

E is defined in 6.2.1.1,

ET is defined in 5.2.1,

TR=Fresh food compartment temperature determined according to 5.1.2 in degrees F,

Number 1 and 2 indicates measurements taken during the first and second test period as appropriate, and

38.0=Standardized fresh food compartment temperature in degrees F.

6.2.2 Refrigerators and refrigerator-freezers. The average per-cycle energy consumption for a cycle type is expressed in kilowatt-hours per-cycle to the nearest one hundredth (0.01) kilowatt-hour and shall be defined in the applicable following manner.

6.2.2.1 If the fresh food compartment temperature is always at or below 45° F. (7.2° C.) in both of the tests and the freezer compartment temperature is always at or below 15° F. (−9.4° C.) in both tests of a refrigerator or at or below 5° F. (−15° C.) in both tests of a refrigerator-freezer, the per-cycle energy consumption shall be:

E=ET1

where

E is defined in 6.2.1.1,

ET is defined in 5.2.1, and

Number 1 indicates the test period during which the highest freezer compartment temperature was measured.

6.2.2.2 If the conditions of 6.2.2.1 do not exist, the per-cycle energy consumption shall be defined by the higher of the two values calculated by the following two formulas:

$E=ET1+((ET2-ET1)\times(45.0-TR1)/(TR2-TR1))$

and

$E=ET1+((ET2-ET1)\times(k-TF1)/(TF2-TF1))$

where

E is defined in 6.2.1.1,

ET is defined in 5.2.1,

TR and number 1 and 2 are defined in 6.2.1.2,

TF=Freezer compartment temperature determined according to 5.1.2 in degrees F,

45.0 is a specified fresh food compartment temperature in degree F, and

k is a constant 15.0 for refrigerators or 5.0 for refrigerator-freezers each being standardized freezer compartment temperature in degrees F.

6.3 Externally vented refrigerator or refrigerator-freezers. Per-cycle energy consumption measurements for the externally vented refrigerator or refrigerator-freezer shall be calculated in accordance with the requirements of this Appendix, as modified in sections 6.3.1–6.3.7.

6.3.1 Correction factor. A correction factor, K, shall be calculated as:

$K = ec_{90}/ec_{80}$

where ec_{90} and ec_{80} = the energy consumption test results as determined under 5.4.2.1.

6.3.2 Combining test results of different settings of compartment temperature controls. For a given setting of the anti-sweat heater, follow the calculation procedures of 6.2 to combine the test results for energy consumption of the unit at different temperature control settings for each condenser inlet air temperature tested under 5.4.2.2, 5.4.2.3, and 5.4.2.4, where applicable, $(e_{90})_i$, $(e_{60})_i$, $(e_{50})_i$, and $(e_{30})_i$. The combined values are ε_{90}, ε_{60}, ε_{50}, and ε_{30}, where applicable, in kWh/day.

6.3.3 Energy consumption corrections. For a given setting of the anti-sweat heater, the energy consumptions ε_{90}, ε_{60}, ε_{50}, and ε_{30} calculated in 6.3.2 shall be adjusted by multiplying the correction factor K to obtain the corrected energy consumptions per day, in kWh/day:

$E_{90} = K \times \varepsilon_{90}$,

$E_{60} = K \times \varepsilon_{60}$

$E_{50} = K \times \varepsilon_{50}$, and

$E_{30} = K \times \varepsilon_{30}$

where,

K is determined under section 6.3.1, and ε_{90}, ε_{60}, ε_{50}, and ε_{30} are determined under section 6.3.2.

6.3.4 Energy profile equation. For a given setting of the anti-sweat heater, the energy consumption E_X, in kWh/day, at a specific exterior air temperature between 80 °F (26.7 °C) and 60 °F (26.7 °C) shall be calculated by the following equation:

$E_X = a + bT_X$,

where,

T_X = exterior air temperature in °F;

$a = 3E_{60} - 2E_{90}$, in kWh/day;

$b = (E_{90} - E_{60})/30$, in kWh/day per °F.

6.3.5 Energy consumption at 80 °F (26.7 °C), 75 °F (23.9 °C) and 65 °F (18.3 °C). For a given setting of the anti-sweat heater, calculate the energy consumptions at 80 °F (26.7 °C), 75 °F (23.9 °C) and 65 °F (18.3 °C) exterior air temperatures, E_{80}, E_{75} and E_{65}, respectively, in kWh/day, using the equation in 6.3.4.

6.3.6 National average per cycle energy consumption. For a given setting of the anti-sweat heater, calculate the national average energy consumption, E_N, in kWh/day, using one of the following equations:

$E_N = 0.523 \times E_{60} + 0.165 \times E_{65} + 0.181 \times E_{75} + 0.131 \times E_{80}$, for units not tested under 5.4.2.4,

$E_N = 0.257 \times E_{30} + 0.266 \times E_{50} + 0.165 \times E_{65} + 0.181 \times E_{75} + 0.131 \times E_{80}$, for units tested under 5.4.2.4,

where,

E_{30}, E_{50}, and E_{60} are defined in 6.3.3,

E_{65}, E_{75}, and E_{80} are defined in 6.3.5, and

the coefficients are weather associated weighting factors.

6.3.7 Regional average per cycle energy consumption. If regional average per cycle energy consumption is required to be calculated, for a given setting of the anti-sweat heater, calculate the regional average per cycle energy consumption, E_R, in kWh/day, for the regions in figure 1 using one of the following equations and the coefficients in the table A:

$E_R = a_1 \times E_{60} + c \times E_{65} + d \times E_{75} + e \times E_{80}$, for a unit that is not required to be tested under 5.4.2.4,

$E_R = a \times E_{30} + b \times E_{50} + c \times E_{65} + d \times E_{75} + e \times E_{80}$, for a unit tested under 5.4.2.4,

where:

E_{30}, E_{50}, and E_{60} are defined in 6.3.3,

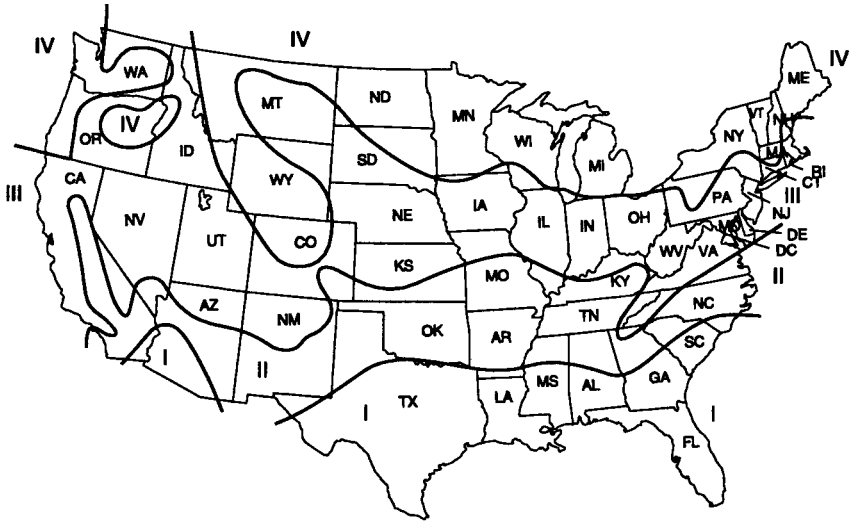
E_{65}, E_{75}, and E_{80} are defined in 6.3.5, and

a_1, a, b, c, d, e are weather associated weighting factors for the Regions, as specified in Table A:

TABLE A.—COEFFICIENTS FOR CALCULATING REGIONAL AVERAGE PER CYCLE ENERGY CONSUMPTION
[Weighting Factors]

Regions	a_1	a	b	c	d	e
I	0.282	0.039	0.244	0.194	0.326	0.198
II	0.486	0.194	0.293	0.191	0.193	0.129
III	0.584	0.302	0.282	0.178	0.159	0.079
IV	0.664	0.420	0.244	0.161	0.121	0.055

FIGURE 1. Weather Regions for the United States



[47 FR 34526, Aug. 10, 1982; 48 FR 13013, Mar. 29, 1983, as amended at 54 FR 36240, Aug. 31, 1989; 54 FR 38788, Sept. 20, 1989; 62 FR 47539, 47540, Sept. 9, 1997]

APPENDIX B1 TO SUBPART B OF PART 430—UNIFORM TEST METHOD FOR MEASURING THE ENERGY CONSUMPTION OF FREEZERS

1. Definitions.

1.1 ''HRF–1–1979'' means the Association of Home Appliance Manufacturers standard for household refrigerators, combination refrigerators-freezers, and household freezers, also approved as an American National Standard as a revision of ANSI B38.1–1970.

1.2 ''Anti-sweat heater'' means a device incorporated into the design of a freezer to prevent the accumulation of moisture on exterior surfaces of the cabinet under conditions of high ambient humidity.

1.3 ''Cycle'' means the period of 24 hours for which the energy use of a freezer is calculated as though the consumer-activated compartment temperature controls were preset so that the desired compartment temperatures were maintained.

1.4 ''Cycle type'' means the set of test conditions having the calculated effect of operating a freezer for a period of 24 hours with the consumer-activated controls other than the compartment temperature control set to establish various operating characteristics.

1.5 ''Standard cycle'' means the cycle type in which the anti-sweat heater switch, when provided, is set in the highest energy consuming position.

1.6 ''Adjusted total volume'' means the product of, (1) the freezer volume as defined in HRF–1–1979 in cubic feet, times (2) an adjustment factor.

1.7 ''Automatic Defrost'' means a system in which the defrost cycle is automatically

initiated and terminated, with resumption of normal refrigeration at the conclusion of defrost operation. The system automatically prevents the permanent formation of frost on all refrigerated surfaces. Nominal refrigerated food temperatures are maintained during the operation of the automatic defrost system.

1.8 ''Long-time Automatic Defrost'' means an automatic defrost system where successive defrost cycles are separated by 14 hours or more of compressor-operating time.

1.9 ''Stabilization Period'' means the total period of time during which steady-state conditions are being attained or evaluated.

1.10 ''Variable defrost control'' means a long-time automatic defrost system (except the 14-hour defrost qualification does not apply) where successive defrost cycles are determined by an operating condition variable or variables other than solely compressor operating time. This includes any electrical or mechanical device. Demand defrost is a type of variable defrost control.

1.11 ''Quick freeze'' means an optional feature on freezers which is initiated manually and shut off manually. It bypasses the thermostat control and places the compressor in a steady-state operating condition until it is shut off.

2. Test Conditions.

2.1 Ambient temperature. The ambient temperature shall be 90.0±1.0° F. (32.2±0.6° C.) during the stabilization period and during the test period. The ambient temperature shall be 80±2°F dry bulb and 67°F wet bulb during the stabilization period and during the test period when the unit is tested in accordance with section 3.3.

2.2 Operational conditions. The freezer shall be installed and its operating conditions maintained in accordance with HRF–1–1979, section 7.2 through section 7.4.3.3, except that the vertical ambient gradient at locations 10 inches (25.4 cm) out from the the centers of the two sides of the unit being tested is to be maintained during the test. Unless the area is obstructed by shields or baffles, the gradient is to be maintained from 2 inches (5.1 cm) above the floor or supporting platform to a height one foot (30.5 cm) above the unit under test. Defrost controls are to be operative and the anti-sweat heater switch is to be ''on'' during one test and ''off'' during a second test. The quick freeze option shall be switched off unless specified.

2.3 Steady State Condition. Steady state conditions exist if the temperature measurements taken at four minute intervals or less during a stabilization period are not changing at a rate greater than 0.042° F. (0.023° C.) per hour as determined by the applicable condition of A or B.

A—The average of the measurements during a two hour period if no cycling occurs or during a number of complete repetitive compressor cycles through a period of no less than two hours is compared to the average over an equivalent time period with three hours elapsed between the two measurement periods.

B—If A above cannot be used, the average of the measurements during a number of complete repetitive compressor cycles through a period of no less than two hours and including the last complete cycle prior to a defrost period, or if no cycling occurs, the average of the measurements during the last two hours prior to a defrost period; are compared to the same averaging period prior to the following defrost period.

3. Test Control Settings.

3.1 Model with no user operable temperature control. A test shall be performed during which the compartment temperature and energy use shall be measured. A second test shall be performed with the temperature control electrically short circuited to cause the compressor to run continuously. If the model has the quick freeze option, it is to be used to bypass the temperature control.

3.2 Model with user operable temperature control. Testing shall be performed in accordance with one of the following sections using the standardized temperature of 0.0° F. (−17.8° C.). Variable defrost control models shall achieve 0±2°F during the steady-state conditions prior to the optional test with no door openings.

3.2.1 A first test shall be performed with all temperature controls set at their median position midway between their warmest and coldest settings. Knob detents shall be mechanically defeated if necessary to attain a median setting. A second test shall be performed with all controls set at either their warmest or their coldest setting (not electrically or mechanically bypassed), whichever is appropriate, to attempt to achieve compartment temperatures measured during the two tests which bound (i.e., one is above and one is below) the standardized temperature. If the compartment temperatures measured during these two tests bound the standardized temperature, then these test results shall be used to determine energy consumption. If the compartment temperature measured with all controls set at their coldest setting is above the standardized temperature, a third test shall be performed with all controls set at their warmest setting and the result of this test shall be used with the result of the test performed with all controls set at their coldest setting to determine energy consumption. If the compartment temperature measured with all controls set at their warmest setting is below

the standardized temperature; then the result of this test alone will be used to determine energy consumption.

3.2.2 Alternatively, a first test may be performed with all temperature controls set at their warmest setting. If the compartment temperature is below the standardized temperature, then the result of this test alone will be used to determine energy consumption. If the above condition is not met, then the unit shall be tested in accordance with 3.2.1 above.

3.2.3 Alternatively, a first test may be performed with all temperature controls set at their coldest setting. If the compartment temperature is above the standardized temperature, a second test shall be performed with all controls set at their warmest setting and the results of these two tests shall be used to determine energy consumption. If the above condition is not met, then the unit shall be tested in accordance with 3.2.1 above.

3.3 Variable defrost control optional test. After a steady-state condition is achieved, the door-opening sequence is initiated with an 18±2 second freezer door-opening occurring every eight hours to obtain three door-openings per 24-hour period. The first freezer door-opening shall occur at the initiation of the test period. The door(s) are to be opened 60 to 90° with an average velocity for the leading edge of the door of approximately two feet per second. Prior to the initiation of the door-opening sequence, the freezer defrost control mechanism may be re-initiated in order to minimize the test duration.

4. Test Period.

4.1 Test Period. Tests shall be performed by establishing the conditions set forth in Section 2 and using control settings as set forth in Section 3 above.

4.1.1 Nonautomatic Defrost. If the model being tested has no automatic defrost system, the test time period shall start after steady state conditions have been achieved, and be of not less than three hours' duration. During the test period the compressor motor shall complete two or more whole cycles (a compressor cycle is a complete ''on'' and a complete ''off'' period of the motor). If no ''off'' cycling will occur, as determined during the stabilization period, the test period shall be three hours. If incomplete cycling (less than two compressor cycles) occurs during a 24 hour period, the results of the 24 hour period shall be used.

4.1.2 Automatic Defrost. If the model being tested has an automatic defrost system, the test time period shall start after steady state conditions have been achieved and be from one point during a defrost period to the same point during the next defrost period. If the model being tested has a long-time automatic defrost system, the alternate provisions of 4.1.2.1 may be used. If the model being tested has a variable defrost control the provisions of 4.1.2.2. shall apply.

4.1.2.1 Long-time Automatic Defrost. If the model being tested has a long-time automatic defrost system, the test time period may consist of two parts. A first part would be the same as the test for a unit having no defrost provisions (section 4.1.1). The second part would start when a defrost period is initiated during a compressor ''on'' cycle and terminate at the second turn ''on'' of the compressor motor or after four hours, whichever comes first.

4.1.2.2 Variable defrost control. If the model being tested has a variable defrost control system, the test shall consist of three parts. Two parts shall be the same as the test for long-time automatic defrost in accordance with section 4.1.2.1 above. The third part is the optional test to determine the time between defrosts (5.2.1.3). The third part is used by manufacturers that choose not to accept the default value of F of 0.20, to calculate CT.

4.1.2.3 Variable defrost control optional test. After steady-state conditions with no door-openings are achieved in accordance with section 3.3 above, the test is continued using the above daily door-opening sequence until stabilized operation is achieved. Stabilization is defined as a minimum of three consecutive defrost cycles with times between defrost that will allow the calculation of a Mean Time Between Defrosts (MTBD1) that satisfies the statistical relationship of 90 percent confidence. The test is repeated on at least one more unit of the model and until the Mean Time Between Defrosts for the multiple unit test (MTBD2) satisfies the statistical relationship. If the time between defrosts is greater than 96 hours (compressor ''on'' time) and this defrost period can be repeated on a second unit, the test may be terminated at 96 hours (CT) and the absolute time value used for MTBD for each unit.

5. Test Measurements.

5.1 Temperature Measurements. Temperature measurements shall be made at the locations prescribed in Figure 7–2 of HRF–1–1979 and shall be accurate to within ±0.5° F. (0.3° C.) of true value.

5.1.1 Measured Temperature. The measured temperature is to be the average of all sensor temperature readings taken at a particular time. Measurements shall be taken at regular intervals not to exceed four minutes.

5.1.2 Compartment Temperature. The compartment temperature for each test period shall be an average of the measured temperatures taken during a complete cycle or several complete cycles of the compressor motor (one compressor cycle is one complete motor ''on'' and one complete motor ''off'' period). For long-time automatic defrost models, compartment temperature shall be

that measured in the first part of the test period specified in 4.1.1. For models equipped with variable defrost controls, compartment temperatures shall be those measured in the first part of the test period specified in 4.1.2.2.

5.1.2.1 The number of complete compressor motor cycles over which the measured temperatures in a compartment are to be averaged to determine compartment temperature shall be equal to the number of minutes between measured temperature readings rounded up to the next whole minute or a number of complete cycles over a time period exceeding one hour. One of the cycles shall be the last complete compressor motor cycles during the test period.

5.1.2.2 If no compressor motor cycling occurs, the compartment temperature shall be the average of the measured temperatures taken during the last thirty-two minutes of the test period.

5.1.2.3 If incomplete cycling occurs (less than one cycle) the compartment temperature shall be the average of all readings taken during the last three hours of the last complete ''on'' period.

5.2 Energy Measurements:

5.2.1 Per-day Energy Consumption. The energy consumption in kilowatt-hours per day for each test period shall be the energy expended during the test period as specified in section 4.1 adjusted to a 24 hour period.

The adjustment shall be determined as follows:

5.2.1.1 Nonautomatic and automatic defrost models. The energy consumption in kilowatt-hours per day shall be calculated equivalent to:

ET=(EP×1440× K)/T where

ET=test cycle energy expended in kilowatt-hours per day,

EP=energy expended in kilowatt-hours during the test period.

T=length of time of the test period in minutes,

1440=conversion factor to adjust to a 24 hour period in minutes per day, and

K=correction factor of 0.7 for chest freezers and 0.85 for upright freezers to adjust for average household usage, dimensionless.

5.2.1.2 Long-time Automatic Defrost. If the two part test method is used, the energy consumption in kilowatt-hours per day shall be calculated equivalent to:

ET=(1440× K× EP1/T1) + ((EP2−(EP1× T2/T1))× K×12/CT)

where

ET, 1440, and K are defined in 5.2.1.1

EP1=energy expended in kilowatt-hours during the first part of the test.

EP2=energy expended in kilowatt-hours during the second part of the test,

CT=Defrost timer run time in hours required to cause it to go through a complete cycle, to the nearest tenth hour per cycle,

12=conversion factor to adjust for a 50% run time of the compressor in hours per day, and

T1 and T2=length of time in minutes of the first and second test parts respectively.

5.2.1.3 Variable defrost control. The energy consumption in kilowatt-hours per day shall be calculated equivalent to:

ET=(1440 x EP1/T1) + (EP2 − (EP1 x T2/T1) x (12/CT) where 1440 is defined in 5.2.1.1 and EP1, EP2, T1, T2 and 12 are defined in 5.2.1.2.

$CT=(CT_L \times CT_M)/(F \times (CT_M - CT_L) + CT_L)$

where:

CT_L=least or shortest time between defrost in tenths of an hour (greater than or equal to 6 hours but less than or equal to 12 hours, $6 \leq_L \leq 12$)

CT_M=maximum time between defrost cycles in tenths of an hour (greater than CT_L but not more than 96 hours, $CT_L \leq CT_M \leq 96$)

F=ratio of per day energy consumption in excess of the least energy and the maximum difference in per day energy consumption and is equal to

$F=(1/CT - 1/CT_M)/(1/CT_L - 1/CT_M) = (ET - ET_L)/(ET_M - ET_L)$ or 0.20 in lieu of testing to find CT

ET_L=least electrical energy consumed, in kilowatt hours

ET_M=maximum electrical energy consumed, in kilowatt hours

For demand defrost models with no values for CT_L and CT_M in the algorithm the default values of 12 and 84 shall be used, respectively.

5.2.1.4 Variable defrost control optional test. Perform the optional test for variable defrost control models to find CT.

CT=MTBD x 0.5

MTBD=mean time between defrost

$$MTBD = \frac{\sum X}{N}$$

X=time between defrost cycles

N=number of defrost cycles

5.3 Volume measurements. The total refrigerated volume, VT, shall be measured in accordance with HRF–1–1979, section 3.20 and section 5.1 through 5.3.

6. Calculation of Derived Results From Test Measurements.

6.1 Adjusted Total Volume. The adjusted total volume, VA, for freezers under test shall be defined as:

VA=VT× CF

where

VA=adjusted total volume in cubic feet,

VT=total refrigerated volume in cubic feet, and

CF=Correction factor of 1.73, dimensionless.

6.2 Average Per Cycle Energy Consumption:

6.2.1 The average per-cycle energy consumption for a cycle type is expressed in kilowatt-hours per cycle to the nearest one hundredth (0.01) kilowatt-hour and shall depend upon the compartment temperature attainable as shown below.

6.2.1.1 If the compartment temperature is always below 0.0° F. (−17.8° C.), the average per-cycle energy consumption shall be equivalent to:

E=ET1

where

E=Total per-cycle energy consumption in kilowatt-hours per day.

ET is defined in 5.2.1, and

Number 1 indicates the test period during which the highest compartment temperature is measured.

6.2.1.2 If one of the compartment temperatures measured for a test period is greater than 0.0° F. (17.8° C.), the average per-cycle energy consumption shall be equivalent to:

E=ET1+((ET2−ET1)×(0.0−TF1)/(TF2−TF1))

where

E is defined in 6.2.1.1

ET is defined in 5.2.1

TF=compartment temperature determined according to 5.1.2 in degrees F.

Numbers 1 and 2 indicate measurements taken during the first and second test period as appropriate, and

0.0=Standardized compartment temperature in degrees F.

[47 FR 34528, Aug. 10, 1982; 48 FR 13013, Mar. 29, 1983, as amended at 54 FR 36241, Aug. 31, 1989; 54 FR 38788, Sept. 20, 1989]

APPENDIX C TO SUBPART B OF PART 430—UNIFORM TEST METHOD FOR MEASURING THE ENERGY CONSUMPTION OF DISHWASHERS

1. *Definitions:* 1.1 ''Cycle'' means a sequence of operations of a dishwasher which performs a complete dishwashing operation, and may include variations or combinations of the functions of washing, rinsing and drying.

1.2 ''Cycle type'' means any complete sequence of operations capable of being preset on the dishwasher prior to the initiation of machine operation.

1.3 ''Normal cycle'' means the cycle type recommended by the manufacturer for completely washing a full load of normally soiled dishes including the power-dry feature.

1.4 ''Power-dry feature'' means that function in a cycle in which electrically generated heat is introduced into the washing chamber for the purpose of improving the drying performance of the dishwasher.

1.5 ''Truncated normal cycle'' means the normal cycle interrupted to eliminate the power-dry feature after the termination of the last rinse operation.

1.6 ''Water Heating Dishwasher'' means a dishwasher which is designed for hearing cold inlet water (nominal 50° F) or a dishwasher for which the manufacturer recommends operation with a nominal inlet water temperature of 120° F, and may operate at either of these inlet water temperatures by providing internal water heating to above 120° F in at least one wash phase of the normal cycle.

2. *Testing conditions:* 2.1 *Installation.* Install the dishwasher in accordance with the manufacturer's instruction, except that undercounter dishwashers need not be installed under a counter.

2.2 *Electrical supply.*

2.2.1 *Dishwashers that operate with an electrical supply of 115 volts.* Maintain the electrical supply to the dishwasher within two percent of 115 volts and within one percent of the nameplate frequency as specified by the manufacturer.

2.2.2 *Dishwashers that operate with an electricial supply of 240 volts.* Maintain the electrical supply to the dishwasher within two percent of 240 volts and within one percent of its nameplate frequency as specified by the manufacturer.

2.3 *Water temperature.*

2.3.1 *Dishwashers to be tested at a nominal 140°F inlet water temperature.* Maintain the water supply temperature between 135°F and 145°F.

2.3.2 Dishwashers to be tested at a nominal 120°F inlet water temperature. Maintain the water supply temperature between 118°F and 122°F.

2.3.3 *Dishwashers to be tested at a nominal 50°F inlet water temperature.* Maintain the water supply temperature between 48°*F and 52°* F.

2.4 *Water pressure.* Maintain the pressure of the water supply between 32.5 and 37.5 pounds per square inch.

2.5 *Ambient and machine temperature.* Maintain the room ambient air temperature between 70°F and 85°F, and assure that the dishwasher and the test load are at room ambient temperature at the start of each test cycle.

2.6 *Load.*

2.6.1 *Dishwashers to be tested at a nominal 140°F inlet water temperature.* The dishwasher shall be tested on the normal cycle and the truncated normal cycle without a test load.

2.6.2 *Dishwashers to be tested at a nominal inlet water temperature of 50°F or 120°F.* The dishwasher shall be tested or normal cycle and the truncated normal cycle with a test load of eight place settings plus six serving pieces as specified in section 6.1.1 of AHAM Standard DW–1. If the capacity of the dishwasher, as stated by the manufacturer, is less than eight place setting then the test load shall be that capacity.

2.7 *Testing requirements.* Provisions in this Appendix pertaining to dishwashers which

operate with a nominal inlet temperature of 50° F or 120° F shall apply only to water heating dishwashers.

3. *Test cycle and measurements.*

3.1 *Test cycle.* Perform a test cycle by establishing the testing conditions set forth in 2 of this Appendix, setting the dishwasher to the cycle type to be tested, initiating the cycle and allowing the cycle to proceed to completion.

3.2 *Machine electrical energy consumption.*

3.2.1 *Dishwashers that operate with a nominal 140°F inlet water temperature, only.* Measure the machine electrical energy consumption, M, specified as the number of kilowatt-hours of electrical energy consumed during the entire test cycle using a water supply temperature as set forth in 2.3.1 of this Appendix. Use a kilowatt-hour meter having a resolution no larger than 0.001 kilowatt hours and a maximum error no greater than one percent.

3.2.2 *Dishwashers that operate with a nominal inlet water temperature of 120°F.* Measure the machine electrical energy consumption, M, specified as the number of kilowatt-hours of electrical energy consumed during the entire test cycle using a water supply temperature as set forth in 2.3.2 of this Appendix. Use a kilowatt-hour meter having a resolution no larger than 0.001 kilowatt-hours and a maximum error no greater than one percent.

3.2.3 *Dishwashers that operate with a nominal inlet water temperature of 50°F.* Measure the machine electrical energy consumption, M, specified as the number of kilowatt-hours of electrical energy consumed during the entire test cycle using a water supply temperature as set forth in 2.3.3 of this appendix. Use a kilowatt-hour meter having a resolution no longer than 0.001 kilowatt-hours and a maximum error no greater than one percent.

3.3 *Water consumption.* Measure the water consumption specified as the number of gallons delivered to the dishwasher during the entire test cycle, using a water meter having a resolution no larger than 0.1 gallon and a maximum error no greater than 1.5 percent for all water flow rates from one to five gallons per minute and for all water temperatures encountered in the test cycle.

3.4 *Report values.* State the reported values of machine electrical energy consumption and water consumption as measured.

4. *Calculation of derived results from test measurements:* 4.1 *Per-cycle water energy consumption using electrically heated water.*

4.1.1 *Dishwashers that operate with a nominal 140°F inlet water temperature, only.* Calculate for the cycle type under test the per-cycle water energy consumption using electrically heated water, We, expressed in kilowatt-hours per cycle and defined as:

$W_e = V \times T \times K$,

where

V=reported water consumption in gallons per cycle for the cycle type under test.

T=nominal water heater temperature rise=90°F.

K=specific heat of water in kilowatt-hours per gallon per degree Fahrenheit=0.00240.

4.1.2 *Dishwashers that operate with a nominal inlet water temperature of 120°F.* Calculate for the cycle type under test the per cycle water energy consumption using electrically heated water, We, expressed in kilowatt-hours per cycle and defined as:

$We = V \times T' \times K$

where

V and K are defined in 4.1.1 of this Appendix and T′=nominal water heated temperature rise=70°F.

4.2 *Per cycle water energy consumption using gas-heated or oil-heated water.*

4.2.1 *Dishwashers that operate with a nominal 140°F inlet water temperature, only.* Calculate for the cycle type under test the per cycle water energy consumption using gas-heated or oil-heated water, We, expressed in Btu's per cycle and defined as:

$Wg = V \times T \times C/e$.

where

V and T are defined in 4.1.1 of this Appendix, and

C=specific heat of water in Btu's per gallon per degree fahrenheit=8.20

e=nominal gas or oil water heater recovery efficiency=0.75.

4.2.2 *Dishwashers that operate with a nominal inlet water temperature of 120°F.* Calculate for the cycle type under test the per cycle water energy consumption using gas-heated or oil-heated water, Wg, expressed in Btu's per cycle and defined as:

$W_g = V \times T' \times C/e$

where

V and T′ are defined in 4.1.2 of this Appendix, and C and e are defined in 4.2.1 of this Appendix.

4.3 *Per-cycle machine electrical energy consumption.*

4.3.1 *Dishwashers that operate with a nominal 140°F inlet water temperature, only.* Use the measured value recorded in 3.2.1 as the per-cycle machine electrical energy consumption, *M,* expressed in kilowatt-hours per cycle.

4.3.2 *Dishwashers that operate with a nominal inlet water temperature of 120°F.* Use the measured value recorded in 3.2.2 as the per-cycle machine electrical energy consumption, *M,* expressed in kilowatt-hours per cycle.

4.3.3 *Dishwashers that operate with a nominal inlet water temperature of 50°F.* Use the measured value recorded at 3.2.3 as the per-cycle machine electrical consumption, M, expressed in kilowatt-hours per-cycle.

4.4 *Total per-cycle energy consumption.* Calculate for the cycle type under test the total per-cycle energy consumption, *E,* expressed in kilowatt-hours per cycle, and defined as

the sum of the per-cycle machine electrical energy consumption, *M*, plus the per-cycle water energy consumption of electrically-heated water, *W*, calculated for the cycle type, determined according to 4.3 and 4.1 respectively.

[48 FR 9206, Mar. 3, 1983, as amended at 49 FR 46536, Nov. 27, 1984; 49 FR 47479, Dec. 5, 1984; 52 FR 47551, Dec. 15, 1987]

APPENDIX D TO SUBPART B OF PART 430—UNIFORM TEST METHOD FOR MEASURING THE ENERGY CONSUMPTION OF CLOTHES DRYERS

1. DEFINITIONS

1.1 ''AHAM'' means the Association of Home Appliance Manufacturers.

1.2 ''Bone dry'' means a condition of a load of test clothes which has been dried in a dryer at maximum temperature for a minimum of 10 minutes, removed and weighed before cool down, and then dried again for 10-minute periods until the final weight change of the load is 1 percent or less.

1.3 ''Compact'' or compact size'' means a clothes dryer with a drum capacity of less than 4.4 cubic feet.

1.4 ''Cool down'' means that portion of the clothes drying cycle when the added gas or electric heat is terminated and the clothes continue to tumble and dry within the drum.

1.5 ''Cycle'' means a sequence of operation of a clothes dryer which performs a clothes drying operation, and may include variations or combinations of the functions of heating, tumbling and drying.

1.6 ''Drum capacity'' means the volume of the drying drum in cubic feet.

1.7 ''HLD–1'' means the test standard promulgated by AHAM and titled ''AHAM Performance Evaluation Procedure for Household Tumble Type Clothes Dryers'', June 1974, and designated as HLD–1.

1.8 ''HLD–2EC'' means the test standard promulgated by AHAM and titled ''Test Method for Measuring Energy Consumption of Household Tumble Type Clothes Dryers,'' December 1975, and designated as HLD–2EC.

1.9 ''Standard size'' means a clothes dryer with a drum capacity of 4.4 cubic feet or greater.

1.10 ''Moisture content'' means the ratio of the weight of water contained by the test load to the bone-dry weight of the test load, expressed as a percent.

1.11 ''Automatic termination control'' means a dryer control system with a sensor which monitors either the dryer load temperature or its moisture content and with a controller which automatically terminates the drying process. A mark or detent which indicates a preferred automatic termination control setting must be present if the dryer is to be classified as having an ''automatic termination control.'' A mark is a visible single control setting on one or more dryer controls.

1.12 ''Temperature sensing control'' means a system which monitors dryer exhaust air temperature and automatically terminates the dryer cycle.

1.13 ''Moisture sensing control'' means a system which utilizes a moisture sensing element within the dryer drum that monitors the amount of moisture in the clothes and automatically terminates the dryer cycle.

2. TESTING CONDITIONS

2.1 *Installation.* Install the clothes dryer in accordance with manufacturer's instructions. The dryer exhaust shall be restricted by adding the AHAM exhaust simulator described in 3.3.5 of HLD–1. All external joints should be taped to avoid air leakage. Disconnect all console light or other lighting systems on the clothes dryer which do not consume more than 10 watts during the clothes dryer test cycle.

2.2 *Ambient temperature and humidity.* Maintain the room ambient air temperature at 75 ±3° F and the room relative humidity at 50±10 percent relative humidity.

2.3 Energy supply.

2.3.1 *Electrical supply.* Maintain the electrical supply at the clothes dryer terminal block within 1 percent of 120/240 or 120/208Y or 120 volts as applicable to the particular terminal block wiring system and within 1 percent of the nameplate frequency as specified by the manufacturer. If the dryer has a dual voltage conversion capability, conduct test at the highest voltage specified by the manufacturer.

2.3.2 *Gas supply.*

2.3.2.1 *Natural gas.* Maintains the gas supply to the clothes dryer at a normal inlet test pressure immediately ahead of all controls at 7 to 10 inches of water column. If the clothes dryer is equipped with a gas appliance pressure regulator, the regulator outlet pressure at the normal test pressure shall be approximately that recommended by the manufacturer. The hourly Btu rating of the burner shall be maintained within ±5 percent of the rating specified by the manufacturer. The natural gas supplied should have a heating value of approximately 1,025 Btu's per standard cubic foot. The actual heating value, H_n2, in Btu's per standard cubic foot, for the natural gas to be used in the test shall be obtained either from measurements made by the manufacturer conducting the test using a standard continuous flow calorimeter as described in 2.4.6 or by the purchase of bottled natural gas whose Btu rating is certified to be at least as accurate a rating as could be obtained from measurements with a standard continuous flow calorimeter as described in 2.4.6.

2.3.2.2 *Propane gas.* Maintain the gas supply to the clothes dryer at a normal inlet

test pressure immediately ahead of all controls at 11 to 13 inches of water column. If the clothes dryer is equipped with a gas appliance pressure regulator, the regulator outlet pressure at the normal test pressure shall be approximately that recommended by the manufacturer. The hourly Btu rating of the burner shall be maintained within ±5 percent of the rating specified by the manufacturer. The propane gas supplied should have a heating value of approximately 2,500 Btu's per standard cubic foot. The actual heating value, H_p, in Btu's per standard cubic foot, for the propane gas to be used in the test shall be obtained either from measurements made by the manufacturer conducting the test using a standard continuous flow calorimeter as described in 2.4.6 or by the purchase of bottled gas whose Btu rating is certified to be at least as accurate a rating as could be obtained from measurement with a standard continuous calorimeter as described in 2.4.6.

2.4 *Instrumentation.* Perform all test measurements using the following instruments as appropriate.

2.4.1 *Weighing scale for test cloth.* The scale shall have a range of 0 to a maximum of 30 pounds with a resolution of at least 0.2 ounces and a maximum error no greater than 0.3 percent of any measured value within the range of 3 to 15 pounds.

2.4.1.2 *Weighing scale for drum capacity measurements.* The scale should have a range of 0 to a maximum of 500 pounds with resolution of 0.50 pounds and a maximum error no greater than 0.5 percent of the measured value.

2.4.2 *Kilowatt-hour meter.* The kilowatt-hour meter shall have a resolution of 0.001 kilowatt-hours and a maximum error no greater than 0.5 percent of the measured value.

2.4.3 *Gas meter.* The gas meter shall have a resolution of 0.001 cubic feet and a maximum error no greater than 0.5 percent of the measured value.

2.4.4 *Dry and wet bulb psychrometer.* The dry and wet bulb psychrometer shall have an error no greater than ±1°F.

2.4.5 *Temperature.* The temperature sensor shall have an error no greater than ±1°F.

2.4.6 *Standard Continuous Flow Calorimeter.* The Calorimeter shall have an operating range of 750 to 3,500 Btu per cubic feet. The maximum error of the basic calorimeter shall be no greater than 0.2 percent of the actual heating value of the gas used in the test. The indicator readout shall have a maximum error no greater than 0.5 percent of the measured value within the operating range and a resolution of 0.2 percent of the full scale reading of the indicator instrument.

2.5 *Lint trap.* Clean the lint trap thoroughly before each test run.

2.6 *Test cloths.*

2.6.1 *Energy test cloth.* The energy test cloth shall be clean and consist of the following:

(a) Pure finished bleached cloth, made with a momie or granite weave, which is a blended fabric of 50 percent cotton and 50 percent polyester and weighs within +10 percent of 5.75 ounces per square yard after test cloth preconditioning and has 65 ends on the warp and 57 picks on the fill. The individual warp and fill yarns are a blend of 50 percent cotton and 50 percent polyester fibers.

(b) Cloth material that is 24 inches by 36 inches and has been hemmed to 22 inches by 34 inches before washing. The maximum shrinkage after five washes shall not be more than four percent on the length and width.

(c) The number of test runs on the same energy test cloth shall not exceed 25 runs.

2.6.2 *Energy stuffer cloths.* The energy stuffer cloths shall be made from energy test cloth material and shall consist of pieces of material that are 12 inches by 12 inches and have been hemmed to 10 inches by 10 inches before washing. The maximum shrinkage after five washes shall not be more than four percent on the length and width. The number of test runs on the same energy stuffer cloth shall not exceed 25 runs after test cloth preconditioning.

2.6.3 *Test Cloth Preconditioning.*

A new test cloth load and energy stuffer cloths shall be treated as follows:

(1) Bone dry the load to a weight change of ±1 percent, or less, as prescribed in Section 1.2.

(2) Place test cloth load in a standard clothes washer set at the maximum water fill level. Wash the load for 10 minutes in soft water (17 parts per million hardness or less), using 6.0 grams of AHAM Standard Test Detergent, IIA, per gallon of water. Wash water temperature is to controlled at 140°±5°F (60°±2.7°C). Rinse water temperature is to be controlled at 100°±5°F (37.7±2.7°C).

(3) Rinse the load again at the same water temperature.

(4) Bone dry the load as prescribed in Section 1.2 and weigh the load.

(5) This procedure is repeated until there is a weight change of one percent or less.

(6) A final cycle is to be a hot water wash with no detergent, followed by two warm water rinses.

2.7 *Test loads.*

2.7.1 *Compact size dryer load.* Prepare a bone-dry test load of energy cloths which weighs 3.00 pounds ±.03 pounds. Adjustments to the test load to achieve the proper weight can be made by the use of energy stuffer cloths, with no more than five stuffer cloths per load. Dampen the load by agitating it in water whose temperature is 100°±5° F and consists of 0 to 17 parts per million hardness for approximately two minutes in order to saturate the fabric. Then, extract water from the wet test load by spinning the load until

the moisture content of the load is between 66.5 percent to 73.5 percent of the bone-dry weight of the test load.

2.7.2 *Standard size dryer load.* Prepare a bone-dry test load of energy cloths which weighs 7.00 pounds ±.07 pounds. Adjustments to the test load to achieve the proper weight can be made by the use of energy stuffer cloths, with no more than five stuffer cloths per load. Dampen the load by agitating it in water whose temperature is 100°±5°F and consists of 0 to 17 parts per million hardness for approximately two minutes in order to saturate the fabric. Then, extract water from the wet test load by spinning the load until the moisture content of the load is between 66.5 percent to 73.5 percent of the bone-dry weight of the test load.

2.7.3 *Method of loading.* Load the energy test cloths by grasping them in the center, shaking them to hang loosely and then dropping them in the dryer at random.

2.8 *Clothes dryer preconditioning.* Before any test cycle, operate the dryer without a test load in the non-heat mode for 15 minutes or until the discharge air temperature is varying less than 1°F for 10 minutes, which ever is longer, in the test installation location with the ambient conditions within the specified rest condition tolerances of 2.2.

3. TEST PROCEDURES AND MEASUREMENTS

3.1 *Drum capacity.* Measure the drum capacity by sealing all openings in the drum except the loading port with a plastic bag, and ensure that all corners and depressions are filled and that there are no extrusions of the plastic bag through the opening in the drum. Support the dryer's rear drum surface on a platform scale to prevent deflection of the dryer, and record the weight of the empty dryer. Fill the drum with water to a level determined by the intersection of the door plane and the loading port. Record the temperature of the water and then the weight of the dryer with the added water and then determine the mass of the water in pounds. Add or subtract the appropriate volume depending on whether or not the plastic bag protrudes into the drum interior. The drum capacity is calculated as follows:

$C = w/d$

C= capacity in cubic feet.

w= weight of water in pounds.

d= density of water at the measured temperature in pounds per cubic feet.

3.2 *Dryer loading.* Load the dryer as specified in 2.7.

3.3 *Test cycle.* Operate the clothes dryer at the maximum temperature setting and, if equipped with a timer, at the maximum time setting and dry the test load until the moisture content of the test load is between 2.5 percent to 5.0 percent of the bone-dry weight of the test load, but do not permit the dryer to advance into cool down. If required, reset the timer or automatic dry control.

3.4 *Data recording.* Record for each test cycle:

3.4.1 Bone-dry weight of the test load described in 2.7.

3.4.2 Moisture content of the wet test load before the test, as described in 2.7.

3.4.3 Moisture content of the dry test load obtained after the test described in 3.3.

3.4.4 Test room conditions, temperature and percent relative humidity described in 2.2.

3.4.5 For electric dryers—the total kilowatt-hours of electric energy, E_t, consumed during the test described in 3.3.

3.4.6 For gas dryers:

3.4.6.1 Total kilowatt-hours of electrical energy, E_{te}, consumed during the test described in 3.3.

3.4.6.2 Cubic feet of gas per cycle, E_{tg}, consumed during the test described in 3.3.

3.4.6.3 On gas dryers using a continuously burning pilot light—the cubic feet of gas, E_{pg}, consumed by the gas pilot light in one hour.

3.4.6.4 Correct the gas heating value, GEF, as measured in 2.3.2.1 and 2.3.2.2, to standard pressure and temperature conditions in accordance with U.S. Bureau of Standards, circular C417, 1938. A sample calculation is illustrated in Appendix E of HLD–1.

3.5 *Test for automatic termination field use factor credits.* Credit for automatic termination can be claimed for those dryers which meet the requirements for either temperature-sensing control, 1.12, or moisture sensing control, 1.13, and having present the appropriate mark or detent feed defined in 1.11.

4. CALCULATION OF DERIVED RESULTS FROM TEST MEASUREMENTS

4.1 *Total per-cycle electric dryer energy consumption.* Calculate the total electric dryer energy consumption per cycle, E_{ce} expressed in kilowatt-hours per cycle and defined as:

$E_{ce} = [66/W_w - W_d)] \times E_{tt} \times FU$

E_t=the energy recorded in 3.4.5.

66=an experimentally established value for the percent reduction in the moisture content of the test load during a laboratory test cycle expressed as a percent.

FU=Field use factor.

=1.18 for time termination control systems.

=1.04 for automatic control systems which meet the requirements of the definitions for automatic termination controls in 1.11.1, 1.12 and 1.13.

W_w=the moisture content of the wet test load as recorded in 3.4.2.

W_d=the moisture content of the dry test load as recorded in 3.4.3.

4.2 *Per-cycle gas dryer electrical energy consumption.* Calculate the gas dryer electrical

energy consumption per cycle, $E_{ge,}$ expressed in kilowatt-hours per cycle and defined as:

$E_{GE}=[66/(W_w-W_d)]\times E_{te}\times FU$

E_{TE}=the energy recorded in 3.4.6.1

FU, 66, W_w, W_d as defined in 4.1

4.3 *Per-cycle gas dryer gas energy consumption.* Calculate the gas dryer gas energy consumption per cycle, $E_{ge.}$ expressed in Btu's per cycle as defined as:

$E_{GG}=[66/(W_w-W_d)]\times E_{tg}\times FU\times GEF$

E_{TG}=the energy recorded in 3.4.6.2

GEF=corrected gas heat value (Btu per cubic feet) as defined in 3.4.6.4

FU, 66, W_w W_d as defined in 4.1

4.4 *Per-cycle gas dryer continuously burning pilot light gas energy consumption.* Calculate the gas dryer continuously burning pilot light gas energy consumption per cycle, E_{up} expressed in Btu's per cycle and defined as:

$E_{up}=E_{pg}\times(8760-140/416)\times GEF$

E_{pg}=the energy recorded in 3.4.6.3

8760=number of hours in a year

416=representative average number of clothes dryer cycles in a year

140=estimated number of hours that the continuously burning pilot light is on during the operation of the clothes dryer for the representative average use cycle for clothes dryers (416 cycles per year)

GEF as defined in 4.3

4.5 *Total per-cycle gas dryer gas energy consumption expressed in Btu's.* Calculate the total gas dryer energy consumption per cycle, $E_{g,}$ expressed in Btu's per cycle and defined as:

$E_g=E_{gg}+E_{up}$

E_{gg} as defined in 4.3

E_{up} as defined in 4.4

4.6 *Total per-cycle gas dryer energy consumption expressed in kilowatt-hours.* Calculate the total gas dryer energy consumption per cycle, E_{cg}, expressed in kilowatt-hours per cycle and defined as:

$E_{cg}=E_{ge}+(E_g/3412\ Btu/k\ Wh)$

E_{ge} as defined in 4.2

E_g as defined in 4.5

[46 FR 27326, May 19, 1981]

APPENDIX E TO SUBPART B OF PART 430—UNIFORM TEST METHOD FOR MEASURING THE ENERGY CONSUMPTION OF WATER HEATERS

1. Definitions

1.1 *Cut-in* means the time when or water temperature at which a water heater control or thermostat acts to increase the energy or fuel input to the heating elements, compressor, or burner.

1.2 *Cut-out* means the time when or water temperature at which a water heater control or thermostat acts to reduce to a minimum the energy or fuel input to the heating elements, compressor, or burner.

1.3 *Design Power Rating* means the nominal power rating that a water heater manufacturer assigns to a particular design of water heater, expressed in kilowatts or Btu (kJ) per hour as appropriate.

1.4 *Energy Factor* means a measure of water heater overall efficiency.

1.5 *First-Hour Rating* means an estimate of the maximum volume of ''hot'' water that a storage-type water heater can supply within an hour that begins with the water heater fully heated (i.e., with all thermostats satisfied). It is a function of both the storage volume and the recovery rate.

1.6 *Heat Trap* means a device which can be integrally connected or independently attached to the hot and/or cold water pipe connections of a water heater such that the device will develop a thermal or mechanical seal to minimize the recirculation of water due to thermal convection between the water heater tank and its connecting pipes.

1.7 *Instantaneous Water Heaters*

1.7.1 *Electric Instantaneous Water Heater* Reserved.

1.7.2 *Gas Instantaneous Water Heater* means a water heater that uses gas as the energy source, initiates heating based on sensing water flow, is designed to deliver water at a controlled temperature of less than 180°F (82°C), has an input greater than 50,000 Btu/h (53 MJ/h) but less than 200,000 Btu/h (210 MJ/h), and has a manufacturer's specified storage capacity of less than 2 gallons (7.6 liters). The unit may use a fixed or variable burner input.

1.8 *Maximum gpm (L/min) Rating* means the maximum gallons per minute (liters per minute) of hot water that can be supplied by an instantaneous water heater while maintaining a nominal temperature rise of 77°F (42.8°C) during steady state operation.

1.9 *Rated Storage Volume* means the water storage capacity of a water heater, in gallons (liters), as specified by the manufacturer.

1.10 *Recovery Efficiency* means the ratio of energy delivered to the water to the energy content of the fuel consumed by the water heater.

1.11 *Standby* means the time during which water is not being withdrawn from the water heater. There are two standby time intervals used within this test procedure: $\tau_{stby,1}$ represents the elapsed time between the time at which the maximum mean tank temperature is observed after the sixth draw and subsequent recovery and the end of the 24-hour test; $\tau_{stby,2}$ represents the total time during the 24-hour simulated use test when water is not being withdrawn from the water heater.

1.12 *Storage-type Water Heaters*

1.12.1 *Electric Storage-type Water Heater* means a water heater that uses electricity as the energy source, is designed to heat and store water at a thermostatically controlled temperature of less than 180°F (82°C), has a nominal input of 12 kilowatts (40,956 Btu/h)

or less, and has a rated storage capacity of not less than 20 gallons (76 liters) nor more than 120 gallons (450 liters).

1.12.2 *Gas Storage-type Water Heater* means a water heater that uses gas as the energy source, is designed to heat and store water at a thermostatically controlled temperature of less than 180°F (82°C), has a nominal input of 75,000 Btu (79 MJ) per hour or less, and has a rated storage capacity of not less than 20 gallons (76 liters) nor more than 100 gallons (380 liters).

1.12.3 *Heat Pump Water Heater* means a water heater that uses electricity as the energy source, is designed to heat and store water at a thermostatically controlled temperature of less than 180°F (82°C), has a maximum current rating of 24 amperes (including the compressor and all auxiliary equipment such as fans, pumps, controls, and, if on the same circuit, any resistive elements) for an input voltage of 250 volts or less, and, if the tank is supplied, has a manufacturer's rated storage capacity of 120 gallons (450 liters) or less. Resistive elements used to provide supplemental heating may use the same circuit as the compressor if (1) an interlocking mechanism prevents concurrent compressor operation and resistive heating or (2) concurrent operation does not result in the maximum current rating of 24 amperes being exceeded. Otherwise, the resistive elements and the heat pump components must use separate circuits. A heat pump water heater may be sold by the manufacturer with or without a storage tank.

a. Heat Pump Water Heater with Storage Tank means an air-to-water heat pump sold by the manufacturer with an insulated storage tank as a packaged unit. The tank and heat pump can be an integral unit or they can be separated.

b. Heat Pump Water Heater without Storage Tank (also called Add-on Heat Pump Water Heater) means an air-to-water heat pump designed for use with a storage-type water heater or a storage tank that is not specified or supplied by the manufacturer.

1.12.4 *Oil Storage-type Water Heater* means a water heater that uses oil as the energy source, is designed to heat and store water at a thermostatically controlled temperature of less than 180°F (82°C), has a nominal energy input of 105,000 Btu/h (110 MJ/h) or less, and has a manufacturer's rated storage capacity of 50 gallons (190 liters) or less.

1.12.5 *Storage-type Water Heater of More than 2 Gallons (7.6 Liters) and Less than 20 Gallons (76 Liters).* Reserved.

1.13 *ASHRAE Standard 41.1–86* means the standard published in 1986 by the American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc., and titled Standard Measurement Guide: Section on Temperature Measurements.

1.14 *ASTM–D–2156–80* means the test standard published in 1980 by the American Society for Testing and Measurements and titled ''Smoke Density in Flue Gases from Burning Distillate Fuels, Test Method for''.

1.15 *Symbol Usage* The following identity relationships are provided to help clarify the symbology used throughout this procedure:

C_p specific heat capacity of water

E_{annual} annual energy consumption of a water heater

E_f energy factor of a water heater

F_{hr} first-hour rating of a storage-type water heater

F_{max} maximum gpm (L/min) rating of an instantaneous water heater rated at a temperature rise of 77°F (42.8°C) across the heater

i a subscript to indicate an *i*th draw during a test

M_i mass of water removed during the *i*th draw (i=1 to 6) of the 24-hr simulated use test

M^*_i for storage-type water heaters, mass of water removed during the *i*th draw (i=1 to n) during the first-hour rating test

M_{10m} for instantaneous water heaters, mass of water removed continuously during a 10-minute interval in the maximum gpm (L/min) rating test

n for storage-type water heaters, total number of draws during the first-hour rating test

Q total fossil fuel and/or electric energy consumed during the entire 24-hr simulated use test

Q_d daily water heating energy consumption adjusted for net change in internal energy

Q_{da} adjusted daily water heating energy consumption with adjustment for variation of tank to ambient air temperature difference from nominal value

Q_{dm} overall adjusted daily water heating energy consumption including Q_{da} and Q_{HWD}

Q_{hr} hourly standby losses

Q_{HW} daily energy consumption to heat water over the measured average temperature rise across the water heater

Q_{HWD} adjustment to daily energy consumption, Q_{hw}, due to variation of the temperature rise across the water heater not equal to the nominal value of 77°F (42.8°C)

Q_r energy consumption of fossil fuel or heat pump water heaters between thermostat (or burner) cut-out prior to the first draw and cut-out following the first draw of the 24-hr simulated use test

$Q_{r,\ max}$ energy consumption of a modulating instantaneous water heater between cut-out (burner) prior to the first draw and cut-out following the first draw of the 24-hr simulated use test

$Q_{r,\ min}$ energy consumption of a modulating instantaneous water heater from immediately prior to the fourth draw to burner cut-out following the fourth draw of the 24-hr simulated use test

Q_{stby} total energy consumed by the water heater during the standby time interval $\tau_{stby,\ 1}$

Q_{su} total fossil fueled and/or electric energy consumed from the beginning of the first draw to the thermostat (or burner) cut-out following the completion of the sixth draw during the 24-hr simulated use test

T_{min} for modulating instantaneous water heaters, steady state outlet water temperature at the minimum fuel input rate

T_0 mean tank temperature at the beginning of the 24-hr simulated use test

T_{24} mean tank temperature at the end of the 24-hr simulated use test

$T_{a,\ stby}$ average ambient air temperature during standby periods of the 24-hr use test

T_{del} for instantaneous water heaters, average outlet water temperature during a 10-minute continuous draw interval in the maximum gpm (L/min) rating test

$T_{del,\ i}$ average outlet water temperature during the *i*th draw of the 24-hr simulated use test

T_{in} for instantaneous water heaters, average inlet water temperature during a 10-minute continuous draw interval in the maximum gpm (L/min) rating test

$T_{in,\ i}$ average inlet water temperature during the *i*th draw of the 24-hr simulated use test

$T_{max,\ 1}$ maximum measured mean tank temperature after cut-out following the first draw of the 24-hr simulated use test

T_{stby} average storage tank temperature during the standby period $\tau_{stby,\ 2}$ of the 24-hr use test

T_{su} maximum measured mean tank temperature after cut-out following the sixth draw of the 24-hr simulated use test

$T_{t,\ stby}$ average storage tank temperature during the standby period $\tau_{stby,\ 1}$ of the 24-hr use test

$T^*_{del,\ i}$ for storage-type water heaters, average outlet water temperature during the *i*th draw (i=1 to n) of the first-hour rating test

$T^*_{max,\ i}$ for storage-type water heaters, maximum outlet water temperature observed during the *i*th draw (i=1 to n) of the first-hour rating test

$T^*_{min,\ i}$ for storage-type water heaters, minimum outlet water temperature to terminate the *i*th draw during the first-hour rating test

UA standby loss coefficient of a storage-type water heater

V_i volume of water removed during the *i*th draw (i=1 to 6) of the 24-hr simulated use test

V^*_i volume of water removed during the *i*th draw (i=1 to n) during the first-hour rating test

V_{10m} for instantaneous water heaters, volume of water removed continuously during a 10-minute interval in the maximum gpm (L/min) rating test

V_{max} steady state water flow rate of an instantaneous water heater at the rated input to give a discharge temperature of 135°F ± 5°F (57.2°C ± 2.8°C)

V_{min} steady state water flow rate of a modulating instantaneous water heater at the minimum input to give a discharge temperature of T_{min} up to 135°F ± 5°F (57.2°C ± 2.8°C)

V_{st} measured storage volume of the storage tank

W_f weight of storage tank when completely filled with water

W_t tare weight of storage tank when completely empty of water

n_r recovery efficiency

ρ density of water

$\tau_{stby,\ 1}$ elapsed time between the time the maximum mean tank temperature is observed after the sixth draw and the end of the 24-hr simulated use test

$\tau_{stby,\ 2}$ overall standby periods when no water is withdrawn during the 24-hr simulated use test

2. Test Conditions

2.1 *Installation Requirements.* Tests shall be performed with the water heater and instrumentation installed in accordance with Section 4 of this appendix.

2.2 *Ambient Air Temperature.* The ambient air temperature shall be maintained between 65.0°F and 70.0°F (18.3°C and 21.1°C) on a continuous basis. For heat pump water heaters, the dry bulb temperature shall be maintained at 67.5°F ± 1°F (19.7°C ± 0.6°C) and, in addition, the relative humidity shall be maintained between 49% and 51%.

2.3 *Supply Water Temperature.* The temperature of the water being supplied to the water heater shall be maintained at 58°F ± 2°F (14.4°C ± 1.1°C) throughout the test.

2.4 *Storage Tank Temperature.* The average temperature of the water within the storage tank shall be set to 135°F ± 5°F (57.2°C ± 2.8°C).

2.5 *Supply Water Pressure.* During the test when water is not being withdrawn, the supply pressure shall be maintained between 40 psig (275 kPa) and the maximum allowable pressure specified by the water heater manufacturer.

2.6 *Electrical and/or Fossil Fuel Supply.*

2.6.1 *Electrical.* Maintain the electrical supply voltage to within ± 1% of the center of the voltage range specified by the water heater and/or heat pump manufacturer.

2.6.2 *Natural Gas.* Maintain the supply pressure in accordance with the manufacturer's specifications. If the supply pressure is not specified, maintain a supply pressure of 7–10 inches of water column (1.7–2.5 kPa). If the water heater is equipped with a gas appliance pressure regulator, the regulator outlet pressure shall be within ± 10% of the manufacturer's specified manifold pressure.

For all tests, use natural gas having a heating value of approximately 1,025 Btu per standard cubic foot (38,190 kJ per standard cubic meter).

2.6.3 *Propane Gas.* Maintain the supply pressure in accordance with the manufacturer's specifications. If the supply pressure is not specified, maintain a supply pressure of 11–13 inches of water column (2.7–3.2 kPa). If the water heater is equipped with a gas appliance pressure regulator, the regulator outlet pressure shall be within ± 10% of the manufacturer's specified manifold pressure. For all tests, use propane gas with a heating value of approximately 2,500 Btu per standard cubic foot (93,147 kJ per standard cubic meter).

2.6.4 *Fuel Oil Supply.* Maintain an uninterrupted supply of fuel oil. Use fuel oil having a heating value of approximately 138,700 Btu per gallon (38,660 kJ per liter).

3. Instrumentation

3.1 *Pressure Measurements.* Pressure-measuring instruments shall have an error no greater than the following values:

Item measured	Instrument accuracy	Instrument precision
Gas pressure	± 0.1 inch of water column (± 0.025 kPa)	± 0.05 inch of water column (± 0.012 kPa).
Atmospheric pressure	± 0.1 inch of mercury column (± 0.34 kPa).	± 0.05 inch of mercury column (± 0.17 kPa).
Water pressure	± 1.0 pounds per square inch (± 6.9 kPa).	± 0.50 pounds per square inch (± 3.45 kPa).

3.2 *Temperature Measurement*

3.2.1 *Measurement.* Temperature measurements shall be made in accordance with the Standard Measurement Guide: Section on Temperature Measurements, ASHRAE Standard 41.1–86.

3.2.2 *Accuracy and Precision.* The accuracy and precision of the instruments, including their associated readout devices, shall be within the following limits:

Item measured	Instrument accuracy	Instrument precision
Air dry bulb temperature	± 0.2°F (± 0.1°C)	± 0.1°F (± 0.06°C)
Air wet bulb temperature	± 0.2°F (± 0.1°C)	± 0.1°F (± 0.06°C)
Inlet and outlet water temperatures	± 0.2°F (± 0.1°C)	± 0.1°F (± 0.06°C)
Storage tank temperatures	± 0.5°F (± 0.3°C)	± 0.25°F (± 0.14°C)

3.2.3 *Scale Division.* In no case shall the smallest scale division of the instrument or instrument system exceed 2 times the specified precision.

3.2.4 *Temperature Difference.* Temperature difference between the entering and leaving water may be measured with any of the following:

a. A thermopile
b. Calibrated resistance thermometers
c. Precision thermometers
d. Calibrated thermistors
e. Calibrated thermocouples
f. Quartz thermometers

3.2.5 *Thermopile Construction.* If a thermopile is used, it shall be made from calibrated thermocouple wire taken from a single spool. Extension wires to the recording device shall also be made from that same spool.

3.2.6 *Time Constant.* The time constant of the instruments used to measure the inlet and outlet water temperatures shall be no greater than 5 seconds.

3.3 *Liquid Flow Rate Measurement.* The accuracy of the liquid flow rate measurement, using the calibration if furnished, shall be equal to or less than ± 1% of the measured value in mass units per unit time.

3.4 *Electric Energy.* The electrical energy used shall be measured with an instrument and associated readout device that is accurate within ± 1% of the reading.

3.5 *Fossil Fuels.* The quantity of fuel used by the water heater shall be measured with an instrument and associated readout device that is accurate within ± 1% of the reading.

3.6 *Mass Measurements.* For mass measurements greater than or equal to 10 pounds (4.5 kg), a scale that is accurate within ± 1% of the reading shall be used to make the measurement. For mass measurements less than 10 pounds (4.5 kg), the scale shall provide a measurement that is accurate within ± 0.1 pound (0.045 kg).

3.7 *Heating Value.* The higher heating value of the natural gas, propane, or fuel oil shall be measured with an instrument and associated readout device that is accurate within ± 1% of the reading. The heating value of natural gas and propane must be corrected for local temperature and pressure conditions.

3.8 *Time.* The elapsed time measurements shall be measured with an instrument that is accurate within ± 0.5 seconds per hour.

3.9 *Volume.* Volume measurements shall be measured with an accuracy of ± 2% of the total volume.

4. Installation

4.1 *Water Heater Mounting.* A water heater designed to be freestanding shall be placed on a ¾ inch (2 cm) thick plywood platform supported by three 2 × 4 inch (5 cm × 10 cm) runners. If the water heater is not approved for installation on combustible flooring, suitable non-combustible material shall be placed between the water heater and the platform. Counter-top water heaters shall be placed against a simulated wall section. Wall-mounted water heaters shall be supported on a simulated wall in accordance with the manufacturer-published installation instructions. When a simulated wall is used, the recommended construction is 2 × 4 inch (5 cm × 10 cm) studs, faced with ¾ inch (2 cm) plywood. For heat pump water heaters that are supplied with a storage tank, the two components, if not delivered as a single package, shall be connected in accordance with the manufacturer-published installation instructions and the overall system shall be placed on the above-described plywood platform. If installation instructions are not provided by the heat pump manufacturer, uninsulated 8 foot (2.4 m) long connecting hoses having an inside diameter of ⅝ inch (1.6 cm) shall be used to connect the storage tank and the heat pump water heater. With the exception of using the storage tank described in 4.10, the same requirements shall apply for heat pump water heaters that are supplied without a storage tank from the manufacturer. The testing of the water heater shall occur in an area that is protected from drafts.

4.2 *Water Supply.* Connect the water heater to a water supply capable of delivering water at conditions as specified in Sections 2.3 and 2.5 of this appendix.

4.3 *Water Inlet and Outlet Configuration.* For freestanding water heaters that are taller than 36 inches (91.4 cm), inlet and outlet piping connections shall be configured in a manner consistent with Figures 1 and 2. Inlet and outlet piping connections for wall-mounted water heaters shall be consistent with Figure 3. For freestanding water heaters that are 36 inches or less in height and not supplied as part of a counter-top enclosure (commonly referred to as an under-the-counter model), inlet and outlet piping shall be installed in a manner consistent with Figures 4, 5, and 6. For water heaters that are supplied with a counter-top enclosure, inlet and outlet piping shall be made in a manner consistent with Figures 7A and 7B, respectively. The vertical piping noted in Figures 7A and 7B shall be located (whether inside the enclosure or along the outside in a recessed channel) in accordance with the manufacturer-published installation instructions.

All dimensions noted in Figures 1 through 7 shall be achieved. All piping between the water heater and the inlet and outlet temperature sensors, noted as T_{IN} and T_{OUT} in the figures, shall be Type ''L'' hard copper having the same diameter as the connections on the water heater. Unions may be used to facilitate installation and removal of the piping arrangements. A pressure gauge and diaphragm expansion tank shall be installed in the supply water piping at a location upstream of the inlet temperature sensor. An appropriately rated pressure and temperature relief valve shall be installed on all water heaters at the port specified by the manufacturer. Discharge piping for the relief valve shall be non-metallic. If heat traps, piping insulation, or pressure relief valve insulation are supplied with the water heater, they shall be installed for testing. Except when using a simulated wall, clearance shall be provided such that none of the piping contacts other surfaces in the test room.

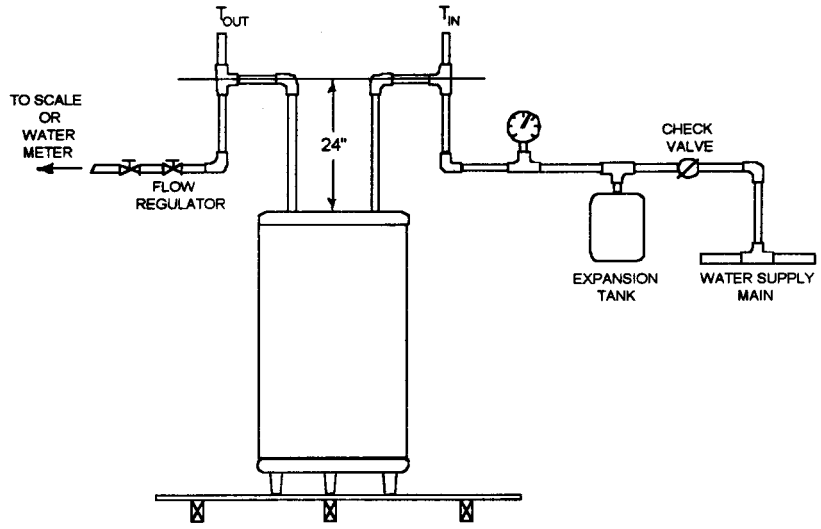


Figure 1.

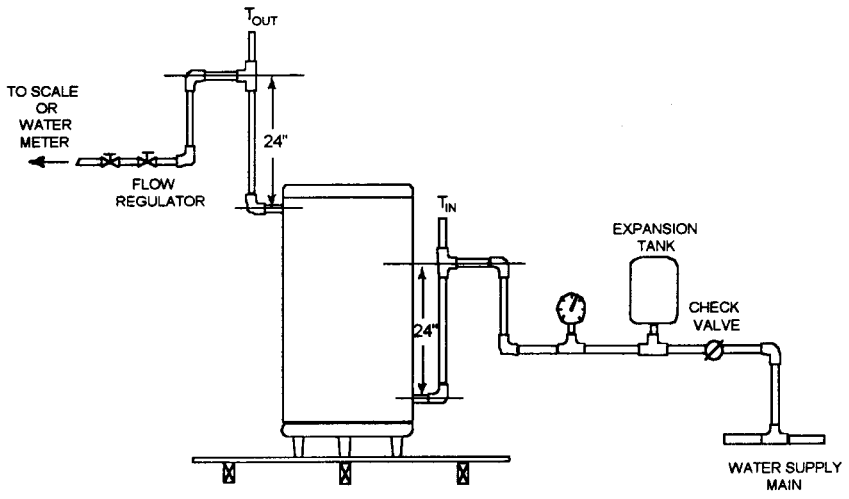


Figure 2.

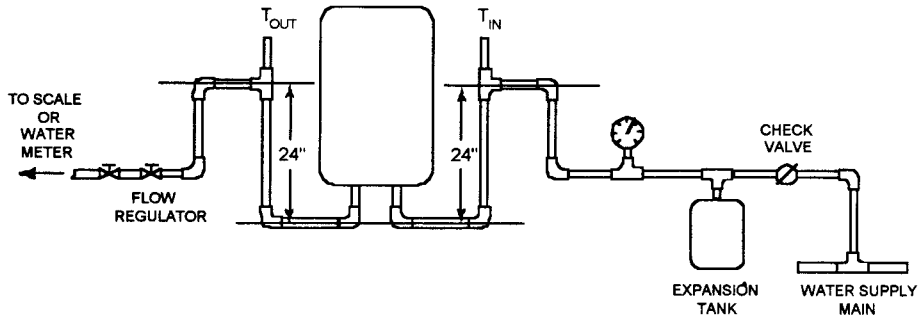


Figure 3.

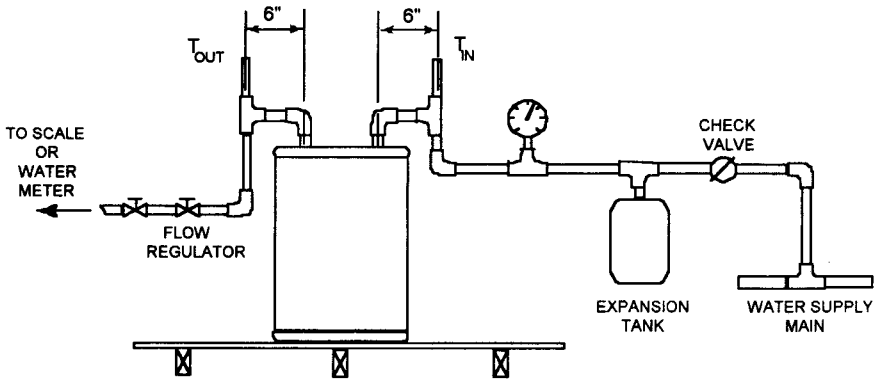


Figure 4.

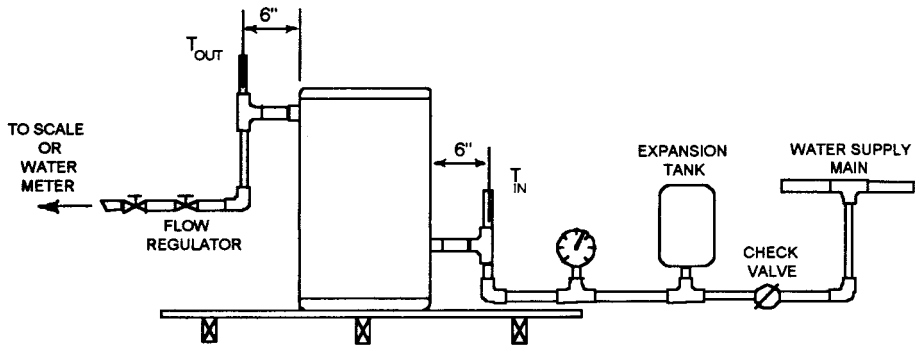


Figure 5.

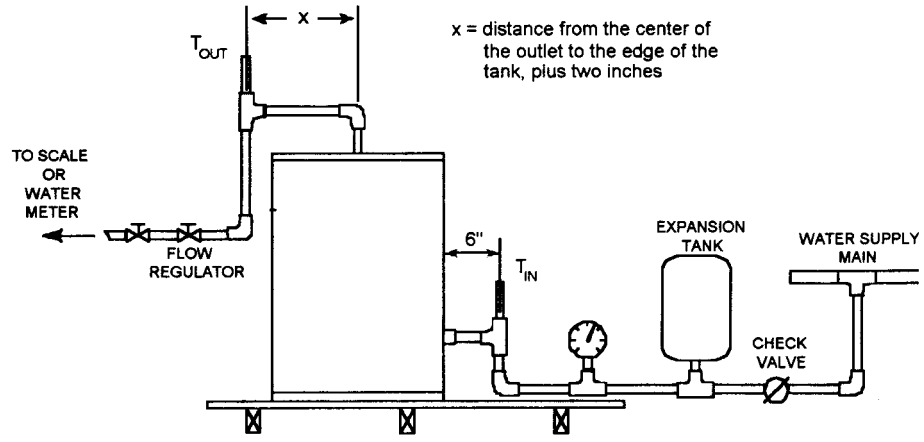


Figure 6.

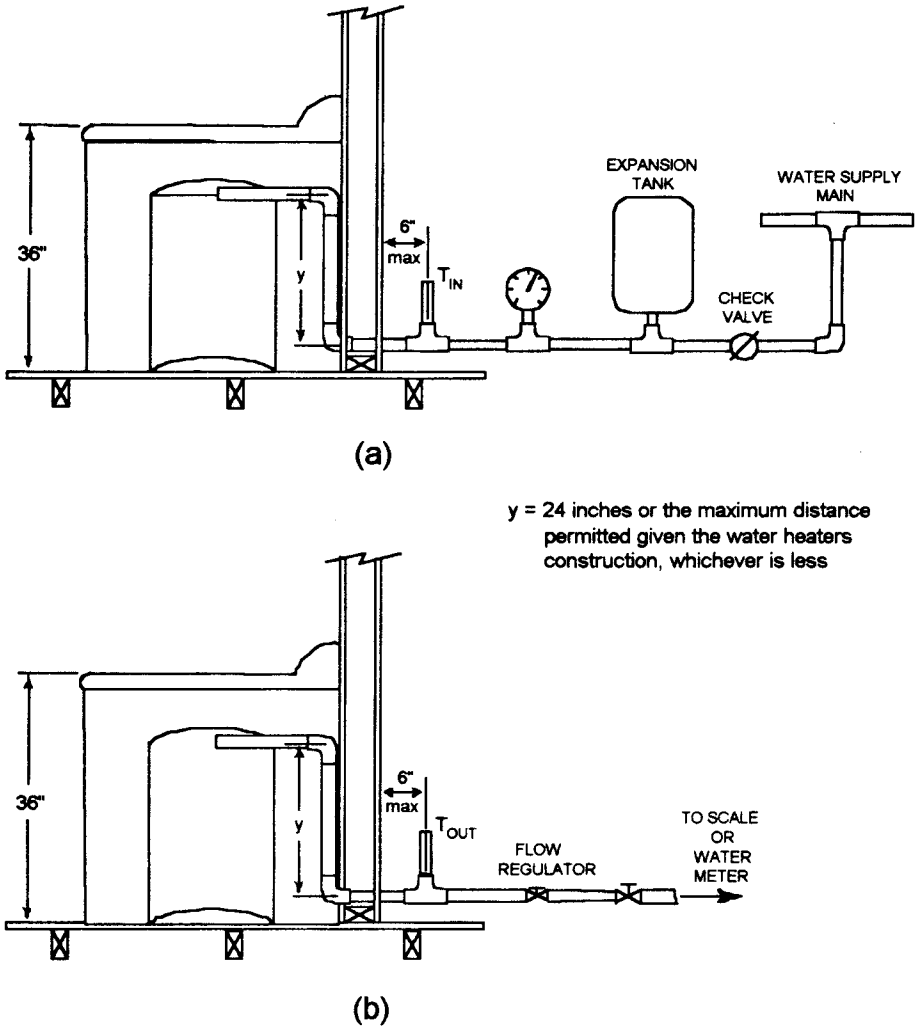


Figure 7.

4.4 *Fuel and/or Electrical Power and Energy Consumption.* Install one or more instruments which measure, as appropriate, the quantity and rate of electrical energy and/or fossil fuel consumption in accordance with Section 3. For heat pump water heaters that use supplemental resistive heating, the electrical energy supplied to the resistive element(s) shall be metered separately from the electrical energy supplied to the entire appliance or to the remaining components (e.g., compressor, fans, pumps, controls).

4.5 *Internal Storage Tank Temperature Measurements.* Install six temperature measurement sensors inside the water heater tank with a vertical distance of at least 4 inches (100 mm) between successive sensors. A temperature sensor shall be positioned at the vertical midpoint of each of the six equal

volume nodes within the tank. Nodes designate the equal volumes used to evenly partition the total volume of the tank. As much as is possible, the temperature sensor should be positioned away from any heating elements, anodic protective devices, tank walls, and flue pipe walls. If the tank cannot accommodate six temperature sensors and meet the installation requirements specified above, install the maximum number of sensors which comply with the installation requirements. The temperature sensors shall be installed either through (1) the anodic device opening; (2) the relief valve opening; or (3) the hot water outlet. If installed through the relief valve opening or the hot water outlet, a tee fitting or outlet piping, as applicable, shall be installed as close as possible to its original location. If the relief valve temperature sensor is relocated, and it no longer extends into the top of the tank, a substitute relief valve that has a sensing element that can reach into the tank shall be installed. If the hot water outlet includes a heat trap, the heat trap shall be installed on top of the tee fitting. Added fittings shall be covered with thermal insulation having an R value between 4 and 8 $h \bullet ft^{2+\circ}F/Btu$ (0.7 and 1.4 $m^{2+\circ}C/W$).

4.6 *Ambient Air Temperature Measurement.* Install an ambient air temperature sensor at the vertical mid-point of the water heater and approximately 2 feet (610 mm) from the surface of the water heater. The sensor shall be shielded against radiation.

4.7 *Inlet and Outlet Water Temperature Measurements.* Install temperature sensors in the cold-water inlet pipe and hot-water outlet pipe as shown in Figures 1, 2, 3, 4, 5, 6, 7a and 7b, as applicable.

4.8 *Flow Control.* A valve shall be installed to provide flow as specified in sections 5.1.4.1 for storage tank water heaters and 5.2.1 for instantaneous water heaters.

4.9 *Flue Requirements.*

4.9.1 *Gas-Fired Water Heaters.* Establish a natural draft in the following manner. For gas-fired water heaters with a vertically discharging draft hood outlet, a 5-foot (1.5-meter) vertical vent pipe extension with a diameter equal to the largest flue collar size of the draft hood shall be connected to the draft hood outlet. For gas-fired water heaters with a horizontally discharging draft hood outlet, a 90-degree elbow with a diameter equal to the largest flue collar size of the draft hood shall be connected to the draft hood outlet. A 5-foot (1.5-meter) length of vent pipe shall be connected to the elbow and oriented to discharge vertically upward. Direct vent gas-fired water heaters shall be installed with venting equipment specified in the manufacturer's instructions using the minimum vertical and horizontal lengths of vent pipe recommended by the manufacturer.

4.9.2 *Oil-Fired Water Heaters.* Establish a draft at the flue collar at the value specified in the manufacturer's instructions. Establish the draft by using a sufficient length of vent pipe connected to the water heater flue outlet, and directed vertically upward. For an oil-fired water heater with a horizontally discharging draft hood outlet, a 90-degree elbow with a diameter equal to the largest flue collar size of the draft hood shall be connected to the draft hood outlet. A length of vent pipe sufficient to establish the draft shall be connected to the elbow fitting and oriented to discharge vertically upward. Direct-vent oil-fired water heaters should be installed with venting equipment as specified in the manufacturer's instructions, using the minimum vertical and horizontal lengths of vent pipe recommended by the manufacturer.

4.10 *Heat Pump Water Heater Storage Tank.* The tank to be used for testing a heat pump water heater without a tank supplied by the manufacturer (see Section 1.12.3b) shall be an electric storage-type water heater having a measured volume of 47.0 gallons ±1.0 gallon (178 liters ±3.8 liters); two 4.5 kW heating elements controlled in such a manner as to prevent both elements from operating simultaneously; and an energy factor greater than or equal to the minimum energy conservation standard (as determined in accordance with Section 6.1.7) and less than or equal to the sum of the minimum energy conservation standard and 0.02.

5. Test Procedures

5.1 *Storage-type Water Heaters, Including Heat Pump Water Heaters.*

5.1.1 *Determination of Storage Tank Volume.* Determine the storage capacity, $V_{st,}$ of the water heater under test, in gallons (liters), by subtracting the tare weight—measured while the tank is empty—from the gross weight of the storage tank when completely filled with water (with all air eliminated and line pressure applied as described in section 2.5) and dividing the resulting net weight by the density of water at the measured temperature.

5.1.2 *Setting the Thermostat.*

5.1.2.1 *Single Thermostat Tanks.* Starting with a tank at the supply water temperature, initiate normal operation of the water heater. After cut-out, determine the mean tank temperature every minute until the maximum value is observed. Determine whether this maximum value for the mean tank temperature is within the range of 135°F±5°F (57.2°C±2.8°C). If not, turn off the water heater, adjust the thermostat, drain and refill the tank with supply water. Then, once again, initiate normal operation of the water heater, and determine the maximum mean tank temperature after cut-out. Repeat this sequence until the maximum mean

tank temperature after cut-out is 135°F±5°F (57.2°C±2.8°C).

5.1.2.2 *Tanks with Two or More Thermostats.* Follow the same sequence as for a single thermostat tank, i.e. start at the supply water temperature, operate normally until cutout. Determine if the thermostat that controls the uppermost heating element yields a maximum water temperature of 135°F±5°F (57.2°C±2.8°C), as measured by the in-tank sensors that are positioned above the uppermost heating element. If the tank temperature at the thermostat is not within 135°F±5°F (57.2°C±2.8°C), turn off the water heater, adjust the thermostat, drain and refill the tank with supply water. The thermostat that controls the heating element positioned next highest in the tank shall then be set to yield a maximum water temperature of 135°F±5°F (57.2°C±2.8°C). This process shall be repeated until the thermostat controlling the lowest element is correctly adjusted. When adjusting the thermostat that controls the lowest element, the maximum mean tank temperature after cut-out, as determined using all the in-tank sensors, shall be 135°F±5°F (57.2°C±2.8°C). When adjusting all other thermostats, use only the in-tank temperature sensors positioned above the heating element in question to evaluate the maximum water temperature after cut-out.

For heat pump water heaters that control an auxiliary resistive element, the thermostat shall be set in accordance with the manufacturer's installation instructions.

5.1.3 *Power Input Determination.* For all water heaters except electric types having immersed heating elements, initiate normal operation and determine the power input, P, to the main burners (including pilot light power, if any) after 15 minutes of operation. If the water heater is equipped with a gas appliance pressure regulator, the regulator outlet pressure shall be set within ± 10% of that recommended by the manufacturer. For oil-fired water heaters the fuel pump pressure shall be within ± 10% of the manufacturer's specified pump pressure. All burners shall be adjusted to achieve an hourly Btu (kJ) rating that is within ± 2% of the value specified by the manufacturer. For an oil-fired water heater, adjust the burner to give a CO_2 reading recommended by the manufacturer and an hourly Btu (kJ) rating that is within ± 2% of that specified by the manufacturer. Smoke in the flue may not exceed No. 1 smoke as measured by the procedure in ASTM–D–2156–80.

5.1.4 *First-Hour Rating Test.*

5.1.4.1 *General.* During hot water draws, remove water at a rate of 3.0±0.25 gallons per minute (11.4±0.95 liters per minute). Collect the water in a container that is large enough to hold the volume removed during an individual draw and suitable for weighing at the termination of each draw. Alternatively, a water meter may be used to directly measure the water volume(s) withdrawn.

5.1.4.2 *Draw Initiation Criteria.* Begin the first-hour rating test by imposing a draw on the storage-type water heater. After completion of this first draw, initiate successive draws based on the following criteria. For gas-and oil-fired water heaters, initiate successive draws when the thermostat acts to reduce the supply of fuel to the main burner. For electric water heaters having a single element or multiple elements that all operate simultaneously, initiate successive draws when the thermostat acts to reduce the electrical input supplied to the element(s). For electric water heaters having two or more elements that do not operate simultaneously, initiate successive draws when the applicable thermostat acts to reduce the electrical input to the element located vertically highest in the storage tank. For heat pump waters heaters that do not use supplemental resistive heating, initiate successive draws immediately after the electrical input to the compressor is reduced by the action of the water heater's thermostat. For heat pump waters heaters that use supplemental resistive heating, initiate successive draws immediately after the electrical input to the compressor or the uppermost resistive element is reduced by the action of the applicable water heater thermostat. This draw initiation criterion for heat pump water heaters that use supplemental resistive heating, however, shall only apply when the water located above the thermostat at cut-out is heated to 135°F±5°F (57.2°C±2.8°C).

5.1.4.3 *Test Sequence.* Establish normal water heater operation. If the water heater is not presently operating, initiate a draw. The draw may be terminated anytime after cut-in occurs. After cut-out occurs (i.e., all thermostats are satisfied), monitor the internal storage tank temperature sensors described in section 4.5 every minute.

Initiate a draw after a maximum mean tank temperature has been observed following cut-out. Record the time when the draw is initiated and designate it as an elapsed time of zero ($\tau^* = 0$). (The superscript * is used to denote variables pertaining to the first-hour rating test.) Record the outlet water temperature beginning 15 seconds after the draw is initiated and at 5-second intervals thereafter until the draw is terminated. Determine the maximum outlet temperature that occurs during this first draw and record it as $T^*_{max,\ 1}$. For the duration of this first draw and all successive draws, in addition, monitor the inlet temperature to the water heater to ensure that the required 58°F±2°F (14.4°C±1.1°C) test condition is met. Terminate the hot water draw when the outlet temperature decreases to $T^*_{max,1} - 25°F$ ($T^*_{max,1} - 13.9°C$). Record this temperature as $T^*_{min,1}$. Following draw termination, determine the average outlet water temperature

and the mass or volume removed during this first draw and record them as $T^*_{del,1}$ and M^*_1 or V^*_1, respectively.

Initiate a second and, if applicable, successive draw each time the applicable draw initiation criteria described in section 5.1.4.2 are satisfied. As required for the first draw, record the outlet water temperature 15 seconds after initiating each draw and at 5-second intervals thereafter until the draw is terminated. Determine the maximum outlet temperature that occurs during each draw and record it as $T^*_{max,\ i}$, where the subscript i refers to the draw number. Terminate each hot water draw when the outlet temperature decreases to $T^*_{max,\ i} - 25°F$ ($T^*_{max,\ i} - 13.9°C$). Record this temperature as $T^*_{min,\ i}$. Calculate and record the average outlet temperature and the mass or volume removed during each draw ($T^*_{del,\ i}$ and M^*_i or V^*_i, respectively). Continue this sequence of draw and recovery until one hour has elapsed, then shut off the electrical power and/or fuel supplied to the water heater.

If a draw is occurring at an elapsed time of one hour, continue this draw until the outlet temperature decreases to $T^*_{max,\ n} - 25°F$ ($T^*_{max,\ n} - 13.9°C$), at which time the draw shall be immediately terminated. (The subscript n shall be used to denote quantities associated with the final draw.) If a draw is not occurring at an elapsed time of one hour, a final draw shall be imposed at one hour. This draw shall be immediately terminated when the outlet temperature first indicates a value less than or equal to the cut-off temperature used for the previous draw ($T^*_{min,\ n} - 1$). For cases where the outlet temperature is close to $T^*_{min,\ n} - 1$, the final draw shall proceed for a minimum of 30 seconds. If an outlet temperature greater than $T^*_{min,\ n} - 1$ is not measured within 30 seconds, the draw shall be immediately terminated and zero additional credit shall be given towards first-hour rating (i.e., $M^*_n = 0$ or $V^*_n = 0$). After the final draw is terminated, calculate and record the average outlet temperature and the mass or volume removed during the draw ($T^*_{del,\ n}$ and M^*_n or V^*_n, respectively).

5.1.5 *24-Hour Simulated Use Test.* During the simulated use test, a total of 64.±3 1.0 gallons (243±3.8 liters) shall be removed. This value is referred to as the daily hot water usage in the following text.

With the water heater turned off, fill the water heater with supply water and apply pressure as described in section 2.5. Turn on the water heater and associated heat pump unit, if present. After the cut-out occurs, the water heater may be operated for up to three cycles of drawing until cut-in, and then operating until cut-out, prior to the start of the test.

At this time, record the mean tank temperature (T_o), and the electrical and/or fuel measurement readings, as appropriate. Begin the 24-hour simulated use test by withdrawing a volume from the water heater that equals one-sixth of the daily hot water usage. Record the time when this first draw is initiated and assign it as the test elapsed time (τ) of zero (0). Record the average storage tank and ambient temperature every 15 minutes throughout the 24-hour simulated use test unless a recovery or a draw is occurring. At elapsed time intervals of one, two, three, four, and five hours from $\tau = 0$, initiate additional draws, removing an amount of water equivalent to one-sixth of the daily hot water usage with the maximum allowable deviation for any single draw being ± 0.5 gallons (1.9 liters). The quantity of water withdrawn during the sixth draw shall be increased or decreased as necessary such that the total volume of water withdrawn equals 64.3 gallons ± 1.0 gallon (243.4 liters ± 3.8 liters).

All draws during the simulated use test shall be made at flow rates of 3.0 gallons ± 0.25 gallons per minute (11.4 liters ± 0.95 liters per minute). Measurements of the inlet and outlet temperatures shall be made 15 seconds after the draw is initiated and at every subsequent 5-second interval throughout the duration of each draw. The arithmetic mean of the hot water discharge temperature and the cold water inlet temperature shall be determined for each draw ($T_{del,\ i}$ and $T_{in,\ i}$). Determine and record the net mass or volume removed (M_i or V_i), as appropriate, after each draw.

At the end of the recovery period following the first draw, record the maximum mean tank temperature observed after cut-out, $T_{max,\ 1}$, and the energy consumed by an electric resistance, gas or oil-fired water heater, Q_r. For heat pump water heaters, the total electrical energy consumed during the first recovery by the heat pump (including compressor, fan, controls, pump, etc.) and, if applicable, by the resistive element(s) shall be recorded as Q_r.

At the end of the recovery period that follows the sixth draw, determine and record the total electrical energy and/or fossil fuel consumed since the beginning of the test, Q_{su}. In preparation for determining the energy consumed during standby, record the reading given on the electrical energy (watt-hour) meter, the gas meter, and/or the scale used to determine oil consumption, as appropriate. Record the maximum value of the mean tank temperature after cut-out as T_{su}. Except as noted below, allow the water heater to remain in the standby mode until 24 hours have elapsed from the start of the test (i.e., since = 0). Prevent the water heater from beginning a recovery cycle during the last hour of the test by turning off the electric power to the electrical heating elements and heat pump, if present, or by turning down the fuel supply to the main burner at an elapsed time of 23 hours. If a recovery is taking place at an elapsed time of 23 hours,

wait until the recovery is complete before reducing the electrical and/or fuel supply to the water heater. At 24 hours, record the mean tank temperature, T_{24}, and the electric and/or fuel instrument readings. Determine the total fossil fuel or electrical energy consumption, as appropriate, for the entire 24-hour simulated use test, Q. Record the time interval between the time at which the maximum mean tank temperature is observed after the sixth draw and the end of the 24-hour test as $_{stby,\ 1}$. Record the time during which water is not being withdrawn from the water heater during the entire 24-hour period as $_{stby,\ 2}$.

5.2 *Instantaneous Gas and Electric Water Heaters*

5.2.1 *Setting the Outlet Discharge Temperature.* Initiate normal operation of the water heater at the full input rating for electric instantaneous water heaters and at the maximum firing rate specified by the manufacturer for gas instantaneous water heaters. Monitor the discharge water temperature and set to a value of 135°F ± 5°F (57.2°C ± 2.8°C) in accordance with the manufacturer's instructions. If the water heater is not capable of providing this discharge temperature when the flow rate is 3.0 gallons ± 0.25 gallons per minute (11.4 liters ± 0.95 liters per minute), then adjust the flow rate as necessary to achieve the specified discharge water temperature. Record the corresponding flow rate as V_{max}.

5.2.2 *Additional Requirements for Variable Input Instantaneous Gas Water Heaters.* If the instantaneous water heater incorporates a controller that permits operation at a reduced input rate, adjust the flow rate as necessary to achieve a discharge water temperature of 135°F ± 5°F (57.2°C ± 2.8°C) while maintaining the minimum input rate. Record the corresponding flow rate as V_{min}. If an outlet temperature of 135°F ± 5°F (57.2°C ± 2.8°C) cannot be achieved at the minimum flow rate permitted by the instantaneous water heater, record the flow rate as V_{min} and the corresponding outlet temperature as T_{min}.

5.2.3 *Maximum GPM Rating Test for Instantaneous Water Heaters.* Establish normal water heater operation at the full input rate for electric instantaneous water heaters and at the maximum firing rate for gas instantaneous water heaters with the discharge water temperature set in accordance with Section 5.2.1. During the 10-minute test, either collect the withdrawn water for later measurement of the total mass removed, or alternatively, use a water meter to directly measure the water volume removed.

After recording the scale or water meter reading, initiate water flow throughout the water heater, record the inlet and outlet water temperatures beginning 15 seconds after the start of the test and at subsequent 5-second intervals throughout the duration of the test. At the end of 10 minutes, turn off the water. Determine the mass of water collected, M_{10m}, in pounds (kilograms), or the volume of water, V_{10m}, in gallons (liters).

5.2.4 *24-hour Simulated Use Test for Gas Instantaneous Water Heaters.*

5.2.4.1 *Fixed Input Instantaneous Water Heaters.* Establish normal operation with the discharge water temperature and flow rate set to values of 135°F ± 5°F (57.2°C ± 2.8°C) and V_{max} per Section 5.2.1, respectively. With no draw occurring, record the reading given by the gas meter and/or the electrical energy meter as appropriate. Begin the 24-hour simulated use test by drawing an amount of water out of the water heater equivalent to one-sixth of the daily hot water usage. Record the time when this first draw is initiated and designate it as an elapsed time, τ, of 0. At elapsed time intervals of one, two, three, four, and five hours from $\tau = 0$, initiate additional draws, removing an amount of water equivalent to one-sixth of the daily hot water usage, with the maximum allowable deviation for any single draw being ± 0.5 gallons (1.9 liters). The quantity of water drawn during the sixth draw shall be increased or decreased as necessary such that the total volume of water withdrawn equals 64.3 gallons ± 1.0 gallons (243.4 liters ± 3.8 liters).

Measurements of the inlet and outlet water temperatures shall be made 15 seconds after the draw is initiated and at every 5-second interval thereafter throughout the duration of the draw. The arithmetic mean of the hot water discharge temperature and the cold water inlet temperature shall be determined for each draw. Record the scale used to measure the mass of the withdrawn water or the water meter reading, as appropriate, after each draw. At the end of the recovery period following the first draw, determine and record the fossil fuel or electrical energy consumed, Q_r. Following the sixth draw and subsequent recovery, allow the water heater to remain in the standby mode until exactly 24 hours have elapsed since the start of the test (i.e., since $\tau = 0$). At 24 hours, record the reading given by the gas meter and/or the electrical energy meter as appropriate. Determine the fossil fuel or electrical energy consumed during the entire 24-hour simulated use test and designate the quantity as Q.

5.2.4.2 *Variable Input Instantaneous Water Heaters.* If the instantaneous water heater incorporates a controller that permits continuous operation at a reduced input rate, the first three draws shall be conducted using the maximum flow rate, V_{max}, while removing an amount of water equivalent to one-sixth of the daily hot water usage, with the maximum allowable deviation for any one of the three draws being ± 0.5 gallons (1.9 liters). The second three draws shall be conducted at V_{min}. If an outlet temperature of 135°F ± 5°F (57.2°C ± 2.8°C) could not be

achieved at the minimum flow rate permitted by the instantaneous water heater, the last three draws should be lengthened such that the volume removed is:

$$V_{4,5,6} = \frac{64.3\ \text{gal}}{6} \times \left[\frac{77^\circ\text{F}}{(T_{min} - 58^\circ\text{F})} \right]$$

or

$$V_{4,5,6} = \frac{243\ \text{L}}{6} \times \left[\frac{42.8^\circ\text{C}}{(T_{min} - 14.4^\circ\text{C})} \right]$$

where T_{min} is the outlet water temperature at the flow rate V_{min} as determined in Section 5.2.1, and where the maximum allowable variation for any one of the three draws is ± 0.5 gallons (1.9 liters). The quantity of water withdrawn during the sixth draw shall be increased or decreased as necessary such that the total volume of water withdrawn equals $(32.15 + 3 \div V_{4,5,6}) \pm 1.0$ gallons

$((121.7 + 3 \div V_{4,5,6}) \pm 3.8$ liters).

Measurements of the inlet and outlet water temperatures shall be made 5 seconds after a draw is initiated and at every 5-second interval thereafter throughout the duration of the draw. Determine the arithmetic mean of the hot water discharge temperature and the cold water inlet temperature for each draw. Record the scale used to measure the mass of the withdrawn water or the water meter reading, as appropriate, after each draw. At the end of the recovery period following the first draw, determine and record the fossil fuel or electrical energy consumed, $Q_{r,\ max}$. Likewise, record the reading of the meter used to measure fossil fuel or electrical energy consumption prior to the fourth draw and at the end of the recovery period following the fourth draw, and designate the difference as $Q_{r,min}$. Following the sixth draw and subsequent recovery, allow the water heater to remain in the standby mode until exactly 24 hours have elapsed since the start of the test (i.e., since τ=0). At 24 hours, record the reading given by the gas meter and/or the electrical energy meter, as appropriate. Determine the fossil fuel or electrical energy consumed during the entire 24-hour simulated use test and designate the quantity as Q.

6. Computations

6.1 *Storage Tank and Heat Pump Water Heaters.*

6.1.1 *Storage Tank Capacity.* The storage tank capacity is computed using the following:

$$V_{st} = \frac{(W_f - W_t)}{\rho}$$

Where:

V_{st} = the storage capacity of the water heater, gal (L).

W_f = the weight of the storage tank when completely filled with water, lb (kg).

W_t = the (tare) weight of the storage tank when completely empty, lb (kg).

ρ = the density of water used to fill the tank measured at the temperature of the water, lb/gal (kg/L).

6.1.2. *First-Hour Rating Computation.* For the case in which the final draw is initiated at or prior to an elapsed time of one hour, the first-hour rating shall be computed using,

$$F_{hr} = \sum_{i=1}^{n} V_i^*$$

Where:

n = the number of draws that are completed during the first-hour rating test.

V^*_i = the volume of water removed during the *ith* draw of the first-hour rating test, gal (L)

or, if the mass of water is being measured,

$$V_i^* = \frac{M_i^*}{\rho}$$

Where:

M^*_i = the mass of water removed during the ith draw of the first-hour rating test, lb (kg).

ρ = the water density corresponding to the average outlet temperature measured during the *ith* draw, $(T^*_{del,\ i})$, lb/gal (kg/L).

For the case in which a draw is not in progress at the elapsed time of one hour and a final draw is imposed at the elapsed time of one hour, the first-hour rating shall be calculated using

$$F_{hr} = \sum_{i=1}^{n-1} V_i^* + V_n^* \left(\frac{\overline{T}^*_{del,\,n} - T^*_{min,\,n-1}}{\overline{T}^*_{del,\,n-1} - T^*_{min,\,n-1}} \right)$$

where *n* and V^*_i are the same quantities as defined above, and

V^*_n = the volume of water drawn during the nth (final) draw of the first-hour rating test, gal (L)

$T^*_{del,n-1}$ = the average water outlet temperature measured during the $(n-1)$th draw of the first-hour rating test, °F (°C).

$T^*_{del,n}$ = the average water outlet temperature measured during the *n*th (final) draw of the first-hour rating test, °F (°C).

$\overline{T}^{*}_{min,n-1}$ = the minimum water outlet temperature measured during the $(n-1)$th draw of the first-hour rating test, °F (°C).

6.1.3 *Recovery Efficiency.* The recovery efficiency for gas, oil, and heat pump storage-type water heaters is computed as:

$$\eta_r = \frac{M_1 C_{p1}\left(\overline{T}_{del,1} - \overline{T}_{in,1}\right)}{Q_r} + \frac{V_{st}\rho_2 C_{p2}\left(\overline{T}_{max,1} - \overline{T}_o\right)}{Q_r}$$

Where:

M_1 = total mass removed during the first draw of the 24-hour simulated use test, lb (kg), or, if the volume of water is being measured,

$M_1 = V_1 \rho_1$

Where:

V_1 = total volume removed during the first draw of the 24-hour simulated use test, gal (L).

ρ_1 = density of the water at the water temperature measured at the point where the flow volume is measured, lb/gal (kg/L).

C_{p1} = specific heat of the withdrawn water, $(T_{del,1} + T_{in,1})$ 2, Btu/lb°F (kJ/kg°C).

$T_{del,1}$ = average water outlet temperature measured during the first draw of the 24-hour simulated use test, °F (°C).

$T_{in,1}$ = average water inlet temperature measured during the first draw of the 24-hour simulated use test, °F (°C).

V_{st} = as defined in section 6.1.1.

ρ_2 = density of stored hot water, $(T_{max,1} + T_o)$/ 2, lb/gal (kg/L).

C_{p2} = specific heat of stored hot water evaluated at $(T_{max,1} + T_o)$ / 2, Btu/lb°F (kJ/kg°C).

$T_{max,1}$ = maximum mean tank temperature recorded after cut-out following the first draw of the 24-hour simulated use test, °F (°C).

T_o = maximum mean tank temperature recorded prior to the first draw of the 24-hour simulated use test, °F (°C).

Q_r = the total energy used by the water heater between cut-out prior to the first draw and cut-out following the first draw, including auxiliary energy such as pilot lights, pumps, fans, etc., Btu (kJ). (Electrical auxiliary energy shall be converted to thermal energy using the following conversion: 1 kWh = 3,412 Btu.)

The recovery efficiency for electric water heaters with immersed heating elements is assumed to be 98%.

6.1.4 *Hourly Standby Losses.* The hourly standby energy losses are computed as:

$$Q_{hr} = \frac{Q_{stby} - \frac{V_{st}\rho C_p\left(\overline{T}_{24} - \overline{T}_{su}\right)}{\eta_r}}{\tau_{stby,1}}$$

Where:

Q_{hr} = the hourly standby energy losses of the water heater, Btu/h (kJ/h).

Q_{stby} = the total energy consumed by the water heater between the time at which the maximum mean tank temperature is observed after the sixth draw and the end of the 24-hour test period, Btu (kJ).

V_{st} = as defined in section 6.1.1.

ρ = density of stored hot water, $(T_{24} + T_{su})$ / 2, lb/gal (kg/L).

C_p = specific heat of the stored water, $(T_{24} + T_{su})$ / 2, Btu/lb÷°F (kJ/kg÷°C).

T_{24} = the mean tank temperature at the end of the 24-hour simulated use test, °F (°C).

T_{su} = the maximum mean tank temperature observed after the sixth draw, °F (°C).

η_r = as defined in section 6.1.3.

$\tau_{stby,1}$ = elapsed time between the time at which the maximum mean tank temperature is observed after the sixth draw and the end of the 24-hour simulated use test, h.

The standby heat loss coefficient for the tank is computed as:

$$UA = \frac{Q_{hr}}{\overline{T}_{t,stby,1} - \overline{T}_{a,stby,1}}$$

Where:

UA = standby heat loss coefficient of the storage tank, Btu/h÷°F (kJ/h÷°C).

Q_{hr} = as defined in this section.

$T_{t,stby,1}$ = overall average storage tank temperature between the time when the maximum mean tank temperature is observed after the sixth draw and the end of the 24-hour simulated use test, °F (°C).

$T_{a,stby,1}$ = overall average ambient temperature between the time when the maximum mean tank temperature is observed after the sixth draw and the end of the 24-hour simulated use test, °F (°C).

6.1.5 *Daily Water Heating Energy Consumption*. The daily water heating energy consumption, Q_d, is computed as:

$$Q_d = Q - \frac{V_{st}\rho C_p\left(\overline{T}_{24} - \overline{T}_o\right)}{\eta_r}$$

Where:

Q = total energy used by the water heater during the 24-hour simulated use test including auxiliary energy such as pilot lights, pumps, fans, etc., Btu (kJ). (Electrical auxiliary energy shall be converted to thermal energy using the following conversion: 1 kWh = 3,412 Btu.)

V_{st} = as defined in section 6.1.1.

ρ= density of the stored hot water, $(\overline{T}_{24} + \overline{T}_o) / 2$, lb/gal (kg/L).

C_p = specific heat of the stored water, $(\overline{T}_{24} + \overline{T}_o) / 2$, Btu/lb÷°F (kJ/kg÷°C).

$\overline{T}_{24}$ = mean tank temperature at the end of the 24-hour simulated use test, °F (°C).

T_o = mean tank temperature at the beginning of the 24-hour simulated use test, recorded one minute before the first draw is initiated, °F (°C).

η_r = as defined in section 6.1.3.

6.1.6 *Adjusted Daily Water Heating Energy Consumption*. The adjusted daily water heating energy consumption, Q_{da}, takes into account that the temperature difference between the storage tank and surrounding ambient air may not be the nominal value of 67.5°F (135°F–67.5°F) or 37.5°C (57.2°C–19.7°C) due to the 10°F (5.6°C) allowable variation in storage tank temperature, 135°F ± 5°F (57.2°C ± 2.8°C), and the 5°F (2.8°C) allowable variation in surrounding ambient temperature 65 °F (18.3°C) to 70°F (21.1°C). The adjusted daily water heating energy consumption is computed as:

$Q_{da} = Q_D - [(\overline{T}_{stby,\ 2} - \overline{T}_{a,\ stby,2}) - (135°F - 67.5°F)]\ UA\tau_{stby,\ 2}$

or $Q_{da} = Q_D - [(\overline{T}_{stby,\ 2} - \overline{T}_{a,\ stby,\ 2}) - (57.2°C - 19.7°C)]\ UA\tau_{stby,\ 2}$

Where:

Q_{da} = the adjusted daily water heating energy consumption, Btu (kJ).

Q_d = as defined in section 6.1.5.

$T_{stby,\ 2}$ = the mean tank temperature during the total standby portion, $\tau_{stby,\ 2}$, of the 24-hour test, °F (°C).

$T_{a,\ stby,\ 2}$ = the average ambient temperature during the total standby portion, $\tau_{stby,\ 2}$, of the 24-hour test, °F (°C).

UA = as defined in section 6.1.4.

$\tau_{stby,\ 2}$ = the number of hours during the 24-hour simulated test when water is not being withdrawn from the water heater.

A modification is also needed to take into account that the temperature difference between the outlet water temperature and supply water temperature may not be equivalent to the nominal value of 77°F (135°F–58°F) or 42.8°C (57.2°C–14.4°C). The following equations adjust the experimental data to a nominal 77°F (42.8°C) temperature rise.

The energy used to heat water, Btu/day (kJ/day), may be computed as:

$$Q_{HW} = \sum_{i=1}^{6} \frac{M_i C_{pi}\left(\overline{T}_{del,\ i} - \overline{T}_{in,\ i}\right)}{\eta_r}$$

Where:

M_i = the mass withdrawn for the *i*th draw (i = 1 to 6), lb (kg).

C_{pi} = the specific heat of the water of the *i*th draw, Btu/lb÷°F (kJ/kg÷°C).

$\overline{T}_{del,\ i}$ = the average water outlet temperature measured during the *i*th draw (i=1 to 6), °F (°C).

$\overline{T}_{in,\ i}$ = the average water inlet temperature measured during the *i*th draw (i=1 to 6), °F (°C).

η_r = as defined in section 6.1.3.

The energy required to heat the same quantity of water over a 77°F (42.8°C) temperature rise, Btu/day (kJ/day), is:

$$Q_{HW,\ 77°F} = \sum_{i=1}^{6} \frac{M_i C_{pi}(135°F - 58°F)}{\eta_r}$$

$$\text{or } Q_{HW,\ 42.8°C} = \sum_{i=1}^{6} \frac{M_i C_{pi}(57.2°C - 14.4°C)}{\eta_r}$$

The difference between these two values is:

$Q_{HWD} = Q_{HW,\ 77°-F} - Q_{HW}$

or $Q_{HWD} = Q_{HW,42.8°-F} - Q_{HW}$

which must be added to the adjusted daily water heating energy consumption value. Thus, the daily energy consumption value which takes into account that the temperature difference between the storage tank and ambient temperature may not be 67.5°F (37.5°C) and that the temperature rise across the storage tank may not be 77°F (42.8°C) is:

$Q_{dm} = Q_{da} + Q_{HWD}$

6.1.7 Energy Factor. The energy factor, Ef, is computed as:

$$E_f = \sum_{i=1}^{6} \frac{M_i C_{pi}(135°F - 58°F)}{Q_{dm}}$$

or

$$E_f = \sum_{i=1}^{6} \frac{M_i C_{pi}(57.2°C - 14.4°C)}{Q_{dm}}$$

Where:

Q_{dm} = the modified daily water heating energy consumption as computed in accordance with section 6.1.6, Btu (kJ).

M_i = the mass withdrawn for the ith draw (i = 1 to 6), lb (kg).

C_{pi} = the specific heat of the water of the ith draw, Btu/lb °F (kJ/kg °C).

6.1.8 *Annual Energy Consumption.* The annual energy consumption for storage-type and heat pump water heaters is computed as:

$E_{annual} = 365 \times Q_{dm}$

Where:

Q_{dm} = the modified daily water heating energy consumption as computed in accordance with section 6.1.6, Btu (kJ).

365 = the number of days in a year.

6.2 *Instantaneous Water Heaters.*

6.2.1 *Maximum GPM (L/min) Rating Computation.* Compute the maximum gpm (L/min) rating as:

$$F_{max} = \frac{M_{10m}\left(\overline{T}_{del} - \overline{T}_{in}\right)}{10(\rho)(135°F - 58°F)}$$

$$\text{or } F_{max} = \frac{M_{10m}\left(\overline{T}_{del} - \overline{T}_{in}\right)}{10(\rho)(57.2°C - 14.4°C)}$$

which may be expressed as:

$$F_{max} = \frac{M_{10m}\left(\overline{T}_{del} - \overline{T}_{in}\right)}{10(\rho)(77°F)}$$

$$\text{or } F_{max} = \frac{M_{10m}\left(\overline{T}_{del} - \overline{T}_{in}\right)}{10(\rho)(42.8°C)}$$

Where:

M_{10m} = the mass of water collected during the 10-minute test, lb (kg).

T_{del} = the average delivery temperature, °F (°C).

T_{in} = the average inlet temperature, °F (°C).

ρ = the density of water at the average delivery temperature, lb/gal (kg/L).

If a water meter is used the maximum gpm (L/min) rating is computed as:

$$F_{max} = \frac{V_{10m}\left(\overline{T}_{del} - \overline{T}_{in}\right)}{10(77°F)}$$

$$\text{or } F_{max} = \frac{V_{10m}\left(\overline{T}_{del} - \overline{T}_{in}\right)}{10(42.8°C)}$$

Where:

V_{10m} = the volume of water measured during the 10-minute test, gal (L).

$\overline{T}_{del}$ = as defined in this section.

T_{in} = as defined in this section.

6.2.2 *Recovery Efficiency*

6.2.2.1 *Fixed Input Instantaneous Water Heaters.* The recovery efficiency is computed as:

$$\eta_r = \frac{M_1 C_{p1}\left(\overline{T}_{del,1} - \overline{T}_{in,1}\right)}{Q_r}$$

Where:

M_1 = total mass removed during the first draw of the 24-hour simulated use test, lb (kg), or, if the volume of water is being measured,

$M_1 = V_1 \cdot \rho$

Where:

V_1 = total volume removed during the first draw of the 24-hour simulated use test, gal (L).

ρ= density of the water at the water temperature measured at the point where the flow volume is measured, lb/gal (kg/L).

C_{p1} = specific heat of the withdrawn water, $(T_{del,1} + T_{in,1}) / 2$, Btu/lb °F (kJ/kg °C).

$T_{del,\ 1}$ = average water outlet temperature measured during the first draw of the 24-hour simulated use test, °F (°C).

$T_{in,\ 1}$ = average water inlet temperature measured during the first draw of the 24-hour simulated use test, °F (°C).

Q_r = the total energy used by the water heater between cut-out prior to the first draw and cut-out following the first draw, including auxiliary energy such as pilot lights, pumps, fans, etc., Btu (kJ). (Electrical auxiliary energy shall be converted to thermal energy using the following conversion: 1 kWh = 3,412 Btu.)

6.2.2.2 *Variable Input Instantaneous Water Heaters.* For instantaneous water heaters that have a variable firing rate, two recovery efficiency values are computed, one at the maximum input rate and one at the minimum input rate. The recovery efficiency used in subsequent computations is taken as the average of these two values. The maximum recovery efficiency is computed as:

$$\eta_{r,\,max} = \frac{M_1 C_{p1}\left(\overline{T}_{del,1} - \overline{T}_{in,1}\right)}{Q_{r,\,max}}$$

Where:

M_1 = as defined in section 6.2.2.1.

C_{p1} = as defined in section 6.2.2.1.

$T_{del,\ 1}$ = as defined in section 6.2.2.1.

$T_{in,\ 1}$ = as defined in section 6.2.2.1.

$Q_{r,\ max}$ = the total energy used by the water heater between burner cut-out prior to the first draw and burner cut-out following the first draw, including auxiliary energy such as pilot lights, Btu (kJ).

The minimum recovery efficiency is computed as:

$$\eta_{r,\min} = \frac{M_4 C_{p4}\left(\overline{T}_{del,4} - \overline{T}_{in,4}\right)}{Q_{r,\min}}$$

Where:

M_4 = the mass withdrawn during the fourth draw, lb (kg), or, if the volume of water is being measured,

$M_4 = V_4 \rho$

Where:

V_4 = total volume removed during the first draw of the 24-hour simulated use test, gal (L).

ρ = as defined in 6.2.2.1

C_{p4} = the specific heat of water, Btu/lb°F (kJ/kg °C).

$\overline{T}_{del,4}$ = the average delivery temperature for the fourth draw, °F (°C).

$T_{in,4}$ = the average inlet temperature for the fourth draw, °F (°C).

$Q_{r,min}$ = the total energy consumed between the beginning of the fourth draw and burner cut-out following the fourth draw, including auxiliary energy such as pilot lights, Btu (kJ).

The recovery efficiency is computed as:

$$\eta_r = \frac{\eta_{r,\max} + \eta_{r,\min}}{2}$$

Where:

$\eta_{r,max}$ = as calculated above.

$\eta_{r,min}$ = as calculated above.

6.2.3 *Daily Water Heating Energy Consumption.* The daily water heating energy consumption, Q_d, is computed as:

$Q_d = Q$

Where:

Q = the energy used by the instantaneous water heater during the 24-hr simulated use test.

A modification is needed to take into account that the temperature difference between the outlet water temperature and supply water temperature may not be equivalent to the nominal value of 77°F (135°F − 58°F) or 42.8°C (57.2°C − 14.4°C). The following equations adjust the experimental data to a nominal 77°F (42.8°C) temperature rise.

The energy used to heat water may be computed as:

$$Q_{HW} = \sum_{i=1}^{6} \frac{M_i C_{pi}\left(\overline{T}_{del,i} - \overline{T}_{in,i}\right)}{\eta_r}$$

Where:

M_i = the mass withdrawn during the ith draw, lb (kg).

C_{pi} = the specific heat of water of the ith draw, Btu/lb°F (kJ/kg (°C).

$\overline{T}_{del,i}$ = the average delivery temperature of the ith draw, °F (°C).

$T_{in,i}$ = the average inlet temperature of the ith draw, °F (°C).

η_r = as calculated in section 6.2.2.2.

The energy required to heat the same quantity of water over a 77°F (42.8°C) temperature rise is:

$$Q_{HW,77°F} = \sum_{i=1}^{6} \frac{M_i C_{pi}(135°F - 58°F)}{\eta_r}$$

$$\text{or } Q_{HW,42.8°C} = \sum_{i=1}^{6} \frac{M_i C_{pi}(57.2°C - 14.4°C)}{\eta_r}$$

Where:

M_i = the mass withdrawn during the *i*th draw, lb (kg).

C_{pi} = the specific heat of water of the ith draw, Btu/lb°F (kJ/kg (°C).

η_r = as calculated above.

The difference between these two values is:

$Q_{HWD} = Q_{HW,\ 77°F} - Q_{HW}$

or $Q_{HWD} = Q_{HW,\ 42.8°C} - Q_{HW}$

which much be added to the daily water heating energy consumption value. Thus, the daily energy consumption value which takes into account that the temperature rise across the storage tank may not be 77°F (42.8°C) is:

$Q_{dm} = Q_d + Q_{HWD}$

6.2.4 *Energy Factor.* The energy factor, E_f, is computed as:

$$E_f = \sum_{i=1}^{6} \frac{M_i C_{pi}(135°F - 58°F)}{Q_{dm}}$$

$$\text{or } E_f = \sum_{i=1}^{6} \frac{M_i C_{pi}(57.2°C - 14.4°C)}{Q_{dm}}$$

Where:

Q_{dm} = the daily water heating energy consumption as computed in accordance with section 6.2.3, Btu (kJ).

M_i = the mass associated with the *i*th draw, lb (kg).

C_{pi} = the specific heat of water computed at a temperature of (58°F + 135°F) / 2, Btu/lb °F [(14.4°C + 57.2°C) / 2, kJ/kg °C].

6.2.5 *Annual Energy Consumption.* The annual energy consumption for instantaneous type water heaters is computed as:

$E_{annual} = 365 \times Q_{dm}$

Where:

Q_{dm} = the modified daily energy consumption, Btu/day (kJ/day).

365 = the number of days in a year.

7. Ratings for Untested Models

In order to relieve the test burden on manufacturers who offer water heaters which differ only in fuel type or power input, ratings for untested models may be established in accordance with the following procedures. In lieu of the following procedures a manufacturer may elect to test the unit for which a rating is sought.

7.1 *Gas Water Heaters.* Ratings obtained for gas water heaters using natural gas can be used for an identical water heater which utilizes propane gas if the input ratings are within ± 10%.

7.2 *Electric Water Heaters*

7.2.1 *First-Hour Rating.* If an electric storage-type water heater is available with more than one input rating, the manufacturer shall designate the standard input rating, and the water heater need only be tested with heating elements at the designated standard input ratings. The first-hour ratings for units having power input rating less than the designated standard input rating shall be assigned a first-hour rating equivalent to the first draw of the first-hour rating for the electric water heater with the standard input rating. For units having power inputs greater than the designated standard input rating, the first-hour rating shall be equivalent to that measured for the water heater with the standard input rating.

7.2.2 *Energy Factor.* The energy factor for identical electric storage-type water heaters, with the exception of heating element wattage, may use the energy factor obtained during testing of the water heater with the designated standard input rating.

[63 FR 26008, May 11, 1998; 63 FR 38738, July 20, 1998]

APPENDIX F TO SUBPART B OF PART 430—UNIFORM TEST METHOD FOR MEASURING THE ENERGY CONSUMPTION OF ROOM AIR CONDITIONERS

1. *Test method.* The test method for testing room air conditioners shall consist of application of the methods and conditions in American National Standard (ANS) Z234.1–1972, ''Room Air Conditioners,'' sections 4, 5, 6.1, and 6.5, and in American Society of Heating, Refrigerating and Air Conditioning in Engineers (ASHRAE) Standard 16–69, ''Method of Testing for Rating Room Air Conditioners.''

2. *Test conditions.* Establish the test conditions described in sections 4 and 5 of ANS Z234.1–1972 and in accordance with ASHRAE Standard 16–69.

3. *Measurements.* Measure the quantities delineated in section 5 of ANS Z234.1–1972.

4. *Calculations.* 4.1 Calculate the cooling capacity (expressed in Btu/hr) as required in section 6.1 of ANS Z234.1–1972 and in accordance with ASHRAE Standard 16–69.

4.2 Determine the electrical power input (expressed in watts) as required by section 6.5 of ANS Z234.1–1972 and in accordance with ASHRAE Standard 16–69.

[42 FR 27898, June 1, 1977. Redesignated and amended at 44 FR 37938, June 29, 1979]

APPENDIX G TO SUBPART B OF PART 430—UNIFORM TEST METHOD FOR MEASURING THE ENERGY CONSUMPTION OF UNVENTED HOME HEATING EQUIPMENT

1. Testing conditions.

1.1 *Installation.*

1.1.1 *Electric heater.* Install heater according to manufacturer's instructions. Heaters shall be connected to an electrical supply circuit of nameplate voltage with a wattmeter installed in the circuit. The wattmeter shall have a maximum error not greater than one percent.

1.1.2 *Unvented gas heater.* Install heater according to manufacturer's instructions. Heaters shall be connected to a gas supply line with a gas displacement meter installed between the supply line and the heater according to manufacturer's specifications. The gas displacement meter shall have a maximum error not greater than one percent. Gas heaters with electrical auxiliaries shall be connected to an electrical supply circuit of nameplate voltage with a wattmeter installed in the circuit. The wattmeter shall have a maximum error not greater than one percent.

1.1.3 *Unvented oil heater.* Install heater according to manufacturer's instructions. Oil heaters with electric auxiliaries shall be connected to an electrical supply circuit of nameplate voltage with a wattmeter installed in the circuit. The wattmeter shall have a maximum error not greater than one percent.

1.2 *Temperature regulating controls.* All temperature regulating controls shall be shorted out of the circuit or adjusted so that they will not operate during the test period.

1.3 *Fan controls.* All fan controls shall be set at the highest fan speed setting.

1.4 *Energy supply.*

1.4.1 *Electrical supply.* Supply power to the heater within one percent of the nameplate voltage.

1.4.2 *Natural gas supply.* For an unvented gas heater utilizing natural gas, maintain the gas supply to the heater with a normal inlet test pressure immediately ahead of all controls at 7 to 10 inches of water column. The regulator outlet pressure at normal supply test pressure shall be approximately that recommended by the manufacturer. The natural gas supplied should have a higher heating value within ± 5 percent of 1,025 Btu's per standard cubic foot. Determine the higher heating value, in Btu's per standard cubic

foot, for the natural gas to be used in the test, with an error no greater than one percent. Alternatively, the test can be conducted using ''bottled'' natural gas of a higher heating value within ± 5 percent of 1,025 Btu's per standard cubic foot as long as the actual higher heating value of the bottled natural gas has been determined with an error no greater than one percent as certified by the supplier.

1.4.3 *Propane gas supply.* For an unvented gas heater utilizing propane, maintain the gas supply to the heater with a normal inlet test pressure immediately ahead of all controls at 11 to 13 inches of water column. The regulator outlet pressure at normal supply test pressure shall be that recommended by the manufacturer. The propane supplied should have a higher heating value of within± 5 percent of 2,500 Btu's per standard cubic foot. Determine the higher heating value in Btu's per standard foot, for the propane to be used in the test, with an error no greater than one percent. Alternatively, the test can be conducted using ''bottled'' propane of a higher heating value within ± 5 percent of 2,500 Btu's per standard cubic foot as long as the actual higher heating value of the bottled propane has been determined with an error no greater than one percent as certified by the supplier.

1.4.4 *Oil supply.* For an unvented oil heater utilizing kerosene, determine the higher heating value in Btu's per gallon with an error no greater than one percent. Alternatively, the test can be conducted using a tested fuel of a higher heating value within ± 5 percent of 137,400 Btu's per gallon as long as the actual higher heating value of the tested fuel has been determined with an error no greater than one percent as certified by the supplier.

1.5 *Energy flow instrumentation.* Install one or more energy flow instruments which measure, as appropriate and with an error no greater than one percent, the quantity of electrical energy, natural gas, propane gas, or oil supplied to the heater.

2. Testing and measurements.

2.1 *Electric power measurement.* Establish the test conditions set forth in section 1 of this appendix. Allow an electric heater to warm up for at least five minutes before recording the maximum electric power measurement from the wattmeter. Record the maximum electric power (P_E) expressed in kilowatts.

Allow the auxiliary electrical system of a forced air unvented gas, propane, or oil heater to operate for at least five minutes before recording the maximum auxiliary electric power measurement from the wattmeter. Record the maximum auxiliary electric power (P_A) expressed in kilowatts.

2.2 *Natural gas, propane, and oil measurement.* Establish the test conditions as set forth in section 1 of this appendix. A natural gas, propane, or oil heater shall be operated for one hour. Using either the nameplate rating or the energy flow instrumentation set forth in section 1.5 of this appendix and the fuel supply rating set forth in sections 1.4.2, 1.4.3, or 1.4.4 of this appendix, as appropriate, determine the maximum fuel input (P_F) of the heater under test in Btu's per hour. The energy flow instrumentation shall measure the maximum fuel input with an error no greater than one percent.

3. Calculations.

3.1 *Annual energy consumption for primary electric heaters.* For primary electric heaters, calculate the annual energy consumption (E_E) expressed in kilowatt-hours per year and defined as:

$E_E=2080(0.77)DHR$

where:

2080=national average annual heating load hours

0.77=adjustment factor

DHR=design heating requirement and is equal to $P_E/1.2$ in kilowatts.

P_E=as defined in 2.1 of this appendix

1.2=typical oversizing factor for primary electric heaters

3.2 *Annual energy consumption for primary electric heaters by geographic region of the United States.* For primary electric heaters, calculate the annual energy consumption by geographic region of the United States (E_R) expressed in kilowatt-hours per year and defined as:

$E_R=HLH(0.77)\ (DHR)$

where:

HLH=heating load hours for a specific region determined from Figure 1 of this appendix in hours

0.77=as defined in 3.1 of this appendix

DHR=as defined in 3.1 of this appendix

3.3 *Rated output for electric heaters.* Calculate the rated output (Q_{out}) for electric heaters, expressed in Btu's per hour, and defined as:

$Q_{out}=P_E$ (3,412 Btu/kWh)

where:

P_E=as defined in 2.1 of this appendix

3.4 *Rated output for unvented heaters using either natural gas, propane, or oil.* For unvented heaters using either natural gas, propane, or oil equipped without auxiliary electrical systems, the rated output (Q_{out}), expressed in Btu's per hour, is equal to P_F, as determined in section 2.2 of this appendix.

For unvented heaters using either natural gas, propane, or oil equipped with auxiliary electrical systems, calculate the rated output (Q_{out}), expressed in Btu's per hour, and defined as:

$Q_{out}=P_F+P_A$ (3,412 Btu/kWh)

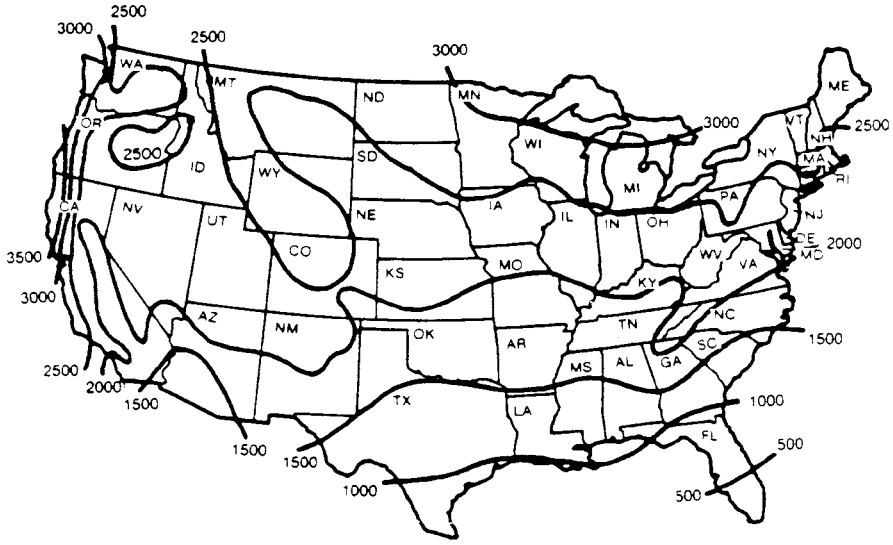
where:

P_F=as defined in 2.2 of this appendix in Btu/hr

P_A=as defined in 2.1 of this appendix in Btu/hr

FIGURE I

Heating Load Hours (HLH) for the United States and Territories



This map is reasonably accurate for most parts of the United States but is necessarily highly generalized and consequently not too accurate in mountainous regions, particularly in the Rockies

Alaska — 3500 HLH
Hawaii and Territories — 0 HLH

(Energy Policy and Conservation Act, Pub. L. 94–163, as amended by Pub. L. 94–385; Federal Energy Administration Act of 1974, Pub. L. 93–275, as amended by Pub. L. 94–385; Department of Energy Organization Act, Pub. L. 95–91; E.O. 11790, 39 FR 23185)

[43 FR 20132, May 10, 1978. Redesignated and amended at 44 FR 37938, June 29, 1979; 49 FR 12157, Mar. 28, 1984]

APPENDIX H TO SUBPART B OF PART 430—UNIFORM TEST METHOD FOR MEASURING THE ENERGY CONSUMPTION OF TELEVISION SETS

1. DEFINITIONS

1.1 ''IRE-unit flat field'' means a specific video electrical signal which results in a particular level of brightness of the television screen as established by the Institute of Radio Engineers.

1.2 ''Filament keep-warm'' means a feature that provides a voltage to keep vacuum tube and/or picture tube filaments warm for the purpose of allowing almost instantaneous response to the power control swtich.

1.3 ''Operating time'' (t_o) means the hours per year during which the television set is operating with power control turned on.

1.4 ''Remote control'' means an optional feature which allows the user to control the

television set from more than one location by a hand held device.

1.5 ''Standby power consumption'' (P_s) means the minimum amount of energy consumed with the power control switch turned off.

1.6 ''Standby time'' (t_s) means the hours per year during which the television set is connected to a power outlet with the power control switch turned off.

1.7 ''Vacation switch or master on-off switch'' means an optional energy saving feature incorporated into the design of a television set that permits the user to disconnect the filament keep-warm circuit(s).

1.8 ''Remote control defeat switch'' means a switch which permits the user to disconnect all standby power to a television set.

2. TESTING CONDITIONS AND MEASUREMENTS

2.1 *Test equipment and test signals.* The following equipment and test signals shall be used for testing of television sets.

2.1.1 Regulated power source capable of supplying 120 volts (±1.2 volts) alternating current.

2.1.2 Signal generator capable of producing radio frequency (RF) television test signals, at a convenient very high frequency (VHF) channel, modulated with, National Television System Committee composite video as follows:

2.1.2.1 Standard White Pattern, RF signal modulated to 87 percent with a 100 IRE-unit flat field.

2.1.2.2 Standard Black Pattern, all adjustments as for 2.1.2.1 except modulated with a zero IRE-unit flat field.

2.1.2.3 The test signals in 2.1.2.1 and 2.1.2.2, supplied by a source whose impedance equals the design antenna impedance of the television set under test, shall be adjusted to a level of 70 decibels (dB) ±3dB, referred to a zero dB level of one femtowatt (1×10^{-15} watt) available power. (For a 300 ohm source, 70 dB referred to one femtowatt corresponds to an open-circuit voltage of 3.5 millivolts. For the calculation of ''available power'' use American National Standard C.16.13–1961, Method of Testing Monochrome Television Broadcast Receivers.)

2.1.3 Wattmeter capable of measuring the average power consumption of the television set under test. The wattmeter shall be accurate to within 1 percent of the full scale value. All measurements shall be made on the upper half of the scale of the wattmeter.

2.2 *Initial set-up of television set.*

2.2.1 Remove all batteries from television sets designed for both battery and alternating current operation. Deactivate all present or automatic controls affecting brightness which are customer options. Adjust all non-customer controls according to the manufacturer's service procedure.

2.2.2 Apply power to the television set under test from the power source specified in 2.1.1 through the wattmeter specified in 2.1.3. Adjust the volume control to the lowest possible setting.

2.2.3 Connect the output of the signal generator as specified in 2.1.2 to the VHF antenna terminals of the television set. Tune the television set to the channel of the RF signal.

2.3 *Measurement of operating power consumption (P_o)*

2.3.1 Turn on the television set and allow at least five minutes warm-up time. With the synchronization controls adjusted for a stable test pattern, apply the standard white pattern specified in 2.1.2.1 to the television set. Adjust any customer controls other than the volume or synchronization controls for maximum power consumption as indicated by the wattmeter specified in 2.1.3. Illuminate any room illuminance sensor which has not been deactivated, to produce maximum power consumption. Record the white pattern consumption (P_w) as indicated by the wattmeter in watts.

2.3.2 Change the signal source to the standard black pattern specified in 2.1.2.2. Adjust any customer controls, other than the volume or synchronization controls, for the minimum power consumption as indicated by the wattmeter. Cover any room illuminance sensor which has not been deactivated. Record the black pattern power consumption (P_b) as indicated by the wattmeter in watts.

2.3.3 Compute the operating power consumption (p_o) as follows:

$$P_o=(P_w+P_b/2)$$

where

P_o=operating power consumption in watts
P_w=as determined from 2.3.1
P_b=as determined from 2.3.2

2.2 *Measurements of standby power consumption (P_s)*

2.4.1 For television sets without either a vacation switch or a remote control defeat switch, turn the power switch off and after two minutes measure the standby power consumption (P).

2.4.2 For a television set equipped with a remote control defeat switch, a vacation switch or both, turn the power switch, any vacation switch, and any remote er consumptions, (P_{max}).The standby power is then calculated from the equation:

$$P_s=[(P_{max}-P_{min})/2]+P_{min}$$

where

P_s=standby power consumption in watts
P_{max}=power consumption, in watts, measured with the television set power switch off and the vacation switch and remote control defeat switch in the highest energy consuming position.
P_{min}=power consumption, in watts, measured with the television set power switch off and the vacation switch and

remote control defeat switch in the lowest energy consuming position.

3.0 *Average Annual Energy Consumption*

$$E=(P_o t_o/1{,}000)+(P_s t_s/1{,}000)=2.2P_o+6.56P_s$$

where

E=total average energy consumed by the television set (kilowatt-hour per year)
P_o=operating power consumption as computed in 2.3.3
t_o=operating time, 2,200 h/yr
P_s=standby power consumption computed in 2.4
t_s=standby time, 6,560 h/yr

[42 FR 46154, Sept. 14, 1977. Redesignated and amended at 44 FR 37938, June 29, 1979]

APPENDIX I TO SUBPART B OF PART 430—UNIFORM TEST METHOD FOR MEASURING THE ENERGY CONSUMPTION OF CONVENTIONAL RANGES, CONVENTIONAL COOKING TOPS, CONVENTIONAL OVENS, AND MICROWAVE OVENS

1. Definitions

1.1 *Built-in* means the product is supported by surrounding cabinetry, walls, or other similar structures.

1.2 *Drop-in* means the product is supported by horizontal surface cabinetry.

1.3 *Forced convection* means a mode of conventional oven operation in which a fan is used to circulate the heated air within the oven compartment during cooking.

1.4 *Freestanding* means the product is not supported by surrounding cabinetry, walls, or other similar structures.

1.5 *IEC 705* refers to the test standard published by the International Electrotechnical Commission, entitled ''Method for Measuring the Performance of Microwave Ovens for Household and Similar Purposes,'' Publication 705–1988 and Amendment 2—1993. (See 10 CFR 430.22)

1.6 *Normal nonoperating temperature* means the temperature of all areas of an appliance to be tested are within 5°F (2.8°C) of the temperature that the identical areas of the same basic model of the appliance would attain if it remained in the test room for 24 hours while not operating with all oven doors closed and with any gas pilot lights on and adjusted in accordance with manufacturer's instructions.

1.7 *Primary energy consumption* means either the electrical energy consumption of a conventional electric oven or the gas energy consumption of a conventional gas oven.

1.8 *Secondary energy consumption* means any electrical energy consumption, other than clock energy consumption, of a conventional gas oven.

1.9 *Standard cubic foot (L) of gas* means that quantity of gas that occupies 1 cubic foot (L) when saturated with water vapor at a temperature of 60°F (15.6°C) and a pressure of 30 inches of mercury (101.6 kPa) (density of mercury equals 13.595 grams per cubic centimeter).

1.10 *Thermocouple* means a device consisting of two dissimilar metals which are joined together and, with their associated wires, are used to measure temperature by means of electromotive force.

1.11 *Symbol Usage.* The following identity relationships are provided to help clarify the symbology used throughout this procedure.

A—Number of Hours in a Year
B—Number of Hours Pilot Light Contributes to Cooking
C—Specific Heat
E—Energy Consumed
Eff—Cooking Efficiency
H—Heating Value of Gas
K—Conversion for Watt-hours to Kilowatt hours
K_e—3.412 Btu/Wh, Conversion for Watt-hours to Btu's
M—Mass
n—Number of Units
O—Annual Useful Cooking Energy Output
P—Power
Q—Gas Flow Rate
R—Energy Factor, Ratio of useful Cooking Energy Output to Total Energy Input
S—Number of Self Cleaning Operations per Year
T—Temperature
t—Time
V—Volume of Gas Consumed
W—Weight of Test Block

2. Test Conditions

2.1 *Installation.* A free standing kitchen range shall be installed with the back directly against, or as near as possible to, a vertical wall which extends at least 1 foot above and on either side of the appliance. There shall be no side walls. A drop-in, built-in or wall-mounted appliance shall be installed in an enclosure in accordance with the manufacturer's instructions. These appliances are to be completely assembled with all handles, knobs, guards and the like mounted in place. Any electric resistance heaters, gas burners, baking racks, and baffles shall be in place in accordance with the manufacturer's instructions; however, broiler pans are to be removed from the oven's baking compartment. Disconnect any electrical clock which uses energy continuously, except for those that are an integral part of the timing or temperature controlling circuit of the oven, cooktop, or microwave oven. Do not disconnect or modify the circuit to any other electrical devices or features.

2.1.1 *Conventional electric ranges, ovens, and cooking tops.* These products shall be connected to an electrical supply circuit with

voltage as specified in Section 2.2.1 with a watt-hour meter installed in the circuit. The watt-hour meter shall be as described in Section 2.9.1.1.

2.1.2 *Conventional gas ranges, ovens, and cooking tops.* These products shall be connected to a gas supply line with a gas meter installed between the supply line and the appliance being tested, according to manufacturer's specifications. The gas meter shall be as described in Section 2.9.2. Conventional gas ranges, ovens and cooking tops with electrical ignition devices or other electrical components shall be connected to an electrical supply circuit of nameplate voltage with a watt-hour meter installed in the circuit. The watt-hour meter shall be as described in Section 2.9.1.1.

2.1.3 *Microwave ovens.* Install the microwave oven in accordance with the manufacturer's instructions and connect to an electrical supply circuit with voltage as specified in Section 2.2.1. A watt-hour meter and watt meter shall be installed in the circuit and shall be as described in Section 2.9.1.1 and 2.9.1.2. If trial runs are needed to set the ''on'' time for the test, the test measurements are to be separated according to Section 4, Paragraph 12.6 of IEC 705 Amendment 2. (See 10 CFR 430.22)

2.2 *Energy supply.*

2.2.1 *Electrical supply.* Maintain the electrical supply to the conventional range, conventional cooking top, and conventional oven being tested at 240/120 volts except that basic models rated only at 208/120 volts shall be tested at that rating. Maintain the voltage within 2 percent of the above specified voltages. For the microwave oven testing, however, maintain the electrical supply to a microwave oven at 120 volts ±1 volt and at 60 hertz.

2.2.2 *Gas supply.*

2.2.2.1 *Gas burner adjustments.* Conventional gas ranges, ovens, and cooking tops shall be tested with all of the gas burners adjusted in accordance with the installation or operation instructions provided by the manufacturer. In every case, the burner must be adjusted with sufficient air flow to prevent a yellow flame or a flame with yellow tips.

2.2.2.2 *Natural gas.* For testing convertible cooking appliances or appliances which are designed to operate using only natural gas, maintain the natural gas pressure immediately ahead of all controls of the unit under test at 7 to 10 inches of water column (1743.6 to 2490.8 Pa). The regulator outlet pressure shall equal the manufacturer's recommendation. The natural gas supplied should have a heating value of approximately 1,025 Btu's per standard cubic foot (38.2 kJ/L). The actual gross heating value, H_n, in Btu's per standard cubic foot (kJ/L), for the natural gas to be used in the test shall be obtained either from measurements made by the manufacturer conducting the test using equipment that meets the requirements described in Section 2.9.4 or by the use of bottled natural gas whose gross heating value is certified to be at least as accurate a value that meets the requirements in Section 2.9.4.

2.2.2.3 *Propane.* For testing convertible cooking appliances with propane or for testing appliances which are designed to operate using only LP-gas, maintain the propane pressure immediately ahead of all controls of the unit under test at 11 to 13 inches of water column (2740 to 3238 Pa). The regulator outlet pressure shall equal the manufacturer's recommendation. The propane supplied should have a heating value of approximately 2,500 Btu's per standard cubic foot (93.2 kJ/L). The actual gross heating value, H_p, in Btu's per standard cubic foot (kJ/L), for the propane to be used in the test shall be obtained either from measurements made by the manufacturer conducting the test using equipment that meets the requirements described in Section 2.9.4 or by the use of bottled propane whose gross heating value is certified to be at least as accurate a value that meets the requirements described in Section 2.9.4.

2.2.2.4 *Test gas.* A basic model of a convertible cooking appliance shall be tested with natural gas, but may also be tested with propane. Any basic model of a conventional range, conventional cooking top, or conventional oven which is designed to operate using only natural gas as the energy source must be tested with natural gas. Any basic model of a conventional range, conventional cooking top, or conventional oven which is designed to operate using only LP gas as the gas energy source must be tested with propane gas.

2.3 *Air circulation.* Maintain air circulation in the room sufficient to secure a reasonably uniform temperature distribution, but do not cause a direct draft on the unit under test.

2.4 *Setting the conventional oven thermostat.*

2.4.1 *Conventional electric oven.* Install a thermocouple approximately in the center of the usable baking space. Provide a temperature indicator system for measuring the oven's temperature with an accuracy as indicated in Section 2.9.3.2. If the oven thermostat does not cycle on and off, adjust or determine the conventional electric oven thermostat setting to provide an average internal temperature which is 325°±5°F (180.6° ±2.8°C) higher than the room ambient air temperature. If the oven thermostat operates by cycling on and off, adjust or determine the conventional electric oven thermostat setting to provide an average internal temperature which is 325°±5°F (180.6°±2.8°C) higher than the room ambient air temperature. This shall be done by measuring the maximum and minimum temperatures in any three consecutive cut-off/cut-on actions

of the electric resistance heaters, excluding the initial cut-off/cut-on action, by the thermostat after the temperature rise of 325°±5°F (180.6° ±2.8°C) has been attained by the conventional electric oven. Remove the thermocouple after the thermostat has been set.

2.4.2 *Conventional gas oven.* Install five parallel-connected weighted thermocouples, one located at the center of the conventional gas oven's usable baking space and the other four equally spaced between the center and the corners of the conventional gas oven on the diagonals of a horizontal plane through the center of the conventional gas oven. Each weighted thermocouple shall be constructed of a copper disc that is 1-inch (25.4 mm) in diameter and ⅛-inch (3.2 mm) thick. The two thermocouple wires shall be located in two holes in the disc spaced ½-inch (12.7 mm) apart, with each hole being located ¼-inch (6.4 mm) from the center of the disc. Both thermocouple wires shall be silver-soldered to the copper disc. Provide a temperature indicator system for measuring the oven's temperature with an accuracy as indicated in Section 2.9.3.2. If the oven thermostat does not cycle on or off, adjust or determine the conventional gas oven thermostat setting to provide an average internal temperature which is 325°±5°F (180.6°±2.8°C) higher than the room ambient air temperature. If the oven thermostat operates by cycling on and off, adjust or determine the conventional gas oven thermostat setting to provide an average internal temperature which is 325°±5°F (180.6±2.8°C) higher than the room ambient air temperature. This shall be done by measuring the maximum and minimum temperatures in any three consecutive cut-off/cut-on actions of the gas burners, excluding the initial cut-off/cut-on action, by the thermostat after the temperature rise of 325°±5°F (180.6°±2.8°C) has been attained by the conventional gas oven. Remove the thermocouples after the thermostat has been set.

2.5 *Ambient room air temperature.* During the test, maintain an ambient room air temperature, T_R, of 77°±9°F (25°±5°C) for conventional ovens and cooking tops, or as indicated in Section 4, Paragraph 12.4 of IEC 705 Amendment 2 for microwave ovens, as measured at least 5 feet (1.5 m) and not more than 8 feet (2.4 m) from the nearest surface of the unit under test and approximately 3 feet (0.9 m) above the floor. The temperature shall be measured with a thermometer or temperature indicating system with an accuracy as specified in Section 2.9.3.1.

2.6 *Normal nonoperating temperature.* All areas of the appliance to be tested shall attain the normal nonoperating temperature, as defined in Section 1.6, before any testing begins. The equipment for measuring the applicable normal nonoperating temperature shall be as described in Sections 2.9.3.1, 2.9.3.2, 2.9.3.3, 2.9.3.4, and 2.9.3.5, as applicable.

2.7 *Test blocks for conventional oven and cooking top.* The test blocks shall be made of aluminum alloy No. 6061, with a specific heat of 0.23 Btu/lb- °F (0.96 kJ/[kg÷ °C]) and with any temper that will give a czoefficient of thermal conductivity of 1073.3 to 1189.1 Btu-in/h-ft²- °F (154.8 to 171.5 W/[m÷ °C]). Each block shall have a hole at its top. The hole shall be 0.08 inch (2.03 mm) in diameter and 0.80 inch (20.3 mm) deep. The manufacturer conducting the test may provide other means which will ensure that the thermocouple junction is installed at this same position and depth.

The bottom of each block shall be flat to within 0.002 inch (0.051 mm) TIR (total indicator reading). Determine the actual weight of each test block with a scale with an accuracy as indicated in Section 2.9.5.

2.7.1 *Conventional oven test block.* The test block for the conventional oven, W_1, shall be 6.25±0.05 inches (158.8±1.3 mm) in diameter, approximately 2.8 inches (71 mm) high and shall weigh 8.5±0.1 lbs (3.86±0.05 kg). The block shall be finished with an anodic black coating which has a minimum thickness of 0.001 inch (0.025 mm) or with a finish having the equivalent absorptivity.

2.7.2 *Small test block for conventional cooking top.* The small test block, W_2, shall be 6.25±0.05 inches (158.8±1.3 mm) in diameter, approximately 2.8 inches (71 mm) high and shall weigh 8.5±0.1 lbs (3.86±0.05 kg).

2.7.3 *Large test block for conventional cooking top.* The large test block for the conventional cooking top, W_3, shall be 9±0.05 inches (228.6±1.3 mm) in diameter, approximately 3.0 inches (76 mm) high and shall weigh 19±0.1 lbs (8.62±0.05 kg).

2.7.4 *Thermocouple installation.* Install the thermocouple such that the thermocouple junction (where the thermocouple contacts the test block) is at the bottom of the hole provided in the test block and that the thermocouple junction makes good thermal contact with the aluminum block. If the test blocks are to be water cooled between tests the thermocouple hole should be sealed, or other steps taken, to insure that the thermocouple hole is completely dry at the start of the next test. Provide a temperature indicator system for measuring the test block temperature with an accuracy as indicated in Section 2.9.3.3.

2.7.5 *Initial test block temperature.* Maintain the initial temperature of the test blocks, T_I, within ±4°F (±2.2°C) of the ambient room air temperature as specified in Section 2.5. If the test block has been cooled (or heated) to bring it to room temperature, allow the block to stabilize for at least 2 minutes after removal from the cooling (or heating) source, before measuring its initial temperature.

2.8 *Microwave oven test load.*

2.8.1 *Test container.* The test container shall be as specified in Section 4, Paragraph 12.2 of IEC 705 Amendment 2.

2.8.2 *Test water load.* The test water load shall be as specified in Section 4, Paragraph 12.1 of IEC 705 Amendment 2.

2.8.2.1 *Test water load and test container temperature.* Before the start of the test, the oven and the test container shall be at ambient temperature as specified in Section 4, Paragraph 12.4 of IEC 705 Amendment 2. The test water load shall be contained in a chiller (not the test container) and maintained at 18° ± 1.8°F (10° ± 1°C) below the ambient room temperature.

2.9 *Instrumentation.* Perform all test measurements using the following instruments, as appropriate:

2.9.1 *Electrical Measurements.*

2.9.1.1 *Watt-hour meter.* The watt-hour meter for measuring the electrical energy consumption of conventional ovens and cooking tops shall have a resolution of 1 watt-hour (3.6 kJ) or less and a maximum error no greater than 1.5 percent of the measured value for any demand greater than 100 watts. The watt-hour meter for measuring the energy consumption of microwave ovens shall have a resolution of 0.1 watt-hour (0.36 kJ) or less and a maximum error no greater than 1.5 percent of the measured value.

2.9.1.2 *Watt meter.* The watt meter used to measure the conventional oven, conventional range, range clock power or the power input of the microwave oven shall have a resolution of 0.2 watt (0.2 J/s) or less and a maximum error no greater than 5 percent of the measured value.

2.9.2 *Gas Measurements.*

2.9.2.1 *Positive displacement meters.* The gas meter to be used for measuring the gas consumed by the gas burners of the oven or cooking top shall have a resolution of 0.01 cubic foot (0.28 L) or less and a maximum error no greater than 1 percent of the measured value for any demand greater than 2.2 cubic feet per hour (62.3 L/h). If a positive displacement gas meter is used for measuring the gas consumed by the pilot lights, it shall have a resolution of at least 0.01 cubic foot (0.28 L) or less and have a maximum error no greater than 2 percent of the measured value.

2.9.2.2 *Flow meter.* If a gas flow meter is used for measuring the gas consumed by the pilot lights, it shall be calibrated to have a maximum error no greater than 1.5 percent of the measured value and a resolution of 1 percent or less of the measured value.

2.9.3 *Temperature measurement equipment.*

2.9.3.1 *Room temperature indicating system.* The room temperature indicating system shall be as specified in Section 4, Paragraph 12.3 of IEC 705 Amendment 2 for microwave ovens and Section 2.9.3.5 for ranges, ovens and cooktops.

2.9.3.2 *Temperature indicator system for measuring conventional oven temperature.* The equipment for measuring the conventional oven temperature shall have an error no greater than ±4°F (±2.2°C) over the range of 65° to 500°F (18°C to 260°C).

2.9.3.3 *Temperature indicator system for measuring test block temperature.* The system shall have an error no greater than ±2°F (±1.1°C) when measuring specific temperatures over the range of 65° to 330°F (18.3°C to 165.6°C). It shall also have an error no greater than ±2°F (±1.1°C) when measuring any temperature difference up to 240°F (133.3 °C) within the above range.

2.9.3.4 *Test load temperatures.* The thermometer or other temperature measuring instrument used to measure the test water load temperature shall be as specified in Section 4, Paragraph 12.3 of IEC 705 Amendment 2. Use only one thermometer or other temperature measuring device throughout the entire test procedure.

2.9.3.5 *Temperature indicator system for measuring surface temperatures.* The temperature of any surface of an appliance shall be measured by means of a thermocouple in firm contact with the surface. The temperature indicating system shall have an error no greater than ±1°F (±0.6°C) over the range 65° to 90°F (18°C to 32°C).

2.9.4 *Heating Value.* The heating value of the natural gas or propane shall be measured with an instrument and associated readout device that has a maximum error no greater than ±0.5% of the measured value and a resolution of ±0.2% or less of the full scale reading of the indicator instrument. The heating value of natural gas or propane must be corrected for local temperature and pressure conditions.

2.9.5 *Scale.* The scale used for weighing the test blocks shall have a maximum error no greater than 1 ounce (28.4 g). The scale used for weighing the microwave oven test water load shall be as specified in Section 4, paragraph 12.3 of IEC 705 Amendment 2.

3. Test Methods and Measurements

3.1 *Test methods.*

3.1.1 *Conventional oven.* Perform a test by establishing the testing conditions set forth in Section 2, ''TEST CONDITIONS,'' of this Appendix, and adjust any pilot lights of a conventional gas oven in accordance with the manufacturer's instructions and turn off the gas flow to the conventional cooking top, if so equipped. Before beginning the test, the conventional oven shall be at its normal nonoperating temperature as defined in Section 1.6 and described in Section 2.6. Set the conventional oven test block W_1 approximately in the center of the usable baking space. If there is a selector switch for selecting the mode of operation of the oven, set it for normal baking. If an oven permits baking

by either forced convection by using a fan, or without forced convection, the oven is to be tested in each of those two modes. The oven shall remain on for at least one complete thermostat ''cut-off/cut-on'' of the electrical resistance heaters or gas burners after the test block temperature has increased 234°F (130°C) above its initial temperature.

3.1.1.1 *Self-cleaning operation of a conventional oven.* Establish the test conditions set forth in Section 2, ''TEST CONDITIONS,'' of this Appendix. Adjust any pilot lights of a conventional gas oven in accordance with the manufacturer's instructions and turn off the gas flow to the conventional cooking top. The temperature of the conventional oven shall be its normal nonoperating temperature as defined in Section 1.6 and described in Section 2.6. Then set the conventional oven's self-cleaning process in accordance with the manufacturer's instructions. If the self-cleaning process is adjustable, use the average time recommended by the manufacturer for a moderately soiled oven.

3.1.1.2 *Continuously burning pilot lights of a conventional gas oven.* Establish the test conditions set forth in Section 2, ''TEST CONDITIONS,'' of this Appendix. Adjust any pilot lights of a conventional gas oven in accordance with the manufacturer's instructions and turn off the gas flow to the conventional cooking top. If a positive displacement gas meter is used the, test duration shall be sufficient to measure a gas consumption which is at least 200 times the resolution of the gas meter.

3.1.2 *Conventional cooking top.* Establish the test conditions set forth in Section 2, ''TEST CONDITIONS,'' of this Appendix. Adjust any pilot lights of a conventional gas cooking top in accordance with the manufacturer's instructions and turn off the gas flow to the conventional oven(s), if so equipped. The temperature of the conventional cooking top shall be its normal nonoperating temperature as defined in Section 1.6 and described in Section 2.6. Set the test block in the center of the surface unit under test. The small test block, W_2, shall be used on electric surface units of 7 inches (178 mm) or less in diameter. The large test block, W_3, shall be used on electric surface units over 7 inches (177.8 mm) in diameter and on all gas surface units. Turn on the surface unit under test and set its energy input rate to the maximum setting. When the test block reaches 144 °F (80 °C) above its initial test block temperature, immediately reduce the energy input rate to 25±5 percent of the maximum energy input rate. After 15±0.1 minutes at the reduced energy setting, turn off the surface unit under test.

3.1.2.1 *Continuously burning pilot lights of a conventional gas cooking top.* Establish the test conditions set forth in Section 2, ''TEST CONDITIONS,'' of this Appendix. Adjust any pilot lights of a conventional gas cooking top in accordance with the manufacturer's instructions and turn off the gas flow to the conventional oven(s). If a positive displacement gas meter is used, the test duration shall be sufficient to measure a gas consumption which is at least 200 times the resolution of the gas meter.

3.1.3 *Microwave oven.*

3.1.3.1 *Microwave oven test energy or power output.* Establish the testing conditions set forth in Section 2, ''TEST CONDITIONS,'' of this Appendix. Follow the test procedure as specified in Section 4, Paragraph 12.4 of IEC 705 Amendment 2.

3.2 *Test measurements.*

3.2.1 *Conventional oven test energy consumption.* If the oven thermostat controls the oven temperature without cycling on and off, measure the energy consumed, E_O, when the temperature of the block reaches T_O (T_O is 234 °F (130 °C) above the initial block temperature, T_I). If the oven thermostat operates by cycling on and off, make the following series of measurements: Measure the block temperature, T_A, and the energy consumed, E_A, or volume of gas consumed, V_A, at the end of the last ''ON'' period of the conventional oven before the block reaches T_O. Measure the block temperature, T_B, and the energy consumed, E_B, or volume of gas consumed, V_B, at the beginning of the next ''ON'' period. Measure the block temperature, T_C, and the energy consumed, E_C, or volume of gas consumed, V_C, at the end of that ''ON'' period. Measure the block temperature, T_D, and the energy consumed, E_D, or volume of gas consumed, V_D, at the beginning of the following ''ON'' period. Energy measurements for E_O, E_A, E_B, E_C and E_D, should be expressed in watt-hours (kJ) for conventional electric ovens and volume measurements for V_A, V_B, V_C and V_D should be expressed in standard cubic feet (L) of gas for conventional gas ovens. For a gas oven, measure in watt-hours (kJ) any electrical energy, E_{IO}, consumed by an ignition device or other electrical components required for the operation of a conventional gas oven while heating the test block to T_O. The energy consumed by a continuously operating clock that is an integral part of the timing or temperature control circuit and cannot be disconnected during the test may be subtracted from the oven test energy to obtain the test energy consumption, E_O or E_{IO}.

3.2.1.1 *Conventional oven average test energy consumption.* If the conventional oven permits baking by either forced convection or without forced convection and the oven thermostat does not cycle on and off, measure the energy consumed with the forced convection mode, $(E_O)_1$, and without the forced convection mode, $(E_O)_2$, when the temperature of the block reaches T_O (T_O is 234 °F (130 °C) above the initial block temperature, T_I). If the conventional oven permits baking by either forced convection or without forced

convection and the oven thermostat operates by cycling on and off, make the following series of measurements with and without the forced convection mode: Measure the block temperature, T_A, and the energy consumed, E_A, or volume of gas consumed, V_A, at the end of the last ''ON'' period of the conventional oven before the block reaches T_O. Measure the block temperature, T_B, and the energy consumed, E_B, or volume of gas consumed, V_B, at the beginning of the next ''ON'' period. Measure the block temperature, T_C, and the energy consumed, E_C, or volume of gas consumed, V_C, at the end of that ''ON'' period. Measure the block temperature, T_D, and the energy consumed, E_D, or volume of gas consumed, V_D, at the beginning of the following ''ON'' period. Energy measurements for E_O, E_A, E_B, E_C and E_D should be expressed in watt-hours (kJ) for conventional electric ovens and volume measurements for V_A, V_B, V_C and V_D should be expressed in standard cubic feet (L) of gas for conventional gas ovens. For a gas oven that can be operated with or without forced convection, measure in watt-hours (kJ) any electrical energy consumed by an ignition device or other electrical components required for the operation of a conventional gas oven while heating the test block to T_O using the forced convection mode, $(E_{IO})_1$, and without using the forced convection mode, $(E_{IO})_2$. The energy consumed by a continuously operating clock that is an integral part of the timing or temperature control circuit and cannot be disconnected during the test may be subtracted from the oven test energy to obtain the test energy consumption, $(E_O)_1$ and $(E_O)_2$ or $(E_{IO})_1$ and $(E_{IO})_2$.

3.2.1.2 *Energy consumption of self-cleaning operation.* Measure the energy consumption, E_S, in watt-hours (kJ) of electricity or the volume of gas consumption, V_S, in standard cubic feet (L) during the self-cleaning test set forth in Section 3.1.1.1. For a gas oven, also measure in watt-hours (kJ) any electrical energy, E_{IS}, consumed by ignition devices or other electrical components required during the self-cleaning test. The energy consumed by a continuously operating clock that is an integral part of the timing or temperature control circuit and cannot be disconnected during the test may be subtracted from the self-cleaning test energy to obtain the energy consumption, E_S or E_{IS}

3.2.1.3 *Gas consumption of continuously burning pilot lights.* Measure the gas consumption of the pilot lights, V_{OP}, in standard cubic feet (L) of gas and the test duration, t_{OP}, in hours for the test set forth in Section 3.1.1.2. If a gas flow rate meter is used, measure the flow rate, Q_{OP}, in standard cubic feet per hour (L/h).

3.2.1.4 *Clock power.* If the conventional oven or conventional range includes an electric clock which is on continuously, and the power rating in watts (J/s) of this feature is not known, measure the clock power, P_{CL}, in watts (J/s.) The power rating or measurement of continuously operating clocks, that are an integral part of the timing or temperature control circuits and cannot be disconnected during testing, shall be multiplied by the applicable test period to calculate the clock energy consumption, in watt-hours (kJ), during a test. The energy consumed by the clock during the test may then be subtracted from the test energy to obtain the specified test energy consumption value.

3.2.2 *Conventional surface unit test energy consumption.* For the surface unit under test, measure the energy consumption, E_{CT}, in watt-hours (kJ) of electricity or the volume of gas consumption, V_{CT}, in standard cubic feet (L) of gas and the test block temperature, T_{CT}, at the end of the 15 minute (reduced input setting) test interval for the test specified in Section 3.1.2 and the total time, t_{CT}, in hours, that the unit is under test. Measure any electrical energy, E_{IC}, consumed by an ignition device of a gas heating element in watt-hours (kJ). The energy consumed by a continuously operating clock that is an integral part of the timing or temperature control circuit and cannot be disconnected during the test may be subtracted from the cooktop test energy to obtain the test energy consumption, E_{CT} or E_{IC}.

3.2.2.1 *Gas consumption of continuously burning pilot lights.* If the conventional gas cooking top under test has one or more continuously burning pilot lights, measure the gas consumed during the test by the pilot lights, V_{CP}, in standard cubic feet (L) of gas, and the test duration, t_{CP}, in hours as specified in Section 3.1.2.1. If a gas flow rate meter is used, measure the flow rate, Q_{CP}, in standard cubic feet per hour (L/h).

3.2.3 *Microwave oven test energy consumption and power input.* Measurements are to be made as specified in Section 4, Paragraphs 12.4 and 13 of IEC 705 and Amendment 2. Measure the electrical input energy, E_M, in watt-hours (kJ) consumed by the microwave oven during the test. Repeat the tests three times unless the power output value resulting from the second measurement is within 1.5% of the value obtained from the first measurement as stated in Section 4, Paragraphs 12.6 of IEC 705 Amendment 2. (See 10 CFR 430.22.)

3.3 *Recorded values.*

3.3.1 Record the test room temperature, T_R, at the start and end of each range, oven or cooktop test, as determined in Section 2.5.

3.3.2 Record measured test block weights W_1, W_2, and W_3 in pounds (kg).

3.3.3 Record the initial temperature, T_1, of the test block under test.

3.3.4 For a conventional oven with a thermostat which operates by cycling on and off, record the conventional oven test measurements T_A, E_A, T_B, E_B, T_C, E_C, T_D, and E_D for conventional electric ovens or T_A, V_A, T_B,

V_B, T_C, V_C, T_D, and V_D for conventional gas ovens. If the thermostat controls the oven temperature without cycling on and off, record E_O. For a gas oven which also uses electrical energy for the ignition or operation of the oven, also record E_{IO}.

3.3.5 For a conventional oven that can be operated with or without forced convection and the oven thermostat controls the oven temperature without cycling on and off, measure the energy consumed with the forced convection mode, $(E_O)_1$, and without the forced convection mode, $(E_O)_2$. If the conventional oven operates with or without forced convection and the thermostat controls the oven temperature by cycling on and off, record the conventional oven test measurements T_A, E_A, T_B, E_B, T_C, E_C, T_D, and E_D for conventional electric ovens or T_A, V_A, T_B, V_B, T_C, V_C, T_D, and V_D for conventional gas ovens. For a gas oven that can be operated with or without forced convection, measure any electrical energy consumed by an ignition device or other electrical components used during the forced convection mode, $(E_{IO})_1$, and without using the forced convection mode, $(E_{IO})_2$.

3.3.6 Record the measured energy consumption, E_S, or gas consumption, V_S, and for a gas oven, any electrical energy, E_{IS}, for the test of the self-cleaning operation of a conventional oven.

3.3.7 Record the gas flow rate, Q_{OP}; or the gas consumption, V_{OP}, and the elapsed time, t_{OP}, that any continuously burning pilot lights of a conventional oven are under test.

3.3.8 Record the clock power measurement or rating, P_{CL}, in watts (J/s), except for microwave oven tests.

3.3.9 For the surface unit under test, record the electric energy consumption, E_{CT}, or the gas volume consumption, V_{CT}, the final test block temperature, T_{CT}, the total test time, t_{CT}. For a gas cooking top which uses electrical energy for ignition of the burners, also record E_{IC}.

3.3.10 Record the gas flow rate, Q_{CP}; or the gas consumption, V_{CP}, and the elapsed time, t_{CP}, that any continuously burning pilot lights of a conventional gas cooking top are under test.

3.3.11 Record the heating value, H_n, as determined in Section 2.2.2.2 for the natural gas supply.

3.3.12 Record the heating value, H_p, as determined in Section 2.2.2.3 for the propane supply.

3.3.13 Record the electrical input energy and power input, E_M and P_M, for the microwave oven test; the initial and final temperature, T_1 and T_2, of the test water load; the mass of the test container before filling with the test water load and the mass of the test water load, M_C and M_W respectively; and the measured room temperature, T_0; as determined in Section 3.2.3.

4. Calculation of Derived Results From Test Measurements

4.1 *Conventional oven.*

4.1.1 *Test energy consumption.* For a conventional oven with a thermostat which operates by cycling on and off, calculate the test energy consumption, E_O, expressed in watt-hours (kJ) for electric ovens and in Btu's (kJ) for gas ovens, and defined as:

$$E_O = E_{AB} + \left[\left(\frac{T_O - T_{AB}}{T_{CD} - T_{AB}}\right) \times \left(E_{CD} - E_{AB}\right)\right]$$

for electric ovens, and,

$$E_O = \left(V_{AB} \times H\right) + \left[\left(\frac{T_O - T_{AB}}{T_{CD} - T_{AB}}\right) \times \left(V_{CD} - V_{AB}\right) \times H\right]$$

For gas ovens

Where:

H = either H_n or H_p, the heating value of the gas used in the test as specified in Section 2.2.2.2 and Section 2.2.2.3, expressed in Btu's per standard cubic foot (kJ/L).

T_O = 234°F (130°C) plus the initial test block temperature.

and,

$$E_{AB} = \frac{(E_A + E_B)}{2}, \quad E_{CD} = \frac{(E_C + E_D)}{2}$$

$$V_{AB} = \frac{(V_A + V_B)}{2}, \quad V_{CD} = \frac{(V_C + V_D)}{2}$$

$$T_{AB} = \frac{(T_A + T_B)}{2}, \quad T_{CD} = \frac{(T_C + T_D)}{2}$$

Where:

T_A = block temperature in °F (°C) at the end of the last ''ON'' period of the conventional oven before the test block reaches T_O.

T_B = block temperature in °F (°C) at the beginning of the ''ON'' period following the measurement of T_A.

T_C = block temperature in °F (°C) at the end of the ''ON'' period which starts with T_B.

T_D = block temperature in °F (°C) at the beginning of the ''ON'' period which follows the measurement of T_C.

E_A = electric energy consumed in Wh (kJ) at the end of the last ''ON'' period before the test block reaches T_O.

E_B = electric energy consumed in Wh (kJ) at the beginning of the ''ON'' period following the measurement of T_A.

E_C = electric energy consumed in Wh (kJ) at the end of the ''ON'' period which starts with T_B.

E_D = electric energy consumed in Wh (kJ) at the beginning of the ''ON'' period which follows the measurement of T_C.

V_A = volume of gas consumed in standard cubic feet (L) at the end of the last ''ON'' period before the test block reaches T_O.

V_B = volume of gas consumed in standard cubic feet (L) at the beginning of the ''ON'' period following the measurement of T_A.

V_C = volume of gas consumed in standard cubic feet (L) at the end of the ''ON'' period which starts with T_B.

V_D = volume of gas consumed in standard cubic feet (L) at the beginning of the ''ON'' period which follows the measurement of T_C.

The energy consumed by a continuously operating clock that cannot be disconnected during the test may be subtracted from the oven test energy to obtain the oven test energy consumption, E_O.

4.1.1.1 *Average test energy consumption.* If the conventional oven can be operated with or without forced convection, determine the average test energy consumption, E_O and E_{IO}, in watt-hours (kJ) for electric ovens and Btu's (kJ) for gas ovens using the following equations:

$$E_O = \frac{(E_O)_1 + (E_O)_2}{2}$$

$$E_{IO} = \frac{(E_{IO})_1 + (E_{IO})_2}{2}$$

Where:

$(E_O)_1$=test energy consumption using the forced convection mode in watt-hours (kJ) for electric ovens and in Btu's (kJ) for gas ovens as measured in Section 3.2.1.1.

$(E_O)_2$=test energy consumption without using the forced convection mode in watt-hours (kJ) for electric ovens and in Btu's (kJ) for gas ovens as measured in Section 3.2.1.1.

$(E_{IO})_1$=electrical energy consumption in watt-hours (kJ) of a gas oven in forced convection mode as measured in Section 3.2.1.1. $(E_{IO})_2$=electrical energy consumption in watt-hours (kJ) of a gas oven without using the forced convection mode as measured in Section 3.2.1.1.

The energy consumed by a continuously operating clock that cannot be disconnected during the test may be subtracted from the oven test energy to obtain the average test energy consumption E_O and E_{IO}.

4.1.2 *Conventional oven annual energy consumption.*

4.1.2.1. *Annual cooking energy consumption.*

4.1.2.1.1. *Annual primary energy consumption.* Calculate the annual primary energy consumption for cooking, E_{CO}, expressed in kilowatt-hours (kJ) per year for electric ovens and in Btu's (kJ) per year for gas ovens, and defined as:

$$E_{CO} = \frac{E_O \times K_e \times O_O}{W_l \times C_p \times T_S} \text{ for electric ovens,}$$

Where:

E_O=test energy consumption as measured in Section 3.2.1 or as calculated in Section 4.1.1 or Section 4.1.1.1.

K_e=3.412 Btu/Wh (3.6 kJ/Wh,) conversion factor of watt-hours to Btu's.

O_O=29.3 kWh (105,480 kJ) per year, annual useful cooking energy output of conventional electric oven.

W_l=measured weight of test block in pounds (kg).

C_p=0.23 Btu/lb-°F (0.96 kJ/kg ·°C), specific heat of test block.

T_S=234°F (130°C), temperature rise of test block.

$$E_{CO} = \frac{E_O \times O_O}{W_l \times C_p \times T_S} \text{ for gas ovens,}$$

Where:

E_O=test energy consumption as measured in Section 3.2.1. or as calculated in Section 4.1.1 or Section 4.1.1.1.

O_O=88.8 kBtu (93,684 kJ) per year, annual useful cooking energy output of conventional gas oven.

W_1, C_p and T_S are the same as defined above.

4.1.2.1.2 *Annual secondary energy consumption for cooking of gas ovens.* Calculate the annual secondary energy consumption for cooking, E_{SO}, expressed in kilowatt-hours (kJ) per year and defined as:

$$E_{SO} = \frac{E_{IO} \times K_e \times O_O}{W_l \times C_p \times T_S},$$

Where:

E_{IO}=electrical test energy consumption as measured in Section 3.2.1 or as calculated in Section 4.1.1.1.

O_O=29.3 kWh (105,480 kJ) per year, annual useful cooking energy output.

K_e, W_1, C_p, and T_S are as defined in Section 4.1.2.1.1.

4.1.2.2 *Annual energy consumption of any continuously burning pilot lights.* Calculate the annual energy consumption of any continuously burning pilot lights, E_{PO}, expressed in Btu's (kJ) per year and defined as:

$$E_{PO}=Q_{OP}\times H\times(A-B),$$

or,

$$E_{PO} = \frac{V_{OP}}{t_{OP}} \times H \times (A-B)$$

Where:

Q_{OP}=pilot gas flow rate in standard cubic feet per hour (L/h), as measured in Section 3.2.1.3.

V_{OP}=standard cubic feet (L) of gas consumed by any continuously burning pilot lights, as measured in Section 3.2.1.3.

t_{OP}=elapsed test time in hours for any continuously burning pilot lights tested, as measured in Section 3.2.1.3.

$H=H_n$ or H_p, the heating value of the gas used in the test as specified in Section 2.2.2.2 and Section 2.2.2.3 in Btu's per standard cubic foot (kJ/L).

A=8,760, number of hours in a year.

B=300, number of hours per year any continuously burning pilot lights contribute to the heating of an oven for cooking food.

4.1.2.3 *Annual conventional oven self-cleaning energy.*

4.1.2.3.1 *Annual primary energy consumption.* Calculate the annual primary energy consumption for conventional oven self-cleaning operations, E_{SC}, expressed in kilowatt-hours (kJ) per year for electric ovens and in Btu's (kJ) for gas ovens, and defined as:

$E_{SC}=E_S\times S_e\times K$, for electric ovens,

Where:

E_S=energy consumption in watt-hours, as measured in Section 3.2.1.2.

S_e=4, average number of times a self-cleaning operation of a conventional electric oven is used per year.

K=0.001 kWh/Wh conversion factor for watt-hours to kilowatt-hours.

or

$E_{SC}=V_S\times H\times S_g$, for gas ovens,

Where:

V_S=gas consumption in standard cubic feet (L), as measured in Section 3.2.1.2.

$H=H_n$ or H_p, the heating value of the gas used in the test as specified in Section 2.2.2.2 and Section 2.2.2.3 in Btu's per standard cubic foot (kJ/L).

S_g=4, average number of times a self-cleaning operation of a conventional gas oven is used per year.

The energy consumed by a continuously operating clock that cannot be disconnected during the self-cleaning test procedure may be subtracted from the test energy to obtain the test energy consumption, E_{SC}.

4.1.2.3.2 *Annual secondary energy consumption for self-cleaning operation of gas ovens.* Calculate the annual secondary energy consumption for self-cleaning operations of a gas oven, E_{SS}, expressed in kilowatt-hours (kJ) per year and defined as:

$E_{SS}=E_{IS}$ x S_g x K,

Where:

E_{IS}=electrical energy consumed during the self-cleaning operation of a conventional gas oven, as measured in Section 3.2.1.2.

S_g=4, average number of times a self-cleaning operation of a conventional gas oven is used per year.

K=0.001 kWh/Wh conversion factor for watt-hours to kilowatt-hours.

4.1.2.4 *Annual clock energy consumption.* Calculate the annual energy consumption of any constantly operating electric clock, E_{CL}, expressed in kilowatt-hours (kJ) per year and defined as:

$E_{CL} = P_{CL} \times A \times K$,

Where:

P_{CL}=power rating of clock which is on continuously, in watts, as measured in Section 3.2.1.4.

A=8,760, number of hours in a year.

K=0.001 kWh/Wh conversion factor for watt-hours to kilowatt-hours.

4.1.2.5 *Total annual energy consumption of a single conventional oven.*

4.1.2.5.1 *Conventional electric oven energy consumption.* Calculate the total annual energy consumption of a conventional electric oven, E_{AO}, expressed in kilowatt-hours (kJ) per year and defined as:

$E_{AO}=E_{CO}+E_{SC}+E_{CL}$,

Where:

E_{CO}=annual primary cooking energy consumption as determined in Section 4.1.2.1.1.

E_{SC}=annual primary self-cleaning energy consumption as determined in Section 4.1.2.3.1.

E_{CL}=annual clock energy consumption as determined in Section 4.1.2.4.

4.1.2.5.2 *Conventional gas oven energy consumption.* Calculate the total annual gas energy consumption of a conventional gas oven, E_{AOG}, expressed in Btu's (kJ) per year and defined as:

$E_{AOG}=E_{CO}+E_{SC}+E_{PO}$,

Where:

E_{CO}=annual primary cooking energy consumption as determined in Section 4.1.2.1.1.

E_{PO}=annual pilot light energy consumption as determined in Section 4.1.2.2.

E_{SC}=annual primary self-cleaning energy consumption as determined in Section 4.1.2.3.1.

If the conventional gas oven uses electrical energy, calculate the total annual electrical energy consumption, E_{AOE}, expressed in kilowatt-hours (kJ) per year and defined as:

$E_{AOE}=E_{SO}+E_{SS}+E_{CL}$,

Where:

E_{SO}=annual secondary cooking energy consumption as determined in Section 4.1.2.1.2.

E_{SS}=annual secondary self-cleaning energy consumption as determined in Section 4.1.2.3.2.

E_{CL}=annual clock energy consumption as determined in Section 4.1.2.4.

4.1.2.6. *Total annual energy consumption of multiple conventional ovens.* If the cooking appliance includes more than one conventional oven, calculate the total annual energy consumption of the conventional ovens using the following equations:

4.1.2.6.1 *Conventional electric oven energy consumption.* Calculate the total annual energy consumption, ETO, in kilowatt-hours (kJ) per year and defined as:

$E_{TO} = E_{ACO} + E_{ASC} + E_{CL}$,

Where:

$$E_{ACO} = \frac{1}{n}\sum_{i=1}^{n}\left(E_{CO}\right)_i,$$

is the average annual primary energy consumption for cooking,

and where:

n = number of conventional ovens in the basic model.

E_{CO} = annual primary energy consumption for cooking as determined in Section 4.1.2.1.1.

$$E_{ASC} = \frac{1}{n}\sum_{i=1}^{n}\left(E_{SC}\right)_i,$$

average annual self-cleaning energy consumption,

Where:

n = number of self-cleaning conventional ovens in the basic model.

E_{SC} = annual primary self-cleaning energy consumption as determined according to Section 4.1.2.3.1.

E_{CL} = clock energy consumption as determined according to Section 4.1.2.4.

4.1.2.6.2 *Conventional gas oven energy consumption.* Calculate the total annual gas energy consumption, E_{TOG}, in Btu's (kJ) per year and defined as:

$E_{TOG} = E_{ACO} + E_{ASC} + E_{TPO}$,

Where:

E_{ACO} = average annual primary energy consumption for cooking in Btu's (kJ) per year and is calculated as:

$$E_{ACO} = \frac{1}{n}\sum_{i=1}^{n}\left(E_{CO}\right)_i,$$

Where:

n = number of conventional ovens in the basic model.

E_{CO} = annual primary energy consumption for cooking as determined in Section 4.1.2.1.1.

and,

E_{ASC} = average annual self-cleaning energy consumption in Btu's (kJ) per year and is calculated as:

$$E_{ASC} = \frac{1}{n}\sum_{i=1}^{n}\left(E_{SC}\right)_i,$$

Where:

n = number of self-cleaning conventional ovens in the basic model.

E_{SC} = annual primary self-cleaning energy consumption as determined according to Section 4.1.2.3.1.

$$E_{TPO} = \sum_{i=1}^{n}\left(E_{PO}\right)_i,$$

total energy consumption of any pilot lights,

Where:

E_{PO} = annual energy consumption of any continuously burning pilot lights determined according to Section 4.1.2.2.

n = number of pilot lights in the basic model.

If the oven also uses electrical energy, calculate the total annual electrical energy consumption, E_{TOE}, in kilowatt-hours (kJ) per year and defined as:

$E_{TOE} = E_{ASO} + E_{AAS} + E_{CL}$,

Where:

$$E_{ASO} = \frac{1}{n}\sum_{i=1}^{n}\left(E_{SO}\right)_i,$$

is the average annual secondary energy consumption for cooking,

Where:

n=number of conventional ovens in the basic model.

E_{SO}=annual secondary energy consumption for cooking of gas ovens as determined in Section 4.1.2.1.2.

$$E_{AAS} = \frac{1}{n}\sum_{i=1}^{n}\left(E_{SS}\right)_i,$$

is the average annual secondary self-cleaning energy consumption,

Where:

n=number of self-cleaning ovens in the basic model.

E_{SS}=annual secondary self-cleaning energy consumption of gas ovens as determined in Section 4.1.2.3.2.

E_{CL}=annual clock energy consumption as determined in Section 4.1.2.4.

4.1.3 *Conventional oven cooking efficiency.*

4.1.3.1 *Single conventional oven.* Calculate the conventional oven cooking efficiency, Eff_{AO}, using the following equations:

For electric ovens:

$$Eff_{AO} = \frac{W_1 \times C_p \times T_S}{E_O \times K_e},$$

and,

For gas ovens:

$$Eff_{AO} = \frac{W_1 \times C_p \times T_S}{E_O + \left(E_{IO} \times K_e\right)},$$

Where:

W_1=measured weight of test block in pounds (kg).

C_p=0.23 Btu/lb-°F (0.96 kJ/kg÷ °C), specific heat of test block.

T_S=234°F (130°C), temperature rise of test block.

E_O=test energy consumption as measured in Section 3.2.1 or calculated in Section 4.1.1 or Section 4.1.1.1.

K_e=3.412 Btu/Wh (3.6 kJ/Wh), conversion factor for watt-hours to Btu's.

E_{IO}=electrical test energy consumption according to Section 3.2.1 or as calculated in Section 4.1.1.1.

4.1.3.2 *Multiple conventional ovens.* If the cooking appliance includes more than one conventional oven, calculate the cooking efficiency for all of the conventional ovens in the appliance, Eff_{TO}, using the following equation:

$$Eff_{TO} = \frac{n}{\sum_{i=1}^{n}\left(\frac{1}{Eff_{AO}}\right)_i},$$

Where:

n=number of conventional ovens in the cooking appliance.

Eff_{AO}=cooking efficiency of each oven determined according to Section 4.1.3.1.

4.1.4 *Conventional oven energy factor.* Calculate the energy factor, or the ratio of useful cooking energy output to the total energy input, R_O, using the following equations:

$$R_O = \frac{O_O}{E_{AO}},$$

For electric ovens,

Where:

O_O=29.3 kWh (105,480 kJ) per year, annual useful cooking energy output.

E_{AO}=total annual energy consumption for electric ovens as determined in Section 4.1.2.5.1.

For gas ovens:

$$R_O = \frac{O_O}{E_{AOG} + \left(E_{AOE} \times K_e\right)},$$

Where:

O_O=88.8 kBtu (93,684 kJ) per year, annual useful cooking energy output.

E_{AOG}=total annual gas energy consumption for conventional gas ovens as determined in Section 4.1.2.5.2.

E_{AOE}=total annual electrical energy consumption for conventional gas ovens as determined in Section 4.1.2.5.2.

K_e=3,412 Btu/kWh (3,600 kJ/kWh), conversion factor for kilowatt-hours to Btu's.

4.2 *Conventional cooking top*

4.2.1 *Conventional cooking top cooking efficiency*

4.2.1.1 *Electric surface unit cooking efficiency.* Calculate the cooking efficiency, Eff_{SU}, of the electric surface unit under test, defined as:

$$Eff_{SU} = W \times C_p \times \left(\frac{T_{SU}}{K_e \times E_{CT}}\right),$$

Where:

W=measured weight of test block, W_2 or W_3, expressed in pounds (kg).

C_p=0.23 Btu/lb-°F (0.96 kJ/kg÷ °C), specific heat of test block.

T_{SU}=temperature rise of the test block: final test block temperature, T_{CT}, as determined in Section 3.2.2, minus the initial test block temperature, T_I, expressed in °F (°C) as determined in Section 2.7.5.

K_e=3.412 Btu/Wh (3.6 kJ/Wh), conversion factor of watt-hours to Btu's.

E_{CT}=measured energy consumption, as determined according to Section 3.2.2, expressed in watt-hours (kJ).

The energy consumed by a continuously operating clock that cannot be disconnected during the cooktop test may be subtracted from the energy consumption, E_{CT}, as determined in Section 3.2.2.

4.2.1.2 *Gas surface unit cooking efficiency*. Calculate the cooking efficiency, Eff_{SU}, of the gas surface unit under test, defined as:

$$Eff_{SU} = \frac{W_3 \times C_P \times T_{SU}}{E},$$

Where:

W_3=measured weight of test block as measured in Section 3.3.2, expressed in pounds (kg).

C_p and T_{SU} are the same as defined in Section 4.2.1.1.

and,

$E=[V_{CT} - V_{CP} \times H] + (E_{IC} \times K_e)$,

Where:

V_{CT}=total gas consumption in standard cubic feet (L) for the gas surface unit test as measured in Section 3.2.2.

E_{IC}=electrical energy consumed in watt-hours (kJ) by an ignition device of a gas surface unit as measured in Section 3.2.2.

K_e=3.412 Btu/Wh (3.6 kJ/Wh), conversion factor of watt-hours to Btu's.

H=either H_n or H_p, the heating value of the gas used in the test as specified in Section 2.2.2.2 and Section 2.2.2.3, expressed in Btu's per standard cubic foot (kJ/L) of gas.

$V_{CP}=Q_{CP} \times t_{CT}$, pilot consumption, in standard cubic feet (L), during unit test,

Where:

t_{CT}=the elapsed test time as defined in Section 3.2.2.

and

$$Q_{CP} = \frac{V_{CP}}{t_{CP}},$$

(pilot flow in standard cubic feet per hour)

Where:

V_{CP}=any pilot lights gas consumption defined in Section 3.2.2.1.

t_{CP}=elapsed time of the cooking top pilot lights test as defined in Section 3.2.2.1.

4.2.1.3 *Conventional cooking top cooking efficiency*. Calculate the conventional cooking top cooking efficiency, Eff_{CT}, using the following equation:

$$Eff_{CT} = \frac{1}{n}\sum_{i=1}^{n}\left(Eff_{SU}\right)_i,$$

Where:

n=number of surface units in the cooking top.

Eff_{SU}=the efficiency of each of the surface units, as determined according to Section 4.2.1.1 or Section 4.2.1.2.

4.2.2 *Conventional cooking top annual energy consumption*.

4.2.2.1 *Conventional electric cooking top energy consumption*. Calculate the annual energy consumption of an electric cooking top, E_{CA}, in kilowatt-hours (kJ) per year, defined as:

$$E_{CA} = \frac{O_{CT}}{Eff_{CT}},$$

Where:

O_{CT}=173.1 kWh (623,160 kJ) per year, annual useful cooking energy output.

Eff_{CT}=conventional cooking top cooking efficiency as defined in Section 4.2.1.3.

4.2.2.2 *Conventional gas cooking top*

4.2.2.2.1 *Annual cooking energy consumption*. Calculate the annual energy consumption for cooking, E_{CC}, in Btu's (kJ) per year for a gas cooking top, defined as:

$$E_{CC} = \frac{O_{CT}}{Eff_{CT}},$$

Where:

O_{CT}=527.6 kBtu (556,618 kJ) per year, annual useful cooking energy output.

Eff_{CT}=the gas cooking top efficiency as defined in Section 4.2.1.3.

4.2.2.2.2 *Annual energy consumption of any continuously burning gas pilots*. Calculate the annual energy consumption of any continuously burning gas pilot lights of the cooking top, E_{PC}, in Btu's (kJ) per year, defined as:

$E_{PC}=Q_{CP} \times A \times H$,

Where:

Q_{CP}=pilot light gas flow rate as measured in Section 3.2.2.1.

A=8,760 hours, the total number of hours in a year.

H=either H_n or H_p, the heating value of the gas used in the test as specified in Section 2.2.2.2. and Section 2.2.2.3, expressed in Btu's per standard cubic foot (kJ/L) of gas.

4.2.2.2.3 *Total annual energy consumption of a conventional gas cooking top*. Calculate the

total annual energy consumption of a conventional gas cooking top, E_{CA}, in Btu's (kJ) per year, defined as:

$E_{CA}=E_{CC}+E_{PC}$,

Where:

E_{CC}=energy consumption for cooking as determined in Section 4.2.2.2.1.

E_{PC}=annual energy consumption of the pilot lights as determined in Section 4.2.2.2.2.

4.2.3 *Conventional cooking top energy factor.* Calculate the energy factor or ratio of useful cooking energy output for cooking to the total energy input, $R_{CT,}$ as follows:

For an electric cooking top, the energy factor is the same as the cooking efficiency as determined according to Section 4.2.1.3.

For gas cooking tops,

$$R_{CT}=\frac{O_{CT}}{E_{CA}},$$

Where:

O_{CT}=527.6 kBtu (556,618 kJ) per year, annual useful cooking energy output of cooking top.

E_{CA}=total annual energy consumption of cooking top determined according to Section 4.2.2.2.3.

4.3 *Combined components.* The annual energy consumption of a kitchen range, e.g. a cooktop and oven combined, shall be the sum of the annual energy consumption of each of its components. The annual energy consumption for other combinations of ovens, cooktops and microwaves will also be treated as the sum of the annual energy consumption of each of its components. The energy factor of a combined component is the sum of the annual useful cooking energy output of each component divided by the sum of the total annual energy consumption of each component.

4.4 *Microwave oven.*

4.4.1 *Microwave oven test energy output.* Calculate the microwave oven test energy output, $E_{T,}$ in watt-hour's (kJ). The calculation is repeated two or three times as required in section 3.2.3. The average of the E_T's is used for a calculation in section 4.4.3. For calculations specified in units of energy [watt-hours (kJ)], use the equation below:

$$E_T=\frac{C_pM_W(T_2-T_1)+C_CM_C(T_2-T_0)}{K_e}$$

Where:

M_W=the measured mass of the test water load, in pounds (g).

M_C=the measured mass of the test container before filling with test water load, in pounds (g).

T_1=the initial test water load temperature, in °F (°C).

T_2=the final test water load temperature, in °F (°C).

T_0=the measured ambient room temperature, in °F (°C).

C_C=0.210 Btu/lb−°F (0.88 kJ/kg · °C), specific heat of test container.

C_p=1.0 Btu/lb−°F (4.187 kJ/kg · °C), specific heat of water.

K_e=3,412 Btu/kWh (3,600 kJ/kWh) conversion factor of kilowatt-hours to Btu's.

4.4.2 *Microwave oven test power output.* Calculate the microwave oven test power output, $P_{T,}$ in watts (J/s) as specified in Section four, paragraph 12.5 of IEC 705 Amendment 2 See Section 430.22. The calculation is repeated for each test as required in section 3.2.3. The average of the two or three P_T's is used for calculations in section 4.4.4. (See 10 CFR 430.22)

4.4.3 *Microwave oven annual energy consumption.* Calculate the microwave oven annual energy consumption, $E_{mo,}$ in KWh's per year, defined as:

$$E_{MO}=\frac{E_M\times O_M}{E_T}$$

Where:

E_M=the energy consumption as defined in Section 3.2.3.

O_M=79.8 kWh (287,280 kJ) per year, the microwave oven annual useful cooking energy output.

E_T=the test energy as calculated in Section 4.4.1.

4.4.4 *Microwave oven cooking efficiency.* Calculate the microwave oven cooking efficiency, $Eff_{MO,}$ as specified in Section four, paragraph 14 of IEC 705.

4.4.5 *Microwave oven energy factor.* Calculate the energy factor or the ratio of the useful cooking energy output to total energy input on a yearly basis, $R_{MO,}$ defined as:

$$R_{MO}=\frac{O_M}{E_{MO}},$$

Where:

O_M=79.8 kWh (287,280 kJ) per year, annual useful cooking energy output.

E_{MO}=annual total energy consumption as determined in Section 4.4.3.

[62 FR 51981, Oct. 3, 1997]

APPENDIX J TO SUBPART B OF PART 430—UNIFORM TEST METHOD FOR MEASURING THE ENERGY CONSUMPTION OF AUTOMATIC AND SEMI-AUTOMATIC CLOTHES WASHERS

The procedures and calculations in sections 3.3, 4.3, and 4.4 of this Appendix need not be performed to determine compliance

with the energy conservation standards for clothes washers.

1. DEFINITIONS

1.1 *Adaptive control system* means a clothes washer control system, other than an adaptive water fill control system, which is capable of automatically adjusting washer operation or washing conditions based on characteristics of the clothes load placed in the clothes container, without allowing or requiring consumer intervention or actions. The automatic adjustments may, for example, include automatic selection, modification, or control of any of the following: wash water temperature, agitation or tumble cycle time, number of rinse cycles, and spin speed. The characteristics of the clothes load, which could trigger such adjustments, could, for example, consist of or be indicated by the presence of either soil, soap, suds, or any other additive laundering substitute or complementary product.

NOTE: Appendix J does not provide a means for determining the energy consumption of a clothes washer with an adaptive control system. Therefore, pursuant to 10 CFR 430.27, a waiver must be obtained to establish an acceptable test procedure for each such clothes washer.

1.2 *Adaptive water fill control system* means a clothes washer water fill control system which is capable of automatically adjusting the water fill level based on the size or weight of the clothes load placed in the clothes container, without allowing or requiring consumer intervention and/or actions.

1.3 *Bone-dry* means a condition of a load of test cloth which has been dried in a dryer at maximum temperature for a minimum of 10 minutes, removed and weighed before cool down, and then dried again for 10-minute periods until the final weight change of the load is 1 percent or less.

1.4 *Clothes container* means the compartment within the clothes washer that holds the clothes during operation of the machine.

1.5 *Compact* means a clothes washer which has a clothes container capacity of less than 1.6 ft^3 (45 L).

1.6 *Deep rinse cycle* means a rinse cycle in which the clothes container is filled with water to a selected level and the clothes load is rinsed by agitating it or tumbling it through the water.

1.7 *Front-loader clothes washer* means a clothes washer which sequentially rotates or tumbles portions of the clothes load above the water level allowing the clothes load to fall freely back into the water. The principal axis of the clothes container is in a horizontal plane and the access to the clothes container is through the front of the machine.

1.8 *Lockout* means that at least one wash/rinse water temperature combination is not available in the normal cycle that is available in another cycle on the machine.

1.9 *Make-up water* means the amount of fresh water needed to supplement the amount of stored water pumped from the external laundry tub back into the clothes washer when the suds-return feature is activated in order to achieve the required water fill level in the clothes washer.

1.10 *Modified energy factor* means the quotient of the cubic foot (or liter) capacity of the clothes container divided by the total clothes washer energy consumption per cycle, with such energy consumption expressed as the sum of the machine electrical energy consumption, the hot water energy consumption, and the energy required for removal of the remaining moisture in the wash load.

1.11 *Most energy intensive cycle* means the non-normal cycle that uses the most energy for a given wash/rinse temperature combination.

1.12 *Non-normal cycle* means a cycle other than the normal cycle, but does not include any manually selected pre-wash, pre-soak, and extra-rinse option.

1.13 *Nonwater-heating clothes washer* means a clothes washer which does not have an internal water heating device to generate hot water.

1.14 *Normal cycle* means the cycle recommended by the manufacturer for washing cotton and/or linen clothes.

1.15 *Sensor filled* means a water fill control which automatically terminates the fill when the water reaches an appropriate level in the tub.

1.16 *Spray rinse cycle* means a rinse cycle in which water is sprayed onto the clothes load for a definite period of time without maintaining any specific water level in the clothes container.

1.17 *Standard* means a clothes washer which has a clothes container capacity of 1.6 ft^3 (45 L) or greater.

1.18 *Suds-return* means a feature or option on a clothes washer which causes the stored wash water obtained by utilizing the suds-saver feature to be pumped from the external laundry tub back into the clothes washer.

1.19 *Suds-saver* means a feature or option on a clothes washer which allows the user to store used wash water in an external laundry tub for use with subsequent wash loads.

1.20 *Temperature use factor* means the percentage of the total number of washes a user would wash with a particular wash/rinse temperature setting.

1.21 *Thermostatically controlled water valves* means clothes washer controls that have the ability to sense and adjust the hot and cold supply water.

1.22 *Time filled* means a water fill control which uses a combination of water flow controls in conjunction with time to terminate the water fill cycle.

1.23 *Top-loader-horizontal-axis clothes washer* means a clothes washer which: rotates or tumbles portions of the clothes load above the water level allowing the clothes load to fall freely back into the water with the principal axis in a horizontal plane and has access to the clothes container through the top of the clothes washer.

1.24 *Top-loader-vertical-axis clothes washer* means a clothes washer that: flexes and oscillates the submerged clothes load through the water by means of mechanical agitation or other movement; has a clothes container with the principal axis in a vertical plane; and has access to the clothes container through the top of the clothes washer.

1.25 *Water consumption factor* means the quotient of the total weighted per-cycle water consumption divided by the capacity of the clothes washer.

1.26 *Water-heating clothes washer* means a clothes washer where some or all of the hot water for clothes washing is generated by a water heating device internal to the clothes washer.

2. TESTING CONDITIONS

2.1 *Installation.* Install the clothes washer in accordance with manufacturer's instructions.

2.2 *Electrical energy supply.* Maintain the electrical supply at the clothes washer terminal block within 2 percent of 120, 120/240 or 120/208Y volts as applicable to the particular terminal block wiring system as specified by the manufacturer. If the clothes washer has a dual voltage conversion capability, conduct the test at the highest voltage specified by the manufacturer.

2.3 *Supply water.* For nonwater-heating clothes washers not equipped with thermostatically controlled water valves, the temperature of the hot and cold water supply shall be maintained at 100°F±10°F (37.8°C±5.5°C). For nonwater-heating clothes washers equipped with thermostatically controlled water valves, the temperature of the hot water supply shall be maintained at 140°F±5°F (60.0°C±2.8°C) and the cold water supply shall be maintained at 60°F±5°F (15.6°C±2.8°C). For water-heating clothes washers, the temperature of the hot water supply shall be maintained at 140°F±5°F (60.0°C±2.8°C) and the cold water supply shall not exceed 60°F (15.6°C). Water meters shall be installed in both the hot and cold water lines to measure water consumption.

2.4 *Water pressure.* The static water pressure at the hot and cold water inlet connections of the machine shall be maintained during the test at 35 pounds per square inch gauge (psig)±2.5 psig (241.3 kPa±17.2 kPa). The static water pressure for a single water inlet connection shall be maintained during the test at 35 psig±2.5 psig (241.3 kPa±17.2 kPa). Water pressure gauges shall be installed in both the hot and cold water lines to measure water pressure.

2.5 *Instrumentation.* Perform all test measurements using the following instruments, as appropriate:

2.5.1 *Weighing scales.*

2.5.1.1 *Weighing scale for test cloth.* The scale shall have a resolution no larger than 0.2 oz (5.7 g) and a maximum error no greater than 0.3 percent of the measured value.

2.5.1.2 *Weighing scale for clothes container capacity measurements.* The scale should have a resolution no larger than 0.50 lbs (0.23 kg) and a maximum error no greater than 0.5 percent of the measured value.

2.5.2 *Watt-hour meter.* The watt-hour meter shall have a resolution no larger than 1 Wh (3.6 kJ) and a maximum error no greater than 2 percent of the measured value for any demand greater than 50 Wh (180.0 kJ).

2.5.3 *Temperature measuring device.* The device shall have an error no greater than ±1°F (±0.6°C) over the range being measured.

2.5.4 *Water meter.* The water meter shall have a resolution no larger than 0.1 gallons (0.4 liters) and a maximum error no greater than 2 percent for all water flow rates from 1 gal/min (3.8 L/min) to 5 gal/min (18.9 L/min).

2.5.5 *Water pressure gauge.* The water pressure gauge shall have a resolution no larger than 1 psig (6.9 kPa) and shall have an error no greater than 5 percent of any measured value over the range of 32.5 psig (224.1 kPa) to 37.5 psig (258.6 kPa).

2.6 *Test cloths.*

2.6.1 *Energy test cloth.* The energy test cloth shall be clean and consist of the following:

2.6.1.1 Pure finished bleached cloth, made with a momie or granite weave, which is 50 percent cotton and 50 percent polyester and weighs 5.75 oz/yd^2 (195.0 g/m^2) and has 65 ends on the warp and 57 picks on the fill.

2.6.1.2 Cloth material that is 24 in by 36 in (61.0 cm by 91.4 cm) and has been hemmed to 22 in by 34 in (55.9 cm by 86.4 cm) before washing. The maximum shrinkage after five washes shall not be more than four percent on the length and width.

2.6.1.3 The number of test runs on the same energy test cloth shall not exceed 25 runs.

2.6.2 *Energy stuffer cloths.* The energy stuffer cloths shall be made from energy test cloth material and shall consist of pieces of material that are 12 in by 12 in (30.5 cm by 30.5 cm) and have been hemmed to 10 in by 10 in (25.4 cm by 25.4 cm) before washing. The maximum shrinkage after five washes shall not be more than four percent on the length and width. The number of test runs on the same energy stuffer cloth shall not exceed 25 runs.

2.7 *Composition of test loads.*

2.7.1 *Seven pound test load.* The seven pound test load shall consist of bone-dry energy test cloths which weigh 7 lbs ±0.07 lbs (3.18 kg ±0.03 kg). Adjustments to the test load to achieve the proper weight can be made by the use of energy stuffer cloths.

2.7.2 *Three pound test load.* The three pound test load shall consist of bone-dry energy test cloths which weigh 3 lbs ±0.03 lbs (1.36 kg ±0.014 kg). Adjustments to the test load to achieve the proper weight can be made by the use of energy stuffer cloths.

2.8 *Use of test loads.*

2.8.1 For a standard size clothes washer, a seven pound load, as described in section 2.7.1, shall be used to test the maximum water fill and a three pound test load, as described in section 2.7.2, shall be used to test the minimum water fill.

2.8.2 For a compact size clothes washer, a three pound test load as described in section 2.7.2 shall be used to test the maximum and minimum water fill levels.

2.8.3 A vertical-axis clothes washer without adaptive water fill control system also shall be tested without a test load for purposes of calculating the energy factor.

2.8.4 The test load sizes to be used to measure remaining moisture content (RMC) are specified in section 3.3.2.

2.8.5 Load the energy test cloths by grasping them in the center, shaking them to hang loosely and then dropping them into the clothes container prior to activating the clothes washer.

2.9 *Preconditioning.* If the clothes washer has not been filled with water in the preceding 96 hours, pre-condition it by running it through a cold rinse cycle and then draining it to ensure that the hose, pump, and sump are filled with water.

2.10 *Wash time setting.* The actual wash time (period of agitation) shall be not less than 9.75 minutes.

2.11 *Agitation and spin speed settings.* Where controls are provided for agitation and spin speed selections, set them as follows:

2.11.1 For energy and water consumption tests, set at the normal cycle settings. If settings at the normal cycle are not offered, set the control settings to the maximum levels permitted on the clothes washer.

2.11.2 For remaining moisture content tests, see section 3.3.

3. TEST MEASUREMENTS

3.1 *Clothes container capacity.* Measure the entire volume which a dry clothes load could occupy within the clothes container during washer operation according to sections 3.1.1 through 3.1.5.

3.1.1 Place the clothes washer in such a position that the uppermost edge of the clothes container opening is leveled horizontally, so that the container will hold the maximum amount of water.

3.1.2 Line the inside of the clothes container with 2 mil (0.051 mm) plastic sheet. All clothes washer components which occupy space within the clothes container and which are recommended for use with the energy test cycle shall be in place and shall be lined with 2 mil (0.051 mm) plastic sheet to prevent water from entering any void space.

3.1.3 Record the total weight of the machine before adding water.

3.1.4 Fill the clothes container manually with either 60°F ±5°F (15.6°C ±2.8°C) or 100°F ±10°F (37.8°C ±5.5°C) water to its uppermost edge. Measure and record the weight of water, W, in pounds.

3.1.5 The clothes container capacity is calculated as follows:

$C=W/d.$

where:

C=Capacity in cubic feet (or liters).

W=Mass of water in pounds (or kilograms).

d=Density of water (62.0 lbs/ft^3 for 100°F (993 kg/m^3 for 37.8°C) or 62.3 lbs/ft^3 for 60°F (998 kg/m^3 for 15.6°C)).

3.2 *Test cycle.* Establish the test conditions set forth in section 2 of this Appendix.

3.2.1 A clothes washer that has infinite temperature selections shall be tested at the following temperature settings: hottest setting available on the machine, hot (a minimum of 140°F (60.0°C) and a maximum of 145°F (62.8°C)), warm (a minimum of 100°F (37.8°C) and a maximum of 105°F (40.6°C)), and coldest setting available on the machine. These temperatures must be confirmed by measurement using a temperature measuring device. If the measured final water temperature is not within the specified range, stop testing, adjust the temperature selector accordingly, and repeat the procedure.

3.2.2 *Clothes washers with adaptive water fill control system and/or unique temperature selections.*

3.2.2.1 *Clothes washers with adaptive water fill control system.* When testing a clothes washer that has adaptive water fill control, the maximum and the minimum test loads as specified in 2.8.1 and 2.8.2 shall be used. The amount of water fill shall be determined by the control system. If the clothes washer provides consumer selection of variable water fill amounts for the adaptive water fill control system, two complete sets of tests shall be conducted. The first set of tests shall be conducted with the adaptive water fill control system set in the setting that will use the greatest amount of energy. The second set of tests shall be conducted with the adaptive water fill control system set in the setting that will use the smallest amount of energy. Then, the results from these two tests shall be averaged to determine the adaptive water fill energy consumption value. If a clothes washer with an adaptive water fill control system allows

consumer selection of manual controls as an alternative, both the manual and adaptive modes shall be tested and the energy consumption values, E_T, M_E, and D_E (if desired), calculated in section 4 for each mode, shall be averaged between the manual and adaptive modes.

3.2.2.2 *Clothes washers with multiple warm wash temperature combination selections.*

3.2.2.2.1 If a clothes washer's temperature combination selections are such that the temperature of each warm wash setting that is above the mean warm wash temperature (the mean temperature of the coldest and warmest warm wash settings) is matched by a warm wash setting that is an equal distance below the mean, then the energy test shall be conducted at the mean warm wash temperature if such a selection is provided, or if there is no position on the control that permits selection of the mean temperature, the energy test shall be conducted with the temperature selection set at the next hotter temperature setting that is available above the mean.

3.2.2.2.2 If the multiple warm wash temperature combination selections do not meet criteria in section 3.2.2.2.1, the energy test shall be conducted with the temperature selection set at the warm wash temperature setting that gives the next higher water temperature than the mean temperature of the coldest and warmest warm wash settings.

3.2.2.3 *Clothes washers with multiple temperature settings within a temperature combination selection.* When a clothes washer is provided with a secondary control that can modify the wash or rinse temperature within a temperature combination selection, the secondary control shall be set to provide the hottest wash temperature available and the hottest rinse temperature available. For instance, when the temperature combination selection is set for the middle warm wash temperature and a secondary control exists which allows this temperature to be increased or decreased, the secondary control shall be set to provide the hottest warm wash temperature available for the middle warm wash setting.

3.2.3 *Clothes washers that do not lockout any wash/rinse temperature combinations in the normal cycle.* Test in the normal cycle all temperature combination selections that are required to be tested.

3.2.3.1 *Hot water consumption, cold water consumption, and electrical energy consumption at maximum fill.* Set the water level selector at maximum fill available on the clothes washer, if manually controlled, and insert the appropriate test load, if applicable. Activate the normal cycle of the clothes washer and also any suds-saver switch.

3.2.3.1.1 For automatic clothes washers, set the wash/rinse temperature selector to the hottest temperature combination setting. For semi-automatic clothes washers, open the hot water faucet valve completely and close the cold water faucet valve completely to achieve the hottest temperature combination setting.

3.2.3.1.2 Measure the electrical energy consumption of the clothes washer for the complete cycle.

3.2.3.1.3 Measure the respective number of gallons (or liters) of hot and cold water used to fill the tub for the wash cycle.

3.2.3.1.4 Measure the respective number of gallons (or liters) of hot and cold water used for all deep rinse cycles.

3.2.3.1.5 Measure the respective gallons (or liters) of hot and cold water used for all spray rinse cycles.

3.2.3.1.6 For non-water-heating automatic clothes washers repeat sections 3.2.3.1.3 through 3.2.3.1.5 for each of the other wash/rinse temperature selections available that uses heated water and is required to be tested. For water-heating clothes washers, repeat sections 3.2.3.1.2 through 3.2.3.1.5 for each of the other wash/rinse temperature selections available that uses heated water and is required to be tested. (When calculating water consumption under section 4.3 for any machine covered by the previous two sentences, also test the cold wash/cold rinse selection.) For semi-automatic clothes washers, repeat sections 3.2.3.1.3 through 3.2.3.1.5 for the other wash/rinse temperature settings in section 6 with the following water faucet valve adjustments:

	Faucet position	
	Hot valve	Cold valve
Hot	Completely open	Closed.
Warm	Completely open	Completely open.
Cold	Closed	Completely open.

3.2.3.1.7 If the clothes washer is equipped with a suds-saver cycle, repeat sections 3.2.3.1.2 to 3.2.3.1.5 with suds-saver switch set to suds return for the Warm/Cold temperature setting.

3.2.3.2 *Hot water consumption, cold water consumption, and electrical energy consumption with the water level selector at minimum fill.* Set the water level selector at minimum fill, if manually controlled, and insert the appropriate test load, if applicable. Activate the

normal cycle of the clothes washer and also any suds-saver switch. Repeat sections 3.2.3.1.1 through 3.2.3.1.7.

3.2.3.3 *Hot and cold water consumption for clothes washers that incorporate a partial fill during the rinse cycle.* For clothes washers that incorporate a partial fill during the rinse cycle, activate any suds-saver switch and operate the clothes washer for the complete normal cycle at both the maximum water fill level and the minimum water fill level for each of the wash/rinse temperature selections available. Measure the respective hot and cold water consumed during the complete normal cycle.

3.2.4 *Clothes washers that lockout any wash/rinse temperature combinations in the normal cycle.* In addition to the normal cycle tests in section 3.2.3, perform the following tests on non-normal cycles for each wash/rinse temperature combination selection that is locked out in the normal cycle.

3.2.4.1 Set the cycle selector to a non-normal cycle which has the wash/rinse temperature combination selection that is locked out. Set the water level selector at maximum fill and insert the appropriate test load, if applicable. Activate the cycle of the clothes washer and also any suds-saver switch. Set the wash/rinse temperature selector to the temperature combination setting that is locked out in the normal cycle and repeat sections 3.2.3.1.2 through 3.2.3.1.5.

3.2.4.2 Repeat section 3.2.4.1 under the same temperature combination setting for all other untested non-normal cycles on the machine that have the wash/rinse temperature combination selection that is locked out.

3.2.4.3 Total the measured hot water consumption of the wash, deep rinse, and spray rinse of each non-normal cycle tested in sections 3.2.4.1 through 3.2.4.2 and compare the total for each cycle. The cycle that has the highest hot water consumption shall be the most energy intensive cycle for that particular wash/rinse temperature combination setting.

3.2.4.4 Set the water level selector at minimum fill and insert the appropriate test load, if applicable. Activate the most energy intensive cycle, as determined in section 3.2.4.3, of the clothes washer and also any suds-saver switch. Repeat tests as described in section 3.2.4.1.

3.3 *Remaining Moisture Content (RMC).*

3.3.1 The wash temperature shall be the same as the rinse temperature for all testing.

3.3.2 Determine the test load as shown in the following table:

Container volume		Test load	
cu. ft. ≥ <	liter ≥ <	lb	kg
0–0.80	0–22.7	3.00	1.36
0.80–0.90	22.7–25.5	3.50	1.59
0.90–1.00	25.5–28.3	3.90	1.77
1.00–1.10	28.3–31.1	4.30	1.95
1.10–1.20	31.1–34.0	4.70	2.13
1.20–1.30	34.0–36.8	5.10	2.31
1.30–1.40	36.8–39.6	5.50	2.49
1.40–1.50	39.6–42.5	5.90	2.68
1.50–1.60	42.5–45.3	6.40	2.90
1.60–1.70	45.3–48.1	6.80	3.08
1.70–1.80	48.1–51.0	7.20	3.27
1.80–1.90	51.0–53.8	7.60	3.45
1.90–2.00	53.8–56.6	8.00	3.63
2.00–2.10	56.6–59.5	8.40	3.81
2.10–2.20	59.5–62.3	8.80	3.99
2.20–2.30	62.3–65.1	9.20	4.17
2.30–2.40	65.1–68.0	9.60	4.35
2.40–2.50	68.0–70.8	10.00	4.54
2.50–2.60	70.8–73.6	10.50	4.76
2.60–2.70	73.6–76.5	10.90	4.94
2.70–2.80	76.5–79.3	11.30	5.13
2.80–2.90	79.3–82.1	11.70	5.31
2.90–3.00	82.1–85.0	12.10	5.49
3.00–3.10	85.0–87.8	12.50	5.67
3.10–3.20	87.8–90.6	12.90	5.85
3.20–3.30	90.6–93.4	13.30	6.03
3.30–3.40	93.4–96.3	13.70	6.21
3.40–3.50	96.3–99.1	14.10	6.40
3.50–3.60	99.1–101.9	14.60	6.62
3.60–3.70	101.9–104.8	15.00	6.80
3.70–3.80	104.8–107.6	15.40	6.99

Notes:
(1) All test load weights are bone dry weights.
(2) Allowable tolerance on the test load weights are +/−0.10 lbs (0.05 kg).

3.3.3 For clothes washers with cold rinse only.

3.3.3.1 Record the actual bone dry weight of the test load (WI), then place the test load in the clothes washer.

3.3.3.2 Set water level selector to maximum fill.

3.3.3.3 Run the normal cycle.

3.3.3.4 Record the weight of the test load immediately after completion of the normal cycle (WC).

3.3.3.5 Calculate the remaining moisture content of the test load, RMC, expressed as a percentage and defined as:

$$RMC=[(WC-WI)/WI]\times 100\%$$

3.3.4 For clothes washers with cold and warm rinse options.

3.3.4.1 Complete steps 3.3.3.1 through 3.3.3.4 for the cold rinse. Calculate the remaining moisture content of the test load for cold rinse, RMC_{COLD}, expressed as a percentage and defined as:

$$RMC_{COLD}=[(WC-WI)/WI]\times 100\%$$

3.3.4.2 Complete steps 3.3.3.1 through 3.3.3.4 for the warm rinse. Calculate the remaining moisture content of the test load for warm rinse, RMC_{WARM}, expressed as a percentage and defined as:

$$RMC_{WARM}=[(WC-WI)/WI]\times 100\%$$

3.3.4.3 Calculate the remaining moisture content of the test load, RMC, expressed as a percentage and defined as:

$RMC=0.73\times RMC_{COLD}+0.27\times RMC_{WARM}$

3.3.5 Clothes washers which have options that result in different RMC values, such as multiple selection of spin speeds or spin times that are available in the normal cycle, shall be tested at the maximum and minimum settings of the available options, excluding any ''no spin'' (zero spin speed) settings, in accordance with requirements in 3.3.3 or 3.3.4. The calculated $RMC_{max\ extraction}$ and $RMC_{min\ extraction}$ at the maximum and minimum settings, respectively, shall be combined as follows and the final RMC to be used in section 4.2 shall be:

$RMC=0.75\times RMC_{max\ extraction}+0.25\times RMC_{min\ extraction}$

3.4 *Data recording.* Record for each test cycle in sections 3.2.1 through 3.3.5.

3.4.1 For non-water-heating clothes washers, record the kilowatt-hours of electrical energy, M_E, consumed during the test to operate the clothes washer in section 3.2.3.1.2. For water-heating clothes washers record the kilowatt-hours of electrical energy, Eh_i consumed at maximum fill in sections 3.2.3.1.2 and 3.2.3.1.6, and Eh_j consumed at minimum fill in section 3.2.3.2.

3.4.2 Record the individual gallons (or liters) of hot and cold water consumption, Vh_i and Vc_i, measured at maximum fill level for each wash/rinse temperature combination setting tested in section 3.2.3, or in both 3.2.3 and 3.2.4, excluding any fresh make-up water required to complete the fill during a suds-return cycle.

3.4.3 Record the individual gallons (or liters) of hot and cold water consumption, Vh_j and Vc_j, measured at minimum fill level for each wash/rinse temperature combination setting tested in section 3.2.3, or in both 3.2.3 and 3.2.4, excluding any fresh make-up water required to complete the fill during a suds-return cycle.

3.4.4 Record the individual gallons (or liters) of hot and cold water, Sh_H and Sc_H, measured at maximum fill for the suds-return cycle.

3.4.5 Record the individual gallons (or liters) of hot and cold water, Sh_L and Sc_L, measured at minimum fill for the suds-return cycle.

3.4.6 Data recording requirements for RMC tests are listed in sections 3.3.3 through 3.3.5.

4. CALCULATION OF DERIVED RESULTS FROM TEST MEASUREMENTS

4.1 *Energy consumption.*

4.1.1 *Per-cycle temperature-weighted hot water consumption for maximum and minimum water fill levels.* Calculate for the cycle under test the per-cycle temperature weighted hot water consumption for the maximum water fill level, Vh_{max}, and for the minimum water fill level, Vh_{min}, expressed in gallons per cycle (or liters per cycle) and defined as:

$$Vh_{max} = X_1\sum_{i=1}^{n}\left[\left(Vh_i \times L\right)\times TUF_i\right] + X_2\left[TUF_W \times Sh_H\right]$$

$$Vh_{min} = X_1\sum_{j=1}^{n}\left[\left(Vh_j \times L\right)\times TUF_j\right] + X_2\left[TUF_W \times Sh_L\right]$$

where:

Vh_i=reported hot water consumption in gallons per cycle (or liters per cycle) at maximum fill for each wash/rinse temperature combination setting, as provided in section 3.4.2. If a clothes washer is equipped with two or more different wash/rinse temperature selections that have the same basic temperature combination selection label (for example, one of them has its water temperature controlled by thermostatically controlled valves and the other one does not), then the largest Vh_i shall be used for this calculation. If a clothes washer has lockout(s), there will be ''Vh_i's'' for wash/rinse temperature combination settings available in the normal cycle and ''Vh_i's'' for wash/rinse temperature combination settings in the most energy intensive cycle.

Vh_j=reported hot water consumption in gallons per cycle (or liters per cycle) at minimum fill for each wash/rinse temperature combination setting, as provided in section 3.4.3. If a clothes washer is equipped with two or more different wash/rinse temperature selections that have the same basic temperature combination selection label (for example, one of them has its water temperature controlled by thermostatically controlled valves and the other one does not), then the largest Vh_j shall be used for the calculation. If a clothes washer has lockouts, there will be ''Vh_j's'' for wash/

rinse temperature combination settings available in the normal cycle and ''Vh_j's'' for wash/rinse temperature combination settings in the most energy intensive cycle.

L=lockout factor to be applied to the reported hot water consumption. For wash/rinse temperature combination settings that are not locked out in the normal cycle, L=1. For each wash/rinse temperature combination setting that is locked out in the normal cycle, L=0.32 in the normal cycle and L=0.68, in the most energy intensive cycle.

TUF_i=applicable temperature use factor in section 5 or 6.

TUF_j=applicable temperature use factor in section 5 or 6.

n=number of wash/rinse temperature combination settings available to the user for the clothes washer under test. For clothes washers that lockout temperature selections in the normal cycle, n=the number of wash/rinse temperature combination settings on the washers plus the number of wash/rinse temperature combination settings that lockout the temperature selections in the normal cycle.

TUF_w=temperature use factor for warm wash setting.

For clothes washers equipped with the suds-saver feature:

X_1=frequency of use without the suds-saver feature=0.86.

X_2=frequency of use with the suds-saver feature=0.14.

Sh_H=fresh make-up water measured during suds-return cycle at maximum water fill level.

Sh_L=fresh hot make-up water measured during suds-return cycle at minimum water fill level.

For clothes washers not equipped with the suds-saver feature:

X_1=1.0

X_2=0.0

4.1.2 *Total per-cycle hot water energy consumption for maximum and minimum water fill levels.* Calculate the total per-cycle hot water energy consumption for the maximum water fill level, E_{max} and for the minimum water fill level, E_{min}, expressed in kilowatt-hours per cycle and defined as:

$E_{max}=[Vh_{max}\times T\times K\times MF]$

$E_{min}=[Vh_{min}\times T\times K\times MF]$

where:

T=temperature rise=90°F (50°C).

K=water specific heat=0.00240 kWh/(gal–°F) [0.00114kWh/(L–°C)].

Vh_{max}=as defined in section 4.1.1.

Vh_{min}=as defined in section 4.1.1.

MF=multiplying factor to account for absence of test load=0.94 for top-loader vertical axis clothes washers that are sensor filled, 1.0 for all other clothes washers.

4.1.3 *Total weighted per-cycle hot water energy consumption expressed in kilowatt-hours.* Calculate the total weighted per cycle hot water energy consumption, E_T, expressed in kilowatt-hours per cycle and defined as:

$E_T=[E_{max}\times F_{max}]+[E_{min}\times F_{min}]$

where:

F_{max}=usage fill factor=0.72.

F_{min}=usage fill factor=0.28.

E_{max}=as defined in section 4.1.2.

E_{min}=as defined in section 4.1.2.

4.1.4 *Per-cycle water energy consumption using gas-heated or oil-heated water.* Calculate for the normal cycle the per-cycle energy consumption, E_{TG}, using gas-heated or oil-heated water, expressed in Btu per cycle (or megajoules per cycle) and defined as:

$$E_{TG} = E_T \times \frac{1}{e} \times \left[\frac{3412\ Btu}{kWh}\right] \text{ or } E_{TG} = E_T \times \frac{1}{e} \times \left[\frac{3.6\ MJ}{kWh}\right]$$

where:

e=nominal gas or oil water heater efficiency=0.75.

E_T=as defined in section 4.1.3.

4.1.5 *Per-cycle machine electrical energy consumption.*

4.1.5.1 *Non-water-heating clothes washers.* The electrical energy value recorded for the maximum fill in section 3.4.1 is the per-cycle machine electrical energy consumption, M_E, expressed in kilowatt-hours per cycle.

4.1.5.2 *Water-heating clothes washers.*

4.1.5.2.1 Calculate for the cycle under test the per-cycle temperature weighted electrical energy consumption for the maximum water fill level, Eh_{max}, and for the minimum water fill level, Eh_{min}, expressed in kilowatt-hours per cycle and defined as:

$$Eh_{max} = \sum_{i=1}^{n}\left[Eh_i \times TUF_i\right]$$

where:

Eh_i=reported electrical energy consumption in kilowatt-hours per cycle at maximum fill for each wash/cycle temperature combination setting, as provided in section 3.4.1.

TUF_i=applicable temperature use factor in section 5 or 6.
n=number of wash/rinse temperature combination settings available to the user for the clothes washer under test.

and

$$Eh_{min} = \sum_{j=1}^{n} \left[Eh_j \times TUF_j \right]$$

where:
Eh_j=reported electrical energy consumption in kilowatt-hours per cycle at minimum fill for each wash/rinse temperature combination setting, as provided in section 3.4.1.
TUF_j=applicable temperature use factor in section 5 or 6.
n=as defined above in this section.

4.1.5.2.2 *Weighted per-cycle machine electrical energy consumption.* Calculate the weighted per cycle machine energy consumption, M_E, expressed in kilowatt-hours per cycle and defined as:

$M_E=[Eh_{max}\times F_{max}]+[Eh_{min}\times F_{min}]$

where:
F_{max}=as defined in section 4.1.3.
F_{min}=as defined in section 4.1.3.
Eh_{max}=as defined in section 4.1.5.2.1.
Eh_{min}=as defined in section 4.1.5.2.1

4.1.6 *Total per-cycle energy consumption when electrically heated water is used.* Calculate for the normal cycle the total per-cycle energy consumption, E_{TE}, using electrically heated water, expressed in kilowatt-hours per cycle and defined as:

$E_{TE}=E_T+M_E$

where:
E_T=as defined in section 4.1.3.
M_E=as defined in section 4.1.5.1 or 4.1.5.2.2.

4.2 *Per-cycle energy consumption for removal of RMC.* Calculate the amount of energy per cycle required to remove RMC. Such amount is D_E, expressed in kilowatt-hours per cycle and defined as:

D_E=(LAF)×(test load weight)×(RMC−4%)×(DEF)×(DUF)

where:
LAF=load adjustment factor=0.52.
Test load weight=as shown in test load table in 3.3.2 expressed in lbs/cycle.
RMC=as defined in 3.3.3.5, 3.3.4.3, or 3.3.5.
DEF=nominal energy required for a clothes dryer to remove moisture from clothes=0.5 kWh/lb (1.1 kWh/kg).
DUF=dryer usage factor, percentage of washer loads dried in a clothes dryer=0.84.

4.3 *Water consumption.*

4.3.1 *Per-cycle temperature-weighted water consumption for maximum and minimum water fill levels.* To determine these amounts, calculate for the cycle under test the per-cycle temperature-weighted total water consumption for the maximum water fill level, Q_{max}, and for the minimum water fill level, Q_{min}, expressed in gallons per cycle (or liters per cycle) and defined as:

$$Q_{max} = X_1 \sum_{i=1}^{n} \left[\left(Vh_i + Vc_i \right) \times TUF_i \right] + X_2 \left[TUF_w \times \left(Sh_H + Sc_H \right) \right]$$

where:
Vh_i=hot water consumption in gallons per-cycle at maximum fill for each wash/rinse temperature combination setting, as provided in section 3.4.2.
Vc_i=total cold water consumption in gallons per-cycle at maximum fill for each wash/rinse temperature combination setting, cold wash/cold rinse cycle, as provided in section 3.4.2.
TUF_i=applicable temperature use factor in section 5 or 6.
n=number of wash/rinse temperature combination settings available to the user for the clothes washer under test.
TUF_w=temperature use factor for warm wash setting.

For clothes washers equipped with suds-saver feature:

X_1=frequency of use without suds-saver feature=0.86
X_2=frequency of use with suds-saver feature=0.14
Sh_H=fresh hot water make-up measured during suds-return cycle at maximum water fill level.
Sc_H=fresh cold water make-up measured during suds-return cycle at maximum water fill level.

For clothes washers not equipped with suds-saver feature:

X_1=1.0
X_2=0.0

and

$$Q_{min} = X_1 \sum_{j=1}^{n} \left[\left(Vh_j + Vc_j \right) \times TUF_j \right] + X_2 \left[TUF_w \times \left(Sh_L + Sc_L \right) \right]$$

where:

Vh_j=hot water consumption in gallons per cycle (or liters per cycle) at minimum fill for each wash/rinse temperature combination setting, as provided in section 3.4.3.

Vc_j=cold water consumption in gallons per cycle (or liters per cycle) at minimum fill for each wash/rinse temperature combination setting, cold wash/cold rinse cycle, as provided in section 3.4.3.

TUF_j=applicable temperature use factor in section 5 or 6.

Sh_L=fresh hot make-up water measured during suds-return cycle at minimum water fill level.

Sc_L=fresh cold make-up water measured during suds-return cycle at minimum water fill level.

n=as defined above in this section.

TUF_w=as defined above in this section.

X_1=as defined above in this section.

X_2=as defined above in this section.

4.3.2 *Total weighted per-cycle water consumption.* To determine this amount, calculate the total weighted per cycle water consumption, Q_T, expressed in gallons per cycle (or liters per cycle) and defined as:

$Q_T=[Q_{max}\times F_{max}]+[Q_{min}\times F_{min}]$

where:

F_{max}=as defined in section 4.1.3.

F_{min}=as defined in section 4.1.3.

Q_{max}=as defined in section 4.3.1.

Q_{min}=as defined in section 4.3.1.

4.3.3 *Water consumption factor.* The following calculates the water consumption factor, WCF, expressed in gallon per cycle per cubic foot (or liter per cycle per liter):

$WCF=Q_T/C$

where:

C=as defined in section 3.1.5.

Q_T=as defined in section 4.3.2.

4.4 *Modified energy factor.* The following calculates the modified energy factor, MEF, expressed in cubic feet per kilowatt-hours per cycle (or liters per kilowatt-hours per cycle):

$$MEF = \frac{C}{\left(M_E + E_T + D_E \right)}$$

where:

C=as defined in section 3.1.5.

M_E=as defined in section 4.1.5.1 or 4.1.5.2.2.

E_T=as defined in section 4.1.3.

D_E=as defined in section 4.2.

4.5 *Energy factor.* Calculate the energy factor, EF, expressed in cubic feet per kilowatt-hours per cycle (or liters per kilowatt-hours per cycle), as:

$$EF = \frac{C}{\left(M_E + E_T \right)}$$

where:

C=as defined in section 3.1.5.

M_E=as defined in section 4.1.5.1 or 4.1.5.2.2.

E_T=as defined in section 4.1.3.

5. APPLICABLE TEMPERATURE USE FACTORS FOR DETERMINING HOT WATER USAGE FOR VARIOUS WASH/RINSE TEMPERATURE SELECTIONS FOR ALL AUTOMATIC CLOTHES WASHERS

5.1 *Clothes washers with discrete temperature selections.*

5.1.1 *Five-temperature selection (n=5).*

Wash/rinse temperature setting	Temperature Use Factor (TUF)
Hot/Warm	0.18
Hot/Cold	.12
Warm/Warm	.30
Warm/Cold	.25
Cold/Cold	.15

5.1.2 *Four-temperature selection (n=4).*

Wash/rinse temperature setting	Temperature Use Factor (TUF)
Alternate I:	
Hot/Warm	0.18
Hot/Cold	.12
Warm/Cold	.55
Cold/Cold	.15
Alternate II:	
Hot/Warm	0.18
Hot/Cold	.12
Warm/Warm	.30
Warm/Cold	.40
Alternate III:	
Hot/Cold	0.12
Warm/Warm	.18
Warm/Cold	.55
Cold/Cold	.15

5.1.3 *Three-temperature selection (n=3).*

Wash/rinse temperature setting	Temperature Use Factor (TUF)
Alternate I:	
Hot/Warm	0.30
Warm/Cold	.55
Cold/Cold	.15
Alternate II:	

Wash/rinse temperature setting	Temperature Use Factor (TUF)
Hot/Cold	0.30
Warm/Cold	.55
Cold/Cold	.15
Alternate III:	
Hot/Cold	0.30
Warm/Warm	.55
Cold/Cold	.15

5.1.4 *Two-temperature selection (n=2).*

Wash/rinse temperature setting	Temperature Use Factor (TUF)
Any heated water/Cold	0.85
Cold/Cold	.15

5.1.5 *One-temperature selection (n=1).*

Wash/rinse temperature setting	Temperature Use Factor (TUF)
Any	1.00

5.2 *Clothes washers with infinite temperature selections.*

Wash/rinse temperature setting	Temperature Use Factor (TUF)	
	≤ 140°F (60°C) (n=3)	> 140°F (60°C) (n=4)
Extra-hot	.....	0.05
Hot	0.30	0.25
Warm	0.55	0.55
Cold	0.15	0.15

6. APPLICABLE TEMPERATURE USE FACTORS FOR DETERMINING HOT WATER USAGE FOR VARIOUS WASH/RINSE TEMPERATURE SETTINGS FOR ALL SEMI-AUTOMATIC, NON-WATER-HEATING, CLOTHES WASHERS

6.1 *Six-temperature settings (n=6).*

Wash/rinse temperature setting	Temperature Use Factor (TUF)
Hot/Hot	0.15
Hot/Warm	.09
Hot/Cold	.06
Warm/Warm	.42
Warm/Cold	.13
Cold/Cold	.15

7. WAIVERS AND FIELD TESTING

7.1 *Waivers and Field Testing for Non-conventional Clothes Washers.* Manufacturers of non-conventional clothes washers, such as clothes washers with adaptive control systems, must submit a petition for waiver pursuant to 10 CFR 430.27 to establish an acceptable test procedure for that clothes washer. For these and other clothes washers that have controls or systems such that the DOE test procedures yield results that are so unrepresentative of the clothes washer's true energy consumption characteristics as to provide materially inaccurate comparative data, field testing may be appropriate for establishing an acceptable test procedure. The following are guidelines for field testing which may be used by manufacturers in support of petitions for waiver. These guidelines are not mandatory and the Department may determine that they do not apply to a particular model. Depending upon a manufacturer's approach for conducting field testing, additional data may be required. Manufacturers are encouraged to communicate with the Department prior to the commencement of field tests which may be used to support a petition for waiver. Section 7.3 provides an example of field testing for a clothes washer with an adaptive water fill control system. Other features, such as the use of various spin speed selections, could be the subject of field tests.

7.2 *Non-conventional Wash System Energy Consumption Test.* The field test may consist of a minimum of 10 of the nonconventional clothes washers (''test clothes washers'') and 10 clothes washers already being distributed in commerce (''base clothes washers''). The tests should include a minimum of 50 normal test cycles per clothes washer. The test clothes washers and base clothes washers should be identical in construction except for the controls or systems being tested. Equal numbers of both the test clothes washer and the base clothes washer should be tested simultaneously in comparable settings to minimize seasonal and/or consumer laundering conditions and/or variations. The clothes washers should be monitored in such a way as to accurately record the total energy consumption per cycle. At a minimum, the following should be measured and recorded throughout the test period for each clothes washer: Hot water usage in gallons (or liters), electrical energy usage in kilowatt-hours, and the cycles of usage. The field test results would be used to determine the best method to correlate the rating of the test clothes washer to the rating of the base clothes washer. If the base clothes washer is rated at A kWh per year, but field tests at B kWh per year, and the test clothes washer field tests at D kWh per year, the test unit would be rated as follows:

$A \times (D/B) = G$ kWh per year

7.3 *Adaptive water fill control system field test.* Section 3.2.2.1 defines the test method for measuring energy consumption for clothes washers which incorporate control systems having both adaptive and alternate manual selections. Energy consumption calculated by the method defined in section 3.2.2.1 assumes the adaptive cycle will be used 50 percent of the time. This section can be used to develop field test data in support

of a petition for waiver when it is believed that the adaptive cycle will be used more than 50 percent of the time. The field test sample size should be a minimum of 10 test clothes washers. The test clothes washers should be totally representative of the design, construction, and control system that will be placed in commerce. The duration of field testing in the user's house should be a minimum of 50 normal test cycles, for each unit. No special instructions as to cycle selection or product usage should be given to the field test participants, other than inclusion of the product literature pack which should be shipped with all units, and instructions regarding filling out data collection forms, use of data collection equipment, or basic procedural methods. Prior to the test clothes washers being installed in the field test locations, baseline data should be developed for all field test units by conducting laboratory tests as defined by section 1 through section 6 of these test procedures to determine the energy consumption values. The following data should be measured and recorded for each wash load during the test period: wash cycle selected, the mode of the clothes washer (adaptive or manual), clothes load dry weight (measured after the clothes washer and clothes dryer cycles are completed) in pounds, and type of articles in the clothes load (i.e., cottons, linens, permanent press, etc.). The wash loads used in calculating the in-home percentage split between adaptive and manual cycle usage should be only those wash loads which conform to the definition of the normal test cycle.

Calculate:

T=The total number of normal test cycles run during the field test

T_a=The total number of adaptive control normal test cycles

T_m=The total number of manual control normal test cycles

The percentage weighting factors:

$P_a=(T_a/T) \times 100$ (the percentage weighting for adaptive control selection)

$P_m=(T_m/T) \times 100$ (the percentage weighting for manual control selection)

Energy consumption values, E_T, M_E, and D_E (if desired) calculated in section 4 for the manual and adaptive modes, should be combined using P_a and P_m as the weighting factors.

[62 FR 45501, Aug. 27, 1997]

APPENDIX J1 TO SUBPART B OF PART 430—UNIFORM TEST METHOD FOR MEASURING THE ENERGY CONSUMPTION OF AUTOMATIC AND SEMI-AUTOMATIC CLOTHES WASHERS

NOTE: Appendix J1 to Subpart B of part 430 is informational. It will not be used for determining compliance with standards, or as a basis for representations, until amended energy conservation standards for clothes washers at 10 CFR 430.32(g) become effective.

1. DEFINITIONS AND SYMBOLS

1.1 *Adaptive control system* means a clothes washer control system, other than an adaptive water fill control system, which is capable of automatically adjusting washer operation or washing conditions based on characteristics of the clothes load placed in the clothes container, without allowing or requiring consumer intervention or actions. The automatic adjustments may, for example, include automatic selection, modification, or control of any of the following: wash water temperature, agitation or tumble cycle time, number of rinse cycles, and spin speed. The characteristics of the clothes load, which could trigger such adjustments, could, for example, consist of or be indicated by the presence of either soil, soap, suds, or any other additive laundering substitute or complementary product.

NOTE: Appendix J1 does not provide a means for determining the energy consumption of a clothes washer with an adaptive control system. Therefore, pursuant to 10 CFR 430.27, a waiver must be obtained to establish an acceptable test procedure for each such clothes washer.

1.2 *Adaptive water fill control system* means a clothes washer water fill control system which is capable of automatically adjusting the water fill level based on the size or weight of the clothes load placed in the clothes container, without allowing or requiring consumer intervention or actions.

1.3 *Bone-dry* means a condition of a load of test cloth which has been dried in a dryer at maximum temperature for a minimum of 10 minutes, removed and weighed before cool down, and then dried again for 10 minute periods until the final weight change of the load is 1 percent or less.

1.4 *Clothes container* means the compartment within the clothes washer that holds the clothes during the operation of the machine.

1.5 *Compact* means a clothes washer which has a clothes container capacity of less than 1.6 ft^3 (45 L).

1.6 *Deep rinse cycle* means a rinse cycle in which the clothes container is filled with water to a selected level and the clothes load is rinsed by agitating it or tumbling it through the water.

1.7 *Energy test cycle* for a basic model means (A) the cycle recommended by the manufacturer for washing cotton or linen clothes, and includes all wash/rinse temperature selections and water levels offered in that cycle, and (B) for each other wash/rinse temperature selection or water level available on that basic model, the portion(s) of

other cycle(s) with that temperature selection or water level that, when tested pursuant to these test procedures, will contribute to an accurate representation of the energy consumption of the basic model as used by consumers. Any cycle under (A) or (B) shall include the agitation/tumble operation, spin speed(s), wash times, and rinse times applicable to that cycle, including water heating time for water heating clothes washers.

1.8 *Load use factor* means the percentage of the total number of wash loads that a user would wash a particular size (weight) load.

1.9 *Manual control system* means a clothes washer control system which requires that the consumer make the choices that determine washer operation or washing conditions, such as, for example, wash/rinse temperature selections, and wash time before starting the cycle.

1.10 *Manual water fill control system* means a clothes washer water fill control system which requires the consumer to determine or select the water fill level.

1.11 *Modified energy factor* means the quotient of the cubic foot (or liter) capacity of the clothes container divided by the total clothes washer energy consumption per cycle, with such energy consumption expressed as the sum of the machine electrical energy consumption, the hot water energy consumption, and the energy required for removal of the remaining moisture in the wash load.

1.12 *Non-water-heating clothes washer* means a clothes washer which does not have an internal water heating device to generate hot water.

1.13 *Spray rinse cycle* means a rinse cycle in which water is sprayed onto the clothes for a period of time without maintaining any specific water level in the clothes container.

1.14 *Standard* means a clothes washer which has a clothes container capacity of 1.6 ft^3 (45 L) or greater.

1.15 *Temperature use factor* means, for a particular wash/rinse temperature setting, the percentage of the total number of wash loads that an average user would wash with that setting.

1.16 *Thermostatically controlled water valves* means clothes washer controls that have the ability to sense and adjust the hot and cold supply water.

1.17 *Uniformly distributed warm wash temperature selection(s)* means (A) multiple warm wash selections for which the warm wash water temperatures have a linear relationship with all discrete warm wash selections when the water temperatures are plotted against equally spaced consecutive warm wash selections between the hottest warm wash and the coldest warm wash. If the warm wash has infinite selections, the warm wash water temperature has a linear relationship with the distance on the selection device (e.g. dial angle or slide movement) between the hottest warm wash and the coldest warm wash. The criteria for a linear relationship as specified above is that the difference between the actual water temperature at any warm wash selection and the point where that temperature is depicted on the temperature/selection line formed by connecting the warmest and the coldest warm selections is less than ±5 percent. In all cases, the mean water temperature of the warmest and the coldest warm selections must coincide with the mean of the ''hot wash'' (maximum wash temperature ≤135°F (57.2°C)) and ''cold wash'' (minimum wash temperature) water temperatures within ±3.8°F (±2.1°C); or (B) on a clothes washer with only one warm wash temperature selection, a warm wash temperature selection with a water temperature that coincides with the mean of the ''hot wash'' (maximum wash temperature ≤135°F (57.2°C)) and ''cold wash'' (minimum wash temperature) water temperatures within ±3.8°F (±2.1°C).

1.18 *Warm wash* means all wash temperature selections that are below the hottest hot, less than 135°F (57.2°C), and above the coldest cold temperature selection.

1.19 *Water consumption factor* means the quotient of the total weighted per-cycle water consumption divided by the cubic foot (or liter) capacity of the clothes washer.

1.20 *Water-heating clothes washer* means a clothes washer where some or all of the hot water for clothes washing is generated by a water heating device internal to the clothes washer.

1.21 *Symbol usage.* The following identity relationships are provided to help clarify the symbology used throughout this procedure.

E—Electrical Energy Consumption
H—Hot Water Consumption
C—Cold Water Consumption
R—Hot Water Consumed by Warm Rinse
ER—Electrical Energy Consumed by Warm Rinse
TUF—Temperature Use Factor
HE—Hot Water Energy Consumption
F—Load Usage Factor
Q—Total Water Consumption
ME—Machine Electrical Energy Consumption
RMC—Remaining Moisture Content
WI—Initial Weight of Dry Test Load
WC—Weight of Test Load After Extraction
m—Extra Hot Wash (maximum wash temp. >135°F (57.2°C.))
h—Hot Wash (maximum wash temp. ≤135°F (57.2°C.))
w—Warm Wash
c—Cold Wash (minimum wash temp.)
r—Warm Rinse (hottest rinse temp.)
x or max—Maximum Test Load
a or avg—Average Test Load
n or min—Minimum Test Load

The following examples are provided to show how the above symbols can be used to define variables:

Em_x=''Electrical Energy Consumption'' for an ''Extra Hot Wash'' and ''Maximum Test Load''
R_a=''Hot Water Consumed by Warm Rinse'' for the ''Average Test Load''
TUF_m=''Temperature Use Factor'' for an ''Extra Hot Wash''
HE_{min}=''Hot Water Energy Consumption'' for the ''Minimum Test Load''

2. TESTING CONDITIONS

2.1 *Installation.* Install the clothes washer in accordance with manufacturer's instructions.

2.2 *Electrical energy supply.* Maintain the electrical supply at the clothes washer terminal block within 2 percent of 120, 120/240, or 120/208Y volts as applicable to the particular terminal block wiring system and within 2 percent of the nameplate frequency as specified by the manufacturer. If the clothes washer has a dual voltage conversion capability, conduct test at the highest voltage specified by the manufacturer.

2.3 *Supply Water.*

2.3.1 *Clothes washers in which electrical energy consumption or water energy consumption are affected by the inlet water temperature. (For example, water heating clothes washers or clothes washers with thermostatically controlled water valves.).* The temperature of the hot water supply at the water inlets shall not exceed 135°F (57.2°C) and the cold water supply at the water inlets shall not exceed 60°F (15.6°C). A water meter shall be installed in both the hot and cold water lines to measure water consumption.

2.3.2 *Clothes washers in which electrical energy consumption and water energy consumption are not affected by the inlet water temperature.* The temperature of the hot water supply shall be maintained at 135°F±5°F (57.2°C±2.8°C) and the cold water supply shall be maintained at 60°F±5°F (15.6°C±2.8°C). A water meter shall be installed in both the hot and cold water lines to measure water consumption.

2.4 *Water pressure.* The static water pressure at the hot and cold water inlet connection of the clothes washer shall be maintained at 35 pounds per square inch gauge (psig) ±2.5 psig (241.3 kPa±17.2 kPa) during the test. The static water pressure for a single water inlet connection shall be maintained at 35 psig±2.5 psig (241.3 kPa±17.2 kPa) during the test. A water pressure gauge shall be installed in both the hot and cold water lines to measure water pressure.

2.5 *Instrumentation.* Perform all test measurements using the following instruments, as appropriate:

2.5.1 *Weighing scales.*

2.5.1.1 *Weighing scale for test cloth.* The scale shall have a resolution of no larger than 0.2 oz (5.7 g) and a maximum error no greater than 0.3 percent of the measured value.

2.5.1.2 *Weighing scale for clothes container capacity measurements.* The scale should have a resolution no larger than 0.50 lbs (0.23 kg) and a maximum error no greater than 0.5 percent of the measured value.

2.5.2 *Watt-hour meter.* The watt-hour meter shall have a resolution no larger than 1 Wh (3.6 kJ) and a maximum error no greater than 2 percent of the measured value for any demand greater than 50 Wh (180.0 kJ).

2.5.3 *Temperature measuring device.* The device shall have an error no greater than ±1°F (±0.6°C) over the range being measured.

2.5.4 *Water meter.* The water meter shall have a resolution no larger than 0.1 gallons (0.4 liters) and a maximum error no greater than 2 percent for the water flow rates being measured.

2.5.5 *Water pressure gauge.* The water pressure gauge shall have a resolution of 1 pound per square inch gauge (psig) (6.9 kPa) and shall have an error no greater than 5 percent of any measured value.

2.6 *Test cloths.*

2.6.1 *Energy test cloth.*

2.6.1.1 The energy test cloth shall not be used for more than 25 test runs and shall be clean and consist of the following:

(A) Pure finished bleached cloth, made with a momie or granite weave, which is 50 percent cotton and 50 percent polyester and weighs 5.75 ounces per square yard (195.0 g/m^2) and has 65 ends on the warp and 57 picks on the fill; and

(B) Cloth material that is 24 inches by 36 inches (61.0 cm by 91.4 cm) and has been hemmed to 22 inches by 34 inches (55.9 cm by 86.4 cm) before washing. The maximum shrinkage after five washes shall not be more than four percent on the length and width.

2.6.1.2 The new test cloths, including energy test cloths and energy stuffer cloths, shall be pre-conditioned in a clothes washer in the following manner:

2.6.1.2.1 Wash the test cloth using a commercially available clothes washing detergent that is suitable for 135°F (57.2°C) wash water as recommended by the manufacturer, with the washer set on maximum water level. Place detergent in washer and then place the new load to be conditioned in the washer. Wash the load for ten minutes in soft water (17ppm or less). Wash water is to be hot, and controlled at 135°F±5°F (57.2°C ±2.8°C). Rinse water temperature is to be cold, and controlled at 60°F ±5°F (15.6°C ±2.8°C). Rinse the load through a second rinse using the same water temperature (if an optional second rinse is available on the clothes washer, use it).

2.6.1.2.2 Dry the load.

2.6.1.2.3 A final cycle is to be hot water wash with no detergent followed by two cold water rinses.

2.6.1.2.4 Dry the load.

2.6.2 *Energy stuffer cloth.* The energy stuffer cloth shall be made from energy test cloth

material and shall consist of pieces of material that are 12 inches by 12 inches (30.5 cm by 30.5 cm) and have been hemmed to 10 inches by 10 inches (25.4 cm by 25.4 cm) before washing. The maximum shrinkage after five washes shall not be more than four percent on the length and width. The number of test runs on the same energy stuffer cloth shall not exceed 25 runs.

2.7 *Test Load Sizes.* Maximum, minimum, and, when required, average test load sizes shall be determined using Table 5.1 and the clothes container capacity as measured in 3.1.1 through 3.1.5. Test loads shall consist of energy test cloths, except that adjustments to the test loads to achieve proper weight can be made by the use of energy stuffer cloths with no more than 5 stuffer clothes per load.

2.8 *Use of Test Loads.* Table 2.8 defines the test load sizes and corresponding water fill settings which are to be used when measuring water and energy consumptions. Adaptive water fill control system and manual water fill control system are defined in section 1 of this appendix:

TABLE 2.8.—TEST LOAD SIZES AND WATER FILL SETTINGS REQUIRED

Manual water fill control system		Adaptive water fill control system	
Test load size	Water fill setting	Test load size	Water fill setting
Max Min	Max Min	Max Avg Min	As determined by the Clothes Washer.

2.8.1 The test load sizes to be used to measure RMC are specified in section 3.8.1.

2.8.2 Test loads for energy and water consumption measurements shall be bone dry prior to the first cycle of the test, and dried to a maximum of 104 percent of bone dry weight for subsequent testing.

2.8.3 Load the energy test cloths by grasping them in the center, shaking them to hang loosely and then put them into the clothes container prior to activating the clothes washer.

2.9 *Pre-conditioning.*

2.9.1 *Nonwater-heating clothes washer.* If the clothes washer has not been filled with water in the preceding 96 hours, pre-condition it by running it through a cold rinse cycle and then draining it to ensure that the hose, pump, and sump are filled with water.

2.9.2 *Water-heating clothes washer.* If the clothes washer has not been filled with water in the preceding 96 hours, or if it has not been in the test room at the specified ambient conditions for 8 hours, pre-condition it by running it through a cold rinse cycle and then draining it to ensure that the hose, pump, and sump are filled with water.

2.10 *Wash time setting.* If one wash time is prescribed in the energy test cycle, that shall be the wash time setting; otherwise, the wash time setting shall be the higher of either the minimum, or 70 percent of the maximum wash time available in the energy test cycle.

2.11 *Test room temperature for water-heating clothes washers.* Maintain the test room ambient air temperature at 75°F±5°F (23.9°C±2.8°C).

3. TEST MEASUREMENTS

3.1 *Clothes container capacity.* Measure the entire volume which a dry clothes load could occupy within the clothes container during washer operation according to the following procedures:

3.1.1 Place the clothes washer in such a position that the uppermost edge of the clothes container opening is leveled horizontally, so that the container will hold the maximum amount of water.

3.1.2 Line the inside of the clothes container with 2 mil (0.051 mm) plastic sheet. All clothes washer components which occupy space within the clothes container and which are recommended for use with the energy test cycle shall be in place and shall be lined with 2 mil (0.051 mm) plastic sheet to prevent water from entering any void space.

3.1.3 Record the total weight of the machine before adding water.

3.1.4 Fill the clothes container manually with either 60°F±5°F (15.6°C±2.8°C) or 100°F±10°F (37.8°C±5.5°C) water to its uppermost edge. Measure and record the weight of water, W, in pounds.

3.1.5 The clothes container capacity is calculated as follows:

$C = W/d.$

where:

C=Capacity in cubic feet (liters).

W=Mass of water in pounds (kilograms).

d=Density of water (62.0 lbs/ft^3 for 100 °F (993 kg/m^3 for 37.8°C) or 62.3 lbs/ft^3 for 60 °F (998 kg/m^3 for 15.6°C)).

3.2 *Procedure for measuring water and energy consumption values on all automatic and semi-automatic washers.* All energy consumption tests shall be performed under the energy test cycle(s), unless otherwise specified. Table 3.2 defines the sections below which govern tests of particular clothes washers, based on the number of wash/rinse temperature selections available on the model, and also, in some instances, method of water

heating. The procedures prescribed are applicable regardless of a clothes washer's washing capacity, loading port location, primary axis of rotation of the clothes container, and type of control system.

3.2.1 *Inlet water temperature and the wash/rinse temperature settings.*

3.2.1.1 For automatic clothes washers set the wash/rinse temperature selection control to obtain the wash water temperature desired (extra hot, hot, warm, or cold) and cold rinse, and open both the hot and cold water faucets.

3.2.1.2 For semi-automatic washers: (1) For hot water temperature, open the hot water faucet completely and close the cold water faucet; (2) for warm inlet water temperature, open both hot and cold water faucets completely; (3) for cold water temperature, close the hot water faucet and open the cold water faucet completely.

3.2.1.3 *Determination of warm wash water temperature(s) to decide whether a clothes washer has uniformly distributed warm wash temperature selections.* The wash water temperature, Tw, of each warm water wash selection shall be calculated or measured.

For non-water-heating clothes washers, calculate Tw as follows:

$$Tw(°F)=((Hw\times 135°F)+(Cw\times 60°F))/(Hw+Cw)$$

or

$$Tw(°C)=((Hw\times 57.2°C)+(Cw\times 15.6°C))/(Hw+Cw)$$

where:

Hw=Hot water consumption of a warm wash

Cw=Cold water consumption of a warm wash

For water-heating clothes washers, measure and record the temperature of each warm wash selection after fill.

3.2.2 Total water consumption during the energy test cycle shall be measured, including hot and cold water consumption during wash, deep rinse, and spray rinse.

3.2.3 *Clothes washers with adaptive water fill/manual water fill control systems*

3.2.3.1 *Clothes washers with adaptive water fill control system and alternate manual water fill control systems.* If a clothes washer with an adaptive water fill control system allows consumer selection of manual controls as an alternative, then both manual and adaptive modes shall be tested and, for each mode, the energy consumption (HE_T, ME_T, and D_E) and water consumption (Q_T), values shall be calculated as set forth in section 4. Then the average of the two values (one from each mode, adaptive and manual) for each variable shall be used in section 4 for the clothes washer.

3.2.3.2 *Clothes washers with adaptive water fill control system.*

3.2.3.2.1. Not user adjustable. The maximum, minimum, and average water levels as defined in the following sections shall be interpreted to mean that amount of water fill which is selected by the control system when the respective test loads are used, as defined in Table 2.8. The load usage factors which shall be used when calculating energy consumption values are defined in Table 4.1.3.

3.2.3.2.2 User adjustable. Four tests shall be conducted on clothes washers with user adjustable adaptive water fill controls which affect the relative wash water levels. The first test shall be conducted with the maximum test load and with the adaptive water fill control system set in the setting that will give the most energy intensive result. The second test shall be conducted with the minimum test load and with the adaptive water fill control system set in the setting that will give the least energy intensive result. The third test shall be conducted with the average test load and with the adaptive water fill control system set in the setting that will give the most energy intensive result for the given test load. The fourth test shall be conducted with the average test load and with the adaptive water fill control system set in the setting that will give the least energy intensive result for the given test load. The energy and water consumption for the average test load and water level, shall be the average of the third and fourth tests.

3.2.3.3 *Clothes washers with manual water fill control system.* In accordance with Table 2.8, the water fill selector shall be set to the maximum water level available on the clothes washer for the maximum test load size and set to the minimum water level for the minimum test load size. The load usage factors which shall be used when calculating energy consumption values are defined in Table 4.1.3.

TABLE 3.2.—TEST SECTION REFERENCE

Max. Wash Temp. Available	≤135°F (57.2°C)		>135°F (57.2°C)[2]		
Number of Wash Temp. Selections	1	2	>2	3	>3
Test Sections Required to be Followed	.....	.....	.....	3.3	3.3
	.....	3.4	3.4	.....	3.4
	.....	.....	3.5	3.5	3.5
	3.6	3.6	3.6	3.6	3.6
	[1]3.7	[1]3.7	[1]3.7	[1]3.7	[1]3.7
	3.8	3.8	3.8	3.8	3.8

[1] Only applicable to machines with warm rinse in any cycle.

[2] This only applies to water hearting clothes washers on which the maximum wash temperature available exceeds 135°F (57.2°C)

3.3 *''Extra Hot Wash'' (Max Wash Temp >135°F (57.2°C)) for water heating clothes washers only.* Water and electrical energy consumption shall be measured for each water fill level and/or test load size as specified in 3.3.1 through 3.3.3 for the hottest wash setting available.

3.3.1 *Maximum test load and water fill.* Hot water consumption (Hm_x), cold water consumption (Cm_x), and electrical energy consumption (Em_x) shall be measured for an extra hot wash/cold rinse energy test cycle, with the controls set for the maximum water fill level. The maximum test load size is to be used and shall be determined per Table 5.1.

3.3.2 *Minimum test load and water fill.* Hot water consumption (Hm_n), cold water consumption (Cm_n), and electrical energy consumption (Em_n) shall be measured for an extra hot wash/cold rinse energy test cycle, with the controls set for the minimum water fill level. The minimum test load size is to be used and shall be determined per Table 5.1.

3.3.3 *Average test load and water fill.* For clothes washers with an adaptive water fill control system, measure the values for hot water consumption (Hm_a), cold water consumption (Cm_a), and electrical energy consumption (Em_a) for an extra hot wash/cold rinse energy test cycle, with an average test load size as determined per Table 5.1.

3.4 *''Hot Wash'' (Max Wash Temp≤135°F (57.2°C)).* Water and electrical energy consumption shall be measured for each water fill level or test load size as specified in 3.4.1 through 3.4.3 for a 135°F (57.2°C)) wash, if available, or for the hottest selection less than 135°F (57.2°C)).

3.4.1 *Maximum test load and water fill.* Hot water consumption (Hh_x), cold water consumption (Ch_x), and electrical energy consumption (Eh_x) shall be measured for a hot wash/cold rinse energy test cycle, with the controls set for the maximum water fill level. The maximum test load size is to be used and shall be determined per Table 5.1.

3.4.2 *Minimum test load and water fill.* Hot water consumption (Hh_n), cold water consumption (Ch_n), and electrical energy consumption (Eh_n) shall be measured for a hot wash/cold rinse energy test cycle, with the controls set for the minimum water fill level. The minimum test load size is to be used and shall be determined per Table 5.1.

3.4.3 *Average test load and water fill.* For clothes washers with an adaptive water fill control system, measure the values for hot water consumption (Hh_a), cold water consumption (Ch_a), and electrical energy consumption (Eh_a) for a hot wash/cold rinse energy test cycle, with an average test load size as determined per Table 5.1.

3.5 *''Warm Wash.''* Water and electrical energy consumption shall be determined for each water fill level and/or test load size as specified in 3.5.1 through 3.5.2.3 for the applicable warm water wash temperature(s).

3.5.1 *Clothes washers with uniformly distributed warm wash temperature selection(s).* The reportable values to be used for the warm water wash setting shall be the arithmetic average of the measurements for the hot and cold wash selections. This is a calculation only, no testing is required.

3.5.2 *Clothes washers that lack uniformly distributed warm wash temperature selections.* For a clothes washer with fewer than four discrete warm wash selections, test all warm wash temperature selections. For a clothes washer that offers four or more warm wash selections, test at all discrete selections, or test at 25 percent, 50 percent, and 75 percent positions of the temperature selection device between the hottest hot (≤135°F (57.2 °C)) wash and the coldest cold wash. If a selection is not available at the 25, 50 or 75 percent position, in place of each such unavailable selection use the next warmer setting. Each reportable value to be used for the warm water wash setting shall be the arithmetic average of all tests conducted pursuant to this section.

3.5.2.1 *Maximum test load and water fill.* Hot water consumption (Hw_x), cold water consumption (Cw_x), and electrical energy consumption (Ew_x) shall be measured with the controls set for the maximum water fill level. The maximum test load size is to be used and shall be determined per Table 5.1.

3.5.2.2 *Minimum test load and water fill.* Hot water consumption (Hw_n), cold water consumption (Cw_n), and electrical energy consumption (Ew_n) shall be measured with the controls set for the minimum water fill level. The minimum test load size is to be used and shall be determined per Table 5.1.

3.5.2.3 *Average test load and water fill.* For clothes washers with an adaptive water fill control system, measure the values for hot water consumption (Hw_a), cold water consumption (Cw_a), and electrical energy consumption (Ew_a) with an average test load size as determined per Table 5.1.

3.6 *''Cold Wash'' (Minimum Wash Temperature Selection).* Water and electrical energy consumption shall be measured for each water fill level or test load size as specified in 3.6.1 through 3.6.3 for the coldest wash temperature selection available.

3.6.1 *Maximum test load and water fill.* Hot water consumption (Hc_x), cold water consumption (Cc_x), and electrical energy consumption (Ec_x) shall be measured for a cold wash/cold rinse energy test cycle, with the controls set for the maximum water fill level. The maximum test load size is to be used and shall be determined per Table 5.1.

3.6.2 *Minimum test load and water fill.* Hot water consumption (Hc_n), cold water consumption (Cc_n), and electrical energy consumption (Ec_n) shall be measured for a cold wash/cold rinse energy test cycle, with the

controls set for the minimum water fill level. The minimum test load size is to be used and shall be determined per Table 5.1.

3.6.3 *Average test load and water fill.* For clothes washers with an adaptive water fill control system, measure the values for hot water consumption (Hc_a), cold water consumption (Cc_a), and electrical energy consumption (Ec_a) for a cold wash/cold rinse energy test cycle, with an average test load size as determined per Table 5.1.

3.7 *Warm Rinse.* Tests in sections 3.7.1 and 3.7.2 shall be conducted with the hottest rinse temperature available. If multiple wash temperatures are available with the hottest rinse temperature, any ''warm wash'' temperature may be selected to conduct the tests.

3.7.1 For the rinse only, measure the amount of hot water consumed by the clothes washer including all deep and spray rinses, for the maximum (R_x), minimum (R_n), and, if required by section 3.5.2.3, average (R_a) test load sizes or water fill levels.

3.7.2 Measure the amount of electrical energy consumed by the clothes washer to heat the rinse water only, including all deep and spray rinses, for the maximum (ER_x), minimum (ER_n), and, if required by section 3.5.2.3, average (ER_a), test load sizes or water fill levels.

3.8 *Remaining Moisture Content:*

3.8.1 The wash temperature will be the same as the rinse temperature for all testing. Use the maximum test load as defined in Table 5.1 and section 3.1 for testing.

3.8.2 *For clothes washers with cold rinse only:*

3.8.2.1 Record the actual 'bone dry' weight of the test load (WI_{max}), then place the test load in the clothes washer.

3.8.2.2 Set water level selector to maximum fill.

3.8.2.3 Run the energy test cycle.

3.8.2.4 Record the weight of the test load immediately after completion of the energy test cycle (WC_{max}).

3.8.2.5 Calculate the remaining moisture content of the maximum test load, RMC_{MAX}, expressed as a percentage and defined as:

$$RMC_{max}=((WC_{max}-WI_{max})/WI_{max})\times 100\%$$

3.8.3 *For clothes washers with cold and warm rinse options:*

3.8.3.1 Complete steps 3.8.2.1 through 3.8.2.4 for cold rinse. Calculate the remaining moisture content of the maximum test load for cold rinse, RMC_{COLD}, expressed as a percentage and defined as:

$$RMC_{COLD}=((WC_{max}-WI_{max})/WI_{max})\times 100\%$$

3.8.3.2 Complete steps 3.8.2.1 through 3.8.2.4 for warm rinse. Calculate the remaining moisture content of the maximum test load for warm rinse, RMC_{WARM}, expressed as a percentage and defined as:

$$RMC_{WARM}=((WC_{max}-WI_{max})/WI_{max})\times 100\%$$

3.8.3.3 Calculate the remaining moisture content of the maximum test load, RMC_{max}, expressed as a percentage and defined as:

$$RMC_{max}=RMC_{COLD}\times(1-TUF_r)+RMC_{WARM}\times(TUF_r).$$

where:

TUF_r is the temperature use factor for warm rinse as defined in Table 4.1.1.

3.8.4 Clothes washers which have options that result in different RMC values, such as multiple selection of spin speeds or spin times, that are available in the energy test cycle, shall be tested at the maximum and minimum extremes of the available options, excluding any ''no spin'' (zero spin speed) settings, in accordance with requirements in 3.8.2 or 3.8.3. The calculated $RMC_{max\ extraction}$ and $RMC_{min\ extraction}$ at the maximum and minimum settings, respectively, shall be combined as follows and the final RMC to be used in section 4.3 shall be:

$$RMC = 0.75\times RMC_{max\ extraction}+0.25\times RMC_{min\ extraction}$$

4. CALCULATION OF DERIVED RESULTS FROM TEST MEASUREMENTS

4.1 *Hot water and machine electrical energy consumption of clothes washers.*

4.1.1 *Per-cycle temperature-weighted hot water consumption for maximum, average, and minimum water fill levels using each appropriate load size as defined in section 2.8 and Table 5.1.* Calculate for the cycle under test the per-cycle temperature weighted hot water consumption for the maximum water fill level, Vh_x, the average water fill level, Vh_a, and the minimum water fill level, Vh_n, expressed in gallons per cycle (or liters per cycle) and defined as:

(a) $Vh_x=[Hm_x\times TUF_m]+[Hh_x\times TUF_h]+[Hw_x\times TUF_w]+[Hc_x\times TUF_c]+[R_x\times TUF_r]$

(b) $Vh_a=[Hm_a\times TUF_m]+[Hh_a\times TUF_h]+[Hw_a\times TUF_w]+[Hc_a\times TUF_c]+[R_a\times TUF_r]$

(c) $Vh_n=[Hm_n\times TUF_m]+[Hh_n\times TUF_h]+[Hw_n\times TUF_w]+[Hc_n\times TUF_c]+[R_n\times TUF_r]$

where:

Hm_x, Hm_a, and Hm_n, are reported hot water consumption values, in gallons per-cycle (or liters per cycle), at maximum, average, and minimum water fill, respectively, for the extra-hot wash cycle with the appropriate test loads as defined in section 2.8.

Hh_x, Hh_a, and Hh_n, are reported hot water consumption values, in gallons per-cycle (or liters per cycle), at maximum, average, and minimum water fill, respectively, for the hot wash cycle with the appropriate test loads as defined in section 2.8.

Hw_x, Hw_a, and Hw_n, are reported hot water consumption values, in gallons per-cycle (or liters per cycle), at maximum, average, and minimum water fill, respectively, for the warm wash cycle with the

appropriate test loads as defined in section 2.8.

Hc_x, Hc_a, and Hc_n, are reported hot water consumption values, in gallons per-cycle (or liters per cycle), at maximum, average, and minimum water fill, respectively, for the cold wash cycle with the appropriate test loads as defined in section 2.8.

R_x, R_a, and R_n are the reported hot water consumption values, in gallons per-cycle (or liters per cycle), at maximum, average, and minimum water fill, respectively, for the warm rinse cycle and the appropriate test loads as defined in section 2.8.

TUF_m, TUF_h, TUF_w, TUF_c, and TUF_r are temperature use factors for extra hot wash, hot wash, warm wash, cold wash, and warm rinse temperature selections, respectively, and are as defined in Table 4.1.1.

TABLE 4.1.1.—TEMPERATURE USE FACTORS

Max Wash Temp Available ..	≤135 °F (57.2 °C)	≤135 °F (57.2 °C)	≤135 °F (57.2 °C)	>135 °F (57.2 °C)	>135 °F (57.2 °C)
No. Wash Temp Selections	Single	2 Temps	>2 Temps	3 Temps	>3 Temps
TUF_m (extra hot)	NA	NA	NA	0.14	0.05
TUF_h (hot)	NA	0.63	0.14	NA	0.09
TUF_w (warm)	NA	NA	0.49	0.49	0.49
TUF_c (cold)	1.00	0.37	0.37	0.37	0.37
TUF_r (warm rinse)	0.27	0.27	0.27	0.27	0.27

4.1.2 *Total per-cycle hot water energy consumption for all maximum, average, and minimum water fill levels tested.* Calculate the total per-cycle hot water energy consumption for the maximum water fill level, HE_{max}, the minimum water fill level, HE_{min}, and the average water fill level, HE_{avg}, expressed in kilowatt-hours per cycle and defined as:

(a) $HE_{max} = [Vh_x \times T \times K]$=Total energy when a maximum load is tested.

(b) $HE_{avg} = [Vh_a \times T \times K]$=Total energy when an average load is tested.

(c) $HE_{min} = [Vh_n \times T \times K]$=Total energy when a minimum load is tested.

where:

T=Temperature rise=75 °F (41.7 °C).

K=Water specific heat in kilowatt-hours per gallon degree F=0.00240 (0.00114 kWh/L-°C).

Vh_x Vh_a, and Vh_n, are as defined in 4.1.1.

4.1.3 *Total weighted per-cycle hot water energy consumption.* Calculate the total weighted per cycle hot water energy consumption, HE_T, expressed in kilowatt-hours per cycle and defined as:

$HE_T=[HE_{max} \times F_{max}]+[HE_{avg} \times F_{avg}]+[HE_{mn} \times F_{min}]$

where:

HE_{max}, HE_{avg}, and HE_{min} are as defined in 4.1.2.

F_{max}, F_{avg}, and F_{min} are the load usage factors for the maximum, average, and minimum test loads based on the size and type of control system on the washer being tested. The values are as shown in table 4.1.3.

TABLE 4.1.3—LOAD USAGE FACTORS

Water fill control system	Manual	Adaptive
F_{max} = ...	0.72[1]	0.12[2]
F_{avg} = ...	.....	0.74[2]
F_{min}=	0.28[1]	0.14[2]

[1] Reference 3.2.3.3.
[2] Reference 3.2.3.2.

4.1.4 *Total per-cycle hot water energy consumption using gas-heated or oil-heated water.* Calculate for the energy test cycle the per-cycle hot water consumption, HE_{TG}, using gas heated or oil-heated water, expressed in Btu per cycle (or megajoules per cycle) and defined as:

$HE_{TG}=H_T \times 1/e \times 3412$ Btu/kWh or $HE_{TG}=HE_T \times 1/e \times 3.6$ MJ/kWh

where:

e=Nominal gas or oil water heater efficiency=0.75.

HE_T=As defined in 4.1.3.

4.1.5 *Per-cycle machine electrical energy consumption for all maximum, average, and minimum test load sizes.* Calculate the total per-cycle machine electrical energy consumption for the maximum water fill level, ME_{max}, the minimum water fill level, ME_{min}, and the average water fill level, ME_{avg}, expressed in kilowatt-hours per cycle and defined as:

(a) $ME_{max}= [Em_x \times TUF_m]+ [Eh_x \times TUF_h]+ [Ew_x \times TUF_w]+ [Ec_x \times TUF_c]+ [ER_x \times TUF_r]$

(b) $ME_{avg}= [Em_a \times TUF_m]+ [Eh_a \times TUF_h]+ [Ew_a \times TUF_w]+ [Ec_a \times TUF_c]+ [ER_a \times TUF_r]$

(c) $ME_{min}= [Em_n \times TUF_m]+ [Eh_n \times TUF_h]+ [Ew_n \times TUF_w]+ [Ec_n \times xTUF_c]+ [ER_n \times TUF_r]$

where:

Em_x, Em_a, and Em_n, are reported electrical energy consumption values, in kilowatt-hours per cycle, at maximum, average,

and minimum test loads, respectively, for the extra-hot wash cycle.

Eh_x, Eh_a, and Eh_n, are reported electrical energy consumption values, in kilowatt-hours per cycle, at maximum, average, and minimum test loads, respectively, for the hot wash cycle.

Ew_x, Ew_a, and Ew_n, are reported electrical energy consumption values, in kilowatt-hours per cycle, at maximum, average, and minimum test loads, respectively, for the warm wash cycle.

Ec_x, Ec_a, and Ec_n, are reported electrical energy consumption values, in kilowatt-hours per cycle, at maximum, average, and minimum test loads, respectively, for the cold wash cycle.

ER_x, ER_a, and ER_n are reported electrical energy consumption values, in kilowatt-hours per cycle, at maximum, average, and minimum test loads, respectively, for the warm rinse cycle.

TUF_m, TUF_h, TUF_w, TUF_c, and TUF_r are as defined in Table 4.1.1.

4.1.6 *Total weighted per-cycle machine electrical energy consumption.* Calculate the total per cycle load size weighted energy consumption, ME_T, expressed in kilowatt-hours per cycle and defined as:

$$ME_T=[ME_{max}\times F_{max}]+[ME_{avg}\times F_{avg}]+[ME_{min}\times F_{min}]$$

where:

ME_{max}, ME_{avg}, and ME_{min} are as defined in 4.1.5.

F_{max}, F_{avg}, and F_{min} are as defined in Table 4.1.3.

4.1.7 *Total per-cycle energy consumption when electrically heated water is used.* Calculate for the energy test cycle the total per-cycle energy consumption, E_{TE}, using electrical heated water, expressed in kilowatt-hours per cycle and defined as:

$$E_{TE}=HE_T+ME_T$$

where:

ME_T=As defined in 4.1.6.

HE_T=As defined in 4.1.3.

4.2 *Water consumption of clothes washers.* (The calculations in this Section need not be performed to determine compliance with the energy conservation standards for clothes washers.)

4.2.1 *Per-cycle water consumption.* Calculate the maximum, average, and minimum total water consumption, expressed in gallons per cycle (or liters per cycle), for the cold wash/cold rinse cycle and defined as:

$$Q_{max}=[Hc_x+Cc_x]$$
$$Q_{avg}=[Hc_a+Cc_a]$$
$$Q_{min}=[Hc_n+Cc_n]$$

where:

Hc_x, Cc_x, Hc_a, Cc_a, Hc_n, and Cc_n are as defined in 3.6.

4.2.2 *Total weighted per-cycle water consumption.* Calculate the total weighted per cycle consumption, Q_T, expressed in gallons per cycle (or liters per cycle) and defined as:

$$Q_T=[Q_{max}\times F_{max}]+[Q_{avg}\times F_{avg}]+[Q_{min}\times F_{min}]$$

where:

Q_{max}, Q_{avg}, and Q_{min} are as defined in 4.2.1.

F_{max}, F_{avg}, and F_{min} are as defined in table 4.1.3.

4.2.3 *Water consumption factor.* Calculate the water consumption factor, WCF, expressed in gallon per cycle per cubic feet (or liter per cycle per liter), as:

$$WCF=Q_T / C$$

where:

Q_T=as defined in section 4.2.2.

C = as defined in section 3.1.5.

4.3 *Per-cycle energy consumption for removal of moisture from test load.* Calculate the per-cycle energy required to remove the moisture of the test load, D_E, expressed in kilowatt-hours per cycle and defined as

D_E=(LAF)×(Maximum test load weight)×(RMC—4%)×(DEF)×(DUF)

where:

LAF=Load adjustment factor=0.52.

Test load weight=As required in 3.8.1, expressed in lbs/cycle.

RMC=As defined in 3.8.2.5, 3.8.3.3 or 3.8.4.

DEF=nominal energy required for a clothes dryer to remove moisture from clothes=0.5 kWh/lb (1.1 kWh/kg).

DUF=dryer usage factor, percentage of washer loads dried in a clothes dryer=0.84.

4.4 *Modified energy factor.* Calculate the modified energy factor, MEF, expressed in cubic feet per kilowatt-hour per cycle (or liters per kilowatt-hour per cycle) and defined as:

$$MEF=C/(E_{TE}+D_E)$$

where:

C=As defined in 3.1.5.

E_{TE}=As defined in 4.1.7.

D_E=As defined in 4.3.

4.5 *Energy factor.* Calculate the energy factor, EF, expressed in cubic feet per kilowatt-hour per cycle (or liters per kilowatt-hour per cycle) and defined as:

$$EF=C/E_{TE}$$

where:

C=As defined in 3.1.5.

E_{TE}=As defined in 4.1.7.

5. TEST LOADS

TABLE 5.1—TEST LOAD SIZES

Container volume		Minimum load		Maximum load		Average load	
cu. ft. ≥ <	(liter) ≥ <	lb	(kg)	lb	(kg)	lb	(kg)
0–0.8	0–22.7	3.00	1.36	3.00	1.36	3.00	1.36
0.80–0.90	22.7–25.5	3.00	1.36	3.50	1.59	3.25	1.47
0.90–1.00	25.5–28.3	3.00	1.36	3.90	1.77	3.45	1.56
1.00–1.10	28.3–31.1	3.00	1.36	4.30	1.95	3.65	1.66
1.10–1.20	31.1–34.0	3.00	1.36	4.70	2.13	3.85	1.75
1.20–1.30	34.0–36.8	3.00	1.36	5.10	2.31	4.05	1.84
1.30–1.40	36.8–39.6	3.00	1.36	5.50	2.49	4.25	1.93
1.40–1.50	39.6–42.5	3.00	1.36	5.90	2.68	4.45	2.02
1.50–1.60	42.5–45.3	3.00	1.36	6.40	2.90	4.70	2.13
1.60–1.70	45.3–48.1	3.00	1.36	6.80	3.08	4.90	2.22
1.70–1.80	48.1–51.0	3.00	1.36	7.20	3.27	5.10	2.31
1.80–1.90	51.0–53.8	3.00	1.36	7.60	3.45	5.30	2.40
1.90–2.00	53.8–56.6	3.00	1.36	8.00	3.63	5.50	2.49
2.00–2.10	56.6–59.5	3.00	1.36	8.40	3.81	5.70	2.59
2.10–2.20	59.5–62.3	3.00	1.36	8.80	3.99	5.90	2.68
2.20–2.30	62.3–65.1	3.00	1.36	9.20	4.17	6.10	2.77
2.30–2.40	65.1–68.0	3.00	1.36	9.60	4.35	6.30	2.86
2.40–2.50	68.0–70.8	3.00	1.36	10.00	4.54	6.50	2.95
2.50–2.60	70.8–73.6	3.00	1.36	10.50	4.76	6.75	3.06
2.60–2.70	73.6–76.5	3.00	1.36	10.90	4.94	6.95	3.15
2.70–2.80	76.5–79.3	3.00	1.36	11.30	5.13	7.15	3.24
2.80–2.90	79.3–82.1	3.00	1.36	11.70	5.31	7.35	3.33
2.90–3.00	82.1–85.0	3.00	1.36	12.10	5.49	7.55	3.42
3.00–3.10	85.0–87.8	3.00	1.36	12.50	5.67	7.75	3.52
3.10–3.20	87.8–90.6	3.00	1.36	12.90	5.85	7.95	3.61
3.20–3.30	90.6–93.4	3.00	1.36	13.30	6.03	8.15	3.70
3.30–3.40	93.4–96.3	3.00	1.36	13.70	6.21	8.35	3.79
3.40–3.50	96.3–99.1	3.00	1.36	14.10	6.40	8.55	3.88
3.50–3.60	99.1–101.9	3.00	1.36	14.60	6.62	8.80	3.99
3.60–3.70	101.9–104.8	3.00	1.36	15.00	6.80	9.00	4.08
3.70–3.80	104.8–107.6	3.00	1.36	15.40	6.99	9.20	4.17

Notes:
(1) All test load weights are bone dry weights.
(2) Allowable tolerance on the test load weights are +/−0.10 lbs (0.05 kg).

6. WAIVERS AND FIELD TESTING

6.1 *Waivers and Field Testing for Non-conventional Clothes Washers.* Manufacturers of nonconventional clothes washers, such as clothes washers with adaptive control systems, must submit a petition for waiver pursuant to 10 CFR 430.27 to establish an acceptable test procedure for that clothes washer. For these and other clothes washers that have controls or systems such that the DOE test procedures yield results that are so unrepresentative of the clothes washer's true energy consumption characteristics as to provide materially inaccurate comparative data, field testing may be appropriate for establishing an acceptable test procedure. The following are guidelines for field testing which may be used by manufacturers in support of petitions for waiver. These guidelines are not mandatory and the Department may determine that they do not apply to a particular model. Depending upon a manufacturer's approach for conducting field testing, additional data may be required. Manufacturers are encouraged to communicate with the Department prior to the commencement of field tests which may be used to support a petition for waiver. Section 6.3 provides an example of field testing for a clothes washer with an adaptive water fill control system. Other features, such as the use of various spin speed selections, could be the subject of field tests.

6.2 *Nonconventional Wash System Energy Consumption Test.* The field test may consist of a minimum of 10 of the nonconventional clothes washers (''test clothes washers'') and 10 clothes washers already being distributed in commerce (''base clothes washers''). The tests should include a minimum of 50 energy test cycles per clothes washer. The test clothes washers and base clothes washers should be identical in construction except for the controls or systems being tested. Equal numbers of both the test clothes washer and the base clothes washer should be tested simultaneously in comparable settings to minimize seasonal or consumer laundering conditions or variations. The clothes washers should be monitored in such a way as to accurately record the total energy consumption per cycle. At a minimum, the following should be measured and recorded throughout the test period for each clothes washer: Hot water usage in gallons

(or liters), electrical energy usage in kilowatt-hours, and the cycles of usage.

The field test results would be used to determine the best method to correlate the rating of the test clothes washer to the rating of the base clothes washer. If the base clothes washer is rated at A kWh per year, but field tests at B kWh per year, and the test clothes washer field tests at D kWh per year, the test unit would be rated as follows:

A×(D/B)=G kWh per year

6.3 *Adaptive water fill control system field test.* Section 3.2.3.1 defines the test method for measuring energy consumption for clothes washers which incorporate control systems having both adaptive and alternate cycle selections. Energy consumption calculated by the method defined in section 3.2.3.1 assumes the adaptive cycle will be used 50 percent of the time. This section can be used to develop field test data in support of a petition for waiver when it is believed that the adaptive cycle will be used more than 50 percent of the time. The field test sample size should be a minimum of 10 test clothes washers. The test clothes washers should be totally representative of the design, construction, and control system that will be placed in commerce. The duration of field testing in the user's house should be a minimum of 50 energy test cycles, for each unit. No special instructions as to cycle selection or product usage should be given to the field test participants, other than inclusion of the product literature pack which would be shipped with all units, and instructions regarding filling out data collection forms, use of data collection equipment, or basic procedural methods. Prior to the test clothes washers being installed in the field test locations, baseline data should be developed for all field test units by conducting laboratory tests as defined by section 1 through section 5 of these test procedures to determine the energy consumption, water consumption, and remaining moisture content values. The following data should be measured and recorded for each wash load during the test period: wash cycle selected, the mode of the clothes washer (adaptive or manual), clothes load dry weight (measured after the clothes washer and clothes dryer cycles are completed) in pounds, and type of articles in the clothes load (e.g., cottons, linens, permanent press). The wash loads used in calculating the in-home percentage split between adaptive and manual cycle usage should be only those wash loads which conform to the definition of the energy test cycle.

Calculate:

T=The total number of energy test cycles run during the field test

T_a=The total number of adaptive control energy test cycles

T_m=The total number of manual control energy test cycles

The percentage weighting factors:

$P_a=(T_a/T)\times 100$ (the percentage weighting for adaptive control selection)

$P_m=(T_m/T)\times 100$ (the percentage weighting for manual control selection)

Energy consumption (HE_T, ME_T, and D_E) and water consumption (Q_T), values calculated in section 4 for the manual and adaptive modes, should be combined using P_a and P_m as the weighting factors.

[62 FR 45508, Aug. 27, 1997; 63 FR 16669, Apr. 6, 1998]

APPENDIX K–L TO SUBPART B OF PART 430—[RESERVED]

APPENDIX M TO SUBPART B—UNIFORM TEST METHOD FOR MEASURING THE ENERGY CONSUMPTION OF CENTRAL AIR CONDITIONERS

1. DEFINITIONS

1.1 ''Annual performance factor'' means the total heating and cooling done by a heat pump in a particular region in one year divided by the total electric power used in one year.

1.2 ''ARI'' means Air-Conditioning and Refrigeration Institute.

1.3 ''ARI Standard 210–79'' means the test standard published in 1979 by the ARI and titled ''Standard for Unitary Air-Conditioning Equipment''.

1.4 ''ARI Standard 240–77'' means the test standard published in 1977 by the ARI and titled ''Standard for Air-Source Unitary Heat Pump Equipment''.

1.5 ''ARI Standard 320–76'' means the test standard published in 1976 by the ARI and titled ''Standard for Water-Source Heat Pumps''. The single number HSPF energy conservation standard for central air conditioning heat pumps specified in section 325(d)(2) (A) and (B) is based on Region IV and the standardized DHR found in section 6 of this appendix, nearest the capacity measured in the 47 ° F test.

1.6 ''ASHRAE'' means the American Society of Heating, Refrigeration and Air-Conditioning Engineers, Inc.

1.7 ''ASHRAE Standard 37–78'' means the test standard published by ASHRAE in 1978 and titled ''Methods of Testing for Rating Unitary Air-Conditioning and Heat Pump Equipment.''

1.8 ''Continuously recorded'' means a method of recording measurements in intervals no greater than 5 seconds.

1.9 ''Cooling load factor (CLF)'' means the ratio of the total cooling done in a complete cycle of a specified time period, consisting of an ''on'' time and ''off'' time, to the steady-

state cooling done over the same period at constant ambient conditions.

1.10 ''Cyclic Test'' means a test where the indoor and outdoor conditions are held constant, but the unit is manually turned ''on'' and ''off'' for specific time periods to simulate part-load operation.

1.11 ''Degradation coefficient (C_D)'' means the measure of the efficiency loss due to the cycling of the unit.

1.12 ''Demand-defrost control system'' means a system which is designed to perform the defrost function on the outdoor coil of the heat pump only when a predetermined degradation of performance is measured.

1.13 ''Design heating requirement (DHR)'' is the amount of heating required to maintain a given indoor temperature at a particular outdoor design temperature.

1.14 ''Dry-coil test'' means a test conducted at a wet-bulb temperature and a dry-bulb temperature such that moisture will not condense on the evaporator coil of the unit.

1.15 ''Heating seasonal performance factor (HSPF)'' means the total heating output of a heat pump during its normal annual usage period for heating divided by the total electric power input during the same period.

1.16 ''Heating load factor (HLF)'' means the ratio of the total heating done in a complete cycle of a specified time period, consisting of an ''on'' time ''off'' time, to the steady state heating done over the same period at constant ambient conditions.

1.17 ''Latent cooling'' means the amount of cooling in Btu's necessary to remove water vapor from the air passing over the indoor coil by condensation during a period of time.

1.18 ''Part-load factor (PLF)'' means the ratio of the cyclic energy efficiency ratio to the steady-state energy efficiency ratio at identical ambient conditions.

1.19 ''Seasonal energy efficiency ratio (SEER)'' means the total cooling of a central air conditioner in Btu's during its normal annual usage period for cooling divided by the total electric power input in watt-hours during the same period.

1.20 ''Sensible cooling'' means the amount of cooling in Btu's performed by a unit over a period of time, excluding latent cooling.

1.21 ''Single package unit'' means any central air conditioner in which all the major assemblies are enclosed in one cabinet.

1.22 ''Split system'' means any central air conditioner in which one or more of the major assemblies are separate from the others.

1.23 ''Steady-state test'' means a test in which all indoor and outdoor conditions are held constant and the unit is in non-changing operating mode.

1.24 ''Temperature bin'' means a 5° F increment over a dry-bulb temperature range of 65° F through 104° F for the cooling cycle and −25° F through 64° F for the heating cycle.

1.25 ''Time-temperature defrost control system'' means a system which automatically provides the defrost function at a predetermined time interval whenever the outdoor temperature drops below a level where frosting will occur.

1.26 ''Test condition tolerance'' means the maximum permissible variation of the average of the test observations from the standard or desired test condition as provided in 6.1.1, 6.2.1, 6.2.2, and 6.2.3 of this Appendix.

1.27 ''Test operating tolerance'' means the maximum permissible difference between the maximum and the minimum instrument observation during a test as provided in 6.1.1, 6.2.1, 6.2.2, and 6.2.3 of this Appendix.

1.28 ''Wet-coil test'' means a test conducted at a wet-bulb temperature and a dry-bulb temperature such that moisture will condense on the test unit evaporator coil.

2. TESTING REQUIRED

2.1 *Testing required for air source cooling only units.* Two steady state wet coil tests required to be performed, test A and test B. Test A is to be conducted as an outdoor dry bulb temperature of 95° F and test B at 82° F. Test C and D are optional tests to be conducted when cyclic performance parameters are to be measured in order to determine the degradation coefficient, C^D Test C is a steady state dry coil test conducted at an outdoor dry bulb temperature of 82° F. Test D is a cyclic test also conducted at an outdoor dry bulb temperature of 82° F. In lieu of conducting tests C and D, an assigned value of 0.25 may be used for the degradation coefficient, C^D.

2.1.1 *Testing required for units with single speed compressors and single speed condenser fans.* Test A and test B shall be performed according to the test procedures outlined in 4.1 of this Appendix. In addition, the cyclic performance shall be evaluated by conducting test C and D according to the requirements outlined in 4.1 of this Appendix.

2.1.2 *Testing required for units with single speed compressors and multiple-speed condenser fans.* The test requirements for multiple-speed condenser fan units shall be the same as described in section 2.1.1 for single speed condensor fan units.

2.1.3 *Testing required for units with two-speed compressors, two compressors, or cylinder unloading.* The test requirements for two-speed compressor units, two compressor units, or units with cylinder unloading are the same as described in 2.1.1 of this Appendix except that test A and test B shall be performed at each compressor speed or at each compressor capacity.

2.1.4 *Testing required for units with two-speed compressors, two compressors, or cylinder unloading capable of varying the sensible to*

total (S/T) capacity ratio. When a unit employing a two-speed compressor, two compressors, or cylinder unloading provides a method of varying the ratio of the sensible cooling capacity to the total cooling capacity, (S/T), the test requirements are the same as for two-speed compressor units as described in 2.1.3 of this Appendix.

2.1.5 *Testing required for units with triple-capacity compressors.* (Reserved)

2.1.6 *Testing required for units with variable-speed compressors.* The tests for variable-speed equipment consist of five (5) wet coil tests and two (2) dry coil tests. Two of the wet coil tests, A and B, are conducted at the maximum speed. Two wet coil tests, B_2 and low temperature test, are conducted at the minimum speed. The fifth wet coil test is conducted at an intermediate speed. Dry coil tests, C and D, are conducted at the minimum speed if the coefficient of degradation (C_D) value of 0.25 is not adopted. The test conditions and procedures for the above are outlined in sections 3.1 and 4.1 of this Appendix.

2.1.7 *Testing required for split-type ductless systems.* The tests for split-type ductless systems are determined by the type of compressor installed in the outdoor unit. For the appropriate tests refer to sections 2.1.1, 2.1.2, 2.1.3, 2.1.4, 2.1.5, or 2.1.6 of this Appendix.

2.2 *Testing required for air source heating only units.* Four types of tests are required to be performed: High Temperature, Cyclic, Frost Accumulation, and Low Temperature. In lieu of conducting the Cyclic Test an assigned value of 0.25 may be used for the degradation coefficient, C^D.

2.2.1 *Testing required for units with single speed compressors.* Units with single speed compressors shall be subjected respectively to the High Temperature Test at 47° F described in section 3.2.1.1, the Cyclic Test as described in section 3.2.1.2, the Frost Accumulation Test as described in section 3.2.1.3, and the Low Temperature Test as described in section 3.2.1.4.

2.2.2 *Testing required for units with two-speed compressors, two compressors, or cylinder unloading.* With the unit operating: at high compressors speed (two-speed compressor), with both compressors in operation (two-compressors), or at the maximum capacity (cylinder unloading); the following tests are required to be performed on all units; the High Temperature Test at 47° F, the Frost Accumulation Test, and the Low Temperature Test. An additional test (cyclic at 47° F) is required, with the unit operating at the high compressor speed (two-speed compressor), with both compressors in operation (two compressors), or at the maximum capacity (cylinder unloading); if the normal mode of operation requires cycling ''on'' and ''off'' of the compressor(s) at high speed or maximum capacity.

With the unit operating: at the low compressor speed (two-speed compressor), with the single compressor which normally operates at low loads (two compressors), or at the low compressor capacity (cylinder unloading); the following tests are required to be performed on all units: the High Temperature Test at 47° F, the High Temperature Test at 62° F, and the Cyclic Test. Additional tests, (Frost Accumulation Test and Low Temperature Test) are required, with the unit operating: on low compressor speed (two-speed compressor), with the single compressor which normally operates at low loads (two compressors) or at the low compressor capacity (cylinder unloading), if the unit's low speed, one compressor or low capacity performance at and below 40° F is needed to calculate its seasonal performance.

2.2.3 *Testing required for units with triple-capacity compressors.* (Reserved)

2.2.4 *Testing required for units with variable-speed compressors.* There are seven basic tests and one optional test for variable-speed units. Three tests (high temperature test, low temperature test, and frost accumulation test) are performed at the maximum speed. Three tests (two high temperature and one cyclic test) are performed with the unit operating at minimum speed. A second frost accumulation test is performed at an intermediate speed. The intermediate speed is the same as in the cooling mode.

In lieu of the maximum speed frost accumulation test, two equations are provided in section 4.2 of this Appendix. In lieu of the cyclic test an assigned value of 0.25 may be used for the coefficient of degradation C_D. The optional test is a nominal capacity test applicable to units which have a heating mode maximum speed greater than the cooling mode maximum speed. The conditions and procedures for the above tests are described in sections 3.2 and 4.2 respectively, of this Appendix.

2.2.5 *Testing required for split-type ductless system.* The type of compressor installed in the outdoor unit determines the testing required, refer to previous sections 2.2.1, 2.2.2, 2.2.3, or 2.2.4. The conditions and procedures will be modified as indicated for the various types as stated in sections 3.2 and 4.2 respectively.

2.3 *Testing required for air source units which provide both heating and cooling.* The requirements for units which provide both heating and cooling shall be the same as the requirements in Section 2.1. and 2.2 of this Appendix.

3. TESTING CONDITIONS

3.1 *Testing conditions for air source cooling only units.* The test room requirement and equipment installation procedures are the same as those specified in sections 11.1 and

11.2 of ASHRAE Standard 37–78. Units designed for both horizontal and vertical installation shall be tested in the orientation in which they are most frequently installed. All tests shall be performed at the normal residential voltage and frequency for which the equipment is designed (either 115 or 230 volts and 60 hertz), the test installation shall be designed such that there will be no air flow through the cooling coil due to natural or forced convection while the indoor fan is ''off''. This shall be accomplished by installing dampers upstream and downstream of the test unit to block the off period air flow. Values of capacity for rating purposes are to be rounded off to the nearest 100 Btu/hour for capacities less than 20,000 Btu/hour; to the nearest 200 Btu/hour for capacities between 20,000 and 37,999 Btu/hour; and to the nearest 500 Btu/hour for capacities between 38,000 and 64,999 Btu/hour.

The following conditions listed in ARI Standard 210.79 shall apply to all tests performed in Section 3.1 of this Appendix:

5.1.3.4 Cooling Coil Air Quantity.

5.1.3.6 Requirements for Separated Assemblies.

3.1.1 *Testing conditions for units with single speed compressors and single speed condenser fans.*

3.1.1.1 *Steady state wet-coil performance tests (Test A and Test B).* Test A and test B shall be performed with the air entering the indoor side of the unit having a dry-bulb temperature of 80° F and a wet-bulb temperature of 87° F. The dry-bulb temperature of the air entering the outdoor side of the unit shall be 95° F in test A and 82° F in test B. The temperature of the air surrounding the outdoor side of the unit in each test shall be the same as the outdoor entering air temperature except for units or sections thereof intended to be installed only indoors, in which case the dry-bulb temperature surrounding that indoor side of the unit shall be 80° F. For those units which reject condensate to the condenser, located in the outdoor side of the unit, the outdoor wet-bulb temperature surrounding the outdoor side of the unit shall be 75° F in test A and 65° F in test B.

3.1.1.2 *Steady state dry coil performance test (Test C) and cyclic dry coil performance test (Test D).* Test C and test D shall be performed with the air entering the indoor side of the unit having a dry-bulb temperature of 80° F and a wet-bulb temperature which does not result in formation of condensate on the indoor coil. (It is recommended that an indoor wet-bulb temperature of 57° F or less be used.) The dry-bulb temperature of the air entering the outdoor portion of the unit shall be 82° F. The outdoor portion of the unit shall be subject to the same conditions as the requirements for conducting test B as stated previously in section 3.1.1.1. Test C shall be conducted with the unit operating steadily. Test D shall be conducted by cycling the unit ''on'' and ''off'' by manual or automatic operation of the normal control circuit of the unit. The unit shall cycle with the compressor ''on'' for 6 minutes and ''off'' for 24 minutes. The indoor fan shall also cycle ''on'' and ''off'', the duration of the indoor fan ''on'' and ''off'' periods being governed by the automatic controls which the manufacturer normally supplies with the unit. The results of tests C and D shall be used to calculate a degradation coefficient, C_D by the procedures outlined in 5.1 of this Appendix.

3.1.2 *Testing conditions for units with single speed compressors and multiple-speed condenser fans.* The condenser fan speed to be used in test A shall be that speed which normally occurs at an outdoor dry-bulb temperature of 95° F, and for test B, the fan speed shall be that which normally occurs at an outdoor dry-bulb temperature of 82° F. If elected to be performed, tests C and D shall be conducted at the same condenser fan speed as in test B.

3.1.3 *Testing conditions for units with two-speed compressors, two compressors, or cylinder unloading.* The condenser fan speed used in conducting test A at each compressor speed shall be that which normally occurs at an outdoor dry-bulb temperature of 95° F. For test B, the condenser fan speed at each compressor speed shall be that which normally occurs at an outdoor dry-bulb temperature of 82° F. If elected to be performed, tests C and D shall be conducted at the low compressor speed with the same condenser fan speed as used in test B. For those two-speed units in which the normal mode of operation involves cycling the compressor ''on'' and ''off'' at high speed, tests C and D shall also be performed with the compressor operating at high speed and at a condenser fan speed that normally occurs at test A ambient conditions. Units consisting of two compressors are subject to the same requirements as those units containing two-speed compressors, except that when operated at high speed, both compressors shall be operating and when operating at low speed, only the compressor which normally operates at an outdoor dry-bulb temperature of 82° F shall be operating.

In lieu of conducting tests C and D, an assigned value of 0.25 may be used for the degradation coefficient, C_D, at each compressor speed. If the assigned degradation coefficient is used for one compressor speed it must also be used for the other compressor speed.

In the case of units with cylinder unloading, the loaded and the unloaded conditions correspond to high and low compressor speed on two-speed units respectively.

3.1.4 *Testing conditions for units with two-speed compressors, two compressors, or cylinder unloading capable of varying the sensible to total (S/T) capacity ratio.* The mode of operation selected for controlling the S/T ratio in

the performance of test A and test B at each compressor speed shall be such that it does not result in an operating configuration which is not typical of a normal residential installation. If elected to be performed, tests C and D shall be conducted at low compressor speed (single compressor operating) with the same S/T control mode as used in test B when performed at the low compressor speed. Likewise, tests C and D shall also be conducted at high compressor speed (two compressors operating) and with the same S/T control mode as in test A when performed at the high compressor speed.

In the case of units with cylinder unloading, the loaded and unloaded conditions correspond to high and low compressor speed on two-speed units respectively.

3.1.5 *Testing conditions for units with triple-capacity compressors.* (Reserved)

3.1.6 *Additional testing conditions for cooling-only units with variable-speed compressors.* For cooling-only units and air-source heat pumps with varaible-speed compressors, the air flow rate at fan speeds less than the maximum fan speed shall be determined by using the fan law for a fixed resistance system. The air flow rate is given by the ratio of the actual fan speed to the maximum fan speed multiplied by the air flow rate at the maximum fan speed. Minimum static pressure requirements only apply when the fan is running at the maximum speed.

3.1.6.1 *Testing conditions for steady-state wet coil tests.* Tests A and B shall be performed at the maximum speed at conditions specified in section 3.1.1 of this Appendix. Test B_2 and the low temperature test are performed at the minimum speed with outdoor dry bulb temperatures of 82°F and 67°F respectively. The intermediate speed wet coil test is performed at the outdoor dry bulb temperature of 87°F. For units which reject condensate the outdoor wet bulb temperature shall be maintained at 75°F for Test A, 65°F for Tests B and B_2, 53.5°F for the low temperature test and 69°F for the intermediate test. The indoor conditions for all wet coil tests are the same as those given in section 3.1.1 of this Appendix.

3.1.6.2 *Test conditions for dry coil tests.* Dry coil Tests C and D are conducted at an outdoor dry bulb temperature of 67°F. For units which reject condensate the outdoor wet bulb temperature shall be maintained at 53.5°F. The indoor dry bulb temperature shall be 80°F and the wet bulb temperature shall be sufficiently low so no condensation occurs on the evaporator (It is recommended that an indoor wet bulb temperature of 57°F or less be used).

3.1.7 *Split-type ductless systems.* Test conditions shall be the same as those specified for the same single outdoor unit compressor type, assuming it was matched with a single indoor coil.

3.1.7.1 *Interconnection.* For split-type ductless systems, all standard rating tests shall be performed with a minimum length of 25 feet of interconnecting tubing between each indoor fan-coil unit and the common outdoor unit. Such equipment in which the interconnection tubing is furnished as an integral part of the machine not recommended for cutting to length shall be tested with complete length of tubing furnished, or with 25 feet of tubing, whichever is greater. At least 10 feet of the interconnection tubing shall be exposed to the outside conditions. The line sizes, insulation and details of installation shall be in accordance with the manufacturer's published recommendation.

3.1.7.2 *Control testing conditions for split-type ductless systems.* For split-type ductless systems, a single control circuit shall be substituted for any multiple thermostats in order to maintain a uniform cycling rate during test D and the high temperature heating cyclic test. During the steady-state tests, all thermostats shall be shunted resulting in all indoor fan-coil units being in operation.

3.1.7.3 *Split-type ductless systems with multiple coils or multiple discharge outlets shall have short plenums attached to each outlet.* Each plenum shall discharge into a single common duct section, the duct section in turn discharging into the air measuring device (or a suitable dampering device when direct air measurement is not employed). Each plenum shall have an adjustable restrictor located in the plane where the plenums enter the common duct section for the purpose of equalizing the static pressures in each plenum. The length of the plenum is a minimum of $2.5\times(A\times B)^{.5}$, A=width and B=height of duct or outlet. Static pressure readings are taken at a distance of $2\times(A\times B)^{.5}$ from the outlet.

3.2 *Testing conditions for air source heating only units.* The equipment under test shall be installed according to the requirements of Section 11.2 of ASHRAE Standard 37–78 and Section 5.1.4.5 of ARI Standard 240–77. Test chamber requirements are the same as given in Section 11.1 of ASHRAE Standard 37–78. Units designed for both horizontal and vertical installation shall be tested in the orientation in which they are most often installed. All tests shall be performed at the normal residential voltage and frequency for which the equipment is designed (either 115 or 230 volts and 60 hertz). Values of capacity for rating purposes are to be rounded off to the nearest 100 Btu/hour for capacities less than 20,000 Btu/hour; to the nearest 200 Btu/hour for capacities between 20,000 and 37,999 Btu/hour; and to the nearest 500 Btu/hour for capacities between 38,000 and 64,999 Btu/hour.

3.2.1 *Testing conditions for units with single speed compressors.*

3.2.1.1 *High temperature test conditions.* The High Temperature Test at 47° F shall be conducted at an outdoor dry-bulb temperature of 47° F and an outdoor wet-bulb temperature at 43° F. The High Temperature Test at 62° F shall be conducted at an outdoor dry-bulb temperature of 62° F and an outdoor wet-bulb temperature of 56.5° F. For both tests, the dry-bulb air temperature entering and surrounding the indoor portion of the unit shall be 70° F and a maximum wet-bulb temperature of 60° F. The duration of the tests shall be for a minimum of ½ hour.

3.2.1.2 *Cycling test conditions.* The Cycling Test at 47° F shall be conducted at the same dry-bulb and wet-bulb temperature as the High Temperature Test at 47° F as described in 3.2.1.1. During the Cycling Test, the indoor fan shall cycle ''on'' and ''off'', as the compressor cycles ''on'' and ''off'', except that the indoor fan cycling times may be delayed due to controls that are normally installed with the unit. The compressor cycling times shall be 6 minutes ''On'' and 24 minutes ''off.'' The test installation shall be designed such that there will be no airflow through the indoor unit due to natural or forced convection while the indoor fan is ''off.'' This shall be accomplished by installing dampers upstream and downstream of the test unit to block the off period airflow.

3.2.1.3 *Frost accumulation test conditions.* The dry-bulb temperature and the resultant dew-point temperature of the air entering the outdoor portion of the unit shall be 35° F and 30° F respectively. The indoor dry-bulb temperature shall be 70° F and the maximum indoor wet-bulb temperature shall be 60° F. The Frost Accumulation Test requires that the unit undergo a defrost prior to the actual test. The test then begins at defrost termination and ends at the next defrost termination. Defrost termination occurs when the controls normally installed within the unit are actuated to cause it to change defrost operation to normal heating operation. During the test, auxiliary resistance heaters shall not be employed during either the heating or defrost portion of the test.

3.2.1.4 *Low temperature test conditions.* The Low Temperature Test shall be conducted at a dry-bulb temperature entering the outdoor portion of the unit of 17° F and a wet-bulb temperature of 15° F. The air entering the indoor portion of the unit shall have a dry-bulb temperature of 70° F and a maximum wet-bulb temperature of 60° F.

3.2.1.5 *Additional testing conditions.* All tests shall be conducted at the indoor-side air quantities specified in Sections 4.1.4.3 and 5.1.4.6 and Table 2 of ARI Standard 240–77. The following conditions listed in ARI Standard 240–77 shall apply to all tests performed in Section 3.2 of this Appendix.

3.2.3 *Testing conditions for units with triple-capacity compressors.* (Reserved)

3.2.4 *Testing conditions for units with variable-speed compressors.* The testing condition for variable-speed compressors shall be the same as those for single speed units as described in section 3.2.1 of this Appendix with the following exceptions; the cyclic test is performed with an outdoor dry bulb temperature of 62°F and a wet bulb temperature of 56.5°F. The optional, nominal capacity test shall be performed at the conditions specified for the 47°F high temperature test.

3.2.5 *Testing conditions for split-type ductless system.* The testing conditions for split-type ductless systems shall be based on the type of compressor installed in the single outdoor unit. The heating mode shall have the same piping and control requirements as in 3.1.7.

5.4.4.4 Outdoor-Side Air Quantity; and

5.1.4.5 Requirements for Separated Assemblies.

In all tests, the specified dry-bulb temperature entering the outdoor portion of the unit also applies to the air temperature surrounding the outdoor portion of the unit. Similarly, models where portions are intended to be installed indoors shall have the air temperature surrounding that portion of the unit the same as the indoor air temperature.

3.2.2 *Testing conditions for units with two-speed compressors, two compressors or cylinder unloading.* The testing conditions for two-speed compressors, two compressors, or cylinder unloading shall be the same as those for single speed units as described in 3.2.1.

3.3 *Testing conditions for air source units which provide both heating and cooling.* The testing conditions for units which provide both heating and cooling shall be the same as the requirements in Sections 3.1 and 3.2 of this Appendix.

4.0 *Testing procedures.* Measure all electrical inputs as described in the procedures below. All electrical measurements during all ''on'' and ''off'' periods shall include auxiliary power or energy (controls, transformers, crankcase heaters, etc.) delivered to the unit.

4.1 *Test procedures for air source cooling-only units.* All steady-state wet- and dry-coil performance tests on single package units shall simultaneously employ the Air-Enthalpy Method (Section 3 of ASHRAE Standard 37–78) on the indoor side and one other method consisting of either the Air-Enthalpy Method or the Compressor Calibration Method (Section 4 of ASHRAE Standard 37–78 on the outdoor side. All steady-state wet- and dry-coil performance tests on split systems shall simultaneously employ the Air-Enthalpy Method or the Compressor Calibration Method on the indoor side and the Air-Enthalpy Method, the Compressor Calibration Method or the Volatile Refrigerant Flow Method (Section 5 of ASHRAE Standard 37–78) on the outside. All cyclic dry-coil

performance tests shall employ the Air-Enthalpy Method, indoor side only. The values calculated from the two test methods must agree within 6 percent in order to constitute a valid test. Only the results from the Air-Enthalpy Method on the indoor side shall be used in the calculations in Section 5.1. Units shall be installed and tested in such a manner that when operated under steady-state conditions, the cooling coil and condenser coil air flows meet the requirements of Sections 5.1.3.4, 5.1.3.5, and 5.1.3.7 of ARI Standard 210.79.

4.1.1 *Test operating procedures.*

4.1.1.1 *Steady-state wet-coil performance tests (Test A and Test B).* Steady-state wet-coil performance tests (A and B) shall be conducted in accordance with the conditions described in sections 3.1.1.1, 3.1.2, 3.1.3, 3.1.4, and 3.1.5 of this Appendix and the procedures described for cooling tests in Section 11.3 of ASHRAE standard 37–78 and evaluated in accordance with the cooling-related requirements of Section 12 of the ASHRAE Standard 37–78. The test room reconditioning apparatus and the equipment under test shall be operated until equilibrium conditions are attained.

4.1.1.2 *Steady-state and cyclic dry-coil performance tests (Test C and Test D).* The steady-state and cyclic dry-coil tests (C and D) shall be conducted as described below in accordance with the conditions described in sections 3.1.1.2, 3.1.2, 3.1.3, 3.1.4, and 3.1.5 of this Appendix. The results shall be evaluated in accordance with the cooling related requirements of Sections 12.1.5, 12.1.6, 12.1.7, of ASHRAE Standard 37.78. The test room reconditioning apparatus and the equipment under test shall be operated until equilibrium conditions are attained, but not for less than one hour before data for test C are recorded. For all equipment test methods including the Compressor Calibration Method, test C shall be performed with data recorded at 10-minute intervals until four consecutive sets of readings are attained with the tolerance prescribed in Section 11.6 of ASHRAE Standard 37–78. When the Air-Enthalpy Method is used on the outdoor side for test C, the requirements of this section shall apply to both the preliminary test and the regular equipment test; the requirements of Section 3.6 of ASHRAE Standard 37–78 shall also apply. Immediately after test C is completed the test unit shall be manually cycled ''off'' and ''on'' using the time periods from 3.1.1 of this Appendix until steadily repeating ambient conditions are again achieved in both the indoor and outdoor test chambers, but for not less than 2 complete ''off''/''on'' cycles. Without a break in the cycling pattern, the unit shall be run through an additional ''off''/''on'' cycle during which the test data required in 5.1 shall be recorded. During this last cycle, which is referred to as the test cycle, the indoor and outdoor test room ambient conditions shall remain within the tolerances specified in 4.1.3 of this Appendix during the cyclic dry-coil tests, all air moving equipment on the condenser side shall cycle ''on'' and ''off'' when the compressor cycles ''on'' and ''off''. The indoor air moving equipment shall also cycle ''off'' as governed by any automatic controls normally installed with the unit. This last requirement applies to units having an indoor fan time delay. Units not supplied with an indoor fan time delay shall have the indoor air moving equipment cycle ''on'' and ''off'' as the compressor cycles ''on'' and ''off.''

Cooling cyclic tests for variable-speed units shall be conducted by cycling the compressor 12 minutes ''on'' and 48 minutes ''off''. The capacity shall be measured for the integration time (θ), which is the compressor ''on'' time of 12 minutes or the ''on'' time as extended by fan delay, if so equipped. The electrical energy shall be measured for the total integration time (θ_{cyc}) of 60 minutes. In lieu of conducting C and D tests, an assigned value of 0.25 shall be used for the degradation coefficient for cooling, C_D.

4.1.1.3 *Testing procedures for triple-capacity compressors.* (Reserved)

4.1.1.4 *Intermediate cooling steady-state test for units with variable-speed compressors.* For units with variable-speed compressors, an intermediate cooling steady-state test shall be conducted in which the unit shall be operated at a constant, intermediate compressor speed (k=i) in which the dry/bulb and wet-bulb temperatures of the air entering the indoor coil are $80°F_{DB}$ and $67°F_{WB}$ and the outdoor coil are $87°_{DB}$ and $69°F_{WB}$. The tolerances for the dry-bulb and wet-bulb temperatures of the air entering the indoor and outdoor coils shall be the test operating tolerance and test condition tolerance specified in Table 6.1.1 of this Appendix. The intermediate compressor speed shall be the minimum compressor speed plus one-third the difference between the maximum and minimum speeds of the cooling mode. (Inter. speed=min. speed+⅓ (max. speed−min. speed.) A tolerance of plus five percent or the next higher inverter frequency step from that calculated is allowed.

4.1.1.5 *Testing procedures for split-type ductless systems.* Cyclic tests of ductless units will be conducted without dampers. The data cycle shall be preceded by a minimum of two cycles in which the indoor fan cycles on and off with the compressor. For the data cycle the indoor fan will operate three minutes prior to compressor cut-on and remain on for three minutes after compressor cut-off. The integration time for capacity and power shall be from compressor cut-on time to indoor fan cut-off time. The fan power for three minutes after compressor cut-off shall be added to the integrated cooling capacity.

4.1.2 *Test instrumentation.* The steady-state and cyclic performance tests shall have

the same requirements pertaining to instrumentation and data as those specified in Section 10 and Table II of ASHRAE Standard 37.78. For the cyclic dry-coil performance tests, the dry-bulb temperature of the air entering and leaving the cooling coil, or the difference between these two dry-bulb temperatures, shall be continuously recorded with instrumentation accurate to within ±0.3° F of indicated value and have a response time of 2.5 seconds or less. Response time in the time required for the instrumentation to obtain 63 percent of the final steady-state temperature difference when subjected to a step change in temperature difference of 15° F or more. Electrical measurement devices (watt-hour meters) used during all tests shall be accurate to within ±0.5 percent of indicated value.

4.1.3 *Test tolerances.* All steady-state wet- and dry-coil performance tests shall be performed within the applicable operating and test condition tolerances specified in Section 11.6 and Table III of ASHRAE Standard 37–78.

4.1.3.1 The indoor and outdoor average dry-bulb temperature for the cyclic dry coil test D shall both be within 1.0° F of the indoor and outdoor average dry bulb temperature for the steady-state dry coil test C, respectively.

4.1.3.2 The test condition and test operating tolerances for conducting test D are stated in 6.1.1 of this Appendix. Variation in the test conditions greater than the tolerances prescribed in 6.1.1 of this Appendix shall invalidate the test. It is suggested that an electric resistance heater having a heating capacity approximately equal to the sum of the cooling capacity and compressor and condenser fan power should be installed in the outdoor test room and cycled ''off'' and ''on'' as the unit cycles ''on'' and ''off'' respectively to improve control in the outdoor test room. Similarly, an electric resistance heater having a heating capacity approximately equal to the cooling capacity of the unit could be installed in the indoor test room, and cycled ''on'' and ''off'' as the test unit cycles ''on'' and ''off'' to improve indoor room control.

4.2 *Testing procedures for air source heating only units.*

4.2.1 *Test operating procedures.* All High Temperature Tests, the Cyclic Test, the Frost Accumulation Test, and the low Temperature test shall have the performance evaluated by the Air-Enthalpy Method on the indoor side. In addition, the High Temperature Test and the Low Temperature Test shall have a simultaneous test method (as described in 4.1) used as a check. The values calculated from the two methods must agree within 6 percent in order to constitute a valid test. Only the results from the Air-Enthalpy Method on the indoor side shall be used in the calulations in section 5.2.

4.2.1.1 *Test procedure for high temperature test.* When the outdoor Air-Enthalpy Method is used, the outdoor chamber must not interfere with the normal air circulating pattern during the preliminary test. It is necessary to determine and adjust for system resistance when the outdoor air measuring apparatus is attached to the outdoor portion of the unit. The test room apparatus and test units must be operated for at least one hour with at least ½ hour at equilibrium and at the specified test conditions prior to starting the test. The High Temperature Test shall then be conducted for a minimum of ½ hour with intermittent data being recorded at 10-minute intervals. For all units, especially those having controls which periodically cause the unit to operate in defrost mode, attention should be given to prevent defrost during the High Temperature Test. Units which have undergone a defrost should operate in the heating mode for at least 10-minutes after defrost termination prior to the start of the test. When the outdoor Air-Enthalpy Method is used as a second test then a preliminary test must be conducted for a minimum of 30 minutes with 4 or more sets of data recorded at 10 minute intervals, all remaining requirements of Section 3.6.1 in the ASHRAE Standard 37–78 shall then apply in conducting the preliminary test for the outdoor air enthalpy method. For some units, at the ambient condition of the test, frost may accumulate on the outdoor coil. If the supply air temperature or the difference between the supply air temperature and the indoor air entering temperature has decreased by more than 1.5° F at the end of the test, the unit shall be defrosted and the test restarted. Only the results of this second High Temperature Test shall be used in the heating seasonal performance calculation in section 5.2. Prior to beginning the High Temperature Test, a unit shall operate in the heating mode for at least 10 minutes after defrost termination to establish equilibrium conditions for the unit and the room reconditioning apparatus. The High Temperature Test may only begin when the test unit and room conditions are within the test condition tolerances specified in Section 6.2.1 of this Appendix.

4.2.1.2 *Test procedures for the cyclic test.* The cyclic test shall follow the High Temperature Test and by cycled ''on'' and ''off'' as specified in 3.2.1.2 until steadily repeating ambient conditions are achieved for both the indoor and outdoor test chambers, but for not less than 2 complete ''off''/''on'' cycles. Without a break in the cycling pattern, the unit shall be operated through an additional ''off''/''on'' cycle, during which the required test data shall be recorded. During the last cycle, which is referred to as the test cycle, the indoor and outdoor test room ambient conditions shall remain within the tolerance specified in section 6.2.2. of this Appendix. If,

prior to the High Temperature Test, the unit underwent a defrost cycle to rid the outdoor coil of any accumulated frost, then prior to cycling the unit ''off'' and ''on'' it should be made to undergo a defrost. After defrost is completed and before starting the cycling process, the unit shall be operated continuously in the heating mode for a least 10 minutes to assure that equilibrium conditions have again been established for the unit and the room conditioning apparatus. Cycling the unit may begin when the test unit and room conditions are within the High Temperature Test condition tolerances specified in section 6.2.1 of this Appendix. Attention should be given to prevent defrost after the cycling process has begun.

The cycle times for variable-speed units is the same as the cyclic time in the cooling mode as specified in section 4.1.1.2 of this Appendix. Cyclic tests of split-type ductless units will be conducted without dampers, and the data cycle shall be preceded by a minimum of two cycles in which the indoor fan cycles on and off with the compressor. During the data cycle for the split type ductless units, the indoor fan will operate three minutes prior to compressor ''cut-on'' and remain on for three minutes after compressor ''cut-off''. The integration time for capacity and power will be from compressor ''cut-on'' time to indoor fan ''cut-off'' time. The fan power for the three minutes after compressor ''cut-off'' shall be subtracted from the integrated heating capacity. For split-type ductless systems which turn the indoor fan off during defrost, the indoor supply duct shall not be blocked.

4.2.1.3 *Test procedures for the frost accumulation test.* The defrost controls shall be set at the normal settings which most typify those encountered in Region IV as described in section 6.2.4 and 6.2.5 of this Appendix. The test room reconditioning equipment and the unit under test shall be operated for at least ½ hour prior to the start of a ''preliminary'' test period. The preliminary test period and the test period itself are to be conducted within the test tolerances given in section 4.2.3.3 of this Appendix. In some cases, the preliminary defrost cycle may be manually induced, however, it is important that the normally operating controls govern the defrost termination in all cases. For units containing defrost controls which are likely to cause defrost at intervals less than one hour when the unit is operating at the required test conditions, the preliminary test period shall start at the termination of a defrost cycle which automatically occurs and shall end at the termination of the next automatically occurring defrost cycle. For units containing defrost controls which are likely to cause defrost at intervals exceeding one hour when operating at the required test condition, the preliminary test period consists of ''heating-only'' preliminary operation for at least one hour, after which a defrost may be manually or automatically induced. The test period then begins at the termination of this defrost cycle and ends at the termination of the next automatically occurring defrost cycle. If the unit has not undergone a defrost after 12 hours, then the tests shall be concluded and the results calculated for this 12-hour period. For units which turn the indoor fan off during defrost the indoor supply duct shall be blocked during all defrost cycles to prevent natural or forced convection through the indoor unit. During defrost, resistance heaters normally installed with the unit shall be prevented from operating.

For units with variable-speed compressors, the frost accumulation test at the intermediate speed shall be conducted such that the unit will operate at a constant, intermediate compressor speed (k=i) as determined in section 4.1.1.4 of this Appendix. The following two equations may be used in lieu of the frost accumulation test for variable-speed.

$$(a)\ Q_{def}^{k=2}(35) = 0.90 * [Q_{ss}^{k=2}(17) + (Q_{ss}^{k=2}(47) - Q_{ss}^{k=2}(17))] * (35-17)/(47-17)$$

$$(b)\ E_{def}^{k=2}(35) = 0.985 * [E_{ss}^{k=2}(17) + (E_{ss}^{k=2}(47) - E_{ss}^{k=2}(17))] * (35-17)/(47-17)$$

4.2.1.4 *Test procedures for the low temperature test.* Where applicable, the High Temperature Test preparation and performance requirements shall also be used in the Low Temperature Test. The test room reconditioning equipment shall first be operated in a steady-state manner for at least one-half hour at equilibrium and at the specified test conditions. The unit shall then undergo a defrost, either automatic or manually induced. It is important that the unit terminate the defrost sequence by the action of its own defrost controls. The defrost controls are to remain at the same setting as specified in

4.2.1.3. At a time no earlier than 10 minutes after defrost termination, the test shall start. Test duration is one-half hour. For all units, defrost should be prevented during the one-half hour test period.

4.2.2 *Test instrumentation.*

4.2.2.1 *Test instrumentation for the high temperature test.* The indoor air flow rate shall be determined as described in Section 7.1 through 7.4 of ASHRAE Standard 37–78. This requires the construction of an air receiving chamber and discharge chamber separated by partition in which one or more nozzles are located. The receiving chamber is connected to the indoor air discharge side of the test specimen through a short plenum. The exhaust side of the air flow rate measuring device contains an exhaust fan with some means to vary its capacity to obtain the desired external resistance to air flow rate. The exhaust side is then left open to the test room or is ducted through a conditioning apparatus and then back to the test specimen inlet. The static pressure across the nozzles, the velocity pressure, and the static pressure measurements at the nozzle throat shall be measured with manometers which will result in errors which are no greater than ±1.0 percent of indicated value and having minimum scale divisions not exceeding 2.0 percent of the reading. Static pressure and temperature measurements must be taken at the nozzle throat in order to obtain density of the air. The areas of the nozzles shall be determined by measuring their diameter with an error no greater than ±0.2 percent in four places approximately 45 degrees apart around the nozzle in each of two places through the nozzle throat, one at the outlets and the others in the straight section near the radius. The energy usage of the compressor, indoor and outdoor fan, and all other equipment components shall be measured with a watt-hour meter which is accurate to within ±0.5 percent of the quantity measured. Measurements of the air temperature entering and leaving the indoor coil or the difference between these two shall be made in accordance with the requirements of ASHRAE Standard 41 part 1. These temperatures shall be continuously recorded with instrumentation having a total system accuracy within ±0.3° F of indicated value and a response time of 2.5 seconds or less. Temperature measurements are to be made upstream of the static pressure tap on the inlet and downstream of the static pressure taps on the outlet. The indoor and outdoor dry-bulb temperatures shall be continuously recorded with instrumentation which will result in an error no greater than ±0.3° F of indicated value. The outdoor wet-bulb temperature shall be continuously recorded. Static pressure measurements in the ducts and across the unit shall be made in accordance with Section 8 of ASHRAE Standard 37–78 using equipment which will result in an error no greater than ±0.01 inch of water. Static pressure measurements shall be made and recorded at 5 minute intervals. All other data not continuously recorded shall be recorded at 10 minute intervals.

4.2.2.2 *Test instrumentation for the cycling test.* The air flow rate during the on-period of the Cyclic Test shall be the same agreed within ±1. percent as the air flow rate measured during the previously conducted High Temperature Test. All other instrumentation requirements are identical to 4.2.2.1 of this Appendix.

4.2.2.3 *Test instrumentation for the frost accumulation test.* The air flow rate for the Frost Accumulation Test shall be the same as described in 4.2.2.1. The indoor-side dry-bulb temperature and outdoor-side dry-bulb temperature shall be continuously recorded with instrumentation having a total system accuracy within ±0.3° F of indicated value. The outdoor dew point temperature shall be determined with an error no greater than ±0.5° F of indicated value using continuously recording instrumentation. All other data shall be recorded at 10 minute intervals during the heating cycle. Defrost initiation, termination and complete test cycle time (from defrost termination to defrost termination) shall be recorded. Defrost initiation is defined as the actuation (either automatically or manually) of the controls normally installed with the unit which cause it to alter its normal heating operation in order to eliminate possible accumulations of frost on the outdoor coil. Defrost termination occurs when the controls normally within the unit are actuated to change from defrost operation to normal heating operation. Provisions should be made so that instrumentation in capable of recording the cooling done during defrost as well as the total electrical energy usage during defrost. These data and the continuously recorded data need be the only data obtained during defrost.

4.2.2.4 *Test instrumentation for the low temperature test.* Instrumentation for the Low Temperature Test is identical to that of the High Temperature Test described in section 4.2.2.1 of this Appendix.

4.2.3 *Test tolerances.*

4.2.3.1 *Test tolerances for the high temperature test.* All tests shall be conducted within the tolerances specified in Section 6.2.1. Variation greater than those given shall invalidate the test. The heating capacity results by the indoor Air Enthalpy Method shall agree within 6 percent of the value determined by any other simultaneously conducted capacity test in order for the test to be valid.

4.2.3.2 *Test tolerances for the cyclic test.* The test condition tolerances and test operating tolerances for the on-period portion of the test cycle are specified in Section 6.2.2. Variation exceeding any specified test tolerance shall invalidate the test results.

4.2.3.3 *Test tolerances for the frost accumulation test.* Test condition and test operating tolerances for Frost Accumulation Tests are specified in Section 6.2.3. Test operating tolerances during heating applies when the unit is in the heating mode, except for the first 5 minutes after the termination of a defrost cycle. Test operating tolerance during defrost applies during a defrost cycle and during the first 5 minutes after defrost termination when the unit is operating in the heating mode. In determining whether the test condition tolerances are met, only the heating portion of the test period shall be used in calculating the average values. Variations exceeding the tolerances presented in Section 6.2.3 shall invalidate the test.

4.2.3.4 *Test tolerances for the low temperature test.* During the test period for the Low Temperature Test, the operating conditions shall be within the tolerances specified in Section 6.2.1 of this Appendix.

4.3 *Testing procedures for air source units which provide both heating and cooling.* The testing procedures for units which provide both heating and cooling shall be the same as those specified in Sections 4.1 and 4.2 of this Appendix. Also during the off-period of the dry-coil cooling test (test D), the switch-over valve shall remain in the cooling mode, unless the controls normally supplied with the unit are designed to reverse it, in which case the controls shall operate the valve. During the off-period of the cyclic heating test at 47° F, the switch-over valve shall remain in the heating mode, unless the controls normally supplied with the unit are designed to reverse it, in which case the controls shall operate the valve.

5.0 *Calculations for performance factors.*

5.1 *Calculations of seasonal energy efficiency ratios (SEER) in air-source units.*

The testing data and results required to calculate the seasonal energy efficiency ratio (SEER) in Btu's per watt-hour shall include the following:

(i) Cooling capacities (Btu/hr) from tests A and B and, if applicable, the cooling capacity (Btu/hr) from test C and the total cooling done from test D (Btu's).

Q_{ss} k (95F)
Q_{ss} k (82F)
Q_{ss}, dry
Q_{cyc}, dry

(ii) Electrical power input to all components and controls (watts) from tests A, B, and if applicable the electrical power input to all components and controls (watts) from test C and the electrical usage (watt-hour) from test D.

E_{ss} k (95F)
E_{ss} k (82F)
E_{ss} k, dry
E_{cyc}, dry

(iii) Indoor air flow rate (SCFM) and external resistance to indoor air flow (inches of water).

(iv) Air temperature (° F)

Outdoor dry bulb
Outdoor wet bulb
Indoor dry bulb
Indoor wet bulb

Where the cooling capacities Q_{ss} k (95F), from test A, Q_{ss} k (82), from test B, and Q_{ss}, dry, from test C, are calculated using the equations specified in section 3.7 of ASHRAE Standard 37–78. The total cooling done, Q_{cyc}, dry from test D, is calculated using equation (1) below.

Units which do not have indoor air circulating fans furnished as part of the model shall have their measured total cooling capacities adjusted by subtracting 1250 Btu/hr per 1,000 CFM of measured indoor air flow and adding to the total steady-state electrical power input 365 watts per 1,000 CFM of measured indoor air flow.

Energy efficiency ratios from tests A, B, and C, EER_A, EER_B, EER_{ss}, dry respectively, are each calculated as the ratio of the total cooling capacity in Btu/hr to the total electrical power input in watts.

Units which do not have indoor air circulating fans furnished as part of the model shall adjust their total cooling done and energy used in one complete cycle for the effect of circulating indoor air equipment power. The value to be used for the circulating indoor air equipment power shall be 1250 Btu/hr per 1,000 CFM of circulating indoor air. The energy usage required in one complete cycle required for indoor air circulation is the product of the circulating indoor air equipment power and the duration of time in one cycle that the circulating indoor air equipment is on. The total cooling done shall then be the measured cooling in one complete cycle minus the energy usage required for indoor air circulation in one complete cycle. The total electrical energy usage shall be the sum of the energy usage required for indoor air circulation in one complete cycle and the energy used by the remaining equipment components (compressor(s), outdoor fan, crankcase heater, transformer(s), etc.) in one complete test cycle.

Energy efficiency ratio from tests D, EER_{cyc} dry is calculated as the ratio of the total cooling done in Btu's to the total electrical energy usage in watt-hours.

The results of the cyclic and steady-state dry-coil performance tests shall be used in the following (4) equations:

$$(1) \qquad Q_{cyc,\,dry} = \frac{60 \times \dot{V} \times C_{pa} \times \Gamma}{[V_n' \times (1 + W_n)]}$$

where

$Q_{cyc,\,dry}$ = Total cooling over a cycle consisting of one compressor "off" period and one compressor "on" period (Btu's).
$\dot{V}$ = Indoor air flow rate (cfm) at the dry-bulb temperature, humidity ratio, and pressure existing in the region of measurement.
C_{pa} = Specific heat at constant pressure of air-water mixture per pound of dry air, (Btu/lb-°F).
V_n' = Specific volume of air-water mixture at the same dry-bulb temperature, humidity ratio, and pressure used in the determination of the indoor air flow rate (ft^3/lb).
W_n = Humidity ratio (lb/lb).

and Γ (hr.-°F), which is described by the equation:

(2)

$$\Gamma = \int_{\text{(time indoor fan on)}}^{\text{(time indoor fan off)}} [T_{a1}(t) - T_{a2}(t)]\,dt$$

where

$T_{a1}(t)$ = Dry bulb temperature of air entering the indoor coil (°F) at time (t).
$T_{a2}(t)$ = Dry-bulb temperature of air leaving the indoor coil (°F) at time (t).

$$(3) \qquad CLF = \frac{Q_{cyc,\,dry}}{Q_{ss\,dry} \times \tau}$$

where

CLF = cooling load factor.
$Q_{ss\,dry}$ = Total steady-state cooling capacity from test C (Btu/hr).
τ = Duration of time (hours) for one complete cycle consisting of one compressor "on" time and one compressor "off" time.

The preceding equations are then used in the following equation to calculate a degradation coefficient C_D rounded to the nearest .01.

$$(4) \qquad C_D = \frac{1 - \frac{EER_{cyc,\,dry}}{EER_{ss,\,dry}}}{1 - CLF}$$

where

$EER_{ss,\,dry}$ = Energy efficiency ratio from test C, (Btu/watt-hr).

5.1.1 Method for calculating a SEER for units with single-speed compressor and single-speed condenser fans. The seasonal energy efficiency ratio for units employing single-speed compressors and single-speed condenser fans shall be based on the performance of test B and a method outlined in 2.1.1 and 3.1.1 of this Appendix to account for the cyclic performance.

The seasonal energy efficiency ratio in Btu's/watt-hour shall be determined by the equation:

$$SEER = PLF(0.5) \times EER_B$$

where

EER_B = Energy efficiency ratio determined from test B as outlined in 2.1.1.
$PLF(0.5)$ = Part-load performance factor when cooling load factor = 0.5 as determined from the equation:

$$PLF(0.5) = 1 - 0.5 \times C_D$$

where

C_D = Is the degradation coefficient described in 2.1.1 or as calculated in equation (4) above.

5.1.2 Method for calculating a SEER for units with single-speed compressors and multi-speed condenser fans. The seasonal energy efficiency ratio (SEER) for units employing single-speed compressors and multi-speed condenser fans shall be based on the energy efficiency ratio obtained for test B and the method outlined in 2.1.2 of this Appendix to account for the performance under cyclic conditions. The energy efficiency ratio for test B is obtained with the unit operating with the condenser fan speed which normally occurs at test B ambient conditions.

The seasonal energy efficiency ratio in Btu's/watt-hour shall be determined by the equation:

$$SEER = PLF(0.5) \times EER_B$$

where

EER_B = energy efficiency ratio determined from test B in 2.8
$PLF(0.5)$ = Part-load performance factor as determined from the equation:

$$PLF(0.5) = 1 - 0.5 \times C_D$$

where

C_D = The degradation coefficient described in 2.1.2 or as calculated in equation (4) above.

5.1.3 Method for calculating a SEER for units with two speed compressors or two compressors, or cylinder unloading. The calculation procedure described in this section shall be based on the performance of test A and B at each of the compressor speeds for two-speed compressor units, subject to the conditions on condenser fan speed described in 3.1.3.

Units operating with two compressors shall have the SEER calculated in the same manner as two-speed compressor units. The superscripted index $k = 1$ (and the term "low-speed") designates the compressor that normally operates at an outdoor dry-bulb temperature of 82° F and $k = 2$ (and the term "high speed") denotes operation with both compressors.

In order to evaluate the steady-state capacity $Q_{ss}^{k}(T_j)$, and power input, $E_{ss}^{k}(T_j)$, at temperature T_j for each compressor speed, $k=1$, $k=2$, the results of tests A and B from 5.1 shall be used in the following equation:

$$Q_{ss}^{k}(T_j)=Q_{ss}^{k}(95\text{ F})+\frac{Q_{ss}^{k}(82\text{ F})-Q_{ss}^{k}(95\text{ F})}{95-82}[33-(5\times j)]$$

where

$Q_{ss}^{k}(95\text{ F})$ = Steady-state capacity measured from test A as outlined in 2.1.3.

$Q_{ss}^{k}(82\text{ F})$ = Steady-state capacity measured from test B as outlined in 2.1.3.

$$E_{ss}^{k}(T_j)=E_{ss}^{k}(95\text{ F})+\frac{E_{ss}^{k}(82\text{ F})-E_{ss}^{k}(95\text{ F})}{95-82}[33-(5\times j)]$$

when

$E_{ss}^{k}(95\text{ F})$ = Electrical power input measured using test A as outlined in 2.1.3.

$E_{ss}^{k}(82\text{ F})$ = Electrical power input measured from using test A as outlined in 2.1.3.

The building cooling load $BL(T_j)$ for the four cases described in section 5.1.3.1 through 5.1.3.4 shall be obtained from the following equation:

$$BL(T_j)=\frac{(5\times j)-3}{95-65}\times\frac{Q_{ss}^{k=2}(95\text{ F})}{1.1}$$

where

$Q_{ss}^{k=2}(95\text{ F})$ = Steady-state capacity measured from test A in 2.9 at the high compressor speed.

The value of the degradation coefficient $C_D^{k=1}$ for low compressor speed cycling and $C_D^{k=2}$ for high speed on/off compressor cycling is determined as described in section 2.1.3, or as calculated above in equation (1).

5.1.3.1 Units operating at low compressor speed ($k=1$) for which the steady-state cooling capacity, $Q_{ss}^{k=1}(T_j)$, is greater than or equal to the building cooling load, $BL(T_j)$, evaluate the following equations:

(1) $$X^{k=1}=\frac{BL(T_j)}{Q_{ss}^{k=1}(T_j)}.$$

where

$X^{k=1}$ = Load factor.

$BL(T_j)$ = Building cooling load (Btu/hr) at temperature (T_j) from section 5.1.3.

$Q_{ss}^{k=1}(T_j)$ = Steady-state cooling capacity (Btu/hr) at temperatures (T_j) from section 5.1.3.

(2) $$\frac{Q(T_j)}{N}=X^{k=1}\times Q_{ss}^{k=1}(T_j)\times\frac{n_j}{N}$$

where

$\frac{Q(T_j)}{N}$ = ratio of total cooling (Btu) in temperature bin j to the number of temperature bin hours.

$\frac{n_j}{N}$ is the fractional number of hours in temperature bin j from 6.1.2.

(3) $$\frac{E(T_j)}{N}=\frac{X^{k=1}\times E_{ss}^{k=1}(T_j)}{PLF^{k=1}}\times\frac{n_j}{N}$$

where

$\frac{E(T_j)}{N}$ = ratio of Energy usage (watt-hr.) in temperature bin j to the number of temperature bin hours.

$$PLF^{k=1}=1-C_D^{k=1}(1-X^{k=1}).$$

Where C_D the degradation coefficient as described in section 2.1.3 or as calculated above in equation (1).

5.1.3.2 When a unit must alternate between high ($k=2$) and low ($k=1$) compressor speeds to satisfy the building cooling load at a temperature T_j, evaluate the following equations:

(1) $$X^{k=1}=\frac{Q_{ss}^{k=2}(T_j)-BL(T_j)}{Q_{ss}^{k=2}(T_j)-Q_{ss}^{k=1}(T_j)}$$

(2) $$X^{k=2}=1-X^{k=1}$$

(3) $$\frac{Q(T_j)}{N}=[X^{k=1}\times Q_{ss}^{k=1}(T_j)+X^{k=2}\times Q_{ss}^{k=2}(T_j)]\times\frac{n_j}{N}$$

(4) $$\frac{E(T_j)}{N}=[X^{k=1}\times E_{ss}^{k=1}(T_j)+X^{k=2}\times E_{ss}^{k=2}(T_j)]\times\frac{n_j}{N}$$

5.1.3.3 When a unit must cycle on and off at high compressor speed ($k=2$) in order to satisfy the building cooling load at a temperature T_j, evaluate the equations provided in section 5.1.3.1 replacing ($k=1$) data with the ($k=2$) data.

5.1.3.4 When a unit operates continuously at high compressor speed ($k=2$) at an outdoor temperature T_j evaluate the following equations:

(1) $$\frac{Q(T_j)}{N}=Q_{ss}^{k=2}(T_j)\times\frac{n_j}{N}$$

(2) $$\frac{E(T_j)}{N}=E_{ss}^{k=2}(T_j)\times\frac{n_j}{N}$$

5.1.3.5 Calculate the SEER in Btu's/watt-hr. using the values for the terms

$$\frac{Q(T_j)}{N}$$

and

$$\frac{E(T_j)}{N}$$

as determined at each temperature bin according to the applicable conditions described in sections 5.1.3.1 through 5.1.3.4 as follows:

$$SEER = \frac{\sum_{j=1}^{8} \frac{Q(T_j)}{N}}{\sum_{j=1}^{8} \frac{E(T_j)}{N}}$$

5.1.4 Method for calculating a SEER for units with two speed compressor, two compressor or cylinder unloading capable of varying the sensible to total capacity (S/T) ratio. Multi-speed compressor and two-speed compressor units capable of varying the sensible to total capacity ratio (S/T) shall have the seasonal energy efficiency ratio determined as described in section 5.1.3. For such units, the mode of operation selected to determine the steady-state capacities $Q_{ss}{}^{k}(95)$, $Q_{ss}{}^{k}(82)$, $E_{ss}{}^{k}(95)$, $E_{ss}{}^{k}(82)$, and power inputs at each compressor speed $k=1$, $k=2$, for tests A and B is outlined in section 2.10.

5.1.5 *Seasonal energy efficiency ratio for air-source units with triple-capacity compressors.* (Reserved)

5.1.6 *Seasonal energy efficiency ratio for air-source units with variable-speed compressors.* For air-source units with variable-speed compressors, the seasonal energy efficiency ratio (SEER), shall be defined as follows:

$$\text{SEER} = \frac{\sum_{j=1}^{8} \frac{Q(T_j)}{N}}{\sum_{j=1}^{8} \frac{E(T_j)}{N}}$$

where the number of hours in the jth temperature bin ($\frac{n_j}{N}$) is defined in Table 6.1.2 of this Appendix.

The SEER shall be determined by evaluating three cases of the compressor operation. Case I is the same as specified in 5.1.3.1 with the exception that the quantities $Q_{ss}^{k=1}(T_j)$ and $E_{ss}^{k=1}(T_j)$ shall be calculated by the following equations:

$$Q_{ss}^{k=1}(T_j) = Q_{ss}^{k=1}(82°F) + \frac{Q_{ss}^{k=1}(67°F) - Q_{ss}^{k=1}(82°F)}{82-67} * (82 - T_j)$$

$$E_{ss}^{k=1}(T_j) = E_{ss}^{k=1}(82°\text{F}) + \frac{E_{ss}^{k=1}(67°\text{F}) - E_{ss}^{k=1}(82°\text{F})}{82-67} * (82 - \text{T}_j)$$

Case II is when the compressor operates at any intermediate (k=v) speed between the maximum (k=2) and minimum (k=1) speeds to satisfy the building cooling load. Evaluate the following equations:

$$Q_{ss}^{k=v}(T_j) = BL\,(T_j)$$

$$E_{ss}^{k=v}(T_j) = \frac{Q_{ss}^{k=v}(T_j)}{\text{EER}_{ss}^{k=v}(T_j)}$$

$$\frac{Q(T_j)}{N} = Q_{ss}^{k=v}(T_j) * \frac{n_j}{N}$$

$$\frac{E(T_j)}{N} = E_{ss}^{k=v}(T_j) * \frac{n_j}{N}$$

where

$\text{E}_{ss}^{k=v}(\text{T}_j)$ = the electrical power input required by the unit to deliver capacity matching the building load at temperature T_j.

$\text{Q}_{ss}^{k=v}(\text{T}_j)$ = the capacity delivered by the unit matching the building load at temperature T_j.

$\text{EER}_{ss}^{k=v}(\text{T}_j)$ = the steady-state energy efficiency ratio at temperature T_j and an intermediate speed at which the unit capacity matches the building load.

Before the steady-state intermediate speed energy efficiency ratio, $\text{EER}_{ss}^{k=v}(\text{T}_j)$, can be calculated, the unit performance has to be evaluated at the compressor speed (k=i) at which the intermediate speed test was conducted. The capacity of the unit at any temperature T_j when the compressor operates at the intermediate speed (k=i) may be determined by:

$$Q_{ss}^{k=i}(T_j) = Q_{ss}^{k=i}(87) + M_Q(T_j - 87)$$

where

$\text{Q}_{ss}^{k=i}(87)$ = the capacity of the unit at 87°F determined by the intermediate cooling steady-state test.

M_Q = slope of the capacity curve for the intermediate compressor speed (k = i)

$$M_Q = \frac{Q_{ss}^{k=i}(82) - Q_{ss}^{k=1}(67)}{82-67} * (1 - N_Q)$$

$$+ N_Q * \frac{Q_{ss}^{k=2}(95) - Q_{ss}^{k=2}(82)}{95-82}$$

$$N_Q = \frac{Q_{ss}^{k=i}(87) - Q_{ss}^{k=1}(87)}{Q_{ss}^{k=2}(87) - Q_{ss}^{k=1}(87)}$$

Once the equation for $Q_{ss}^{k=i}(T_j)$ has been determined, the temperature where $Q_{ss}^{k=i}(T_j) = BL(T_j)$ can be found. This temperature is designated as (T_{vc}). The electrical power input for the unit operating at the intermediate compressor speed (k = i) and the temperature (T_{vc}) is determined by:

$$E_{ss}^{k=i}(T_{vc}) = E_{ss}^{k=i}(87) + M_E (T_{vc} - 87)$$

where

$E_{ss}^{k=i}(87)$ = the electrical power input of the unit at 87°F determined by the intermediate cooling steady-state test

M_E = slope of the electrical power input curve for the intermediate compressor speed (k = i)

$$M_E = \frac{E_{ss}^{k=i}(82) - E_{ss}^{k=1}(67)}{82-67} * (1 - N_E)$$

$$+ N_E \frac{E_{ss}^{k=2}(95) - E_{ss}^{k=2}(82)}{95-82}$$

$$N_E = \frac{E_{ss}^{k=i}(87) - E_{ss}^{k=1}(87)}{E_{ss}^{k=2}(87) - E_{ss}^{k=1}(87)}$$

The energy efficiency ratio of the unit, $EER_{ss}(T_{vc})$, at the intermediate speed (k = i) and temperature T_{vc} can be calculated by the equation:

$$EER_{ss}^{k=i}(T_{vc}) = \frac{Q_{ss}^{k=i}(T_{vc})}{E_{ss}^{k=i}(T_{vc})}$$

Similarly, energy efficiency ratios at temperatures T_1 and T_2 can be calculated by the equations:

$$EER_{ss}^{k=1}(T_1) = \frac{Q_{ss}^{k=1}(T_1)}{E_{ss}^{k=1}(T_1)}$$

$$EER_{ss}^{k=2}(T_2) = \frac{Q_{ss}^{k=2}(T_2)}{E_{ss}^{k=2}(T_2)}$$

where

T_1 = temperature at which the unit, operating at the minimum compressor speed, delivers capacity equal to the building load ($Q_{ss}^{k=1}(T_1) = BL(T_1)$), found by equating the capacity equation [$(Q_{ss}^{k=1}(T_j)$] and building load equation [$BL(T_j)$] in section 5.1.3 and solving for temperature.

T_2 = temperature at which the unit, operating at the maximum compressor speed, delivers capacity equal to the building load ($Q_{ss}^{k=2}(T_2) = BL(T_2)$), found by equating the capacity equation [$(Q_{ss}^{k=2}(T_j)$] and the building equation [$BL(T_j)$] in section 5.1.3 and solving for temperature.

$EER_{ss}^{k=1}(T_1)$ = the steady state energy efficiency ratio at the minimum compressor speed at temperature T_1.

$EER_{ss}^{k=2}(T_2)$ = the steady state energy efficiency ratio at the maximum compressor speed at temperature T_2.

$E_{ss}^{k=1}(T_1)$ = the electrical power input at the minimum compressor speed at temperature T_1, calculated by the equation in section 5.1.3.

$E_{ss}^{k=2}(T_2)$ = the electrical power input at the maximum compressor speed at temperature T_2, calculated by the equation in section 5.1.3.

The energy efficiency ratio, $EER_{ss}^{k=v}(T_j)$, shall be calculated by the following equation:

$$EER_{ss}^{k=v}(T_j) = A + B * T_j + C * T_j^2$$

where coefficients A, B, and C shall be evaluated using the following calculation steps:

$$D = \frac{T_2^2 - T_1^2}{T_{vc}^2 - T_1^2}$$

$$B=\frac{\mathrm{EER}_{ss}^{k=1}(T_1)-\mathrm{EER}_{ss}^{k=2}(T_2)-D(\mathrm{EER}_{ss}^{k=1}(T_1)-\mathrm{EER}_{ss}^{k=1}(T_{vc}))}{T_1-T_2-D^*(T_1-T_{vc})}$$

$$C=\frac{\mathrm{EER}_{ss}^{k=1}(T_1)-\mathrm{EER}_{ss}^{k=2}(T_2)-B^*(T_1-T_2)}{T_1^{\,2}-T_2^{\,2}}$$

$$A=\mathrm{EER}_{ss}^{k=2}(T_2)-B^*T_2-C^*T_2^{\,2}$$

Case III is the same as specified in 5.1.3.4. The quantities $Q_{ss}^{k=1}(T_j)$ and $E_{ss}^{k=2}(T_j)$ and $E_{ss}^{k=2}(T_j)$ shall be calculated by the equations prescribed in 5.1.3.

5.1.7. *Seasonal energy efficiency ratio for split-type ductless systems.* For split-type ductless systems, SEER shall be defined as specified in section 5.1.1 of this Appendix for each combination set of indoor coils to be used with a common outdoor unit.

5.2 *Calculation of Heating Seasonal Performance Factors (HSPF) for Air-Source Units.*

The testing data and results required to calculate the heating seasonal performance factor (HSPF), in Btu's per watt-hr, shall include the following:

(i) Heating capacities (Btu/hr) from the indoor air enthalpy method for the High Temperature Tests, and the total heating done (Btu's) for the cyclic and frost accumulation tests.

$\dot{Q}_{ss}(47)$ or $\dot{Q}_{ss}(62)$.
$\dot{Q}_{ss}(17)$.
$Q_{cyc}(47)$.
$Q_{DEF}(35)$.

(ii) Electrical power input to all components (watts) for the steady state tests, and the electrical usage (watt-hours) for the cyclic and frost accumulation tests

$\dot{E}_{ss}(47)$ or $\dot{E}_{ss}(62)$.
$\dot{E}_{ss}(17)$.
$E_{cyc}(47)$.
$E_{DEF}(35)$.

(iii) Indoor air flow rate (SCFM) and external resistance to indoor air flow (inches of water).

(iv) Air temperature (°F)
Outdoor dry bulb
Outdoor wet bulb or dew point
Indoor dry bulb and
Indoor wet bulb.

(v) Data as specified in Table II of ASHRAE Standard 37–78.

Where the heating capacities $\dot{Q}_{ss}(47)$, $\dot{Q}_{ss}(62)$ and $\dot{Q}_{ss}(17)$ and the indoor air flow rate are calculated using the equations specified in section 3.8.1 and 7.4 of ASHRAE standard 37–78. The total heating done, $Q_{cyc}(47)$ and $Q(_{DEF}35)$ are calculated using the equations below.

Units not having an indoor fan as part of the model tested shall add 1250 Btu/hr per 1,000 SCFM of indoor air handled to the measured capacity to obtain the total heating capacity, $\dot{Q}_{ss}(17)$, $\dot{Q}_{ss}(47)$ or $\dot{Q}_{ss}(62)$, and add 365 watts per 1,000 SCFM of indoor air handled to the measured power to obtain the total power input, $\dot{E}_{ss}(17)$, $\dot{E}_{ss}(47)$, or $\dot{E}_{ss}(62)$, to the unit.

The coefficients of performance (COP) for the High Temperature Tests $COP_{ss}(62)$ or $COP_{ss}(47)$, and Low Temperature Test, $COP_{ss}(17)$, are calculated as the ratio of the heating capacity in Btu/hr to the product of 3.413 and the power inputs to the indoor fan in watts and the power inputs to the remaining equipment components (including all controls) in watts.

Units which do not have indoor air circulating fans furnished as part of the model shall have their total heating done ($Q_{cyc}(47)$) and energy used $E_{cyc}(47)$ in one complete cycle adjusted for the effect of circulating indoor air equipment power. For units tested without an indoor fan as part of the model, $Q_{cyc}(47)$ shall be increased by a quantity of heat equal to the product of 1250 Btu/hr per 1,000 SCFM, the length of the on-period of the test cycle in hours, and the flow rate of indoor air circulated in units of 1,000 SCFM. The total energy usage, $E_{cyc}(47)$, shall be the sum of the energy usage required for air circulation during the test cycle and the energy used by the remaining equipment components (including all controls) during the test cycle. Units not having an indoor fan as part of the model tested, shall set the energy required for indoor air circulation equal to the quantity given by the product of 365 watts per 1000 SCFM, the length of the on-period of the test cycle in hours, and the rate of indoor air circulated in units of 1000 SCFM.

The cyclic coefficient of performance, $COP_{cyc}(47)$ is calculated as the ratio of the total heating done ($Q_{cyc}(47)$) in Btu's to the product of 3.413 Btu/watt-hour and the total energy usage ($E_{cyc}(47)$) in watt hours.

The net heating capacity, $\dot{Q}_{DEF}(35)$ (Btu/hr), is the total net heating done over the test period (including any credit for the indoor fan heat) divided by the total length of the test period, in hours.

For units tested without indoor fans, the value determined for $\dot{Q}_{DEF}(35)$ below shall be increased by a quantity of heat equal to the product of 1250 Btu/hr per 1000 SCFM, the length of time in hours during the Frost Accumulation Test that there was indoor air circulating, and the average flow rate of indoor air circulated in units of 1000 SCFM.

The total energy usage, $E_{DEF}(35)$ shall be the sum of the energy usage required for indoor-air circulation during the test period and the energy used by the remaining equipment components during the test period. Units not having an indoor fan as part of the model tested, shall set the energy required for indoor air circulation equal to the quantity given by the product of 365 watts per 1000 SCFM, the length of time in hours during the Frost Accumulation Test that there was indoor air circulating, and the average flow rate of indoor air circulated in units of 1000 SCFM.

The actual heating done during the Cyclic Test, $Q_{cyc}(47)$, shall be determined using the following equation:

$$(1) \qquad Q_{cyc}(47)=\frac{60\times\dot{\bar{V}}\times C_{pa}\times\Gamma}{[V_n{}^1\times(1+W_n)]}$$

where

$\dot{\bar{V}}$ = the flow rate during the on-period calculated in accordance with section 7.4 of ASHRAE Standard 37-78 in CFM.
C_{pa} = Specific heat at constant pressure of air-water mixture per pound of dry air, (Btu/lb-°F).
$V_n{}^1$ = Specific volume of air-water mixture at the same dry-bulb temperature, humidity ratio, and pressure used in the determination of the indoor air flow rate (ft³/lb).
W_n = Humidity ratio (lb/lb).

and Γ (hr-°F), which is described by the equation:

$$\Gamma=\int_{\text{(time indoor fan on)}}^{\text{(time indoor fan off)}}[T_{a2}(t)-T_{a1}(t)]dt$$

where

$T_{a1}(t)$ = Dry-bulb temperature of air entering the indoor coil (°F) at time (t).
$T_{a2}(t)$ = Dry-bulb temperature of air leaving the indoor coil (°F) at time (t).

The net heating, Q_{DEF} (35) in Btu's done during the test period shall be determined using the following equation:

$$(2) \qquad Q_{DEF}(35)=\frac{60\times\dot{\bar{V}}\times C_{pa}\times\Gamma}{[V_n{}^1\times(1+W_n)]}$$

where

$\dot{\bar{V}}$ = the average of the air flow rate calculated at four or more time intervals throughout the heating phase of the test using the equation in section 7.4 of ASHRAE Standard 37-78.
C_{pa} = Specific heat at constant pressure of air-water mixture per pound of dry air, (Btu/lb−°F).
$V_n{}^1$ = Specific volume of air-water mixture at the same dry-bulb temperature, humidity ratio, and pressure used in the determination of the indoor air flow rate (ft³/lb).
W_n = Humidity ratio (lb/lb).

and Γ (hr.−°F), which is described by the equation:

$$\Gamma=\int_{\text{(time of defrost termination}}^{\text{(time of next defrost termination)}}\times[T_{a2}(t)-T_{a1}(t)]dt$$

where

$T_a{}^1(t)$ = Dry-bulb temperature of air entering the indoor coil (°F) at time (t).
$T_a{}^2(t)$ = Dry-bulb temperature of air leaving the indoor coil (°F) at time (t).

The cyclic degradation coefficient shall be calculated as follows:

$$(3) \qquad C_D=\frac{1-\frac{COP_{cyc}(47)}{COP_{ss}(47)}}{1-HLF}$$

where

C_D = the cyclic degradation coefficient rounded to the nearest .01
$COP_{cyc}(47)$ as defined above
$COP_{ss}(47)$ as defined above
HLF is the heating load factor calculated as follows:

$$HLF=\frac{Q_{cyc}(47)}{\dot{Q}_{ss}(47)\times\tau}$$

where

$Q_{cyc}(47)$ as defined above
$\dot{Q}_{ss}(47)$ as defined above
τ = Duration of time (hours) for one complete cycle consisting of one compressor "on" time and one compressor "off" time.

For air-source units that are equipped with "demand defrost control systems", the value for HSPF, as determined above shall be multiplied by an enhancement factor F_{def} to compensate for improved performance not measured in the Frost Accumulation Test. The factor, F_{def} depends on the number of defrost cycles in a 12-hour period and should be calculated as follows:

$$F_{def}=1+0.03*(1-(T_{test}-90)/(T_{max}-90))$$

where

F_{def} = demand defrost credit (used as a multiplier to HSPF)

T_{test} = time between defrost terminations in minutes or 90 (whichever is greater)

T_{max} = maximum time between defrosts allowed by controls, in minutes or 720 (whichever is less)

5.2.1 Calculation of the heating seasonal performance factor (HSPF) for air-source heat pumps with single speed compressors.

For each climatic region listed in section 6.2.4, and for design heating requirements equal to both the standardized minimum and maximum design heating requirements defined below, calculate the HSPF defined as:

$$HSPF = \frac{\sum_j \frac{n_j}{N} BL(T_j)}{\left[\sum_j \frac{n_j}{N} \frac{X(T_j)}{PLF(X)} \delta(T_j) E(T_j)(T_j) + \sum_j \frac{RH(T_j)}{N}\right]},$$

where

$j = 1, 2, 3, \ldots, n$ corresponds to the jth temperature bin.

n = total number of non-zero temperature bins in the climatic region.

$T_j = (67 - 5j)$ is the representative temperature of the jth bin, (°F).

Σ = indicated the quantity following the symbol is to be summed over all temperature bins.

$\frac{RH(T_j)}{N}$ = supplementary resistance heat term at temperature T_j required in those cases where the heat pump automatically turns off ($T_j < T_{off}$) or when it is needed to meet the balance of the building heating requirements. (watts).

$\frac{n_j}{N}$ = is the number of hours in the jth temperature bin divided by $N \equiv \Sigma_j n_j$ and is referred to as the "fractional hours in j^{th} temperature bin".

3.413 = is a conversion factor which converts watt hours to Btu.

$BL(T_j)$ = building load at temperature T_j, (Btu/hr).

$\delta(T_j)$ = heat pump low temperature cut-out factor.

$X(T_j)$ = heat pump heating load factor.

$PLF(X)$ = heat pump part load factor.

The quantities $BLCT_j$, $\delta(T_j)$, $X(T_j)$, $PLF(X)$ and

$$\frac{RH(T_j)}{N}$$

are defined by the following equations:

$$BL(T_j) = \left(\frac{65 - T_j}{65 - T_{OD}}\right)(C)(DHR)$$

where

(C) = 0.77 is a correction factor which tends to improve the agreement between calculated and measured building loads

(DHR) = the minimum and maximum design heating requirement which the heat pump is likely to encounter when installed in a residence, rounded off to the nearest standardized DHR in section 6.2b in Btu/hr

where

(minimum design heating requirement)

$$= \begin{cases} \dot{Q}_{ss}(47)\ \frac{(65 - T_{OD})}{60}, & \text{for regions I, II, III, IV, and VI} \\ \dot{Q}_{ss}(47), & \text{for region V} \end{cases}$$

and

maximum design heating requirement

$$= \begin{cases} 2\dot{Q}_{ss}(47)\ \frac{(65 - T_{OD})}{60}, & \text{for regions I, II, III, IV, and VI} \\ 2.2\dot{Q}_{ss}(47), & \text{for region V} \end{cases}$$

where

$\dot{Q}_{ss}(47)$ is the heat pump capacity measured during the High Temperature Test @ 47° F

T_{OD} is the outdoor design temperature given in section 6.2.4

$$\delta(T_j) = \begin{cases} 0;\ T_j \le T_{OFF} \text{ or } \frac{\dot{Q}(T_j)}{(3.413)(\dot{E}(T_j))} < 1 \\ \frac{1}{2};\ T_{OFF} < T_j \le T_{ON} \text{ and } \frac{\dot{Q}(T_j)}{(3.413)(\dot{E}(T_j))} \ge 1 \\ 1;\ T_j > T_{ON} \text{ and } \frac{\dot{Q}(T_j)}{(3.413)(\dot{E}(T_j))} \ge 1 \end{cases}$$

$$X(T_j) = \begin{cases} \frac{BL(T_j)}{\dot{Q}(T_j)};\ \dot{Q}(T_j) \ge BL(T_j) \\ 1;\ \dot{Q}(T_j) \le BL(T_j) \end{cases}$$

$$PLF(X) = 1 - C_D(1 - X(T_j))$$

$$\frac{RH(T_j)}{N} = \frac{[BL(T_j) - \dot{Q}(T_j)X(T_j)\delta(T_j)]\frac{n_j}{N}}{3.413}$$

where

T_{OFF} = the outdoor temperature that the compressor is automatically shut off at (If no such temperature exists, T_j is always greater than T_{OFF} and T_{ON}.)

T_{ON} = the outdoor temperature that the compressor is automatically turned on (if applicable) if designed for low temperature automatic shut-off.

C_D = degradation factor determined described in section 5.2 and 2.2.1.

In using the above equation to calculate HSPF, the heat pump capacity in Btu/hr, $\dot{Q}$, and the power in watts, $\dot{E}$, shall be obtained as follows:

$$\dot{Q}(T_j)=\begin{cases}\dot{Q}_{ss}(17)+\dfrac{(\dot{Q}_{ss}(47)-\dot{Q}_{ss}(17))}{30}\times(T_j-17), & T_j\geq 45°\text{F or } T_j\leq 17°\text{F}\\ \dot{Q}_{ss}(17)+\dfrac{(\dot{Q}_{DEF}(35)-\dot{Q}_{ss}(17))}{18}\times(T_j-17), & 17°\text{F}<T_j<45°\text{F}\end{cases}$$

$$\dot{E}(T_j)=\begin{cases}\dot{E}_{ss}(17)+\dfrac{(\dot{E}_{ss}(47)-\dot{E}_{ss}(17))}{30}\times(T_j-17), & T_j\geq 45°\text{F or } T_j\leq 17°\text{F}\\ \dot{E}_{ss}(17)+\dfrac{(\dot{E}_{DEF}(35)-\dot{E}_{ss}(17))}{18}\times(T_j-17), & 17°\text{F}<T_j<45°\text{F}\end{cases}$$

where $\dot{Q}_{ss}(47)$ and $\dot{E}_{ss}(47)$ and $\dot{Q}_{DEF}(35)$ and $\dot{E}_{ss}(47)$ and $\dot{Q}_{ss}(17)$ and $\dot{E}_{ss}(17)$ are the capacities (in Btu/hr) and powers (in watts), measured during the High Temperature Test, the Frost Accumulation test, and the Low Temperature Test, respectively.

Once the maximum and minimum HSPF and operating cost values have been obtained for each region, the HSPF and operating cost shall be determined for each standardized design heating requirement (see section 6.2.6) between the maximum and minimum design heating requirements by means of interpolation.

5.2.2 Calculation of the heating seasonal performance factor (HSPF) for air source heat pumps with a two-speed compressor, two compressors, or cylinder unloading.

For each climatic region listed in section 6.2.4, and for design heating requirements equal to both the standardized minimum and maximum design heating requirements defined below, calculate the HSPF defined as:

$$HSPF=\frac{\sum_j \frac{n_j}{N}\,BL(T_j)}{\left[\sum_j \frac{E(T_j)}{N}+\sum_j \frac{RH(T_j)}{N}\right]}$$

where

$\sum_j$ as defined in 5.2.1

$\frac{n_j}{N}$ as defined in 5.2.1

T_j as defined in 5.2.1

and $BL(T_j)$ is the building load at temperature T_j, in Btu/hr, calculated by:

$$BL(T_j)=\left(\frac{65-T_j}{65-T_{OD}}\right)\times(C)\times(DHR)$$

where

(C) = 0.77 is a correction factor which tends to improve the agreement between calculated and measured building loads

(DHR) = the minimum and maximum design heating requirement which the heat pump is likely to encounter when installed in a residence, rounded off to the nearest standardized DHR in section 6.2.6 in Btu's per hour

where

(minimum design heating requirement)

$$=\begin{cases}\dot{Q}_{ss}^{(k=2)}(47)\,\dfrac{(65-T_{OD})}{60}, & \text{for regions I, II, III, IV, and VI}\\ \dot{Q}_{ss}^{(k=2)}(47), & \text{for region V}\end{cases}$$

and

(maximum design heating requirement)

$$=\begin{cases}2\dot{Q}_{ss}^{(k=2)}(47)\,\dfrac{(65-T_{OD})}{60}, & \text{for regions I, II, III, IV and VI}\\ 2.2\dot{Q}_{ss}^{(k=2)}(47) & \text{for region V}\end{cases}$$

where

$\dot{Q}_{ss}^{(k=2)}(47)$ is the heat pump capacity measured during the high temperature performance test at 47°F, with the unit operating at the high compressor speed or with both compressors in operation, in Btu/hr

T_{OD} is the outdoor design temperature given in section 6.2.4 in degrees °F.

NOTE: The superscript $(k=1)$ and $(k=2)$ refer to the heat pump operating at low speed or single compressor operation and high speed or two compressor operation respectively.

$\frac{E(T_j)}{N}$ is the heat pump electrical energy usage in the jth temperature bin divided by the total number of bin hours and is evaluated according to the four possible cases of heat pump operation denoted below in watts.

$\frac{RH(T_j)}{N}$ as defined in 5.2.1 and is evaluated according to the four possible cases of heat pump operation denoted below (in watts).

Case I.—Units operating at low compressor speed or with a single compressor, i.e., $k=1$, for which the building heating load, $BL(T_j)$ is less than or equal to the heating capacity, $\dot{Q}^{k=1}(T_j)$.

$$BL(T_j) \leq \dot{Q}^{k=1}(T_j)$$

$$\frac{E(T_j)}{N} = \frac{\dot{E}^{k=1}(T_j) X^{k=1}(T_j) \delta'(T_j)}{PLF^{k=1}} \frac{n_j}{N}$$

$$\frac{RH(T_j)}{N} = \frac{\frac{n_j}{N} BL(T_j)[1-\delta'(T_j)]}{3.413}$$

$$X^{k=1}(T_j) = \frac{BL(T_j)}{\dot{Q}^{k=1}(T_j)}$$

$$PLF^{k=1} = 1 - C_D^{k=1}(1 - X_j^{k=1})$$

$$\delta'(T_j) = \begin{cases} 0; & T_j \leq T_{OFF} \\ \frac{1}{2}; & T_{OFF} < T_j \leq T_{ON} \\ 1; & T_j > T_{ON} \end{cases}$$

Case II.— Units alternating between high speed or two compressor operation ($k=2$) and low speed or single compressor operation ($k=1$) to satisfy the building heating load at temperature T_j.

$$\dot{Q}^{k=1}(T_j) < BL(T_j) < \dot{Q}^{k=2}(T_j)$$

$$\frac{E(T_j)}{N} = [\dot{E}^{k=1}(T_j) X^{k=1}(T_j) + \dot{E}^{k=2}(T_j) X^{k=2}(T_j)] \delta'(T_j) \frac{n_j}{N}$$

$$\frac{RH(T_j)}{N} = \frac{\frac{n_j}{N} BL(T_j)[1-\delta'(T_j)]}{3.413}$$

$$X^{k=1}(T_j) = \frac{\dot{Q}^{k=2}(T_j) - BL(T_j)}{\dot{Q}^{k=2}(T_j) - \dot{Q}^{k=1}(T_j)}$$

$$X^{k=2}(T_j) = 1 - X^{k=1}(T_j)$$

$$\delta'(T_j) \begin{cases} 0; & T_j \leq T_{OFF} \\ \frac{1}{2}; & T_{OFF} < T_j \leq T_{ON} \\ 1; & T_j > T_{ON} \end{cases}$$

Case III.—Units cycling on and off at high compressor speed or cycling both compressors on and off together ($k=2$) in order to satisfy the building heating load at temperature T_j.

$$\dot{Q}^{k=1}(T_j) < BL(T_j) < \dot{Q}^{k=2}(T_j)$$

$$\frac{E(T_j)}{N} = \frac{\dot{E}^{k=2}(T_j) X^{k=2}(T_j) \delta''(T_j) \frac{n_j}{N}}{PLF^{k=2}}$$

$$\frac{RH(T_j)}{N} = \frac{\frac{n_j}{N} BL(T_j)[1-\delta''(T_j)]}{3.413}$$

$$X^{k=2}(T_j) = \frac{BL(T_j)}{\dot{Q}^{k=2}(T_j)}$$

$$PLF^{k=2} = 1 - C_D^{k=2}(1 - X^{k=2}(T_j))$$

$$\delta''(T_j) = \begin{cases} 0; & T_j \leq T_{OFF} \\ \frac{1}{2}; & T_{OFF} < T_j \leq T_{ON} \\ 1; & T_j > T_{ON} \end{cases}$$

Case IV.—Units operating continuously at high compressor speed or with both compressors in continuous operation ($k=2$) in order to satisfy the building heating load at temperature T_j.

$$BL(T_j) \geq \dot{Q}^{k=2}(T_j)$$

$$\frac{E(T_j)}{N} = \dot{E}^{k=2}(T_j) X^{k=2}(T_j) \delta''(T_j) \frac{n_j}{N}$$

$$\frac{RH(T_j)}{N} = \frac{[BL(T_j) - \dot{Q}^{k=2}(T_j) X^{k=2}(T_j) \delta''(T_j)] \frac{n_j}{N}}{3.413}$$

$$X^{k=2}(T_j) = 1.0$$

$$\delta''(T_j) = \begin{cases} 0;\ T_j \leq T_{OFF} \text{ or } \frac{\dot{Q}^{k=2}(T_j)}{(3.413)(\dot{E}^{k=2}(T_j))} < 1 \\ \frac{1}{2};\ T_{OFF} < T_j \leq T_{ON} \text{ and } \frac{\dot{Q}^{k=2}(T_j)}{(3.413)(\dot{E}^{k=2}(T_j))} \geq 1 \\ 1;\ T_j \geq T_{ON} \text{ and } \frac{\dot{Q}^{k=2}(T_j)}{(3.413)(\dot{E}^{k=2}(T_j))} \geq 1 \end{cases}$$

Where in each of the above cases

$X(T_j)$ = heat pump heating load factor.
PLF = heat pump part load factor (not required for cases II and IV.)
$\delta''(T_j)$ = heat pump low temperature cut-out factor.
T_{off} as defined in 5.2.1.
T_{on} as defined in 5.2.1.
$C_D^{k=2}$ = the part load degradation factor described in section 2.2.1 and 5.2 for the unit cycling at high compressor speed or with both compressors simultaneously cycling (if applicable).
$C_D^{(k=1)}$ = the part load degradation factor described in section 2.2.1 and 5.2 for the unit cycling at low compressor speed or with the single compressor that normally operates at low heating loads.

$$\dot{Q}^{k=1}(T_j)=\begin{cases}\dot{Q}_{ss}^{k=1}(47)+\dfrac{(\dot{Q}_{ss}^{k=1}(62)-\dot{Q}_{ss}^{k=1}(47))}{15}\times(T_j-47); & T_j\geq 40^\circ\text{ F}\\ \dot{Q}_{ss}^{k=1}(17)+\dfrac{(\dot{Q}_{DEF}^{k=1}(35)-\dot{Q}_{ss}^{k=1}(17))}{18}\times(T_j-17); & 17^\circ\text{ F}\leq T_j<40^\circ\text{ F}\\ \dot{Q}_{ss}^{k=1}(17)+\dfrac{(\dot{Q}_{ss}^{k=1}(47)-\dot{Q}_{ss}^{k=1}(17))}{30}\times(T_j-17); & T_j<17^\circ\text{ F}\end{cases}$$

$$\dot{E}^{k=1}(T_j)=\begin{cases}\dot{E}_{ss}^{k=1}(47)+\dfrac{(\dot{E}_{ss}^{k=1}(62)-\dot{E}_{ss}^{k=1}(47))}{15}\times(T_j-47); & T_j\geq 40^\circ\text{ F}\\ \dot{E}_{ss}^{k=1}(17)+\dfrac{(\dot{E}_{DEF}^{k=1}(35)-\dot{E}_{ss}^{k=1}(17))}{18}\times(T_j-17); & 17^\circ\text{ F}\leq T_j<40^\circ\text{ F}\\ \dot{E}_{ss}^{k=1}(17)+\dfrac{(\dot{E}_{ss}^{k=1}(47)-\dot{E}_{ss}^{k=1}(17))}{30}\times(T_j-17); & T_j<17^\circ\text{ F}\end{cases}$$

$$\dot{Q}^{k=2}(T_j)=\begin{cases}\dot{Q}_{ss}^{k=2}(17)+\dfrac{(\dot{Q}_{ss}^{k=2}(47)-\dot{Q}_{ss}^{k=2}(17))}{30}\times(T_j-17); & T_j\geq 45^\circ\text{ F or } T_j\leq 17^\circ\text{ F}\\ \dot{Q}_{ss}^{k=2}(17)+\dfrac{(\dot{Q}_{DEF}^{k=2}(35)-\dot{Q}_{ss}^{k=2}(17))}{18}\times(T_j-17); & 17^\circ\text{ F}<T_j<45^\circ\text{ F}\end{cases}$$

$$\dot{E}^{k=2}(T_j)=\begin{cases}\dot{E}_{ss}^{k=2}(17)+\dfrac{(\dot{E}_{ss}^{k=2}(47)-\dot{E}_{ss}^{k=2}(17))}{30}\times(T_j-17); & T_j\geq 45^\circ\text{ F or } T_j\leq 17^\circ\text{ F}\\ \dot{E}_{ss}^{k=2}(17)+\dfrac{(\dot{E}_{DEF}^{k=2}(35)-\dot{E}_{ss}^{k=2}(17))}{18}\times(T_j-17); & 17^\circ\text{ F}<T_j<45^\circ\text{ F}\end{cases}$$

For each of the six regions specified in section 6.2.5, calculate the heating seasonal performance factors and seasonal operating costs corresponding to the standardized maximum and minimum design heating requirements and for all other standardized design heating requirements (see section 6.2.6) between the maximum and the minimum.

5.2.3 *Heating seasonal performance factor for air-source units with triple-capacity compressors.* (Reserved)

5.2.4 *Heating seasonal performance factor for units with variable-speed compressors.* For units with variable-speed compressors, the heating seasonal performance factor (HSPF) is defined by the following equation:

$$HSPF = \frac{\sum_j \frac{n_j}{N} BL(T_j)}{\left(\sum_j \frac{E(T_j)}{N} + \sum_j \frac{RH(T_j)}{N} \right)}$$

where all symbols in the above equations are as defined in 5.2.2.

The minimum and maximum heating design requirements, DHR_{min} and DHR_{max}, which a variable-speed heat pump is likely to encounter, shall be evaluated as described for two-speed units in 5.2.2 with the option of using the nominal capacity, $Q_{ss}^{k=n}(47°F)$, in lieu of the maximum speed capacity, $Q_{ss}^{k=2}(47)$, in the prescribed equations if the manufacturer performed the nominal capacity test.

In evaluation of HSPF, three cases are considered, the quantities $\frac{E(T_j)}{N}$ and $\frac{RH(T_j)}{N}$ shall be calculated depending on compressor mode of operation.

Case I

The compressor operates at the minimum speed (k=1) for which the building heating load, $BL(T_j)$, is less than or equal to the heating capacity, $Q_{ss}^{k=1}(T_j)$.

Calculations shall be performed as prescribed for two-speed systems in Case I of 5.2.2 with the exception that system capacity $Q_{ss}^{k=1}(T_j)$, and power, $E_{ss}^{k=1}(T_j)$, shall be calculated by the following equations:

$$Q_{ss}^{k=1}(T_j) = Q_{ss}^{k=1}(47) + \frac{Q_{ss}^{k=1}(62) - Q_{ss}^{k=1}(47)}{15} * (T_j - 47)$$

$$E_{ss}^{k=1}(T_j) = E_{ss}^{k=1}(47) + \frac{E_{ss}^{k=1}(62) - E_{ss}^{k=1}(47)}{15} * (T_j - 47)$$

Case II

The compressor operates at any intermediate (k=v) speed between the maximum speed (k=2) and minimum (k=1) speed to satisfy the building load and evaluate the following equations:

$$Q^{k=v}(T_j) = BL(T_j)$$

$$\frac{Q(T_j)}{N} = Q^{k=v}(T_j) * \frac{n_j}{N}$$

$$E^{k=v}(T_j) = \frac{Q^{k=v}(T_j)}{3.413 * COP^{k=v}(T_j)}$$

$$\frac{E(T_j)}{N} = E^{k=v}(T_j) * \frac{n_j}{N}$$

where

$Q^{k=v}(T_j)$ = capacity delivered by the unit at any intermediate speed between the minimum and maximum compressor speed matching the building load at temperature T_j

$E^{k=v}(T_j)$ = the electrical power input required by the unit at temperature T_j to deliver capacity matching the building load

$COP^{k=v}(T_j)$ = the coefficient of performance at which the unit delivers capacity matching the building load at temperature T_j

Before the coefficient of performance, $COP^{k=v}(T_j)$, can be calculated, the unit performance has to be evaluated at the compressor speed (k=i) at which the intermediate speed test was conducted. The capacity of the unit at any temperature T_j when compressor operates at the intermediate speed (k=i) may be determined by:

$$Q_{def}^{k=i}(T_j) = Q_{def}^{k=i}(35) + M_Q(T_j - 35)$$

where

$Q_{def}^{k=i}(35)$ = the capacity of the unit at 35°F determined at the intermediate compressor speed (k=i) in the frost accumulation test

M_Q = slope of the capacity curve for the intermediate compressor speed (k=i)

$$M_Q = \frac{Q_{ss}^{k=1}(62) - Q_{ss}^{k=1}(47)}{62 - 47} * (1 - N_Q) + N_Q \frac{Q_{def}^{k=2}(35) - Q_{ss}^{k=2}(17)}{35 - 17}$$

$$N_Q = \frac{Q_{def}^{k=i}(35) - Q_{ss}^{k=1}(35)}{Q_{def}^{k=2}(35) - Q_{ss}^{k=1}(35)}$$

Once the equation for $Q^{k=i}(T_j)$ has been determined, the temperature where $Q_{def}^{k=i}(T_j) = BL(T_j)$ can be found. This temperature is designated at T_{vh}. A separate T_{vh} shall be determined for each design heating requirement.

The electrical power input for the unit operating at the intermediate compressor speed (k=v) and at the temperature (T_{vh}) is determined by:

$$E_{def}^{k=i}(T_{vh}) = E_{def}^{k=i}(35) + M_E(T_{vh} - 35)$$

where

$E_{def}^{k=i}(35)$ = the electrical power input of the unit at 35°F determined at the intermediate compressor speed (k=i) in the frost accumulation test

M_E = slope of the electrical power input curve for the intermediate compressor speed (k=i)

$$M_E = \frac{E_{ss}^{k=1}(62) - E_{ss}^{k=1}(47)}{62-47} * (1 - N_E) + N_E \frac{E_{def}^{k=2}(35) - E_{ss}^{k=2}(17)}{35-17}$$

$$N_E = \frac{E_{def}^{k=i}(35) - E_{ss}^{k=1}(35)}{E_{def}^{k=2}(35) - E_{ss}^{k=1}(35)}$$

The coefficient of performance, $COP^{k=i}(T_{vh})$, at the intermediate speed (k=i) and temperature T_{vh} can be calculated by the equation:

$$COP^{k=i}(T_{vh}) = \frac{Q_{def}^{k=i}(T_{vh})}{3.413 * E_{def}^{k=i}(T_{vh})}$$

Similarly, coefficients of performance at temperature T_3 and T_4 can be calculated by the equations:

$$COP^{k=1}(T_3) = \frac{Q^{k=1}(T_3)}{3.413 * E^{k=1}(T_3)}$$

$$COP^{k=2}(T_4) = \frac{Q^{k=2}(T_4)}{3.413 * E^{k=2}(T_4)}$$

where

T_3 = temperature at which the unit, operating at the minimum compressor speed, delivers capacity equal to the building load ($Q^{k=1}(T_3) = BL(T_3)$), found by equating the capacity by using the equation $Q^{k=1}(T_j)$ (at $T_j \geq 40°F$) equal to the building load equation $BL(T_j)$ as identified in section 5.2.2 of this Appendix and solving for temperature

T_4 = temperature at which the unit, operating at the maximum, delivers capacity equal to the building load ($Q^{k=2}(T_4) = BL(T_4)$), found by setting the equation for capacity $Q^{k=2}(T_j)$ equal to the equation for building load $BL(T_j)$ from the two-speed procedure in section 5.2.2 and solving for temperature

$COP^{k=1}(T_3)$ = the coefficient of performance at the minimum compressor speed at temperature T_3

$COP^{k=2}(T_4)$ = the coefficient of performance at the maximum compressor speed at temperature T_4

$Q^{k=1}(T_3)$ = steady-state capacity at the minimum compressor speed at temperature T_3, using equations for $Q^{k=1}(T_j)$ from the two-speed procedure

$Q^{k=2}(T_4)$ = steady-state capacity at the maximum compressor speed at temperature T_4, calculated using the equation for $Q^{k=2}(T_j)$ of the two-speed procedure.

$E^{k=1}(T_3)$ = the electrical power input at the minimum compressor speed at temperature T_3, calculated by using the equation for $E^{k=1}(T_j)$ (where $T_j \geq 40°F$) from the two-speed procedure in section 5.2.2 of this Appendix

$E^{k=2}(T_4)$ = the electrical power input at the maximum compressor speed at temperature T_4, calculated by using the equation for $E^{k=2}(T_j)$ from the two-speed procedure in section 5.2.2 of this Appendix

The coefficient of performance, $COP^{k=v}(T_j)$, shall be calculated by the following equation:

$$COP^{k=v}(T_j) = A + B * T_j + C * T_j^2$$

where coefficients A, B and C shall be evaluated using the following calculations step:

$$D = \frac{T_3^2 - T_4^2}{T_{rh}^2 - T_4^2}$$

$$B = \frac{COP^{k=2}(T_4) - COP^{k=1}(T_3) - D^*[COP^{k=2}(T_4) - COP^{k=1}(T_{th})]}{T_4 - T_3 - D^*(T_4 - T_{th})}$$

$$C = \frac{COP^{k=2}(T_4) - COP^{k=1}(T_3) - B^*(T_4 - T_3)}{T_4^{\ 2} - T_3^{\ 2}}$$

$$A = COP^{k=2}(T_4) - B^*T_4 - C^*T_4^{\ 2}$$

Case III

The compressor operates at the maximum speed (k 2) for which the building heating load, $BL(T_j)$, is greater than or equal to the heating capacity, $Q_{ss}^{k=2}(T_j)$.

Calculations shall be performed as prescribed for two-speed systems in Case IV of 5.2.2.

5.2.5 *Heating seasonal performance factor for split-type ductless systems.* For split-type ductless systems, HSPF shall be defined as specified in section 5.2.1 of this Appendix. Separate values of HSPF shall be determined for each corresponding combination set of indoor coils used in the development of SEER as specified in Section 5.1.7. The calculations used shall be the same as those used for units with the same type of compressor.

5.3 *Calculations of the Actual Representative Regional Annual Performance Factors for Air Source Central Air Conditioners (Heat Pumps) Which Provide Both Heating and Cooling.*

5.3.1 Calculation of actual regional annual performance factors (APF_A) for a particular location and for each standardized design heating requirement.

$$(APF_A) = \frac{(CLH_A)(\dot{Q}_{ss}^{k}(95F))}{\frac{(CLH_A)(\dot{Q}_{ss}^{k}(95F))}{(SEER)} + \frac{(HLH_A)(DHR)(C)}{(HSPF)}} + (HLH_A)(DHR)(C)$$

where

(CLH_A) is the actual cooling load hours for the particular location, determined from the map in section 6.1.3.

$(\dot{Q}_{ss}^{k}(95F))$ is defined in 5.1.

(DHR) is defined in 5.2.2.

(C) is defined in 5.2.2.

(HLH_A) is the actual heating load hours for the particular location determined from the map in section 6.2.5.

$(SEER)$ is the seasonal energy efficiency ratio determined in section 5.1.

$(HSPF)$ is the heating seasonal performance factors as determined in section 5.2 for each standardized design heating requirement within the particular location's region or for the actual design heating requirement if known.

where the particular location's region is determined from the map in section 6.2.5 and, the standardized design heating requirements within the region are determined in sections 5.2 and 6.2.6.

5.3.2 Calculation of representative regional annual performance factors (APF_R) for each region and for each standardized design heating requirement.

$$(APF_R) = \frac{(CLH_R)(\dot{Q}_{ss}^{k}(95F))}{\frac{(CLH_R)(\dot{Q}_{ss}^{k}(95F))}{SEER} + \frac{(HLH_R)(DHR)(C)}{HSPF}} + (HLH_R)(DHR)(C)$$

$(\dot{Q}_{ss}^{k}(95F))$ is defined in 5.1.

(DHR) is defined in 5.2.2.

(C) is defined in 5.2.2.

where

(CLH_R) is the representative cooling load hours for each heating load hours region, as determined in section 6.3.

(HLH_R) is the representative heating load hours for each region as determined in section 6.2.5.

$(SEER)$ is the seasonal energy efficiency ratio as determined in section 5.1.

$(HSPF)$ is the heating seasonal performance factor as determined in section 5.2 for each region and for each standardized design heating requirement within each region.

where the regions are listed in section 6.2.5 and, the standardized design heating requirements within the regions are determined in sections 5.2 and 6.2.6.

6.0 *Reference material.*

6.1 *Cooling reference material.*

6.1.1 *Test operating and test condition tolerance for cyclic dry-coil tests.*

Readings, remarks	Test operating tolerance [1]	Test condition tolerance [2]
Outdoor dry-bulb air temperature, Fahrenheit: Entering	2.0	0.5
Indoor dry-bulb air temperature, Fahrenheit: Entering	2.0	0.5
Indoor wet-bulb air temperature, Fahrenheit: Entering	([3])	([3])
After the first 30 sec after compressor startup:		
External resistance to airflow, inches water	0.05	0.02
Nozzle pressure drops, percent of reading	2.0	

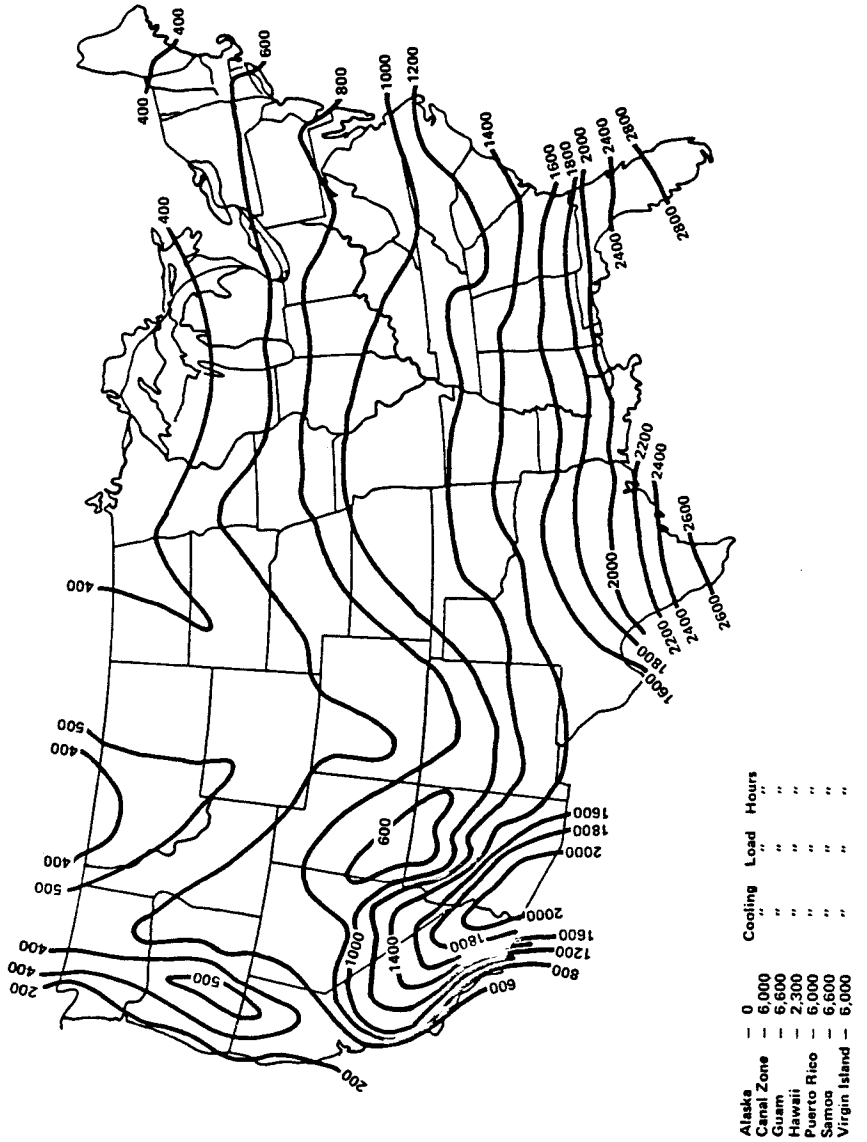
Readings, remarks	Test operating tolerance [1]	Test condition tolerance [2]
Electrical voltage inputs to the test unit, percent	2.0	

[1] Total observed range.
[2] Variation of average from specified test condition.
[3] Shall at no time exceed that value of the wet-bulb temperature which results in the production of condensate by the indoor coil at the dry-bulb temperature existing for the air entering the indoor portion of the unit.

6.1.2 *Distribution of fractional hours in temperature bins to be used for calculation of the SEER for 2-speed compressor and 2-compressor units.*

Bin No. j:	Bin temperature range (degrees Fahrenheit)	Representative temperature bin for (degrees Fahrenheit)	Fraction of total temperature bin hours n_j/N
1	65–69	67	.214
2	70–74	72	.231
3	75–79	77	.216
4	80–84	82	.161
5	85–89	87	.104
6	90–94	92	.052
7	95–99	97	.018
8	100–104	102	.004

6.1.3 Distribution of Actual Cooling Load Hours (CLH_A) Throughout the United States



6.2 *Heating reference material.*

6.2.1 *Test operating and test condition tolerance for Steady-State High Temperature Test [at 47° F (8.3° C) or 62° F (16.7° C)] and Low Temperature Test [at 17° F (−8.3° C)].*

	Test operating [1] tolerance	Test condition [2] tolerance
Indoor dry-bulb, ° F:		
Entering	2.0	0.5
Leaving	2.0	.....
Indoor wet-bulb, ° F:		
Entering	1.0	.....
Leaving	1.0	.....

	Test operating [1] tolerance	Test condition [2] tolerance
Outdoor dry-bulb, ° F:		
Entering	2.0	0.5
Leaving	2.0	.....
Outdoor wet-bulb, ° F:		
Entering	1.0	0.3
Leaving	1.0	.....
External resistance to air flow, inches of water	.05	.02
Electrical voltage, percent	2.0	.....

[1] Test operating tolerance is the maximum permissible variation of any measurement. When expressed as a percentage, the maximum allowable variation is the specified percentage of the average value.

[2] Test condition tolerance is the maximum permissible variation of the average value of the measurement from the standard or desired test condition.

6.2.2 *Test operating and test condition tolerances for the on-period portion of cyclic performance tests.*

	Test operating tolerances [1]	Test condition tolerance [2]
Indoor dry-bulb, ° F:		
Entering	2.0	0.5
Leaving	.....	.....
Indoor wet-bulb, ° F:		
Entering	1.0	.....
Leaving	.....	.....
Outdoor dry-bulb, ° F:		
Entering	2.0	0.5
Leaving	.....	.....
Outdoor wet-bulb, ° F:		
Entering	2.0	1.0
Leaving	.....	.....
External resistance to air-flow, inches of water	.05	.02
Electrical voltage, percent	2.0	.....

[1] Test operating tolerance is the maximum permissible variation of any measurement. When expressed as a percentage, the maximum allowable variation is the specified percentage of the average value. (Applies after the first 30 seconds after compressor start-up.)

[2] Test condition tolerance is the maximum permissible variation of the average value of the measurement from the standard or desired test condition.

6.2.3 *Test operating and test tolerances for frost accumulation tests.*

	Testing operating tolerance [1]		Test condition tolerance [2] (heating portion only)
	During heating	During defrost	
Indoor dry-bulb, ° F:			
Entering	2.0	[3] 4.0	0.5
Leaving	.....	.....	.....
Indoor wet-bulb, ° F:			
Entering	1.0	.....	.....
Leaving	.....	.....	.....
Outdoor dry-bulb, ° F:			
Entering	2.0	10.0	1.0
Leaving	.....	.....	.....
Outdoor dew-point, ° F:			
Entering	1.5	.....	0.7
Leaving	.....	.....	.....
External resistance to air-flow, inches of water	.05	.....	.02
Electrical voltage, percent	2.0	.....	.....

[1] Test operating tolerance is the maximum permissible variation of any measurement. When expressed as a percentage, the maximum allowable variation is the specified percentage of the average value. Test Operating Tolerance During Heating applies when the heat pump is in the heating mode, except for the first 5 minutes after termination of a defrost cycle. Test Operating Tolerance During Defrost applies during a defrost cycle and during the first 5 minutes after the termination of a defrost cycle when the heat pump is operating in the heating mode.

[2] Test condition tolerance is the maximum permissible variation of the average value of the measurement from the standard or desired test condition. Test Condition Tolerance applies only when the heat pump is operating in the heating mode.

[3] Not applicable during defrost if the indoor fan is off.

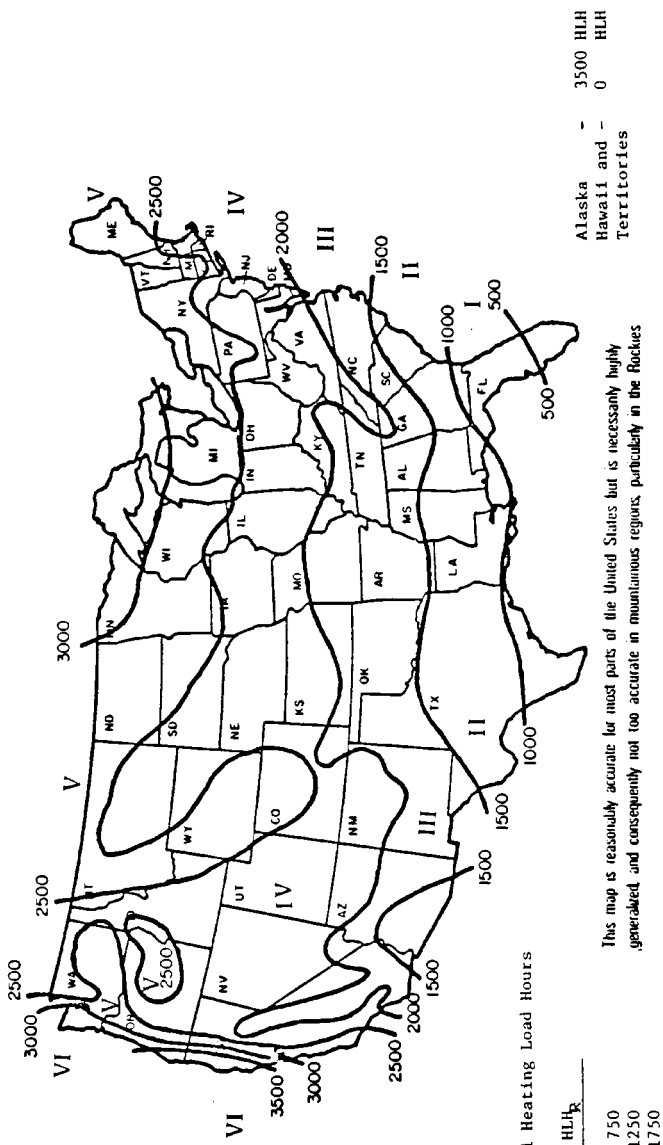
6.2.4 *Distribution of fractional hours in temperature bins, heating load hours and outdoor design temperature for the different climatic regions.*

Fractional hours		Region					
Bin No.	T_j (°F)	I	II	III	IV	V	VI
		Heating Load Hours, HLH					
		750	1,250	1,750	2,250	2,750	[1] 2,750
		Outdoor Design Temperature, T_{OD}, for the region					
		37	27	17	5	-10	30
j=1	62	.291	.215	.153	.132	.106	.113
2	57	.239	.189	.142	.111	.092	.206
3	52	.194	.163	.138	.103	.086	.215
4	47	.129	.143	.137	.093	.076	.204
5	42	.081	.112	.135	.100	.078	.141
6	37	.041	.088	.118	.109	.087	.076
7	32	.019	.056	.092	.126	.102	.034
8	27	.005	.024	.047	.087	.094	.008
9	22	.001	.008	.021	.055	.074	.003
10	17	0	.002	.009	.036	.055	0
11	12	0	0	.005	.026	.047	0
12	7	0	0	.002	.013	.038	0
13	2	0	0	.001	.006	.029	0
14	-3	0	0	0	.002	.018	0

Fractional hours		Region					
Bin No.	T_j (°F)	I	II	III	IV	V	VI
15	-8	0	0	0	.001	.010	0
16	-13	0	0	0	0	.005	0
17	-18	0	0	0	0	.002	0
18	-23	0	0	0	0	.001	0

[1] Pacific Coast Region.

6.2.5 Actual heating load hours (HLH_A) and regional heating load hours (HLH_R) for the United States



Regional Heating Load Hours

Region	HLH_R
I	750
II	1250
III	1750
IV	2250
V	2750
VI	2750

6.2.6 *Standard Design Heating Requirements (Btu/hr)*

5,000	25,000	50,000	90,000
10,000	30,000	60,000	100,000
15,000	35,000	70,000	110,000
20,000	40,000	80,000	130,000

6.3 *Representative Cooling Load Hours (CLH_R)* for Each Heating Load Hours Region.

Region	CLH_R	HLH_R
I	2,400	750
II	1,800	1,250
III	1,200	1,750
IV	800	2,250
V	400	2,750
VI	200	2,750

6.4 *Ground Water Temperature Map (Reserved).*

[44 FR 76707, Dec. 27, 1979, as amended at 54 FR 6076, Feb. 7, 1989]

APPENDIX N TO SUBPART B OF PART 430—UNIFORM TEST METHOD FOR MEASURING THE ENERGY CONSUMPTION OF FURNACES AND BOILERS

1.0 *Scope.* The scope of this appendix is as specified in section 2.0 of ANSI/ASHRAE Standard 103–1993.

2.0 *Definitions.* Definitions include the definitions specified in section 3 of ANSI/ASHRAE Standard 103–1993 and the following additional and modified definitions:

2.1 *ANSI/ASHRAE Standard 103–1993* means the test standard published in 1993 by ASHRAE, approved by the American National Standards Institute (ANSI) on October 4, 1993, and entitled ''Method of Testing for Annual Fuel Utilization Efficiency of Residential Central Furnaces and Boilers'' (with errata of October 24, 1996).

2.2 *ASHRAE* means the American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.

2.3 *Thermal stack damper* means a type of stack damper which is dependent for operation exclusively upon the direct conversion of thermal energy of the stack gases to open the damper.

2.4 *Isolated combustion system.* The definition of isolation combustion system in section 3 of ANSI/ASHRAE Standard 103–1993 is incorporated with the addition of the following: ''The unit is installed in an un-conditioned indoor space isolated from the heated space.''

3.0 *Classifications.* Classifications are as specified in section 4 of ANSI/ASHRAE Standard 103–1993.

4.0 *Requirements.* Requirements are as specified in section 5 of ANSI/ASHRAE Standard 103–1993.

5.0 *Instruments.* Instruments must be as specified in section 6 of ANSI/ASHRAE Standard 103–1993.

6.0 *Apparatus.* The apparatus used in conjunction with the furnace or boiler during the testing shall be as specified in section 7 of ANSI/ASHRAE Standard 103–1993 except for the second paragraph of section 7.2.2.2 and except for section 7.2.2.5, and as specified in section 6.1 of this appendix.

6.1 *Downflow furnaces.* Install the internal section of vent pipe the same size as the flue collar for connecting the flue collar to the top of the unit, if not supplied by the manufacturer. Do not insulate the internal vent pipe during the jacket loss test (if conducted) described in section 8.6 of ANSI/ASHRAE Standard 103–1993 or the steady-state test described in section 9.1 of ANSI/ASHRAE Standard 103–1993. Do not insulate the internal vent pipe before the cool-down and heat-up tests described in sections 9.5 and 9.6, respectively, of ANSI/ASHRAE Standard 103–1993. If the vent pipe is surrounded by a metal jacket, do not insulate the metal jacket. Install a 5-ft test stack of the same cross sectional area or perimeter as the vent pipe above the top of the furnace. Tape or seal around the junction connecting the vent pipe and the 5-ft test stack. Insulate the 5-ft test stack with insulation having an R-value not less than 7 and an outer layer of aluminum foil. (See Figure 3–E of ANSI/ASHRAE Standard 103–1993.)

7.0 *Testing conditions.* The testing conditions shall be as specified in section 8 of ANSI/ASHRAE Standard 103–1993 with errata of October 24, 1996, except for section 8.6.1.1; and as specified in section 7.1 of this appendix.

7.1 *Measurement of jacket surface temperature.* The jacket of the furnace or boiler shall be subdivided into 6-inch squares when practical, and otherwise into 36-square-inch regions comprising 4 in. x 9 in. or 3 in. x 12 in. sections, and the surface temperature at the center of each square or section shall be determined with a surface thermocouple. The 36-square-inch areas shall be recorded in groups where the temperature differential of the 36-square-inch area is less than 10°F for temperature up to 100°F above room temperature and less than 20°F for temperature more than 100°F above room temperature. For forced air central furnaces, the circulating air blower compartment is considered as part of the duct system and no surface temperature measurement of the blower compartment needs to be recorded for the purpose of this test. For downflow furnaces, measure all cabinet surface temperatures of the heat exchanger and combustion section, including the bottom around the outlet duct, and the burner door, using the 36 square-inch thermocouple grid. The cabinet surface temperatures around the blower section do not need to be measured (See figure 3–E of ANSI/ASHRAE Standard 103–1993.)

8.0 *Test procedure.* Testing and measurements shall be as specified in section 9 of ANSI/ASHRAE Standard 103–1993 except for sections 9.5.1.1, 9.5.1.2.1, 9.5.1.2.2, 9.5.2.1, and section 9.7.1. ; and as specified in sections 8.1, 8.2, 8.3, 8.4, and 8.5, of this appendix.

8.1 *Input to interrupted ignition device.* For burners equipped with an interrupted ignition device, record the nameplate electric power used by the ignition device, PE_{IG}, or use PE_{IG}=0.4 kW if no nameplate power input is provided. Record the nameplate ignition device on-time interval, t_{IG}, or measure the on-time period at the beginning of the test at the time the burner is turned on with a stop watch, if no nameplate value is given. Set t_{IG}=0 and PE_{IG}=0 if the device on-time is less than or equal to 5 seconds after the burner is on.

8.2 *Gas- and oil-fueled gravity and forced air central furnaces without stack dampers cool-down test.* Turn off the main burner after steady-state testing is completed, and measure the flue gas temperature by means of the thermocouple grid described in section 7.6 of ANSI/ASHRAE 103–1993 at 1.5 minutes ($T_{F,OFF}(t_3)$) and 9 minutes ($T_{F,OFF}(t_4)$) after the burner shuts off. An integral draft diverter shall remain blocked and insulated, and the stack restriction shall remain in place. On atmospheric systems with an integral draft diverter or draft hood, equipped with either an electromechanical inlet damper or an electro-mechanical flue damper that closes within 10 seconds after the burner shuts off to restrict the flow through the heat exchanger in the off-cycle, bypass or adjust the control for the electromechanical damper so that the damper remains open during the cool-down test. For furnaces that employ post purge, measure the length of the post-purge period with a stopwatch. The time from burner OFF to combustion blower OFF (electrically de-energized) shall be recorded as t_p. For the case where t_p is intended to be greater than 180 seconds, stop the combustion blower at 180 seconds and use that value for t_p. Measure the flue gas temperature by means of the thermocouple grid described in section 7.6 of ANSI/ASHRAE 103–1993 at the end of post-purge period, t_p ($T_{F,OFF}(t_p)$), and at the time (1.5 + t_p) minutes ($T_{F,OFF}(t_3)$) and (9.0 + t_p) minutes ($T_{F,OFF}(t_4)$) after the main burner shuts off. For the case where the measured tp is less than or equal to 30 seconds, it shall be tested as if there is no post purge and t_p shall be set equal to 0.

8.3 *Gas- and oil-fueled gravity and forced air central furnaces without stack dampers with adjustable fan control—cool-down test.* For a furnace with adjustable fan control, this time delay will be 3.0 minutes for non-condensing furnaces or 1.5 minutes for condensing furnaces or until the supply air temperature drops to a value of 40°F above the inlet air temperature, whichever results in the longest fan on-time. For a furnace without adjustable fan control or with the type of adjustable fan control whose range of adjustment does not allow for the delay time specified above, the control shall be bypassed and the fan manually controlled to give the delay times specified above. For a furnace which employs a single motor to drive the power burner and the indoor air circulating blower, the power burner and indoor air circulating blower shall be stopped together.

8.4 *Gas-and oil-fueled boilers without stack dampers cool-down test.* After steady-state testing has been completed, turn the main burner(s) OFF and measure the flue gas temperature at 3.75 ($T_{F,OFF}(t_3)$) and 22.5 ($T_{F,OFF}(t_4)$) minutes after the burner shut off, using the thermocouple grid described in section 7.6 of ANSI/ASHRAE 103–1993. During this off-period, for units that do not have pump delay after shutoff, no water shall be allowed to circulate through the hot water boilers. For units that have pump delay on shutoff, except those having pump controls sensing water temperature, the pump shall be stopped by the unit control and the time t^+, between burner shutoff and pump shutoff shall be measured within one-second accuracy. For units having pump delay controls that sense water temperature, the pump shall be operated for 15 minutes and t^+ shall be 15 minutes. While the pump is operating, the inlet water temperature and flow rate shall be maintained at the same values as used during the steady-state test as specified in sections 9.1 and 8.4.2.3 of ANSI/ASHRAE 103–1993.

For boilers that employ post purge, measure the length of the post-purge period with a stopwatch. The time from burner OFF to combustion blower OFF (electrically de-energized) shall be recorded as t_P. For the case where t_P is intended to be greater than 180 seconds, stop the combustion blower at 180 seconds and use that value for t_P. Measure the flue gas temperature by means of the thermocouple grid described in section 7.6 of ANSI/ASHRAE 103–1993 at the end of the post purge period t_P($T_{F,OFF}(t_P)$) and at the time (3.75 + t_P) minutes ($T_{F,OFF}(t_3)$) and (22.5 + t_P) minutes ($T_{F,OFF}(t_4)$) after the main burner shuts off. For the case where the measured t_P is less or equal to 30 seconds, it shall be tested as if there is no post purge and t_P shall be set to equal 0.

8.5 *Direct measurement of off-cycle losses testing method.* [Reserved.]

9.0 *Nomenclature.* Nomenclature shall include the nomenclature specified in section 10 of ANSI/ASHRAE Standard 103–1993 and the following additional variables:

Eff_{motor}=Efficiency of power burner motor
PE_{IG}=Electrical power to the interrupted ignition device, kW
$R_{T,a}$=$R_{T,F}$ if flue gas is measured
=$R_{T,S}$ if stack gas is measured
$R_{T,F}$=Ratio of combustion air mass flow rate to stoichiometric air mass flow rate
$R_{T,S}$=Ratio of the sum of combustion air and relief air mass flow rate to stoichiometric air mass flow rate
t_{IG}=Electrical interrupted ignition device on-time, min.

$T_{a,SS,X}=T_{F,SS,X}$ if flue gas temperature is measured, °F

$=T_{S,SS,X}$ if stack gas temperature is measured, °F

y_{IG}=ratio of electrical interrupted ignition device on-time to average burner on-time

y_P=ratio of power burner combustion blower on-time to average burner on-time

10.0 *Calculation of derived results from test measurements.* Calculations shall be as specified in section 11 of ANSI/ASHRAE Standard 103–1993 and the October 24, 1996, Errata Sheet for ASHRAE Standard 103–1993, except for appendices B and C; and as specified in sections 10.1 through 10.8 and Figure 1 of this appendix.

10.1 *Annual fuel utilization efficiency.* The annual fuel utilization efficiency (AFUE) is as defined in sections 11.2.12 (non-condensing systems), 11.3.12 (condensing systems), 11.4.12 (non-condensing modulating systems) and 11.5.12 (condensing modulating systems) of ANSI/ASHRAE Standard 103–1993, except for the definition for the term $Effy_{HS}$ in the defining equation for AFUE. $Effy_{HS}$ is defined as:

$Effy_{HS}$=heating seasonal efficiency as defined in sections 11.2.11 (non-condensing systems), 11.3.11 (condensing systems), 11.4.11 (non-condensing modulating systems) and 11.5.11 (condensing modulating systems) of ANSI/ASHRAE Standard 103–1993 and is based on the assumptions that all weatherized warm air furnaces or boilers are located out-of-doors, that warm air furnaces which are not weatherized are installed as isolated combustion systems, and that boilers which are not weatherized are installed indoors.

10.2 *National average burner operating hours, average annual fuel energy consumption and average annual auxiliary electrical energy consumption for gas or oil furnaces and boilers.*

10.2.1 *National average number of burner operating hours.* For furnaces and boilers equipped with single stage controls, the national average number of burner operating hours is defined as:

BOH_{SS}=2,080 (0.77) A DHR–2,080 B

where:

2,080=national average heating load hours

0.77=adjustment factor to adjust the calculated design heating requirement and heating load hours to the actual heating load experienced by the heating system

DHR=typical design heating requirements as listed in Table 8 (in unit of kBtu/h) of ANSI/ASHRAE Standard 103–1993, using the proper value of Q_{OUT} defined in 11.2.8.1 of ANSI/ASHRAE Standard 103–1993

A=100,000 / [341,300(y_PPE+$y_{IG}PE_{IG}$+yBE)+(Q_{IN}–Q_P)$Effy_{HS}$], for forced draft unit, indoors

=100,000 / [341,300(y_PPE Eff_{motor}+$y_{IG}PE_{IG}$+yBE)+(Q_{IN}–Q_P)$Effy_{HS}$], for forced draft unit, ICS,

=100,000 / [341,300(y_PPE(1–Eff_{motor})+$y_{IG}PE_{IG}$+yBE)+(Q_{IN}–Q_P)$Effy_{HS}$], for induced draft unit, indoors, and

=100,000 / [341,300($y_{IG}PE_{IG}$+yBE)+(Q_{IN}–Q_P)$Effy_{HS}$], for induced draft unit, ICS

B=2 Q_P($Effy_{HS}$)(A) / 100,000

where:

Eff_{motor}=Power burner motor efficiency provided by manufacturer,

=0.50, an assumed default power burner efficiency if not provided by manufacturer.

100,000=factor that accounts for percent and kBtu

PE=burner electrical power input at full-load steady-state operation, including electrical ignition device if energized, as defined in 9.1.2.2 of ANSI/ASHRAE Standard 103–1993

y_P=ratio of induced or forced draft blower on-time to average burner on-time, as follows:

1 for units without post purge;

1+(t_P/3.87) for single stage furnaces with post purge;

1+(t_P/10) for two-stage and step modulating furnaces with post purge;

1+(t_P/9.68) for single stage boilers with post purge; or

1+(t_P/15) for two stage and step modulating boilers with post purge.

PE_{IG}=electrical input rate to the interrupted ignition device on burner (if employed), as defined in 8.1 of this appendix

y_{IG}=ratio of burner interrupted ignition device on-time to average burner on-time, as follows:

0 for burners not equipped with interrupted ignition device;

(t_{IG}/3.87) for single stage furnaces;

(t_{IG}/10) for two-stage and step modulating furnaces;

(t_{IG}/9.68) for single stage boilers; or

(t_{IG}/15) for two stage and step modulating boilers.

t_{IG}=on-time of the burner interrupted ignition device, as defined in 8.1 of this appendix

t_P=post purge time as defined in 8.2 (furnace) or 8.4 (boiler) of this appendix

=0 if t_P is equal to or less than 30 second.

y=ratio of blower or pump on-time to average burner on-time, as follows:

1 for furnaces without fan delay;

1 for boilers without a pump delay;

1+(t^+—t^-)/3.87 for single stage furnaces with fan delay;

1+(t^+—t^-)/10 for two-stage and step modulating furnaces with fan delay;

1+(t^+/9.68) for single stage boilers with pump delay; or

1+(t^+/15) for two stage and step modulating boilers with pump delay.

BE=circulating air fan or water pump electrical energy input rate at full load

steady-state operation, as defined in ANSI/ASHRAE Standard 103–1993

Q_{IN}=as defined in 11.2.8.1 of ANSI/ASHRAE Standard 103–1993

Q_P=as defined in 11.2.11 of ANSI/ASHRAE Standard 103–1993

$Effy_{HS}$=as defined in 11.2.11 (non-condensing systems) or 11.3.11.3 (condensing systems) of ANSI/ASHRAE Standard 103–1993, percent, and calculated on the basis of:

ICS installation, for non-weatherized warm air furnaces;

indoor installation, for non-weatherized boilers; or

outdoor installation, for furnaces and boilers that are weatherized.

2=ratio of the average length of the heating season in hours to the average heating load hours

t^+=as defined in 9.5.1.2 of ANSI/ASHRAE Standard 103–1993 or 8.4 of this appendix

t^-=as defined in 9.6.1 of ANSI/ASHRAE Standard 103–1993

10.2.1.1 For furnaces and boilers equipped with two stage or step modulating controls the average annual energy used during the heating season, E_M, is defined as:

$$E_M=(Q_{IN}-Q_P)\ BOH_{SS}+(8{,}760-4{,}600)Q_P$$

where:

Q_{IN}=as defined in 11.4.8.1.1 of ANSI/ASHRAE Standard 103–1993

Q_P=as defined in 11.4.12 of ANSI/ASHRAE Standard 103–1993

BOH_{SS}=as defined in section 10.2.1 of this appendix, in which the weighted $Effy_{HS}$ as defined in 11.4.11.3 or 11.5.11.3 of ANSI/ASHRAE Standard 103–1993 is used for calculating the values of A and B, the term DHR is based on the value of Q_{OUT} defined in 11.4.8.1.1 or 11.5.8.1.1 of ANSI/ASHRAE Standard 103–1993, and the term ($y_P PE+y_{IG} PE_{IG}+yBE$) in the factor A is increased by the factor R, which is defined as:

R=2.3 for two stage controls

=2.3 for step modulating controls when the ratio of minimum-to-maximum output is greater than or equal to 0.5

=3.0 for step modulating controls when the ratio of minimum-to-maximum output is less than 0.5

A=100,000/[341,300($y_P PE+y_{IG} PE_{IG}+y$ BE) $R+(Q_{IN}-Q_P)\ Effy_{HS}$], for forced draft unit, indoors

=100,000/[341,300($y_P PE\ Eff_{motor}+y_{IG} PE_{IG}+y$ BE) $R+(Q_{IN}-Q_P)Effy_{HS}$], for forced draft unit, ICS,

=100,000/[341,300($y_P PE(1–Eff_{motor})+y_{IG} PE_{IG}+y$ BE) $R+(Q_{IN}-Q_P)\ Effy_{HS}$], for induced draft unit, indoors, and

=100,000/[341,300($y_{IG} PE_{IG}+y$ BE) $R+(Q_{IN}-Q_P)\ Effy_{HS}$], for induced draft unit, ICS

where:

Eff_{motor}=Power burner motor efficiency provided by manufacturer,

=0.50, an assumed default power burner efficiency if none provided by manufacturer.

$Effy_{HS}$=as defined in 11.4.11.3 or 11.5.11.3 of ANSI/ASHRAE Standard 103–1993, and calculated on the basis of:

—ICS installation, for non-weatherized warm air furnaces

—indoor installation, for non-weatherized boilers

—outdoor installation, for furnaces and boilers that are weatherized

8,760=total number of hours per year

4,600=as specified in 11.4.12 of ANSI/ASHRAE Standard 103–1993

10.2.1.2 For furnaces and boilers equipped with two stage or step modulating controls the national average number of burner operating hours at the reduced operating mode is defined as:

$$BOH_R=X_R E_M/Q_{IN,R}$$

where:

X_R=as defined in 11.4.8.7 of ANSI/ASHRAE Standard 103–1993

E_M=as defined in section 10.2.1.1 of this appendix

$Q_{IN,R}$=as defined in 11.4.8.1.2 of ANSI/ASHRAE Standard 103–1993

10.2.1.3 For furnaces and boilers equipped with two stage controls the national average number of burner operating hours at the maximum operating mode (BOH_H) is defined as:

$$BOH_H=X_H E_M/Q_{IN}$$

where:

X_H=as defined in 11.4.8.6 of ANSI/ASHRAE Standard 103–1993

E_M=as defined in section 10.2.1.1 of this appendix

Q_{IN}=as defined in 11.4.8.1.1 of ANSI/ASHRAE Standard 103–1993

10.2.1.4 For furnaces and boilers equipped with step modulating controls the national average number of burner operating hours at the modulating operating mode (BOH_M) is defined as:

$$BOH_M=X_H E_M/Q_{IN,M}$$

where:

X_H=as defined in 11.4.8.6 of ANSI/ASHRAE Standard 103–1993

E_M=as defined in section 10.2.1.1 of this appendix

$Q_{IN,M}=Q_{OUT,M}/(Effy_{SS,M}/100)$

$Q_{OUT,M}$=as defined in 11.4.8.10 or 11.5.8.10 of ANSI/ASHRAE Standard 103–1993, as appropriate

$Effy_{SS,M}$=as defined in 11.4.8.8 or 11.5.8.8 of ANSI/ASHRAE Standard 103–1993, as appropriate, in percent

100=factor that accounts for percent

10.2.2 *Average annual fuel energy consumption for gas or oil fueled furnaces or boilers.* For furnaces or boilers equipped with single

stage controls the average annual fuel energy consumption (E_F) is expressed in Btu per year and defined as:

$E_F = BOH_{SS}(Q_{IN} - Q_P) + 8{,}760\ Q_P$

where:

BOH_{SS}=as defined in 10.2.1 of this appendix
Q_{IN}=as defined in 11.2.8.1 of ANSI/ASHRAE Standard 103–1993
Q_P=as defined in 11.2.11 of ANSI/ASHRAE Standard 103–1993
8,760=as specified in 10.2.1 of this appendix

10.2.2.1 For furnaces or boilers equipped with either two stage or step modulating controls E_F is defined as:

$E_F = E_M + 4{,}600 Q_P$

where:

E_M=as defined in 10.2.1.1 of this appendix
4,600=as specified in 11.4.12 of ANSI/ASHRAE Standard 103–1993
Q_P=as defined in 11.2.11 of ANSI/ASHRAE Standard 103–1993

10.2.3 *Average annual auxiliary electrical energy consumption for gas or oil fueled furnaces or boilers.* For furnaces or boilers equipped with single stage controls the average annual auxiliary electrical consumption (E_{AE}) is expressed in kilowatt-hours and defined as:

$E_{AE} = BOH_{SS}(y_P PE + y_{IG} PE_{IG} + y BE)$

where:

BOH_{SS}=as defined in 10.2.1 of this appendix
PE=as defined in 10.2.1 of this appendix
y_P=as defined in 10.2.1 of this appendix
y_{IG}=as defined in 10.2.1 of this appendix
PE_{IG}=as defined in 10.2.1 of this appendix
y=as defined in 10.2.1 of this appendix
BE=as defined in 10.2.1 of this appendix

10.2.3.1 For furnaces or boilers equipped with two stage controls E_{AE} is defined as:

$E_{AE} = BOH_R(y_P PE_R + y_{IG} PE_{IG} + y BE_R) + BOH_H(y_P PE_H + y_{IG} PE_{IG} + y\ BE_H)$

where:

BOH_R=as defined in 10.2.1.2 of this appendix
y_P=as defined in 10.2.1 of this appendix
PE_R=as defined in 9.1.2.2 and measured at the reduced fuel input rate, of ANSI/ASHRAE Standard 103–1993
y_{IG}=as defined in 10.2.1 of this appendix
PE_{IG}=as defined in 10.2.1 of this appendix
y=as defined in 10.2.1 of this appendix
BE_R=as defined in 9.1.2.2 of ANSI/ASHRAE Standard 103–1993, measured at the reduced fuel input rate
BOH_H=as defined in 10.2.1.3 of this appendix
PE_H=as defined in 9.1.2.2 of ANSI/ASHRAE Standard 103–1993, measured at the maximum fuel input rate
BE_H=as defined in 9.1.2.2 of ANSI/ASHRAE Standard 103–1993, measured at the maximum fuel input rate

10.2.3.2 For furnaces or boilers equipped with step modulating controls E_{AE} is defined as:

$E_{AE} = BOH_R(y_P PE_R + y_{IG} PE_{IG} + y BE_R) + BOH_M(y_P PE_H + y_{IG} PE_{IG} + y\ BE_H)$

where:

BOH_R=as defined in 10.2.1.2 of this appendix
y_P=as defined in 10.2.1 of this appendix
PE_R=as defined in 9.1.2.2 of ANSI/ASHRAE Standard 103–1993, measured at the reduced fuel input rate
y_{IG}=as defined in 10.2.1 of this appendix
PE_{IG}=as defined in 10.2.1 of this appendix
y=as defined in 10.2.1. of this appendix
BE_R=as defined in 9.1.2.2 of ANSI/ASHRAE Standard 103–1993, measured at the reduced fuel input rate
BOH_M=as defined in 10.2.1.4 of this appendix
PE_H=as defined in 9.1.2.2 of ANSI/ASHRAE Standard 103–1993, measured at the maximum fuel input rate
BE_H=as defined in 9.1.2.2 of ANSI/ASHRAE Standard 103–1993, measured at the maximum fuel inputs rate

10.3 *Average annual electric energy consumption for electric furnaces or boilers.* For electric furnaces and boilers the average annual energy consumption (E_E) is expressed in kilowatt-hours and defined as:

$E_E = 100(2{,}080)(0.77)DHR/(3.412\ AFUE)$

where:

100=to express a percent as a decimal
2,080=as specified in 10.2.1 of this appendix
0.77=as specified in 10.2.1 of this appendix
DHR=as defined in 10.2.1 of this appendix
3.412=conversion to express energy in terms of watt-hours instead of Btu
AFUE=as defined in 11.1 of ANSI/ASHRAE Standard 103–1993, in percent, and calculated on the basis of:
ICS installation, for non-weatherized warm air furnaces;
indoor installation, for non-weatherized boilers; or
outdoor installation, for furnaces and boilers that are weatherized.

10.4 *Energy factor.*

10.4.1 *Energy factor for gas or oil furnaces and boilers.* Calculate the energy factor, EF, for gas or oil furnaces and boilers defined as, in percent:

$$EF = \frac{(E_F - 4{,}600\ Q_P)\ Effy_{HS}}{E_F + 3{,}412\ E_{AE}}$$

where:

E_F=average annual fuel consumption as defined in 10.2.2 of this appendix.
E_{AE}=as defined in 10.2.3 of this appendix.
$Effy_{HS}$=Annual Fuel Utilization Efficiency as defined in 11.2.11, 11.3.11, 11.4.11 or 11.5.11 of ANSI/ASHRAE Standard 103–1993, in percent, and calculated on the basis of:
ICS installation, for non-weatherized warm air furnaces;
indoor installation, for non-weatherized boilers; or

outdoor installation, for furnaces and boilers that are weatherized.
3,412=conversion factor from kilowatt to Btu/h

10.4.2 *Energy factor for electric furnaces and boilers.* The energy factor, EF, for electric furnaces and boilers is defined as:

$EF=AFUE$

where:

AFUE=Annual Fuel Utilization Efficiency as defined in section 10.3 of this appendix, in percent

10.5 *Average annual energy consumption for furnaces and boilers located in a different geographic region of the United States and in buildings with different design heating requirements.*

10.5.1 *Average annual fuel energy consumption for gas or oil-fueled furnaces and boilers located in a different geographic region of the United States and in buildings with different design heating requirements.* For gas or oil-fueled furnaces and boilers the average annual fuel energy consumption for a specific geographic region and a specific typical design heating requirement (E_{FR}) is expressed in Btu per year and defined as:

$$E_{FR}=(E_F-8{,}760\ Q_P)(HLH/2{,}080)+8{,}760\ Q_P$$

where:

E_F=as defined in 10.2.2 of this appendix
8,760=as specified in 10.2.1 of this appendix
Q_P=as defined in 11.2.11 of ANSI/ASHRAE Standard 103–1993
HLH=heating load hours for a specific geographic region determined from the heating load hour map in Figure 1 of this appendix
2,080=as defined in 10.2.1 of this appendix

10.5.2 *Average annual auxiliary electrical energy consumption for gas or oil-fueled furnaces and boilers located in a different geographic region of the United States and in buildings with different design heating requirements.* For gas or oil-fueled furnaces and boilers the average annual auxiliary electrical energy consumption for a specific geographic region and a specific typical design heating requirement (E_{AER}) is expressed in kilowatt-hours and defined as:

$$E_{AER}=E_{AE}\ (HLH/2{,}080)$$

where:

E_{AE}=as defined in 10.2.3 of this appendix
HLH=as defined in 10.5.1 of this appendix
2,080=as specified in 10.2.1 of this appendix

10.5.3 *Average annual electric energy consumption for electric furnaces and boilers located in a different geographic region of the United States and in buildings with different design heating requirements.* For electric furnaces and boilers the average annual electric energy consumption for a specific geographic region and a specific typical design heating requirement (E_{ER}) is expressed in kilowatt-hours and defined as:

$$E_{ER}=100\ (0.77)\ DHR\ HLH/(3.412\ AFUE)$$

where:

100=as specified in 10.3 of this appendix
0.77=as specified in 10.2.1 of this appendix
DHR=as defined in 10.2.1 of this appendix
HLH=as defined in 10.5.1 of this appendix
3.412=as specified in 10.3 of this appendix
AFUE=as defined in 10.3 of this appendix, in percent

10.6 *Annual energy consumption for mobile home furnaces*

10.6.1 *National average number of burner operating hours for mobile home furnaces (BOH_{SS}).* BOH_{SS} is the same as in 10.2.1 of this appendix, except that the value of $Effy_{HS}$ in the calculation of the burner operating hours, BOH_{SS}, is calculated on the basis of a direct vent unit with system number 9 or 10.

10.6.2 *Average annual fuel energy for mobile home furnaces (E_F).* E_F is same as in 10.2.2 of this appendix except that the burner operating hours, BOH_{SS}, is calculated as specified in 10.6.1 of this appendix.

10.6.3 *Average annual auxiliary electrical energy consumption for mobile home furnaces (E_{AE}).* E_{AE} is the same as in 10.2.3 of this appendix, except that the burner operating hours, BOH_{SS}, is calculated as specified in 10.6.1 of this appendix.

10.7 *Calculation of sales weighted average annual energy consumption for mobile home furnaces.* In order to reflect the distribution of mobile homes to geographical regions with average HLH_{MHF} value different from 2,080, adjust the annual fossil fuel and auxiliary electrical energy consumption values for mobile home furnaces using the following adjustment calculations.

10.7.1 For mobile home furnaces the sales weighted average annual fossil fuel energy consumption is expressed in Btu per year and defined as:

$$E_{F,MHF}=(E_F-8{,}760\ Q_P)HLH_{MHF}/2{,}080+8{,}760\ Q_P$$

where:

E_F=as defined in 10.6.2 of this appendix
8,760=as specified in 10.2.1 of this appendix
Q_P=as defined in 11.2.11 of ANSI/ASHRAE Standard 103–1993
HLH_{MHF}=1880, sales weighted average heating load hours for mobile home furnaces
2,080=as specified in 10.2.1 of this appendix

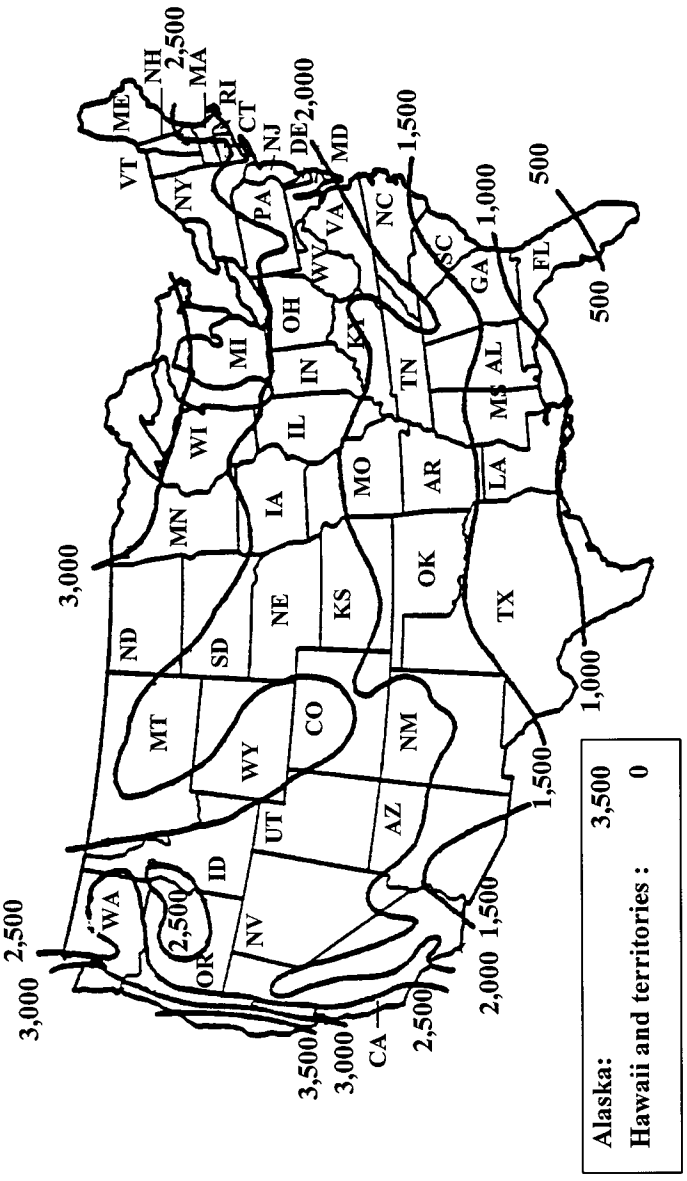
10.7.2 For mobile home furnaces the sales weighted average annual auxiliary electrical energy consumption is expressed in kilowatt-hours and defined as:

$$E_{AE,MHF}=E_{AE}HLH_{MHF}/2{,}080$$

where:

E_{AE}=as defined in 10.6.3 of this appendix
HLH_{MHF}=as defined in 10.7.1 of this appendix
2,080=as specified in 10.2.1 of this appendix

10.8 *Direct determination of off-cycle losses for furnaces and boilers equipped with thermal stack dampers.* [Reserved.]



This map is reasonably accurate for most parts of the United States but is necessarily generalized, and consequently not too accurate in mountainous regions, particularly in the rockies.

FIGURE 1- HEATING LOAD HOURS (HLH) FOR THE UNITED STATES

[62 FR 26157, May 12, 1997, as amended at 62 FR 53510, Oct. 14, 1997]

APPENDIX O TO SUBPART B OF PART 430–UNIFORM TEST METHOD FOR MEASURING THE ENERGY CONSUMPTION OF VENTED HOME HEATING EQUIPMENT

1.0 *Definitions.*

1.1 ''Air shutter'' means an adjustable device for varying the size of the primary air

inlet(s) to the combustion chamber power burner.

1.2 ''Air tube'' means a tube which carries combustion air from the burner fan to the burner nozzle for combustion.

1.3 ''Barometic draft regulator or barometric damper'' means a mechanical device designed to maintain a constant draft in a vented heater.

1.4 ''Draft hood'' means an external device which performs the same function as an integral draft diverter, as defined in section 1.17 of this appendix.

1.5 ''Electro-mechanical stack damper'' means a type of stack damper which is operated by electrical and/or mechanical means.

1.6 ''Excess air'' means air which passes through the combustion chamber and the vented heater flues in excess of that which is theoretically required for complete combustion.

1.7 ''Flue'' means a conduit between the flue outlet of a vented heater and the integral draft diverter, draft hood, barometric damper or vent terminal through which the flue gases pass prior to the point of draft relief.

1.8 ''Flue damper'' means a device installed between the furnace and the integral draft diverter, draft hood, barometric draft regulator, or vent terminal which is not equipped with a draft control device, designed to open the venting system when the appliance is in operation and to close the venting system when the appliance is in a standby condition.

1.9 ''Flue gases'' means reaction products resulting from the combustion of a fuel with the oxygen of the air, including the inerts and any excess air.

1.10 ''Flue losses'' means the sum of sensible and latent heat losses above room temperature of the flue gases leaving a vented heater.

1.11 ''Flue outlet'' means the opening provided in a vented heater for the exhaust of the flue gases from the combustion chamber.

1.12 ''Heat input'' (Q_{in}) means the rate of energy supplied in a fuel to a vented heater operating under steady-state conditions, expressed in Btu's per hour. It includes any input energy to the pilot light and is obtained by multiplying the measured rate of fuel consumption by the measured higher heating value of the fuel.

1.13 ''Heating capacity'' (Q_{out}) means the rate of useful heat output from a vented heater, operating under steady-state conditions, expressed in Btu's per hour. For room and wall heaters, it is obtained by multiplying the ''heat input'' (Q_{in}) by the steady-state efficency (η_{ss}) divided by 100. For floor furnaces, it is obtained by multiplying (A) the ''heat input'' (Q_{in}) by (B) the steady-state efficiency divided by 100, minus the quantity (2.8) (L_j) divided by 100, where L_j is the jacket loss as determined in section 3.2 of this appendix.

1.14 ''Higher heating value'' (HHV) means the heat produced per unit of fuel when complete combustion takes place at constant pressure and the products of combustion are cooled to the initial temperature of the fuel and air and when the water vapor formed during combustion is condensed. The higher heating value is usually expressed in Btu's per pound, Btu's per cubic foot for gaseous fuel, or Btu's per gallon for liquid fuel.

1.15 ''Induced draft'' means a method of drawing air into the combustion chamber by mechanical means.

1.16 ''Infiltration parameter'' means that portion of unconditioned outside air drawn into the heated space as a consequence of loss of conditioned air through the exhaust system of a vented heater.

1.17 ''Integral draft diverter'' means a device which is an integral part of a vented heater, designed to: (1) Provide for the exhaust of the products of combustion in the event of no draft, back draft, or stoppage beyond the draft diverter, (2) prevent a back draft from entering the vented heater, and (3) neutralize the stack action of the chimney or gas vent upon the operation of the vented heater.

1.18 ''Manually controlled vented heaters'' means either gas or oil fueled vented heaters equipped without thermostats.

1.19 ''Modulating control'' means either a step-modulating or two-stage control.

1.20 ''Power burner'' means a vented heater burner which supplies air for combustion at a pressure exceeding atmospheric pressure, or a burner which depends on the draft induced by a fan incorporated in the furnace for proper operation.

1.21 ''Reduced heat input rate'' means the factory adjusted lowest reduced heat input rate for vented home heating equipment equipped with either two stage thermostats or step-modulating thermostats.

1.22 ''Single stage thermostat'' means a thermostat that cycles a burner at the maximum heat input rate and off.

1.23 ''Stack'' means the portion of the exhaust system downstream of the integral draft diverter, draft hood or barometric draft regulator.

1.24 ''Stack damper'' means a device installed downstream of the integral draft diverter, draft hood, or barometric draft regulator, designed to open the venting system when the appliance is in operation and to close off the venting system when the appliance is in the standby condition.

1.25 ''Stack gases'' means the flue gases combined with dilution air that enters at the integral draft diverter, draft hood or barometric draft regulator.

1.26 ''Steady-state conditions for vented home heating equipment'' means equilibrium conditions as indicated by temperature variations of not more than 5° F (2.8C) in the flue gas temperature for units equipped with draft hoods, barometric draft regulators or direct vent systems, in three successive readings taken 15 minutes apart or not more than 3° F (1.7C) in the stack gas temperature for units equipped with integral draft diverters in three successive readings taken 15 minutes apart.

1.27 ''Step-modulating control'' means a control that either cycles off and on at the low input if the heating load is light, or gradually, increases the heat input to meet any higher heating load that cannot be met with the low firing rate.

1.28 ''Thermal stack damper'' means a type of stack damper which is dependent for operation exclusively upon the direct conversion of thermal energy of the stack gases into movement of the damper plate.

1.29 ''Two stage control'' means a control that either cycles a burner at the reduced heat input rate and off or cycles a burner at the maximum heat input rate and off.

1.30 ''Vaporizing-type oil burner'' means a device with an oil vaporizing bowl or other receptacle designed to operate by vaporizing liquid fuel oil by the heat of combustion and mixing the vaporized fuel with air.

1.31 ''Vent/air intake terminal'' means a device which is located on the outside of a building and is connected to a vented heater by a system of conduits. It is composed of an air intake terminal through which the air for combustion is taken from the outside atmosphere and a vent terminal from which flue gases are discharged.

1.32 ''Vent limiter'' means a device which limits the flow of air from the atmospheric diaphragm chamber of a gas pressure regulator to the atmosphere. A vent limiter may be a limiting orifice or other limiting device.

1.33 ''Vent pipe'' means the passages and conduits in a direct vent system through which gases pass from the combustion chamber to the outdoor air.

2.0 *Testing conditions.*

2.1 *Installation of test unit.*

2.1.1 *Vented wall furnaces (including direct vent systems).* Install gas fueled vented wall furnaces for test as specified in sections 2.1.3 and 2.1.4 of ANSI Z21.49–1975. Install gas fueled wall furnaces with direct vent systems for test as described in sections 2.1.3 and 2.1.4 of ANSI Z21.44–1973. Install oil fueled vented wall furnaces as specified in UL–730–1974, section 33. Install oil fueled vented wall furnaces with direct vent systems as specified in UL–730–1974, section 34.

2.1.2 *Vented floor furnaces.* Install vented floor furnaces for test as specified in sections 35.1 through 35.5 of UL–729–1976.

2.1.3 *Vented room heaters.* Install in accordance with manufacturer's instructions.

2.2 *Flue and stack requirements.*

2.2.1 *Gas fueled vented home heating equipment employing integral draft diverters and draft hoods (excluding direct vent systems).* Attach to, and vertically above the outlet of gas fueled vented home heating equipment employing draft diverters or draft hoods with vertically discharging outlets, a five (5) foot long test stack having a cross sectional area the same size as the draft diverter outlet.

Attach to the outlet of vented heaters having a horizontally discharging draft diverter or draft hood outlet a 90 degree elbow, and a five (5) foot long vertical test stack. A horizontal section of pipe may be used on the floor furnace between the diverter and the elbow if necessary to clear any framing used in the installation. Use the minimum length of pipe possible for this section. Use stack, elbow, and horizontal section with same cross sectional area as the diverter outlet.

2.2.2 *Oil fueled vented home heating equipment (excluding direct vent systems).* Use flue connections for oil fueled vented floor furnaces as specified in section 35 of UL 729–1976, sections 34.10 through 34.18 of UL 730–1974 for oil fueled vented wall furnaces and sections 36.2 and 36.3 of UL 896–1973 for oil fueled vented room heaters.

2.2.3 *Direct vent systems.* Have the exhaust/air intake system supplied by the manufacturer in place during all tests. Test units intended for installation with a variety of vent pipe lengths with the minimum length recommended by the manufacturer. Do not connect a heater employing a direct vent system to a chimney or induced draft source. Vent the gas solely on the provision for venting incorporated in the heater and the vent/air intake system supplied with it.

2.3 *Fuel supply.*

2.3.1 *Natural gas.* For a vented heater utilizing natural gas, maintain the gas supply to the unit under test at a normal inlet test pressure immediately ahead of all controls at 7 to 10 inches water column. Maintain the regulator outlet pressure at normal test pressure approximately at that recommended by the manufacturer. Use natural gas having a specific gravity of approximately 0.65 and a higher heating value within ± 5 percent of 1,025 Btu's per standard cubic foot. Determine the actual higher heating value in Btu's per standard cubic foot for the natural gas to be used in the test with an error no greater than one percent.

2.3.2 *Propane gas.* For a vented heater utilizing propane gas, maintain the gas supply to the unit under test at a normal inlet pressure of 11 to 13 inches water column and a specific gravity of approximately 1.53. Maintain the regulator outlet pressure, on units so equipped, approximately at that recommended by the manufacturer. Use propane having a specific gravity of approximately 1.53 and a higher heating value within ± 5

percent of 2,500 Btu's per standard cubic foot. Determine the actual higher heating value in Btu's per standard cubic foot for the propane to be used in the test with an error no greater than one percent.

2.3.3 *Other test gas.* Use other test gases with characteristics as described in section 2.2, table VII, of ANSI Standard Z21.11.1–1974. Use gases with a measured higher heating value within ± 5 percent of the values specified in the above ANSI standard. Determine the actual higher heating value of the gas used in the test with an error no greater than one percent.

2.3.4 *Oil supply.* For a vented heater utilizing fuel oil, use No. 1, fuel oil (kerosene) for vaporizing-type burners and either No. 1 or No. 2 fuel oil, as specified by the manufacturer, for mechanical atomizing type burners. Use No. 1 fuel oil with a viscosity meeting the specifications as specified in UL–730–1974, section 36.9. Use test fuel conforming to the specifications given in tables 2 and 3 of ANSI Standard Z91.1–1972
for No. 1 and No. 2 fuel oil. Measure the higher heating value of the test fuel with an error no greater than one percent.

2.3.5 *Electrical supply.* For auxiliary electric components of a vented heater, maintain the electrical supply to the test unit within one percent of the nameplate voltage for the entire test cycle. If a voltage range is used for nameplate voltage, maintain the electrical supply within one percent of the midpoint of the nameplate voltage range.

2.4 *Burner adjustments.*

2.4.1 *Gas burner adjustments.* Adjust the burners of gas fueled vented heaters to their maximum Btu ratings at the test pressure specified in section 2.3 of this appendix. Correct the burner volumetric flow rate to 60° F (15.6C) and 30 inches of mercury barometric pressure, set the fuel flow rate to obtain a heat rate of within ±2 percent of the hourly Btu rating specified by the manufacturer as measured after 15 minutes of operation starting with all parts of the vented heater at room temperature. Set the primary air shutters in accordance with the manufacturer's recommendations to give a good flame at this adjustment. Do not allow the deposit of carbon during any test specified herein.

If a vent limiting means is provided on a gas pressure regulator, have it in place during all tests.

For gas fueled heaters with modulating controls adjust the controls to operate the heater at the maximum fuel input rate. Set the thermostat control to the maximum setting. Start the heater by turning the safety control valve to the ''on'' position. In order to prevent modulation of the burner at maximum input, place the thermostat sensing element in a temperature control bath which is held at a temperature below the maximum set point temperature of the control.

For gas fueled heaters with modulating controls adjust the controls to operate the heater at the reduced fuel input rate. Set the thermostat control to the minimum setting. Start the heater by turning the safety control valve to the ''on'' position. If ambient test room temperature is above the lowest control set point temperature, initiate burner operation by placing the thermostat sensing element in a temperature control bath that is held at a temperature below the minimum set point temperature of the control.

2.4.2 *Oil burner adjustments.* Adjust the burners of oil fueled vented heaters to give the CO_2 reading recommended by the manufacturer and an hourly Btu input, during the steady-state performance test described below, which is within ±2 percent of the heater manufacturer's specified normal hourly Btu input rating. On units employing a power burner do not allow smoke in the flue to exceed a No. 1 smoke during the steady-state performance test as measured by the procedure in ANSI Standard Z11.182–1965 (R1971) (ASTM D 2156–65 (1970)). If, on units employing a power burner, the smoke in the flue exceeds a No. 1 smoke during the steady-state test, readjust the burner to give a lower smoke reading, and, if necessary a lower CO_2 reading, and start all tests over. Maintain the average draft over the fire and in the flue during the steady-state performance test at that recommended by the manufacturer within ±0.005 inches of water gauge. Do not make additional adjustments to the burner during the required series of performance tests. The instruments and measuring apparatus for this test are described in section 6.3 of ANSI standard Z91.1–1972.

2.5 *Circulating air adjustments.*

2.5.1 *Forced air vented wall furnaces (including direct vent systems).* During tests maintain the air flow through the heater as specified by the manufacturer and operate the vented heater with the outlet air temperature between 80° F and 130° F above room temperature. If adjustable air discharge registers are provided, adjust them so as to provide the maximum possible air restriction. Measure air discharge temperature as specified in section 2.14 of ANSI Z21.49–1975.

2.5.2 *Fan type vented room heaters and floor furnaces.* During tests on fan type furnaces and heaters, adjust the air flow through the heater as specified by the manufacturer. If adjustable air discharge registers are provided, adjust them to provide the maximum possible air restriction.

2.6 *Location of temperature measuring instrumentation.*

2.6.1 *Gas fueled vented home heating equipment (including direct vent systems).* For units employing an integral draft diverter, install nine thermocouples, wired in parallel, in a horizontal plane in the five foot test stack located one foot from the test stack inlet. Equalize the length of all thermocouple

leads before paralleling. Locate one thermocouple in the center of the stack. Locate eight thermocouples along imaginary lines intersecting at right angles in this horizontal plane at points one third and two thirds of the distance between the center of the stack and the stack wall.

For units which employ a direct vent system, locate at least one thermocouple at the center of each flue way exiting the heat exchanger. Provide radiation shields if the thermocouples are exposed to burner radiation.

For units which employ a draft hood or units which employ a direct vent system which does not significantly preheat the incoming combustion air, install nine thermocouples, wired in parallel, in a horizontal plane located within 12 inches (304.8 mm) of the heater outlet and upstream of the draft hood on units so equipped. Locate one thermocouple in the center of the pipe and eight thermocouples along imaginary lines intersecting at right angles in this horizontal plane at points one third and two thirds of the distance between the center of the pipe and the pipe wall.

For units which employ direct vent systems that significantly preheat the incoming combustion air, install nine thermocouples, wired in parallel, in a plane parallel to and located within 6 inches (152.4 mm) of the vent/air intake terminal. Equalize the length of all thermocouple leads before paralleling. Locate one thermocouple in the center of the vent pipe and eight thermocouples along imaginary lines intersecting at right angles in this plane at points one third and two thirds of the distance between the center of the flue pipe and the pipe wall.

Use bead-type thermocouples having wire size not greater than No. 24 American Wire Gauge (AWG). If there is a possibility that the thermocouples could receive direct radiation from the fire, install radiation shields on the fire side of the thermocouples only and position the shields so that they do not touch the thermocouple junctions.

Install thermocouples for measuring conditioned warm air temperature as described in ANSI Z21.49–1975, section 2.14. Establish the temperature of the inlet air by means of single No. 24 AWG bead-type thermocouple, suitably shielded from direct radiation and located in the center of the plane of each inlet air opening.

2.6.2 *Oil fueled vented home heating equipment (including direct vent systems).* Install nine thermocouples, wired in parallel and having equal length leads, in a plane perpendicular to the axis of the flue pipe. Locate this plane at the position shown in Figure 34.4 of UL 730–1974, or Figures 35.1 and 35.2 of UL 729–1976 for a single thermocouple, except that on direct vent systems which significantly preheat the incoming combustion air, it shall be located within 6 inches (152.5 mm) of the outlet of the vent/air intake terminal. Locate one thermocouple in the center of the flue pipe and eight thermocouples along imaginary lines intersecting at right angles in this plane at points one third and two thirds of the distance between the center of the pipe and pipe wall.

Use bead-type thermocouples having a wire size not greater than No. 24 AWG. If there is a possibility that the thermocouples could receive direct radiation from the fire, install radiation shields on the fire side of the thermocouples only and position the shields so that they do not touch the thermocouple junctions.

Install thermocouples for measuring the conditioned warm air temperature as described in sections 35.12 through 35.17 of UL 730–1974. Establish the temperature of the inlet air by means of a single No. 24 AWG bead-type thermocouple, suitably shielded from direct radiation and located in the center of the plane of each inlet air opening.

2.7 *Combustion measurement instrumentation.* Analyze the samples of stack and flue gases for vented heaters to determine the concentration by volume of carbon dioxide present in the dry gas with instrumentation which will result in a reading having an accuracy of ±0.1 percentage points.

2.8 *Energy flow instrumentation.* Install one or more instruments, which measure the rate of gas flow or fuel oil supplied to the vented heater, and if appropriate, the electrical energy with an error no greater than one percent.

2.9 *Room ambient temperature.* During the time period required to perform all the testing and measurement procedures specified in section 3.0 of this appendix, maintain the room temperature within ±5° F (±2.8C) of the value T_{RA} measured during the steady-state performance test. At no time during these tests shall the room temperature exceed 100° F (37.8C) or fall below 65° F (18.3C).

Temperature (T_{RA}) shall be the arithmetic average temperature of the test area, determined by measurement with four No. 24 AWG bead-type thermocouples with junctions shielded against radiation, located approximately at 90-degree positions on a circle circumscribing the heater or heater enclosure under test, in a horizontal plane approximately at the vertical midpoint of the appliance or test enclosure, and with the junctions approximately 24 inches from sides of the heater or test enclosure and located so as not to be affected by other than room air. Locate a thermocouple at each elevation of draft relief inlet opening and combustion air inlet opening at a distance of approximately 24 inches from the inlet openings. The temperature of the air for combustion and the air for draft relief shall not differ more than ±5° F from room temperature as measured above.

2.10 *Equipment used to measure mass flow rate in flue and stack.* The tracer gas chosen for this task should have a density which is less than or approximately equal to the density of air. Use a gas unreactive with the environment to be encountered. Using instrumentation of either the batch or continuous type, measure the concentration of tracer gas with an error no greater than 2 percent of the value of the concentration measured.

3.0 *Testing and measurements.*

3.1 *Steady-state testing.*

3.1.1 *Gas fueled vented home heating equipment (including direct vent systems).* Set up the vented heater as specified in sections 2.1, 2.2, and 2.3 of this appendix. The draft diverter shall be in the normal open condition and the stack shall not be insulated. (Insulation of the stack is no longer required for the vented heater test.) Begin the steady-state performance test by operating the burner and the circulating air blower, on units so equipped, with the adjustments specified by sections 2.4.1 and 2.5 of this appendix, until steady-state conditions are attained as indicated by a temperature variation of not more than 3° F (1.7 C) in the stack gas temperature for vented heaters equipped with draft diverters or 5° F (2.8 C) in the flue gas temperature for vented heaters equipped with either draft hoods or direct vent systems; in three successive readings taken 15 minutes apart.

On units employing draft diverters, measure the room temperature (T_{RA}) as described in section 2.9 of this appendix and measure the steady-state stack gas temperature ($T_{S,SS}$) using the nine thermocouples located in the 5 foot test stack as specified in section 2.6.1 of this appendix. Secure a sample of the stack gases in the plane where $T_{S,SS}$ is measured or within 3.5 feet downstream of this plane. Determine the concentration by volume of carbon dioxide (X_{CO2S}) present in the dry stack gas. If the location of the gas sampling differs from the temperature measurement plane, there shall be no air leaks through the stack between these two locations.

On units employing draft hoods or direct vent systems, measure the room temperature (T_{RA}) as described in section 2.9 of this appendix and measure the steady-state flue gas temperature ($T_{F,SS}$), using the nine thermocouples located in the flue pipe as described in section 2.6.1 of this appendix. Secure a sample of the flue gas in the plane of temperature measurement and determine the concentration by volume of CO_2 (X_{CO2F}) present in dry flue gas. In addition, for units employing draft hoods, secure a sample of the stack gas in a horizontal plane in the five foot test stack located one foot from the test stack inlet; and determine the concentration by volume of CO_2 (X_{CO2S}) present in dry stack gas.

Determine the steady-state heat input rate (Q_{in}) including pilot gas by multiplying the measured higher heating value of the test gas by the steady-state gas input rate corrected to standard conditions of 60° F and 30 inches of mercury. Use measured values of gas temperature and pressure at the meter and the barometric pressure to correct the metered gas flow rate to standard conditions.

After the above test measurements have been completed on units employing draft diverters, secure a sample of the flue gases at the exit of the heat exchanger(s) and determine the concentration of CO_2 (X_{CO2F}) present. In obtaining this sample of flue gas, move the sampling probe around or use a sample probe with multiple sampling ports in order to assure that an average value is obtained for the CO_2 concentration. For units with multiple heat exchanger outlets, measure the CO_2 concentration in a sample from each outlet to obtain the average CO_2 concentration for the unit. A manifold (parallel connected sampling tubes) may be used to obtain this sample.

For heaters with single stage thermostat control (wall mounted electric thermostats), determine the steady-state efficiency at the maximum fuel input rate as specified in section 2.4 of this appendix.

For gas fueled vented heaters equipped with either two stage thermostats or step-modulating thermostats, determine the steady-state efficiency at the maximum fuel input rate, as specified in section 2.4.1 of this appendix, and at the reduced fuel input rate, as specified in section 2.4.1 of this appendix.

For manually controlled gas fueled vented heaters, with various input rates determine the steady-state efficiency at a fuel input rate that is within ±5 percent of 50 percent of the maximum fuel input rate. If the heater is designed to use a control that precludes operation at other than maximum output (single firing rate) determine the steady state efficiency at the maximum input rate only.

3.1.2 *Oil fueled vented home heating equipment (including direct vent systems).* Set up and adjust the vented heater as specified in sections 2.1, 2.2, and 2.3.4 of this appendix. Begin the steady-state performance test by operating the burner and the circulating air blower, on units so equipped, with the adjustments specified by sections 2.4.2 and 2.5 of this appendix until steady-state conditions are attained as indicated by a temperature variation of not more than 5° F (2.8 C) in the flue gas temperature in three successive readings taken 15 minutes apart.

Do not allow smoke in the flue, for units equipped with power burners, to exceed a No. 1 smoke during the steady-state performance test as measured by the procedure described in ANSI standard Z11.182–1965 (R1971) (ASTM D 2156–65 (1970)). Maintain the average draft over the fire and in the breeching during the

steady-state performance test at that recommended by the manufacturer ±0.005 inches of water gauge.

Measure the room temperature (T_{RA}) as described in section 2.9 of this appendix and measure the steady-state flue gas temperature ($T_{F,SS}$) using nine thermocouples located in the flue pipe as described in section 2.6.2 of this appendix. Secure a sample of the flue gas in the plane of temperature measurement and determine the concentration by volume of CO_2(X_{CO2F}) present in dry flue gas. Measure and record the steady-state heat input rate (Q_{in}).

For manually controlled oil fueled vented heaters, determine the steady-state efficiency at a fuel input rate that is within ±5 percent of 50 percent of the maximum fuel input rate.

3.1.3 *Auxiliary Electric Power Measurement.* Allow the auxiliary electrical system of a gas or oil vented heater to operate for at least five minutes before recording the maximum auxiliary electric power measurement from the wattmeter. Record the maximum electric power (P_E) expressed in kilowatts. For vented heaters with modulating controls, the recorded (P_E) shall be maximum measured electric power multiplied by the following factor (R). For two stage controls, R=1.3. For step modulating controls, R=1.4 when the ratio of minimum-to-maximum fuel input is greater than or equal to 0.7, R=1.7 when the ratio of minimum-to-maximum fuel input is less than 0.7 and greater than or equal to 0.5, and R=2.2 when the ratio of minimum-to-maximum fuel input is less than 0.5.

3.2 *Jacket loss measurement.* Conduct a jacket loss test for vented floor furnaces. Measure the jacket loss (L_j) in accordance with the ANSI standard Z21.48–1976 section 2.12.

3.3 *Measurement of the off-cycle losses for vented heaters equipped with thermal stack dampers.* Install the thermal stack damper according to the manufacturer's instructions. Unless specified otherwise, the thermal stack damper should be at the draft diverter exit collar. Attach a five foot length of bare stack to the outlet of the damper. Install thermocouples as specified in section 2.6.1 of this appendix.

For vented heaters equipped with single stage thermostats, measure the off-cycle losses at the maximum fuel input rate. For vented heaters equipped with two stage thermostats, measure the off-cycle losses at the maximum fuel input rate and at the reduced fuel input rate. For vented heaters equipped with step-modulating thermostats, measure the off-cycle losses at the reduced fuel input rate.

Let the vented heater heat up to a steady-state condition. Feed a tracer gas at a constant metered rate into the stack directly above and within one foot above the stack damper. Record tracer gas flow rate and temperature. Measure the tracer gas concentration in the stack at several locations in a horizontal plane through a cross section of the stack at a point sufficiently above the stack damper to ensure that the tracer gas is well mixed in the stack.

Continuously measure the tracer gas concentration and temperature during a 10 minute cool down period. Shut the burner off and immediately begin measuring tracer gas concentration in the stack, stack temperature, room temperature, and barometric pressure. Record these values as the midpoint of each one-minute interval between burner shut down and ten minutes after burner shut down. Meter response time and sampling delay time shall be considered in timing these measurements.

3.4 *Measurement of the effectiveness of electro-mechanical stack dampers.* For vented heaters equipped with electro-mechanical stack dampers, measure the cross sectional area of the stack (A_s), the net area of the damper plate (A_o), and the angle that the damper plate makes when closed with a plane perpendicular to the axis of the stack (Ω). The net area of the damper plate means the area of the damper plate minus the area of any holes through the damper plate.

3.5 *Pilot light measurement.*

3.5.1 Measure the energy input rate to the pilot light (Q_P) with an error no greater than 3 percent for vented heaters so equipped.

3.5.2 For manually controlled heaters where the pilot light is designed to be turned off by the user when the heater is not in use, that is, turning the control to the OFF position will shut off the gas supply to the burner(s) and to the pilot light, the measurement of Q_P is not needed. This provision applies only if an instruction to turn off the unit is provided on the heater near the gas control valve (e.g. by label) by the manufacturer.

3.6 *Optional procedure for determining* D_p, D_F, and D_s *for systems for all types of vented heaters.* For all types of vented heaters, D_p, D_F, and D_S can be measured by the following optional cool down test.

Conduct a cool down test by letting the unit heat up until steady-state conditions are reached, as indicated by temperature variation of not more than 5°F (2.8°C) in the flue gas temperature in three successive readings taken 15 minutes apart, and then shutting the unit off with the stack or flue damper controls by-passed or adjusted so that the stack or flue damper remains open during the resulting cool down period. If a draft was maintained on oil fueled units in the flue pipe during the steady-state performance test described in section 3.1 of this appendix, maintain the same draft (within a range of −.001 to +.005 inches of water gauge of the average steady-state draft) during this cool down period.

Measure the flue gas mass flow rate ($m_{F,OFF}$) during the cool down test described above at a specific off-period flue gas temperature and corrected to obtain its value at the steady-state flue gas temperature ($T_{F,SS}$), using the procedure described below.

Within one minute after the unit is shut off to start the cool down test for determining D_F, begin feeding a tracer gas into the combustion chamber at a constant flow rate of V_T, and at a point which will allow for the best possible mixing with the air flowing through the chamber. (On units equipped with an oil fired power burner, the best location for injecting this tracer gas appears to be through a hole drilled in the air tube.) Periodically measure the value of V_T with an instantaneously reading flow meter having an accuracy of ±3 percent of the quantity measured. Maintain V_T at less than 1 percent of the air flow rate through the furnace. If a combustible tracer gas is used, there should be a delay period between the time the burner gas is shut off and the time the tracer gas is first injected to prevent ignition of the tracer gas.

Between 5 and 6 minutes after the unit is shut off to start the cool down test, measure at the exit of the heat exchanger the average flue gas temperature, $T^*_{F,Off}$. At the same instant the flue gas temperature is measured, also measure the percent volumetric concentration of tracer gas C_T in the flue gas in the same plane where $T^*_{F,Off}$ is determined. Obtain the concentration of tracer gas using an instrument which will result in an accuracy of ±2 percent in the value of C_T measured. If use of a continuous reading type instrument results in a delay time between drawing of a sample and its analysis, this delay should be taken into account so that the temperature measurement and the measurement of tracer gas concentration coincide. In addition, determine the temperature of the tracer gas entering the flow meter (T_T) and the barometric pressure (P_B).

The rate of the flue gas mass flow through the vented heater and the factors D_P, D_F, and D_S are calculated by the equations in sections 4.5.1 through 4.5.3 of this appendix.

4.0 *Calculations.*

4.1 *Annual fuel utilization efficiency for gas or oil fueled vented home heating equipment equipped without manual controls and without thermal stack dampers.* The following procedure determines the annual fuel utilization efficiency for gas or oil fueled vented home heating equipment equipped without manual controls and without thermal stack dampers.

4.1.1 *System number.* Obtain the system number from Table 1 of this appendix.

4.1.2 *Off-cycle flue gas draft factor.* Based on the system number, determine the off-cycle flue gas draft factor (D_F) from Table 1 of this appendix.

4.1.3 *Off-cycle stack gas draft factor.* Based on the system number, determine the off-cycle stack gas draft factor (D_s) from Table 1 of this appendix.

4.1.4 *Pilot fraction.* Calculate the pilot fraction (P_F) expressed as a decimal and defined as:

$P_F = Q_P/Q_{in}$

where:

Q_P= as defined in 3.5 of this appendix

Q_{in}= as defined in 3.1 of this appendix at the maximum fuel input rate

4.1.5 *Jacket loss for floor furnaces.* Determine the jacket loss (L_j) expressed as a percent and measured in accordance with section 3.2 of this appendix. For other vented heaters L_j=0.0.

4.1.6 *Latent heat loss.* Based on the fuel, obtain the latent heat loss ($L_{L,A}$) from Table 2 of this appendix.

4.1.7 *Ratio of combustion air mass flow rate to stoichiometric air mass flow rate.* Determine the ratio of combustion air mass flow rate to stoichiometric air mass flow rate ($R_{T,F}$), and defined as:

$R_{T,F}=A+B/X_{CO2F}$

where:

A=as determined from Table 2 of this appendix

B=as determined from Table 2 of this appendix

X_{CO2F}=as defined in 3.1 of this appendix

4.1.8 *Ratio of combustion and relief air mass flow rate to stoichiometric air mass flow rate.* For vented heaters equipped with either an integral draft diverter or a drafthood, determine the ratio of combustion and relief air mass flow rate to stoichiometric air mass flow rate ($R_{T,S}$), and defined as:

$$R_{T,S}=A+[B/X_{CO2S}]$$

where:

A=as determined from Table 2 of this appendix

B=as determined from Table 2 of this appendix

X_{CO2S}=as defined in 3.1 of this appendix

4.1.9 *Sensible heat loss at steady-state operation.* For vented heaters equipped with either an integral draft diverter or a draft hood, determine the sensible heat loss at steady-state operation ($L_{S,SS,A}$) expressed as a percent and defined as:

where:

$L_{S,SS,A}=C(R_{T,S}+D)(T_{S,SS}-T_{RA})$

C=as determined from Table 2 of this appendix

$R_{T,S}$=as defined in 4.1.8 of this appendix

D=as determined from Table 2 of this appendix

$T_{S,SS}$=as defined in 3.1 of this appendix

T_{RA}=as defined in 2.9 of this appendix

For vented heaters equipped without an integral draft diverter, determine ($L_{S,SS,A}$) expressed as a percent and defined as:

$L_{S,SS,A}=C(R_{T,F}+D)(T_{F,SS}-T_{RA})$

where:

C=as determined from Table 2 of this appendix

$R_{T,F}$=as defined in 4.1.7 of this appendix

D=as determined from Table 2 of this appendix

$T_{F,SS}$=as defined in 3.1 of this appendix

T_{RA}=as defined in 2.9 of this appendix

4.1.10 *Steady-state efficiency.* For vented heaters equipped with single stage thermostats, calculate the steady-state efficiency (excluding jacket loss, η_{SS}, expressed in percent and defined as:

$\eta_{SS}=100-L_{L,A}-L_{S,SS,A}$

where:

$L_{L,A}$=as defined in 4.1.6 of this appendix

$L_{S,SS,A}$=as defined in 4.1.9 of this appendix

For vented heaters equipped with either two stage thermostats or with step-modulating thermostats, calculate the steady-state efficiency at the reduced fuel input rate, $\eta_{SS,\ L}$, expressed in percent and defined as:

$\eta_{SS-L}=100-L_{L,A}-L_{S,SS,A}$

where:

$L_{L,A}$=as defined in 4.1.6 of this appendix

$L_{S,SS,A}$=as defined in 4.1.9 of this appendix in which $L_{S,SS,A}$ is determined at the reduced fuel input rate

For vented heaters equipped with two stage thermostats, calculate the steady-state efficiency at the maximum fuel input rate,

η_{SS-H}, expressed in percent and defined as:

$\eta_{SS-H}=100-L_{L,A}-L_{S,SS,A}$

where:

$L_{L,A}$=as defined in 4.1.6 of this appendix

$L_{S,SS,A}$=as defined in 4.1.9 of this appendix in which $L_{S,SS,A}$ is measured at the maximum fuel input rate

For vented heaters equipped with step-modulating thermostats, calculate the weighted-average steady-state efficiency in the modulating mode, η_{SS-MOD}, expressed in percent and defined as:

$$\eta_{SS-MOD}=\left[\eta_{SS-H}-\eta_{SS-L}\right]\left[\frac{T_C-T_{OA*}}{T_C-15}\right]+\eta_{SS-L}$$

where:

η_{SS-H}=as defined in 4.1.10 of this appendix

η_{SS-L}=as defined in 4.1.10 of this appendix

T_{OA*}=average outdoor temperature for vented heaters with step-modulating thermostats operating in the modulating mode and is obtained from Table 3 or Figure 1 of this appendix

T_C=balance point temperature which represents a temperature used to apportion the annual heating load between the reduced input cycling mode and either the modulating mode or maximum input cycling mode and is obtained either from Table 3 of this appendix or calculated by the following equation:

$T_C=65-[(65-15)R]$

where:

65=average outdoor temperature at which a vented heater starts operating

15=national average outdoor design temperature for vented heaters

R=ratio of reduced to maximum heat output rates, as defined in 4.1.13 of this appendix

4.1.11 *Reduced heat output rate.* For vented heaters equipped with either two stage thermostats or step-modulating thermostats, calculate the reduced heat output rate ($Q_{red-out}$) defined as:

$Q_{red-out}=\eta_{SS-L}\ Q_{red-in}$

where:

η_{SS-L}=as defined in 4.1.10 of this appendix

Q_{red-in}=the reduced fuel input rate

4.1.12 *Maximum heat output rate.* For vented heaters equipped with either two stage thermostats or step-modulating thermostas, calculate the maximum heat output rate ($Q_{max-out}$) defined as:

$Q_{max,out\&equal\geq}\ h_{SS,H}\ Q_{max,in}$

where:

η_{SS-H}=as defined in 4.1.10 of this appendix

Q_{max-in}=the maximum fuel input rate

4.1.13 *Ratio of reduced to maximum heat output rates.* For vented heaters equipped with either two stage thermostats or step-modulating thermostats, calculate the ratio of reduced to maximum heat output rates (R) expressed as a decimal and defined as:

$R=Q_{red-out}/Q_{max-out}$

where:

$Q_{red-out}$=as defined in 4.1.11 of this appendix

$Q_{max-out}$=as defined in 4.1.12 of this appendix

4.1.14 *Fraction of heating load at reduced operating mode.* For vented heaters equipped with either two stage thermostats or step-

modulating thermostats, determine the fraction of heating load at the reduced operating mode (X_1) expressed as a decimal and listed in Table 3 of this appendix or obtained from Figure 2 of this appendix.

4.1.15 *Fraction of heating load at maximum operating mode or noncycling mode.* For vented heaters equipped with either two stage thermostats or step-modulating therostats, determine the fraction of heating load at the maximum operating mode or noncycling mode (X_2) expressed as a decimal and listed in Table 3 of this appendix or obtained from Figure 2 of this appendix.

4.1.16 *Weighted-average steady-state efficiency.* For vented heaters equipped with single stage thermostats, the weighted-average steady-state efficiency (η_{SS-WT}) is equal to η_{SS}, as defined in section 4.1.10 of this appendix. For vented heaters equipped with two stage thermostats, η_{SS-WT} is defined as:

$$\eta_{SS-WT}=X_1\eta_{SS-L}+X_2\eta_{SS-H}$$

where:

X_1=as defined in 4.1.14 of this appendix
η_{SS-L}=as defined in 4.1.10 of this appendix
X_2=as defined in 4.1.15 of this appendix
η_{SS-H}=as defined in 4.1.10 of this appendix

For vented heaters equipped with step-modulating thermostats, η_{SS-WT} is defined as:

$$\eta_{SS-WT}=X_1\eta_{SS-L}+X_2\eta_{SS-MOD}$$

where:

X_1=as defined in 4.1.14 of this appendix
η_{SS-L}=as defined in 4.1.10 of this appendix
X_2=as defined in 4.1.15 of this appendix
η_{SS-MOD}=as defined in 4.1.10 of this appendix

4.1.17 *Annual fuel utilization efficiency.* Calculate the annual fuel utilization efficiency (AFUE) expressed as percent and defined as:

$$AFUE=[0.968\eta_{SS-WT}]-1.78D_F-1.89D_S-129P_F-2.8\ L_J+1.81$$

where:

η_{SS-WT}=as defined in 4.1.16 of this appendix
D_F=as defined in 4.1.2 of this appendix
D_S=as defined in 4.1.3 of this appendix
P_F=as defined in 4.1.4 of this appendix
L_J=as defined in 4.1.5 of this appendix

4.2 *Annual fuel utilization efficiency for gas or oil fueled vented home heating equipment equipped with manual controls.* The following procedure determines the annual fuel utilization efficiency for gas or oil fueled vented home heating equipment equipped with manual controls.

4.2.1 *Average ratio of stack gas mass flow rate to flue gas mass flow rate at steady-state operation.* For vented heaters equipped with either direct vents or direct exhaust or are outdoor units, the average ratio of stack gas mass flow rate to flue gas mass flow rate at steady-state operation (S/F) shall be equal to unity. (S/F=1.) For all other types of vented heaters, calculate (S/F) defined as:

$$S/F=1.3R_{T,S}/R_{T,F}$$

where:

$R_{T,S}$=as defined in 4.1.8 of this appendix with X_{CO2s} measured at 50% fuel input rate
$R_{T,F}$=as defined in 4.1.7 of this appendix with X_{CO2F} measured at 50% fuel input rate

4.2.2 *Multiplication factor for infiltration loss during burner on-cycle.* Calculate the multiplication factor for infiltration loss during burner on-cycle ($K_{I,ON}$) defined as:

$$K_{I,ON}=100(0.24)\ (S/F)\ (0.7)\ [1+R_{T,F}(A/F)]/HHV_A$$

where:

100=converts a decimal fraction into a percent
0.24=specific heat of air
A/F=stoichiometric air/fuel ratio, determined in accordance with Table 2 of this appendix
S/F=as defined in 4.2.1 of this appendix at 50 percent of rated maximum fuel input
0.7=infiltration parameter
$R_{T,F}$=as defined in 4.1.7 of this appendix
HHV_A=average higher heating value of the test fuel, determined in accordance with Table 2 of this appendix

4.2.3 *On-cycle infiltration heat loss.* Calculate the on-cycle infiltration heat loss ($L_{I,ON}$) expressed as a percent and defined as:

$$L_{I,ON}=K_{I,ON}\ (70–45)$$

where:

$K_{I,ON}$=as defined in 4.2.2 of this appendix
70=average indoor temperature
45=average outdoor temperature

4.2.4 *Weighted-average steady-state efficiency.*

4.2.4.1 For manually controlled heaters with various input rates the weighted average steady-state efficiency (η_{SS-WT}), is determined as follows:

(1) at 50 percent of the maximum fuel input rate as measured in either section 3.1.1 of this appendix for manually controlled gas vented heaters or section 3.1.2 of this appendix for manually controlled oil vented heaters, or

(2) at the minimum fuel input rate as measured in either section 3.1.1 to this appendix for manually controlled gas vented heaters or section 3.1.2 to this appendix for manually controlled oil vented heaters if the design of the heater is such that the ± 5 percent of 50 percent of the maximum fuel input rate cannot be set, provided this minimum rate is no greater than ⅔ of maximum input rate of the heater.

4.2.4.2 For manually controlled heater with one single firing rate the weighted average steady-state efficiency is the steady-state efficiency measured at the single firing rate.

4.2.5 *Part-load fuel utilization efficiency.* Calculate the part-load fuel utilization efficiency (η_u) expressed as a percent and defined as:

$$\eta_u=\eta_{SS-WT}-L_{I,ON}$$

where:

η_{SS-WT}=as defined in 4.2.4 of this appendix
$L_{I,ON}$=as defined in 4.2.3 of this appendix

4.2.6 *Annual Fuel Utilization Efficiency.*

4.2.6.1 For manually controlled vented heaters, calculate the AFUE expressed as a percent and defined as:

$$AFUE = \frac{2{,}950\ \eta_{SS}\ \eta_u\ Q_{in-max}}{2{,}950\ \eta_{SS}\ Q_{in-max} + 2.083(4{,}600)\eta_u\ Q_P}$$

where:

2,950=average number of heating degree days
η_{SS}=as defined as η_{SS-WT} in 4.2.4 of this appendix
η_u=as defined in 4.2.5 of this appendix
Q_{in-max}=as defined as Q_{in} at the maximum fuel input rate, as defined in 3.1 of this appendix
4,600=average number of non-heating season hours per year
Q_P=as defined in 3.5 of this appendix
2.083=(65–15)/24=50/24
65=degree day base temperature, °F
15=national average outdoor design temperature for vented heaters as defined in section 4.1.10 of this appendix
24=number of hours in a day

4.2.6.2 For manually controlled vented heaters where the pilot light can be turned off by the user when the heater is not in use as described in section 3.5.2, calculate the AFUE expressed as a percent and defined as:

$AFUE=\eta_u$

where:

η_u=as defined in section 4.2.5 of this appendix

4.3 *Annual fuel utilization efficiency by the tracer gas method.* The annual fuel utilization efficiency shall be determined by the following tracer gas method for all vented heaters equipped with thermal stack dampers. All other types of vented heaters can elect to use the following tracer gas method, as an optional procedure.

4.3.1 *On-cycle sensible heat loss.* For vented heaters equipped with single stage thermostats, calculate the on-cycle sensible heat loss ($L_{S,ON}$) expressed as a percent and defined as:

$L_{S,ON}=L_{S,SS,A}$

where:

$L_{S,SS,A}$=as defined in 4.1.9 of this appendix

For vented heaters equipped with two stage thermostats, calculate $L_{S,ON}$ defined as:
$L_{S,ON}=X_1\ L_{S,SS,A\text{-}red}+X_2\ L_{S,SS,A\text{-}max}$

where:

X_1=as defined in 4.1.14 of this appendix
$L_{S,SS,A\text{-}red}$=as defined as $L_{S,SS,A}$ in 4.1.9 of this appendix at the reduced fuel input rate
X_2=as defined in 4.1.15 of this appendix
$L_{S,SS,A\text{-}max}$=as defined as $L_{S,SS,A}$ in 4.1.9 of this appendix at the maximum fuel input rate

For vented heaters with step-modulating thermostats, calculate $L_{S,ON}$ defined as:

$L_{S,ON}=X_1\ L_{S,SS,A\text{-}red}+X_2\ L_{S,SS,A\text{-}avg}$

where:

$X=_1$-as defined in 4.1.14 of this appendix
$L_{LS,SS,A\text{-}red}$=as defined in 4.3.1 of this appendix
X_2=as defined in 4.1.15 of this appendix
$L_{S,SS,A\text{-}avg}$=average sensible heat loss for step-modulating vented heaters operating in the modulating mode

$$L_{S,SS,A-avg} = \left[\left[L_{S,SS,A-max} - L_{S,SS,A-red}\right]\left[\frac{T_C - T_{OA*}}{TC-15}\right]\right] + L_{S,SS,A-red}$$

where:

$L_{S,SS,A\text{-}avg}$=as defined in 4.3.1 of this appendix
T_C=as defined in 4.1.10 of this appendix
T_{OA*}=as defined in 4.1.10 of this appendix
15=as defined in 4.1.10 of this appendix

4.3.2 *On-cycle infiltration heat loss.* For vented heaters equipped with single stage thermostats, calculate the on-cycle infiltration heat loss ($L_{I,ON}$) expressed as a percent and defined as:

$L_{I,ON}=K_{I,ON}(70–45)$
where:

$K_{I,ON}$=as defined in 4.2.2 of this appendix
70=as defined in 4.2.3 of this appendix
45=as defined in 4.2.3 of this appendix

For vented heaters equipped with two stage thermostats, calculate $L_{I,ON}$ defined as:

$L_{I,ON}=X_1K_{I,ON\text{-}Max}(70–T_{OA*})+X_2K_{I,ON,red}(70–T_{OA})$
where:

X_1=as defined in 4.1.14 of this appendix
$K_{I,ON-max\&thnsp\geq}$=as defined as $K_{I,ON}$ in 4.2.2 of this appendix at the maximum heat input rate
70=as defined in 4.2.3 of this appendix
T_{OA*}=as defined in 4.3.4 of this appendix
$K_{I,ON,red}$=as defined as $K_{I,ON}$ in 4.2.2 of this appendix at the minimum heat input rate
T_{OA}=as defined in 4.3.4 of this appendix
X_2=as defined in 4.1.15 of this appendix

For vented heaters equipped with step-modulating thermostats, calculate $L_{I,ON}$ defined as:

$L_{I,ON}=X_1\ K_{I,ON-avg}(70-T_{OA*})+X_2\ K_{I,ON-red}(70-T_{OA})$

where:

X_1=as defined in 4.1.14 of this appendix

$$K_{I,on,avg}=\frac{\left[K_{I,on,max}+K_{I,ON,red}\right]}{2}$$

70=as defined in 4.2.3 of this appendix
T_{OA*}=as defined in 4.3.4 of this appendix
X_2=as defined in 4.1.15 of this appendix
T_{OA}=as defined in 4.3.4 of this appendix

4.3.3 *Off-cycle sensible heat loss.* For vented heaters equipped with single stage thermostats, calculate the off-cycle sensible heat loss ($L_{S,OFF}$) at the maximum fuel input rate. For vented heaters equipped with step-modulating thermostats, calculate $L_{S,OFF}$ defined as:

$L_{S,OFF}=X_1\ L_{S,OFF,red}$

where:

X_1=as defined in 4.1.14 of this appendix
$L_{S,OFF,red}$=as defined as $L_{S,OFF}$ in 4.3.3 of this appendix at the reduced fuel input rate

For vented heaters equipped with two stage thermostats, calculate $L_{S,OFF}$ defined as:

$L_{S,OFF}=X_1\ L_{S,OFF,red}+X_2\ L_{S,OFF,Max}$

where:

X_1=as defined in 4.1.14 of this appendix
$L_{S,OFF,red}$=as defined as $L_{S,OFF}$ in 4.3.3 of this appendix at the reduced fuel input rate
X_2=as defined in 4.1.15 of this appendix
$L_{S,OFF,Max}$=as defined as $L_{S,OFF}$ in 4.3.3 of this appendix at the maximum fuel input rate

Calculate the off-cycle sensible heat loss ($L_{S,OFF}$) expressed as a percent and defined as:

$$L_{S,OFF}=\frac{100(0.24)}{.Q_{in}t_{on}}\sum m_{S,OFF}\left(T_{S,OFF}-T_{RA}\right)$$

where:

100=conversion factor for percent
0.24=specific heat of air in Btu per pound−°F
Q_{in}=fuel input rate, as defined in 3.1 of this appendix in Btu per minute (as appropriate for the firing rate)
t_{on}=average burner on-time per cycle and is 20 minutes
$\Sigma\ m_{S,OFF}(T_{S,OFF}-T_{RA})$=summation of the twenty values of the quantity, $m_{S,OFF}(T_{S,OFF}-T_{RA})$, measured in accordance with 3.3 of this appendix
$m_{S,OFF}$=stack gas mass flow rate pounds per minute

$$m_{S,OFF}=\frac{1.325P_BV_T\left(100-C_T\right)}{C_T\left(T_T+460\right)}$$

$T_{S,OFF}$=stack gas temperature measured in accordance with 3.3 of this appendix
T_{RA}=average room temperature measured in accordance with 3.3 of this appendix
P_B=barometric pressure in inches of mercury
V_T=flow rate of the tracer gas through the stack in cubic feet per minute
C_{T*}=concentration by volume of the active tracer gas in the mixture in percent and is 100 when the tracer gas is a single component gas
C_T=concentration by volume of the active tracer gas in the diluted stack gas in percent
T_T=temperature of the tracer gas entering the flow meter in degrees Fahrenheit
(T_T+460)=absolute temperature of the tracer gas entering the flow meter in degrees Rankine

4.3.4 *Average outdoor temperature.* For vented heaters equipped with single stage thermostats, the average outdoor temperature (T_{OA}) is 45° F. For vented heaters equipped with either two stage thermostats or step-modulating thermostats, T_{OA} during the reduced operating mode is obtained from Table 3 or Figure 1 of this appendix. For

vented heaters equipped with two stage thermostats, T_{OA}* during the maximum operating mode is obtained from Table 3 or Figure 1 of this appendix.

4.3.5 *Off-cycle infiltration heat loss.* For vented heaters equipped with single stage thermostats, calculate the off-cycle infiltration heat loss ($L_{I,OFF}$) at the maximum fuel input rate. For vented heaters equipped with step-modulating thermostats, calculate $L_{I,OFF}$ defined as:

$L_{I,OFF}=X_1 L_{I,OFF,red}$

where:

X_1=as defined in 4.1.14 of this appendix

$L_{I,OFF,red}$=as defined in $L_{I,OFF}$ in 4.3.3 of this appendix at the reduced fuel input rate

For vented heaters equipped with two stage thermostats, calculate $L_{I,OFF}$ defined as:

$L_{I,OFF}=X_1 L_{I,OFF,red}+ X_2 L_{I,OFF,max}$

where:

X_1=as defined in 4.1.14 of this appendix

$L_{I,OFF,red}$=as defined as $L_{I,OFF}$ in 4.3.3 of this appendix at the reduced fuel input rate

X_2=as defined in 4.1.15 of this appendix

$L_{I,OFF,Max}$=as defined as $L_{I,OFF}$ in 4.3.3 of this appendix at the maximum fuel input rate

Calculate the off-cycle infiltration heat loss ($L_{I,OFF}$) expressed as a percent and defined as:

$$L_{I,OFF}=\frac{100(0.24)(1.3)(0.7)\left(70-T_{OA}\right)}{Q_{in}t_{on}}\sum m_{S,OFF}$$

where:

100=conversion factor for percent

0.24=specific heat of air in Btu per pound−° F

1.3=dimensionless factor for converting laboratory measured stack flow to typical field conditions

0.7=infiltration parameter

70=assumed average indoor air temperature, ° F

T_{OA}=average outdoor temperature as defined in 4.3.4 of this appendix

Q_{in}=fuel input rate, as defined in 3.1 of this appendix in Btu per minute (as appropriate for the firing rate)

t_{on}=average burner on-time per cycle and is 20 minutes

$\sum m_{S,OFF}$=summation of the twenty values of the quantity, $m_{S,OFF}$, measured in accordance with 3.3 of this appendix

$m_{S,OFF}$=as defined in 4.3.3 of this appendix

4.3.6 *Part-load fuel utilization efficiency.* Calculate the part-load fuel utilization efficiency (η_u) expressed as a percent and defined as:

$$\eta_u=100-L_{L,A}-C_jL_j\left[\frac{t_{on}}{t_{on}+P_Ft_{off}}\right]+\left[L_{s,on}+L_{s,OFF}+L_{I,on}+L_{s,OFF}\right]$$

where:

C_j=2.8, adjustment factor

L_j=jacket loss as defined in 4.1.5

$L_{L,A}$=as defined in 4.1.6 of this appendix

t_{on}=as defined in 4.3.3 of this appendix

$L_{S,ON}$=as defined in 4.3.1 of this appendix

$L_{S,OFF}$=as defined in 4.3.3 of this appendix

$L_{I,ON}$=as defined in 4.3.2 of this appendix

$L_{I,OFF}$=as defined in 4.1.4 of this appendix

P_F=as defined in 4.1.4 of this appendix

t_{OFF}=average burner off-time per cycle and is 20 minutes

4.3.7 Annual Fuel Utilization Efficiency.

Calculate the AFUE expressed as a percent and defined as:

$$AFUE=\frac{2{,}950\,\eta_{SS-WT}\,\eta_u\,Q_{in-max}}{2{,}950\,\eta_{SS-WT}\,Q_{in-max}+2.083(4{,}600)\,\eta_u\,Q_P}$$

where:

2,950=average number of heating degree days

$\eta_{SS\text{-}WT}$=as defined in 4.1.16 of this appendix
η_u=as defined in 4.3.6 of this appendix
Q_{in-max}=as defined in 4.2.6 of this appendix
4,600=as specified in 4.2.6 of this appendix
Q_P=as defined in 3.5 of this appendix
2.083=as specified in 4.2.6 of this appendix

4.4 *Stack damper effectiveness for vented heaters equipped with electro-mechanical stack dampers.* Determine the stack damper effectiveness for vented heaters equipped with electro-mechanical stack dampers (D_o), defined as:

$D_o=1.62\ [1—A_D \cos \Omega/A_S]$

where:

A_D=as defined in 3.4 of this appendix
Ω=as defined in 3.4 of this appendix
A_S=as defined in 3.4 of this appendix

4.5 *Addition requirements for vented home heating equipment using indoor air for combustion and draft control.* For vented home heating equipment using indoor air for combustion and draft control, D_F, as described in section 4.1.2 of this appendix, and D_S, as described in section 4.1.3 of this appendix, shall be determined from Table 1 of this appendix.

4.5.1 *Optional procedure for determining D_P for vented home heating equipment.* Calculate the ratio (D_P) of the rate of flue gas mass through the vented heater during the off-period, $M_{F,OFF}(T_{F,SS})$, to the rate of flue gas mass flow during the on-period, $M_{F,SS}(T_{F,SS})$, and defined as:

$D_P=M_{F,OFF}(T_{F,SS})/M_{F,SS}(T_{F,SS})$

For vented heaters in which no draft is maintained during the steady-state or cool down tests, $M_{F,OFF}(T_{F,SS})$ is defined as:

$$M_{F,OFF}\left(T_{F,SS}\right)=M_{F,OFF}\left(T^*_{F,OFF}\right)\left[\frac{T_{F,SS}-T_{RA}}{T^*_{F,OFF}-T_{RA}}\right]^{0.56}\left[\frac{T^*_{F,OFF}+460}{T_{F,SS}+460}\right]^{1.19}$$

For oil fueled vented heaters in which an imposed draft is maintained, as described in section 3.6 of this appendix, $M_{F,OFF}(T_{F,SS})$ is defined as:

$M_{F,OFF}(T_{F,SS})=M_{F,OFF}(T^*_{F,SS})$

where:

$T_{F,SS}$=as defined in 3.1.1 of this appendix
$T^*_{F,OFF}$=flue gas temperature during the off-period measured in accordance with 3.6 of this appendix in degrees Fahrenheit
T_{RA}=as defined in 2.9 of this appendix

$$M_{F,OFF}\left(T_{F,OFF}\right)=\frac{1.325P_B V_T\left(100-C_T\right)}{C_T\left(T_T+460\right)}$$

p_B=barometric pressure measured in accordance with 3.6 of this appendix in inches of mercury
V_T=flow rate of tracer gas through the vented heater measured in accordance with 3.6 of this appendix in cubic feet per minute
C_T=concentration by volume of tracer gas present in the flue gas sample measured in accordance with 3.6 of this appendix in percent
C_T*=concentration by volume of the active tracer gas in the mixture in percent and is 100 when the tracer gas is a single component gas
T_T=the temperature of the tracer gas entering the flow meter measured in accordance with 3.6 of this appendix in degrees Fahrenheit
(T_T+460)=absolute temperature of the tracer gas entering the flow meter in degrees Rankine
$M_{F,SS}(T_{F,SS})=Q_{in}[R_{T,F}(A/F)+1]/[60HHV_A]$
Q_{in}=as defined in 3.1 of this appendix
$R_{T,F}$=as defined in 4.1.7 of this appendix
A/F=as defined in 4.2.2 of this appendix
HHV_A=as defined in 4.2.2 of this appendix

4.5.2 *Optional procedure for determining off-cycle draft factor for flue gas flow for vented heaters.* For systems numbered 1 thru 10, calculate the off-cycle draft factor for flue gas flow (D_F) defined as:

$D_F=D_P$

For systems numbered 11 or 12: $D_F=D_P\ D_O$

where:

D_p=as defined in 4.5.1. of this appendix
D_O=as defined in 4.4 of this appendix

4.5.3 *Optional procedure for determining off-cycle draft factor for stack gas flow for vented heaters.* Calculate the off-cycle draft factor for stack gas flow (D_S) defined as:

For systems numbered 1 or 2: $D_S=1.0$
For systems numbered 3 or 4: $D_S=(D_P+0.79)/1.4$
For systems numbered 5 or 6: $D_S=D_O$
For systems numbered 7 or 8 and if $D_O(S/F)<1$: $D_S=D_O\ D_P$
For systems numbered 7 or 8 and if $D_O(S/F)>1$:

$D_S=D_O\ D_P+[0.85-D_O\ D_P]\ [D_O(S/F)-1]/[S/F-1]$

where:

D_P=as defined in 4.5.1 of this appendix
D_O=as defined in 4.4 of this appendix

4.6 *Annual energy consumption.*

4.6.1 *National average number of burner operating hours.* For vented heaters equipped with single stage controls or manual controls, the national average number of burner operating hours (BOH) is defined as:

$BOH_{SS}=1{,}416A_F A\ DHR-1{,}416\ B$

where:

1,416=national average heating load hours for vented heaters based on 2,950 degree days and 15°F outdoor design temperature

A_F=0.7067, adjustment factor to adjust the calculated design heating requirement and heating load hours to the actual heating load experienced by the heating system

DHR=typical design heating requirements based on Q_{OUT}, from Table 4 of this appendix.

$Q_{OUT}=[(\eta_{SS}/100)-C_j\ (L_j/100)]\ Q_{in}$

L_j=jacket loss as defined in 4.1.5 of this appendix

C_j=2.8, adjustment factor as defined in 4.3.6 of this appendix

η_{SS}=steady-state efficiency as defined in 4.1.10 of this appendix, percent

Q_{in}=as defined in 3.1 of this appendix at the maximum fuel input rate

$A=100{,}000/[341{,}300P_E+(Q_{in}-Q_P)\eta_u]$

$B=2.938(Q_P)\ \eta_u\ A/100{,}000$

100,000=factor that accounts for percent and kBtu

P_E=as defined in 3.1.3 of this appendix

Q_P=as defined in 3.5 of this appendix

η_u=as defined in 4.3.6 of this appendix for vented heaters using the tracer gas method, percent

=as defined in 4.2.5 of this appendix for manually controlled vented heaters, percent

$=2{,}950\ AFUE\eta_{SS}\ Q_{in}/[2{,}950\ \eta_{SS}\ Q_{in}—AFUE(2.083)(4{,}600)Q_P]$, for vented heaters equipped without manual controls and without thermal stack dampers and not using the optional tracer gas method, where:

AFUE=as defined in 4.1.17 of this appendix, percent

2,950=average number of heating degree days as defined in 4.2.6 of this appendix

4,600=average number of non-heating season hours per year as defined in 4.2.6 of this appendix

2.938=(4,160/1,416)=ratio of the average length of the heating season in hours to the average heating load hours

2.083=as specified in 4.2.6 of this appendix

4.6.1.1 For vented heaters equipped with two stage or step modulating controls the national average number of burner operating hours at the reduced operating mode is defined as:

$BOH_R=X_1E_M/Q_{red\text{-}in}$

where:

X_1=as defined in 4.1.14 of this appendix

$Q_{red\text{-}in}$=as defined in 4.1.11 of this appendix

E_M=average annual energy used during the heating season

$=(Q_{in}-Q_P)BOH_{SS}+(8{,}760-4{,}600)Q_P$

Q_{in}=as defined in 3.1 of this appendix at the maximum fuel input rate

Q_P=as defined in 3.5 of this appendix

BOH_{SS}=as defined in 4.6.1 of this appendix, in which the term P_E in the factor A is increased by the factor R, which is defined in 3.1.3 of this appendix as:

R=1.3 for two stage controls

=1.4 for step modulating controls when the ratio of minimum-to-maximum fuel input is greater than or equal to 0.7

=1.7 for step modulating controls when the ratio of minimum-to-maximum fuel input is less than 0.7 and greater than or equal to 0.5

=2.2 for step modulating controls when the ratio of minimum-to-maximum fuel input is less than 0.5

$A=100{,}000/[341{,}300\ PE\ R+(Q_{in}-Q_P)\eta_u]$

8,760=total number of hours per year

4,600=as specified in 4.2.6 of this appendix

4.6.1.2 For vented heaters equipped with two stage or step modulating controls the national average number of burner operating hours at the maximum operating mode (BOH_H) is defined as:

$BOH_H=X_2E_M/Q_{in}$

where:

X_2=as defined in 4.1.15 of this appendix

E_M=average annual energy used during the heating season

$=(Q_{in}-Q_P)BOH_{SS}+(8{,}760-4{,}600)Q_P$

Q_{in}=as defined in 3.1 of this appendix at the maximum fuel input rate

4.6.2 *Average annual fuel energy for gas or oil fueled vented heaters.* For vented heaters equipped with single stage controls or manual controls, the average annual fuel energy consumption (E_F) is expressed in Btu per year and defined as:

$E_F=BOH_{SS}\ (Q_{in}-Q_P)+8{,}760\ Q_P$

where:

BOH_{SS}=as defined in 4.6.1 of this appendix

Q_{in}=as defined in 3.1 of this appendix

Q_P=as defined in 3.5 of this appendix

8,760=as specified in 4.6.1 of this appendix

4.6.2.1 For vented heaters equipped with either two stage or step modulating controls E_F is defined as:

$E_F=E_M+4{,}600Q_P$

where:

E_M=as defined in 4.6.1.2 of this appendix

4,600=as specified 4.2.6 of this appendix

Q_P=as defined in 3.5 of this appendix

4.6.3 *Average annual auxiliary electrical energy consumption for vented heaters.* For vented heaters with single stage controls or manual controls the average annual auxiliary electrical consumption (E_{AE}) is expressed in kilowatt-hours and defined as:

$E_{AE}=BOH_{SS}P_E$

where:

BOH_{SS}=as defined in 4.6.1 of this appendix
P_E=as defined in 3.1.3 of this appendix

4.6.3.1 For vented heaters equipped with two stage or modulating controls E_{AE} is defined as:

$E_{AE}=(BOH_R+BOH_H)P_E$

where:

BOH_R=as defined in 4.6.1 of this appendix
BOH_H=as defined in 4.6.1 of this appendix
P_E=as defined in 3.1.3 of this appendix

4.6.4 *Average annual energy consumption for vented heaters located in a different geographic region of the United States and in buildings with different design heating requirements.*

4.6.4.1 *Average annual fuel energy consumption for gas or oil fueled vented home heaters located in a different geographic region of the United States and in buildings with different design heating requirements.* For gas or oil fueled vented heaters the average annual fuel energy consumption for a specific geographic region and a specific typical design heating requirement (E_{FR}) is expressed in Btu per year and defined as:

$E_{FR}=(E_F-8{,}760\ Q_P)(HLH/1{,}416)+8{,}760Q_P$

where:

E_F=as defined in 4.6.2 of this appendix
8,760=as specified in 4.6.1 of this appendix
Q_P=as defined in 3.5 of this appendix
HLH=heating load hours for a specific geographic region determined from the heating load hour map in Figure 3 of this appendix
1,416=as specified in 4.6.1 of this appendix

4.6.4.2 *Average annual auxiliary electrical energy consumption for gas or oil fueled vented home heaters located in a different geographic region of the United States and in buildings with different design heating requirements.* For gas or oil fueled vented home heaters the average annual auxiliary electrical energy consumption for a specific geographic region and a specific typical design heating requirement (E_{AER}) is expressed in kilowatt-hours and defined as:

$E_{AER}=E_{AE}\ HLH/1{,}416$

where:

E_{AE}=as defined in 4.6.3 of this appendix
HLH=as defined in 4.6.4.1 of this appendix
1,416=as specified in 4.6.1 of this appendix

TABLE 1—OFF-CYCLE DRAFT FACTORS FOR FLUE GAS FLOW (D_F) AND FOR STACK GAS FLOW (D_S) FOR VENTED HOME HEATING EQUIPMENT EQUIPPED WITHOUT THERMAL STACK DAMPERS

System number	(D_F)	(D_S)	Burner type	Venting system type [1]
1	1.0	1.0	Atmospheric	Draft hood or diverter.
2	0.4	1.0	Power	Draft hood or diverter.
3	1.0	1.0	Atmospheric	Barometric draft regulator.
4	0.4	0.85	Power	Barometric draft regulator.
5	1.0	D_o	Atmospheric	Draft hood or diverter with damper.
6	0.4	D_o	Power	Draft hood or diverter with damper.
7	1.0	D_o	Atmospheric	Barometric draft regulator with damper.
8	0.4	D_o D_p	Power	Barometric draft regulator with damper.
9	1.0	.....	Atmospheric	Direct vent.
10	0.4	.....	Power	Direct vent.
11	D_o.	.....	Atmospheric	Direct vent with damper.
12	0.4 D_o	.....	Power	Direct vent with damper.

[1] Venting systems listed with dampers means electro-mechanical dampers only.

TABLE 2—VALUES OF HIGHER HEATING VALUE (HHV_A), STOICHIOMETRIC AIR/FUEL (A/F), LATENT HEAT LOSS ($L_{L,A}$) AND FUEL-SPECIFIED PARAMETERS (A, B, C, AND D) FOR TYPICAL FUELS

Fuels	HHV_A (Btu/lb)	A/F	$L_{L,A}$	A	B	C	D
No. 1 oil	19,800	14.56	6.55	0.0679	14.22	0.0179	0.167
No. 2 oil	19,500	14.49	6.50	0.0667	14.34	0.0181	0.167
Natural gas	20,120	14.45	9.55	0.0919	10.96	0.0175	0.171
Manufactured gas	18,500	11.81	10.14	0.0965	10.10	0.0155	0.235
Propane	21,500	15.58	7.99	0.0841	12.60	0.0177	0.151
Butane	20,000	15.36	7.79	0.0808	12.93	0.0180	0.143

TABLE 3—FRACTION OF HEATING LOAD AT REDUCED OPERATING MODE (X1) AND AT MAXIMUM OPERATING MODE (X2), AVERAGE OUTDOOR TEMPERATURES (TOA AND TOA*), AND BALANCE POINT TEMPERATURE (TC) FOR VENTED HEATERS EQUIPPED WITH EITHER TWO-STAGE THERMOSTATS OR STEP-MODULATING THERMOSTATS

Heat output ratio [a]	X1	X2	TOA	TOA*	TC
0.20 to 0.24	.12	.88	57	40	53
0.25 to 0.29	.16	.84	56	39	51
0.30 to 0.34	.20	.80	54	38	49
0.35 to 0.39	.30	.70	53	36	46
0.40 to 0.44	.36	.64	52	35	44
0.45 to 0.49	.43	.57	51	34	42
0.50 to 0.54	.52	.48	50	32	39
0.55 to 0.59	.60	.40	49	30	37
0.60 to 0.64	.70	.30	48	29	34
0.65 to 0.69	.76	.24	47	27	32
0.70 to 0.74	.84	.16	46	25	29
0.75 to 0.79	.88	.12	46	22	27
0.80 to 0.84	.94	.06	45	20	23
0.85 to 0.89	.96	.04	45	18	21
0.90 to 0.94	.98	.02	44	16	19
0.95 to 0.99	.99	.01	44	13	17

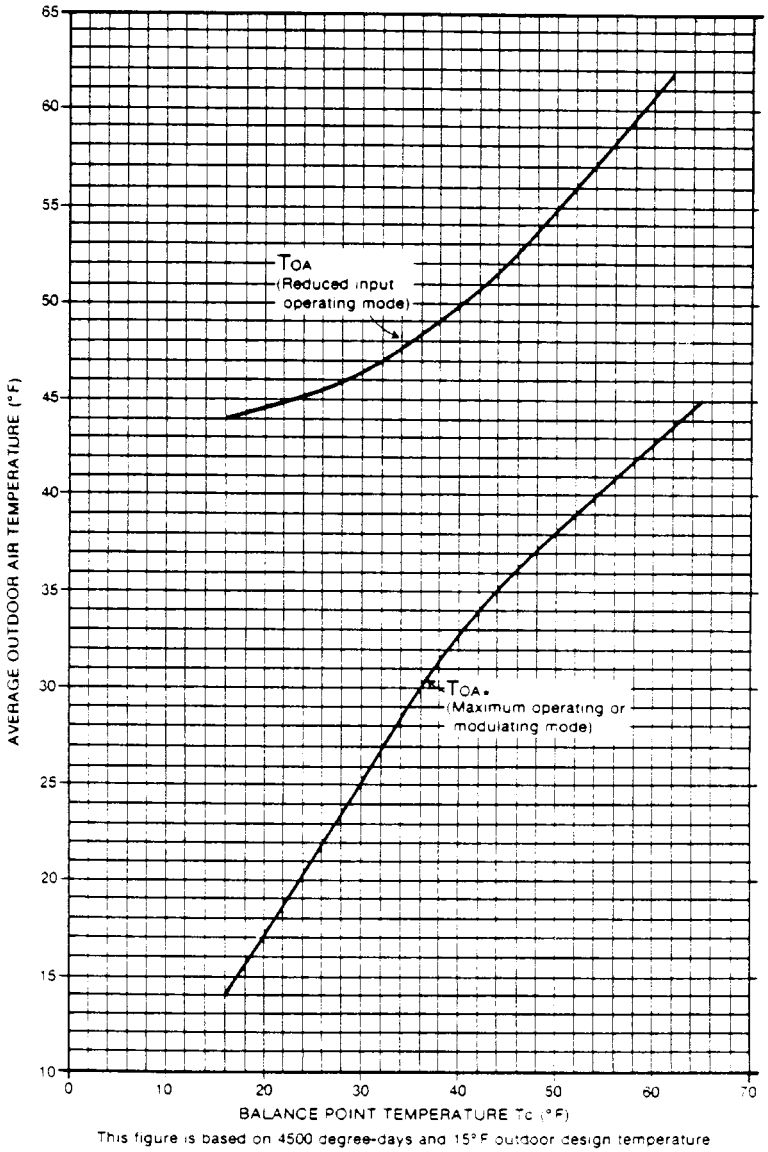
[a] The heat output ratio means the ratio of minimum to maximum heat output rates as defined in 4.1.13.

TABLE 4.—AVERAGE DESIGN HEATING REQUIREMENTS FOR VENTED HEATERS WITH DIFFERENT OUTPUT CAPACITIES

Vented heaters output capacity Q_{out}—(Btu/hr)	Average design heating requirements (kBtu/hr)
5,000–7,499	5.0
7,500–10,499	7.5
10,500–13,499	10.0
13,500–16,499	12.5
16,500–19,499	15.0
19,500–22,499	17.5
22,500–26,499	20.5
26,500–30,499	23.5
30,500–34,499	26.5
34,500–38,499	30.0
38,500–42,499	33.5
42,500–46,499	36.5
46,500–51,499	40.0
51,500–56,499	44.0
56,500–61,499	48.0
61,500–66,499	52.0
66,500–71,499	56.0
71,500–76,500	60.0

FIGURE 1

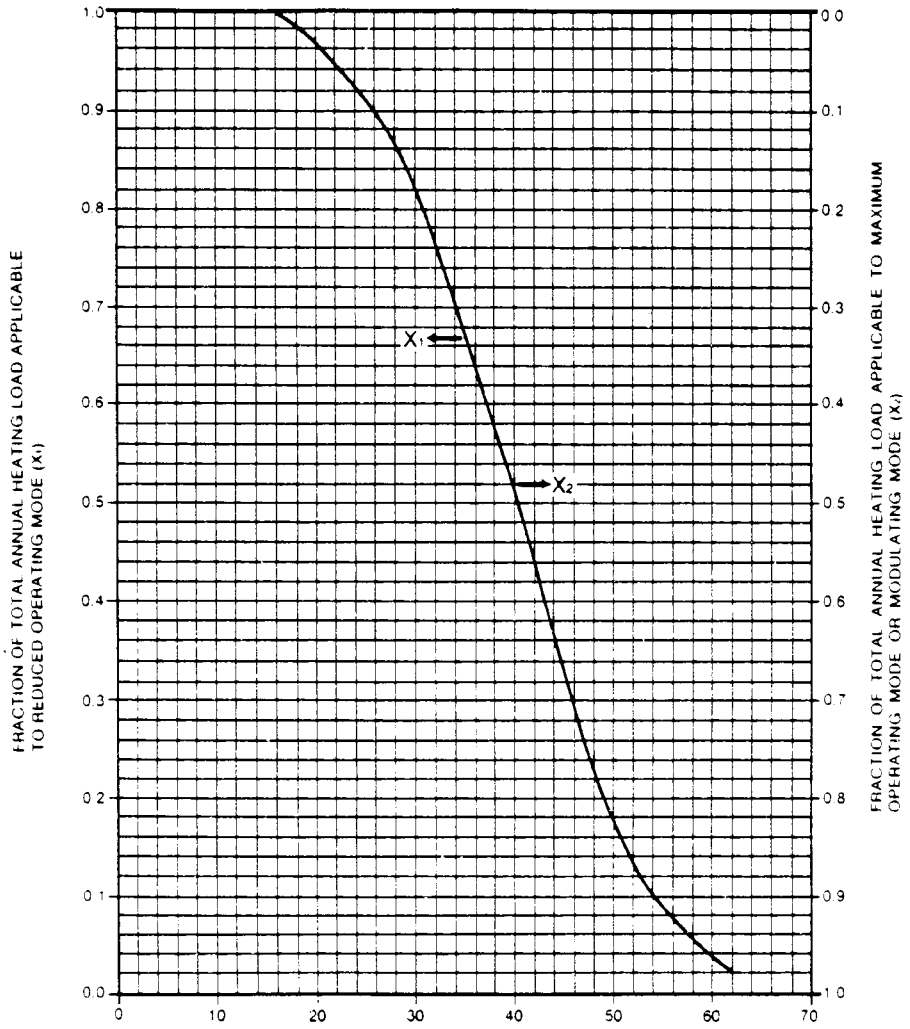
Average Outdoor Air Temperature vs. Balance Point Temperature for Modulating Vented Heaters



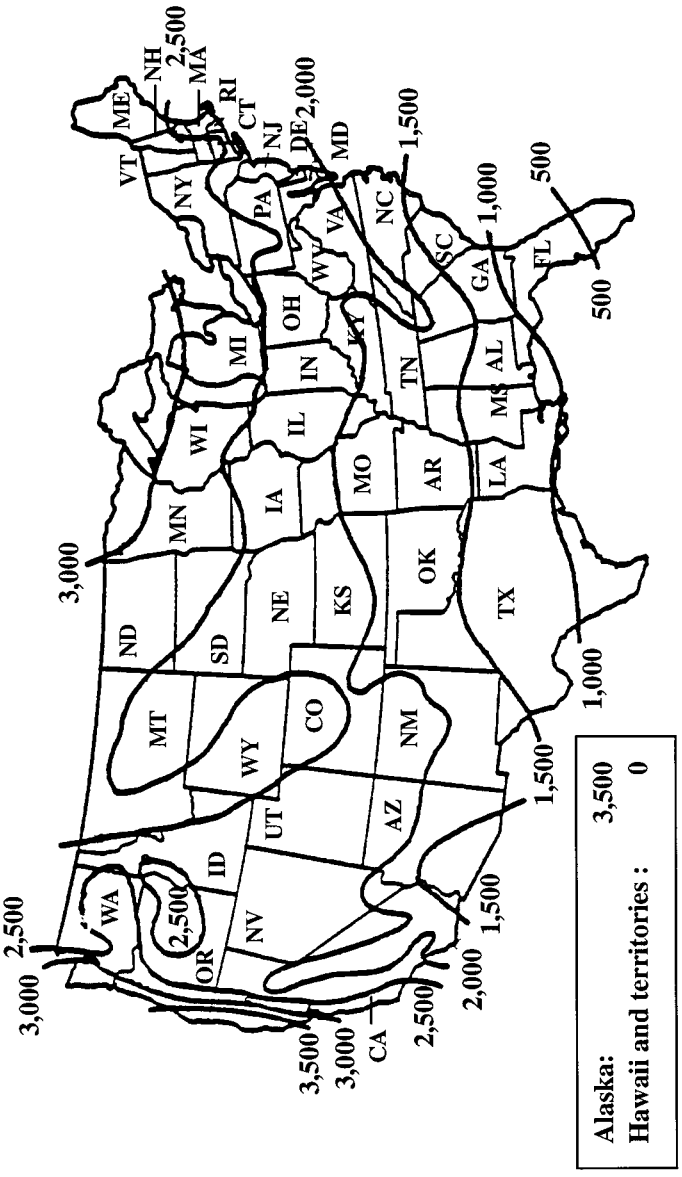
This figure is based on 4500 degree-days and 15° F outdoor design temperature

FIGURE 2

Fraction of Total Annual Heating Load Applicable to Reduced Operating Mode (X_1) and to Maximum Operating Mode or Modulating Mode (X_2) vs. Balance Point Temperature for Modulating Vented Heaters



This figure is based on 4500 degree-days and 15°F outdoor design temperature.



This map is reasonably accurate for most parts of the United States but is necessarily generalized, and consequently not too accurate in mountainous regions, particularly in the rockies.

FIGURE 3- HEATING LOAD HOURS (HLH) FOR THE UNITED STATES

[49 FR 12169, Mar. 28, 1984, as amended at 62 FR 26162, May 12, 1997]

APPENDIX P TO SUBPART B OF PART 430—UNIFORM TEST METHOD FOR MEASURING THE ENERGY CONSUMPTION OF POOL HEATERS

1. Test method. The test method for testing pool heaters is as specified in American National Standards Institute Standard for Gas-Fired Pool Heaters, Z21.56–1994.

2. Test conditions. Establish the test conditions specified in section 2.9 of ANSI Z21.56–1994.

3. Measurements. Measure the quantities delineated in section 2.9 of ANSI Z21.56–1994. The measurement of energy consumption for oil-fired pool heaters in Btu is to be carried out in appropriate units, e.g., gallons.

4. Calculations.

4.1 *Thermal efficiency.* Calculate the thermal efficiency, E_t (expressed as a percent), as specified in section 2.9 of ANSI Z21.56–1994. The expression of fuel consumption for oil-fired pool heaters shall be in Btu.

4.2 *Average annual fossil fuel energy for pool heaters.* The average annual fuel energy for pool heater, E_F, is defined as:

$$E_F = BOH\ Q_{IN} + (POH - BOH) Q_P$$

where:

BOH=average number of burner operating hours=104 h

POH=average number of pool operating hours=4464 h

Q_{IN}=rated fuel energy input as defined according to 2.9.1 or 2.9.2 of ANSI Z21.56–1994, as appropriate

Q_P=energy consumption of continuously operating pilot light if employed, in Btu/h.

4.3 *Average annual auxiliary electrical energy consumption for pool heaters.* The average annual auxiliary electrical energy consumption for pool heaters, E_{AE}, is expressed in Btu and defined as:

$$E_{AE} = BOH\ PE$$

where:

$PE = 2E_c$ if heater tested according to 2.9.1 of ANSI Z21.56–1994

$= 3.412\ PE_{rated}$ if heater tested according to 2.9.2 of ANSI Z21.56–1994, in Btu/h

E_c=Electrical consumption of the heater (converted to equivalent unit of Btu), including the electrical energy to the recirculating pump if used, during the 30-minute thermal efficiency test, as defined in 2.9.1 of ANSI Z21.56–1994, in Btu per 30 min.

2=Conversion factor to convert unit from per 30 min. to per h.

PE_{rated}=nameplate rating of auxiliary electrical equipment of heater, in Watts

BOH=as defined in 4.2 of this appendix

4.4 *Heating seasonal efficiency.*

4.4.1 Calculate the seasonal useful output of the pool heater as:

$$E_{OUT} = BOH\ [(E_t/100)(Q_{IN} + PE)]$$

where:

BOH=as defined in 4.2 of this appendix

E_t=thermal efficiency as defined in 4.1 of this appendix

Q_{IN}=as defined in 4.2 of this appendix

PE=as defined in 4.3 of this appendix

100=conversion factor, from percent to fraction

4.4.2 Calculate the seasonal input to the pool heater as:

$$E_{IN} = BOH\ (Q_{IN} + PE) + (POH - BOH)\ Q_P$$

where:

BOH=as defined in 4.2 of this appendix

Q_{IN}=as defined in 4.2 of this appendix

PE=as defined in 4.3 of this appendix

POH=as defined in 4.2 of this appendix

Q_P=as defined in 4.2 of this appendix

4.4.3 *Calculate the pool heater heating seasonal efficiency (in percent).*

4.4.3.1 For pool heaters employing a continuous pilot light:

$$EFFY_{HS} = 100(E_{OUT}/E_{IN})$$

where:

E_{OUT}=as defined in 4.4.1 of this appendix

E_{IN}=as defined in 4.4.2 of this appendix

100=to convert a fraction to percent

4.4.3.2 For pool heaters without a continuous pilot light:

$$EFFY_{HS} = E_t$$

where:

E_t=as defined in 4.1 of this appendix.

[62 FR 26165, May 12, 1997]

APPENDIX Q TO SUBPART B OF PART 430—UNIFORM TEST METHOD FOR MEASURING THE ENERGY CONSUMPTION OF FLUORESCENT LAMP BALLASTS

1. Definitions

1.1 *ANSI Standard* means a standard developed by a committee accredited by the American National Standards Institute.

1.2 *Ballast input voltage* means the rated input voltage of a fluorescent lamp ballast.

1.3 *F4OT12 lamp* means a nominal 40 watt tubular fluorescent lamp which is 48 inches in length and one and a half inches in diameter, and conforms to ANSI standard C78.1–1978(R1984).

1.4 *F96T12 lamp* means a nominal 75 watt tubular fluorescent lamp which is 96 inches in length and one and one-half inches in diameter, and conforms to ANSI Standard C78.1–1978 (R1984).

1.5 *F96T12HO lamp* means a nominal 110 watt tubular fluorescent lamp which is 96

inches in length and one and a half inches in diameter, andto operate.

1.6 *Input current* means the root-mean-square (RMS) current in amperes delivered to a fluorescent lamp ballast.

1.7 *Luminaire* means a complete lighting unit consisting of a fluorescent lamp or lamps, together with parts designed to distribute the light, to position and protect such lamps, and to connect such lamps to the power supply through the ballast.

1.8 *Nominal lamp watts* means the wattage at which a fluorescent lamp is designed to operate.

1.9 *Power factor* means the power input divided by the product of ballast input voltage and input current of a fluorescent lamp ballast, as measured under test conditions specified in ANSI Standard C–82.2–1984.

1.10 *Power input* means the power consumption in watts of a ballast and fluorescent lamp or lamps, as determined in accordance with the test procedures specified in ANSI Standard C82.2–1984.

1.11 *Relative light output* means the light output delivered through the use of a ballast divided by the light output delivered through the use of a reference ballast, expressed as a percent, as determined in accordance with the test procedures specified in ANSI Standard C82.2–1984.

1.12 *Residential building* means a structure or portion of a structure which provides facilities or shelter for human residency, except that such term does not include any multifamily residential structure of more than three stores above grade.

1.13 *ANSI Standard C82.2–1984* means the test standard published by the American National Standard Institute (ANSI), titled ''American National Standard for Fluorescent Lamp Ballasts—Method of Measurement, 1984'', and designated as ANSI C82.2–1984.

2. *Test conditions.* The test conditions for testing fluorescent lamp ballasts shall be done in accordance with the American National Standard Institute (ANIS) Standard C82.2–1984, ''American National Standard for Fluorescent Lamp Ballasts—Methods of Measurement,'' approved October 21, 1983. This incorporation by reference was approved by the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR part 51. Copies may be obtained from ANSI Publication Sales, 1430 Broadway, New York, NY 10068. Copies may be inspected at the Department of Energy, Freedom of Information Reading Room, Room 1E–190, Fluorescent Lamp Ballasts, Docket No. CE–RM–89–102, 1000 Independence Avenue, SW, Washington DC 20585, or at the Office of the Federal Register, 800 North Capitol Street, NW., suite 700, Washington, DC 20001. Any subsequent amendment to this standard by the standard-setting organization will not affect the DOE test procedures unless and until amended by DOE. The test conditions are described in sections 4, 5, 6, 7, and 21 of ANSI Standard C82.2–1984.

3. *Test Method and Measurements.*

3.1. The test method for testing fluorescent lamp ballasts shall be done in accordance with ANSI Standard C82.2–1984.

3.2 *Instrumentation.* The instrumentation shall be as specified by sections 8, 9, 10, 11, 12, 19.1, and 23.2 of ANSI Standard C82.2–1984.

3.3 *Electric Supply.*

3.3.1. *Input Power.* Measure the input power (watts) to the ballast in accordance with ANSI Standard C82.2–1984, section 3.2.1(3) and section 4.

3.3.2 *Input Voltage.* Measure the input voltage (volts) (RMS) to the ballast in accordance with ANSI Standard C82.2–1984, section 3.2.1(1) and section 4.

3.3.3 *Input Current.* Measure the input current (amps) (RMS) to the ballast in accordance with ANSI Standard C82.2–1984, section 3.2.1(2) and section 4.

3.4 *Light Output.*

3.4.1 Measure the light output of the reference lamp with the reference ballast in accordance with ANSI Standard C82.2–1984, section 16.

3.4.2 Measure the light output of the reference lamp with the test ballast in accordance with ANSI Standard C82.2–1984, section 16.

4. *Calculations.*

4.1 Calculate relative light output:

$$\frac{\text{Photocell output of lamp on test ballast}}{\text{Photocell output of lamp on ref. ballast}} \times 100 = \text{relative light output}$$

Where:

photocell output of lamp on test ballast is determined in accordance with section 3.4.2, expressed in watts, and photocell output of lamp on ref. ballast is determined in accordance with section 3.4.1, expressed in watts.

4.2. Determine the Ballast Efficacy Factor (BEF) using the following equations:

(a) Single lamp ballast

$$\text{BEF} = \frac{\text{relative light output}}{\text{input power}}$$

(b) Multiple lamp ballast

$$\text{BEF} = \frac{\text{average relative light output}}{\text{input power}}$$

Where:

input power is determined in accordance with section 3.3.1,

relative light output as defined in section 4.1, and

average relative light output is the relative light output, as defined in section 4.1, for all lamps, divided by the total number of lamps.

4.3 Determine Ballast Power Factor (PF):

$$PF = \frac{\text{Input power}}{\text{Input voltage} \times \text{input current}}$$

Where:

Input power is as defined in section 3.3.1,
Input voltage is determined in accordance with section 3.3.2, expressed in volts, and
Input current is determined in accordance with section 3.3.3, expressed in amps.

[54 FR 6076, Feb. 7, 1989, as amended at 56 FR 18682, April 24, 1991]

APPENDIX R TO SUBPART B OF PART 430—UNIFORM TEST METHOD FOR MEASURING AVERAGE LAMP EFFICACY (LE) AND COLOR RENDERING INDEX (CRI) OF ELECTRIC LAMPS

1. *Scope:* This appendix applies to the measurement of lamp lumens, electrical characteristics and CRI for general service fluorescent lamps, and to the measurement of lamp lumens and electrical characteristics for general service incandescent lamps, incandescent reflector lamps and medium base compact fluorescent lamps.

2. *Definitions*

2.1 To the extent that definitions in the IESNA and CIE standards do not conflict with the DOE definitions, the definitions specified in §1.2 of IESNA LM–9, §3.0 of IESNA LM–20, §2 of IESNA LM–45, §2 of IESNA LM–58, §1.2 of IESNA LM–66 and §IV of CIE Publication No. 13.2 shall be included.

2.2 *ANSI Standard* means a standard developed by a committee accredited by the American National Standards Institute (ANSI).

2.3 *CIE* means the International Commission on Illumination.

2.4 *CRI* means Color Rendering Index as defined in §430.2.

2.5 *IESNA* means the Illuminating Engineering Society of North America.

2.6 *Lamp efficacy* means the ratio of measured lamp lumen output in lumens to the measured lamp electrical power input in watts, rounded to the nearest whole number, in units of lumens per watt.

2.7 *Lamp lumen output* means the total luminous flux produced by the lamp, at the reference condition, in units of lumens.

2.8 *Lamp electrical power input* means the total electrical power input to the lamp, including both arc and cathode power where appropriate, at the reference condition, in units of watts.

2.9 *Reference condition* means the test condition specified in IESNA LM–9 for general service fluorescent lamps, in IESNA LM–20 for incandescent reflector lamps, in IESNA LM–45 for general service incandescent lamps and in IESNA LM–66 for medium base compact fluorescent lamps (see 10 CFR 430.22).

3. *Test Conditions*

3.1 *General Service Fluorescent Lamps:* For general service fluorescent lamps, the ambient conditions of the test and the electrical circuits, reference ballasts, stabilization requirements, instruments, detectors, and photometric test procedure and test report shall be as described in the relevant sections of IESNA LM–9 (see 10 CFR 430.22).

3.2 *General Service Incandescent Lamps:* For general service incandescent lamps, the selection and seasoning (initial burn-in) of the test lamps, the equipment and instrumentation, and the test conditions shall be as described in IESNA LM–45 (see 10 CFR 430.22).

3.3 *Incandescent Reflector Lamps:* For incandescent reflector lamps, the selection and seasoning (initial burn-in) of the test lamps, the equipment and instrumentation, and the test conditions shall conform to sections 4.2 and 5.0 of IESNA LM–20 (see 10 CFR 430.22).

3.4 *Medium Base Compact Fluorescent Lamps:* For medium base compact fluorescent lamps, the selection, seasoning and stabilization of the test lamps, and the test conditions, shall be as described in Sections 1, 2, 3, and 7 of IESNA LM–66 (see 10 CFR 430.22).

4. *Test Methods and Measurements*

All lumen measurements made with instruments calibrated to the devalued NIST lumen after January 1, 1996, shall be multiplied by 1.011.

4.1 *General Service Fluorescent Lamps*

4.1.1 The measurement procedure shall be as described in IESNA LM–9, except that lamps shall be operated at the appropriate voltage and current conditions as described in ANSI C78.375 and in ANSI C78.1, C78.2 or C78.3, and lamps shall be operated using the appropriate reference ballast as described in ANSI C82.3 (see 10 CFR 430.22).

4.1.2 Lamp lumen output (lumens) and lamp electrical power input (watts), at the reference condition, shall be measured and recorded. Lamp efficacy shall be determined by computing the ratio of the measured lamp lumen output and lamp electrical power input at equilibrium for the reference condition.

4.2 *General Service Incandescent Lamps*

4.2.1 The measurement procedure shall be as described in IESNA LM–45 (see 10 CFR

430.22). Lamps shall be operated at the rated voltage as defined in §430.2.

4.2.2 The test procedure shall conform with section 7 of IESNA LM–45 and the lumen output of the lamp shall be determined in accordance with Sections 4.2a or 4.2b of IESNA LM–45 at the reference condition. Lamp electrical power input in watts shall be measured and recorded. Lamp efficacy shall be determined by computing the ratio of the measured lamp lumen output and lamp electrical power input at equilibrium for the reference condition. The test report shall conform to §8 of IESNA LM–45 (see 10 CFR §430.22).

4.3 *Incandescent Reflector Lamps*

4.3.1 The measurement procedure shall be as described in IESNA LM–20 (see 10 CFR 430.22). Lamps shall be operated at the rated voltage as defined in §430.2.

4.3.2. Lamp lumen output shall be determined as total forward lumens, and may be measured in an integrating sphere at the reference condition in accordance with §7.2 of IESNA LM–20 (see 10 CFR 430.22) or from an average intensity distribution curve measured at the reference condition specified in §6.0 of IESNA LM–20. Lamp electrical power input in watts shall be measured and recorded.

4.3.3 Lamp efficacy shall be determined by computing the ratio of the measured lamp lumen output and lamp electrical power input at equilibrium for the reference condition. The test report shall conform to section 10.0 of IES LM–20 (see §430.22).

4.4 *Medium Base Compact Fluorescent Lamps*

4.4.1 The measurement procedure shall be as described in IESNA LM–66 (see 10 CFR 430.22) except that the provisions of IESNA LM–66 which refer to operation of the lamp using a reference ballast do not apply to the testing of integrally ballasted compact fluorescent lamps. Lamps shall be operated at 120 V and 60 Hertz. Lamp lumen output shall be measured with the integral ballast according to section 11.3 of IESNA LM–66. Lamp electrical power input in watts shall be measured and recorded.

4.4.2 Lamp efficacy shall be determined by computing the ratio of the measured lamp lumen output and lamp electrical power input at equilibrium for the reference condition. The test report shall conform to section 13 of IESNA LM–66 (see 10 CFR 430.22).

4.5 *Determination of Color Rendering Index*

4.5.1 The CRI shall be determined in accordance with the method specified in CIE Publication 13.2 for general service fluorescent lamps. The required spectroradiometric measurement and characterization shall be conducted in accordance with the methods given in IESNA LM–58 and IESNA LM–16 (see 10 CFR 430.22).

4.5.2 The test report shall include a description of the test conditions, equipment, measured lamps, spectroradiometric measurement results and CRI determination.

[62 FR 29240, May 29, 1997]

APPENDIX S TO SUBPART B OF PART 430—UNIFORM TEST METHOD FOR MEASURING THE WATER CONSUMPTION OF FAUCETS AND SHOWERHEADS

1. *Scope:* This Appendix covers the test requirements used to measure the hydraulic performance of faucets and showerheads.

2. *Flow Capacity Requirements:*

a. Faucets—The test procedures to measure the water flow rate for faucets, expressed in gallons per minute (gpm) and liters per minute (L/min), or gallons per cycle (gal/cycle) and liters per cycle (L/cycle), shall be conducted in accordance with the test requirements specified in section 6.5, Flow Capacity Test, of the ASME/ANSI Standard A112.18.1M–1996 (see §430.22). Measurements shall be recorded at the resolution of the test instrumentation. Calculations shall be rounded off to the same number of significant digits as the previous step. The final water consumption value shall be rounded to one decimal place for non-metered faucets, or two decimal places for metered faucets.

b. Showerheads—The test conditions to measure the water flow rate for showerheads, expressed in gallons per minute (gpm) and liters per minute (L/min), shall be conducted in accordance with the test requirements specified in section 6.5, Flow Capacity Test, of the ASME/ANSI Standard A112.18.1M–1996 (see §430.22). Measurements shall be recorded at the resolution of the test instrumentation. Calculations shall be rounded off to the same number of significant digits as the previous step. The final water consumption value shall be rounded to one decimal place.

[63 FR 13316, Mar. 18, 1998]

APPENDIX T TO SUBPART B OF PART 430—UNIFORM TEST METHOD FOR MEASURING THE WATER CONSUMPTION OF WATER CLOSETS AND URINALS

1. *Scope:* This Appendix covers the test requirements used to measure the hydraulic performances of water closets and urinals.

2. *Test Apparatus and General Instructions:*

a. The test apparatus and instructions for testing water closets shall conform to the requirements specified in section 7.1.2, Test

Apparatus and General Requirements, subsections 7.1.2.1, 7.1.2.2, and 7.1.2.3 of the ASME/ANSI Standard A112.19.6–1995 (see § 430.22). Measurements shall be recorded at the resolution of the test instrumentation. Calculations shall be rounded off to the same number of significant digits as the previous step. The final water consumption value shall be rounded to one decimal place.

b. The test apparatus and instructions for testing urinals shall conform to the requirements specified in section 8.2, Test Apparatus and General Requirements, subsections 8.2.1, 8.2.2, and 8.2.3 of the ASME/ANSI Standard A112.19.6–1995 (see § 430.22). Measurements shall be recorded at the resolution of the test instrumentation. Calculations shall be rounded off to the same number of significant digits as the previous step. The final water consumption value shall be rounded to one decimal place.

3. *Test Measurement:*

a. Water closets—The measurement of the water flush volume for water closets, expressed in gallons per flush (gpf) and liters per flush (Lpf), shall be conducted in accordance with the test requirements specified in section 7.1.6, Water Consumption and Hydraulic Characteristics, of the ASME/ANSI Standard A112.19.6–1995 (see § 430.22).

b. Urinals—The measurement of water flush volume for urinals, expressed in gallons per flush (gpf) and liters per flush (Lpf), shall be conducted in accordance with the test requirements specified in section 8.5, Water Consumption, of the ASME/ANSI Standard A112.19.6–1995 (see § 430.22).

[63 FR 13317, Mar. 18, 1998]

Subpart C—Energy and Water Conservation Standards

§ 430.31 Purpose and scope.

This subpart contains energy conservation standards and water conservation standards (in the case of faucets, showerheads, water closets, and urinals) for classes of covered products that are required to be administered by the Department of Energy pursuant to the Energy Conservation Program for Consumer Products Other Than Automobiles under the Energy Policy and Conservation Act, as amended (42 U.S.C. 6291 *et seq.*). Basic models of covered products manufactured before the date on which an amended energy conservation standard or water conservation standard (in the case of faucets, showerheads, water closets, and urinals) becomes effective (or revisions of such models that are manufactured after such date and have the same energy efficiency, energy use characteristics, or water use characteristics (in the case of faucets, showerheads, water closets, and urinals), that comply with the energy conservation standard or water conservation standard (in the case of faucets, showerheads, water closets, and urinals) applicable to such covered products on the day before such date shall be deemed to comply with the amended energy conservation standard or water conservation standard (in the case of faucets, showerheads, water closets, and urinals).

[63 FR 13317, Mar. 18, 1998]

§ 430.32 Energy and water conservation standards and effective dates.

The energy and water (in the case of faucets, showerheads, water closets, and urinals) conservation standards for the covered product classes are:

(a) *Refrigerators/refrigerator-freezers/freezers.* These standards do not apply to refrigerators and refrigerator-freezers with total refrigerated volume exceeding 39 cubic feet or freezers with total refrigerated volume exceeding 30 cubic feet.

Product class	Energy standards equations (Kwh/yr) Effective dates	
	January 1, 1990	January 1, 1993
1. Refrigerators and Refrigerator-Freezers with manual defrost	(16.3AV+316)	(13.5AV+299)
2. Refrigerator-Freezer—partial automatic defrost	(21.8AV+429)	(10.4AV+398)
3. Refrigerator-Freezers—automatic defrost with: Top-mounted freezer without through-the-door ice service [1]	(23.5AV+471)	(16.0AV+355)
4. Refrigerator-Freezers—automatic defrost with: Side-mounted freezer without through-the-door ice service	(27.7AV+488)	(11.8AV+501)
5. Refrigerator-Freezers—automatic defrost with: Bottom-mounted freezer without through-the-door ice service	(27.7AV+488)	(16.5AV+367)
6. Refrigerator-Freezers—automatic defrost with: Top-mounted freezer with through-the-door ice service	(26.4AV+535)	(17.6AV+391)
7. Refrigerator-Freezers—automatic defrost with: Side-mounted freezer with through-the-door ice service	(30.9AV+547)	(16.3AV+527)

Product class	Energy standards equations (Kwh/yr) Effective dates	
	January 1, 1990	January 1, 1993
8. Upright Freezers with: Manual defrost	(10.9AV+422)	(10.3AV+264)
9. Upright Freezers with: Automatic defrost	(16.0AV+623)	(14.9AV+391)
10. Chest Freezers and all other Freezers	(14.8AV+223)	(11.0AV+160)

[1] Including all refrigerators with automatic defrost
AV=Total adjusted volume, expressed in Ft.^{3}, as determined in Appendices A1 and B1 of Subpart B of this Part.

(b) *Room air conditioners.*

Product class	Energy efficiency ratio, effective as of	
	Jan. 1, 1990	Oct. 1, 2000
1. Without reverse cycle, with louvered sides, and less than 6,000 Btu/h	8.0	9.7
2. Without reverse cycle, with louvered sides, and 6,000 to 7,999 Btu/h	8.5	9.7
3. Without reverse cycle, with louvered sides, and 8,000 to 13,999 Btu/h	9.0	9.8
4. Without reverse cycle, with louvered sides, and 14,000 to 19,999 Btu/h	8.8	9.7
5. Without reverse cycle, with louvered sides, and 20,000 Btu/h or more	8.2	8.5
6. Without reverse cycle, without louvered sides, and less than 6,000 Btu/h	8.0	9.0
7. Without reverse cycle, without louvered sides, and 6,000 to 7,999 Btu/h	8.5	9.0
8. Without reverse cycle, without louvered sides, and 8,000 to 13,999 Btu/h	8.5	8.5
9. Without reverse cycle, without louvered sides, and 14,000 to 19,999 Btu/h	8.5	8.5
10. Without reverse cycle, without louvered sides, and 20,000 Btu/h or more	8.2	8.5
11. With reverse cycle, with louvered sides, and less than 20,000 Btu/h	8.5	9.0
12. With reverse cycle, without louvered sides, and less than 14,000 Btu/h	8.0	8.5
13. With reverse cycle, with louvered sides, and 20,000 Btu/h or more	8.5	8.5
14. With reverse cycle, without louvered sides, and 14,000 Btu/h or more	8.0	8.0
15. Casement-Only	*	8.7
16. Casement-Slider	*	9.5

*Casement-only and casement-slider room air conditioners are not separate product classes under standards effective January 1, 1990. These units are subject to the applicable standards in classes 1 through 14 based on unit capacity and the presence or absence of louvered sides and a reverse cycle.

(c) *Central air conditioners and central air conditioning heat pumps.*

Product class	Seasonal energy efficiency ratio	Heating seasonal performance factor	Effective date
1. Split systems	10.0	6.8	01/01/92
2. Single package systems	9.7	6.6	01/01/93

(d) *Water heaters.*

The energy factor of water heaters shall not be less than the following products manufactured on or after the indicated dates:

Product class	Energy factor, as of Jan. 1, 1990	Energy factor, as of April 15, 1991
1. Gas Water Heater.	0.62 − (.0019 × Rated Storage Volume in gallons).	0.62 − (.0019 × Rated Storage Volume in gallons).
2. Oil Water Heater.	0.59 − (.0019 × Rated Storage Volume in gallons).	0.59 − (.0019 × Rated Storage Volume in gallons).
3. Electric Water Heater.	0.95 − (.00132 × Rated Storage Volume in gallons).	0.93 − (.00132 × Rated Volume Storage in gallons).

Note: Rated Storage Volume=the water storage capacity of a water heater, in gallons, as specified by the manufacturer.

(e) *Furnaces*

Product class	AFUE [1] (percent)	Effective date
1. Furnaces (excluding classes noted below) (percent)	78	01/01/92
2. Mobile Home Furnaces (percent)	75	09/01/90
3. Small furnaces (other than furnaces designed solely for installation in mobile homes) having an input rate of less than 45,000 Btu/hr		
(A) Weatherized (outdoor)	78	01/01/92
(B) Non-weatherized (indoor)	78	01/01/92
4. Boilers (excluding gas steam) (percent)	80	01/01/92
5. Gas steam boilers (percent)	75	01/01/92

[1] Annual Fuel Utilization Efficiency, as determined in § 430.22(n)(2) of this part.

(f) *Dishwashers.* (1) Dishwashers manufactured between January 1, 1988, and

May 14 1994 shall be equipped with an option to dry without heat.

(2) Dishwashers manufactured on or after May 14, 1994, shall have an energy factor no less than:

Product class	Energy factor (cycles/KWh)
i. Compact Dishwasher (less than 22 inches in exterior width)	0.62
ii. Standard Dishwasher (equal to or greater than 22 inches in exterior width)	0.46

(g) *Clothes washers.* (1) Clothes washers manufactured between January 1, 1988, and May 14, 1994, shall include an unheated rinse water option.

(2) Clothes washers manufactured on or after May 14, 1994, shall have an energy factor no less than:

Product class	Energy factor (cu. ft./Kwh/cycle)
i. Top Loading, Compact (less than 1.6 ft.^{3} capacity).	0.90.
ii. Top Loading, Standard (1.6 ft.^{3} or greater capacity).	1.18.
iii. Top Loading, Semi-Automatic	Not Applicable.[1]
iv. Front Loading	Not Applicable.[1]
v. Suds saving	Not Applicable.[1]

[1] These classes shall have an unheated rinse water option.

(h) *Clothes dryers.* (1) Gas clothes dryers manufactured between January 1, 1988, and May 14, 1994, shall not be equipped with a constant burning pilot.

(2) Clothes dryers manufactured on or after May 14, 1994, shall have an energy factor no less than;

Product class	Energy factor (lbs/KWh)
i. Electric, Standard (4.4 ft^3 or greater capacity)	3.01
ii. Electric, Compact (120v) (less than 4.4 ft^3 capacity)	3.13
iii. Electric, Compact (240v) (less than 4.4 ft^3 capacity)	2.90
iv. Gas	2.67

(i) *Direct heating equipment.*

Product class	Annual fuel utilization efficiency, Jan. 1, 1990 (percent)
1. Gas wall fan type up to 42,000 Btu/hour	73
2. Gas wall fan type over 42,000 Btu/hour	74
3. Gas wall gravity type up to 10,000 Btu/hour	59
4. Gas wall gravity type over 10,000 Btu/hour up to 12,000 Btu/hour	60
5. Gas wall gravity type over 12,000 Btu/hour up to 15,000 Btu/hour	61
6. Gas wall gravity type over 15,000 Btu/hour up to 19,000 Btu/hour	62
7. Gas wall gravity type over 19,000 Btu/hour up to 27,000 Btu/hour	63
8. Gas wall gravity type over 27,000 Btu/hour up to 46,000 Btu/hour	64
9. Gas wall gravity type over 46,000 Btu/hour	65
10. Gas floor up to 37,000 Btu/hour	56
11. Gas floor over 37,000 Btu/hour	57
12. Gas room up to 18,000 Btu/hour	57
13. Gas room over 18,000 Btu/hour up to 20,000 Btu/hour	58
14. Gas room over 20,000 Btu/hour up to 27,000 Btu/hour	63
15. Gas room over 27,000 Btu/hour up to 46,000 Btu/hour	64
16. Gas room over 46,000 Btu/hour	65

(j) *Cooking Products.* Gas cooking products with an electrical supply cord shall not be equipped with a constant burning pilot light. This standard is effective on January 1, 1990.

(k) *Pool heaters.* The thermal efficiency of pool heaters must be no less than 78%. The standard is effective on January 1, 1990.

(l) *Television sets.* [Reserved]

(m) *Fluorescent lamp ballasts.* (1) Except as provided in paragraph (m)(2) of this section, each fluorescent lamp ballast—

(i)(A) Manufactured on or after January 1, 1990;

(B) Sold by the manufacturer on or after April 1, 1990; or

(C) Incorporated into a luminarie by a luminarie manufacturer on or after April 1, 1991; and

(ii) Designed—

(A) To operate at nominal input voltages of 120 or 277 volts;

(B) To operate with an input current frequency of 60 Hertz; and

(C) For use in connection with F40T12, F96T12, or F96T12HO lamps; shall have a power factor of 0.90 or greater and shall have a ballast efficacy factor not less than the following:

Application for operation of	Ballast input voltage	Total nominal lamp watts	Ballast efficacy factor
One F40T12 lamp	120	40	1.805
	277	40	1.805
Two F40T12 lamps	120	80	1.060
	277	80	1.050
Two F9T12 lamps	120	150	0.570
	277	150	0.570
Two F96T12HO lamps	120	220	0.390
	277	220	0.390

(2) The standards described in paragraph (m)(1) of this section do not apply to (i) a ballast which is designed for dimming or for use in ambient temperatures of 0°F or less, or (ii) a ballast which has a power factor of less than 0.90 and is designed for use only in residential building applications.

(n) *General service fluorescent lamps and incandescent reflector lamps.* (1) Each of the following general service fluorescent lamps manufactured after the effective dates specified in the table shall meet or exceed the lamp efficacy and CRI standards shown in the table below:

FLUORESCENT LAMPS

Lamp type	Nominal lamp wattage	Minimum CRI	Minimum average lamp efficacy (LPW)	Effective date
4-foot medium bi-pin	gt;35W	69	75.0	Nov. 1, 1995.
	≤35W	45	75.0	Nov. 1, 1995.
2-foot U-shaped	gt;35W	69	68.0	Nov. 1, 1995.
	≤35W	45	64.0	Nov. 1, 1995.
8-foot slimline	gt;65W	69	80.0	May 1, 1994.
	≤65W	45	80.0	May 1, 1994.
8-foot high output	gt;100W	69	80.0	May 1, 1994.
	≤100W	45	80.0	May 1, 1994.

(2) Each of the following incandescent reflector lamps manufactured after November 1, 1995, shall meet or exceed the lamp efficacy standards shown in the table in this paragraph:

INCANDESCENT REFLECTOR LAMPS

Nominal lamp wattage	Minimum average lamp efficacy (LPW)
40–50	10.5
51–66	11.0
67–85	12.5
86–115	14.0
116–155	14.5
156–205	15.0

(o) *Faucets.* The maximum water use allowed for any of the following faucets manufactured after January 1, 1994, when measured at a flowing water pressure of 60 pounds per square inch (414 kilopascals), shall be as follows:

Faucet type	Maximum flow rate (gpm (L/min)) or (gal/cycle (L/cycle))
Lavatory faucets	2.2 gpm (8.3 L/min)[1,2]
Lavatory replacement aerators.	2.2 gpm (8.3 L/min)
Kitchen faucets	2.2 gpm (8.3 L/min)
Kitchen replacement aerators.	2.2 gpm (8.3 L/min)
Metering faucets	0.25 gal/cycle (0.95 L/cycle)[3,4]

Note:
[1] Sprayheads with independently-controlled orifices and manual controls.
The maximum flow rate of each orifice that manually turns on or off shall not exceed the maximum flow rate for a lavatory faucet.
[2] Sprayheads with collectively controlled orifices and manual controls.
The maximum flow rate of a sprayhead that manually turns on or off shall be the product of (a) the maximum flow rate for a lavatory faucet and (b) the number of component lavatories (rim space of the lavatory in inches (millimeters) divided by 20 inches (508 millimeters)).
[3] Sprayheads with independently controlled orifices and metered controls.
The maximum flow rate of each orifice that delivers a preset volume of water before gradually shutting itself off shall not exceed the maximum flow rate for a metering faucet.
[4] Sprayheads with collectively-controlled orifices and metered controls.
The maximum flow rate of a sprayhead that delivers a preset volume of water before gradually shutting itself off shall be the product of (a) the maximum flow rate for a metering faucet and (b) the number of component lavatories (rim space of the lavatory in inches (millimeters) divided by 20 inches (508 millimeters)).

(p) *Showerheads.* The maximum water use allowed for any showerheads manufactured after January 1, 1994, shall be 2.5 gallons per minute (9.5 liters per minute) when measured at a flowing pressure of 80 pounds per square inch gage (552 kilopascals). Any such showerhead shall also meet the requirements of ASME/ANSI Standard A112.18.1M–1996, 7.4.4(a).

(q) *Water closets.* (1) The maximum water use allowed in gallons per flush for any of the following water closets manufactured after January 1, 1994, shall be as follows:

Water closet type	Maximum flush rate (gpf (Lpf))
Gravity tank-type toilets	1.6 (6.0)
Flushometer tank toilets	1.6 (6.0)

Water closet type	Maximum flush rate (gpf (Lpf))
Electromechanical hydraulic toilets	1.6 (6.0)
Blowout toilets	3.5 (13.2)

(2) The maximum water use allowed for flushometer valve toilets, other than blowout toilets, manufactured after January 1, 1997, shall be 1.6 gallons per flush (6.0 liters per flush).

(r) *Urinals.* The maximum water use allowed for any urinals manufactured after January 1, 1994, shall be 1.0 gallons per flush (3.8 liters per flush). The maximum water use allowed for a trough-type urinal shall be the product of:

(1) The maximum flow rate for a urinal and

(2) The length of the trough-type urinal in inches (millimeter) divided by 16 inches (406 millimeters).

[54 FR 6077, Feb. 7, 1989, as amended at 54 FR 47943, Nov. 17, 1989; 55 FR 42177, Oct. 17, 1990; 56 FR 22279, May 14, 1991; 56 FR 24333, May 30, 1991; 59 FR 49475, Sept. 28, 1994; 63 FR 13317, Mar. 18, 1998; 63 FR 48057, Sept. 8, 1998]

EFFECTIVE DATE NOTE 1: At 62 FR 23116, Apr. 28, 1997, § 430.32 was amended by revising paragraph (a), effective July 1, 2001. For the convenience of the user, the revised text follows.

§ 430.32 Energy conservation standards and effective dates.

* * * * *

(a) *Refrigerators/refrigerator-freezers/freezers.* These standards do not apply to refrigerators and refrigerator-freezers with total refrigerated volume exceeding 39 cubic feet (1104 liters) or freezers with total refrigerated volume exceeding 30 cubic feet (850 liters).

Product class	Energy standards equations for maximum energy use (kWh/yr)	
	Effective January 1, 1993	Effective July 1, 2001
1. Refrigerators and Refrigerator-freezers with manual defrost	13.5AV+299 0.48av+299	8.82AV+248.4 0.31av+248.4
2. Refrigerator-Freezer—partial automatic defrost	10.4AV+398 0.37av+398	8.82AV+248.4 0.31av+248.4
3. Refrigerator-Freezers—automatic defrost with top-mounted freezer without through-the-door ice service and all-refrigerators—automatic defrost	16.0AV+355 0.57av+355	9.80AV+276.0 0.35av+276.0
4. Refrigerator-Freezers—automatic defrost with side-mounted freezer without through-the-door ice service	11.8AV+501 0.42AV+501	4.91AV+507.5 0.17av+507.5
5. Refrigerator-Freezers—automatic defrost with bottom-mounted freezer without through-the-door ice service	16.5AV+367 0.58av+367	4.60AV+459.0 0.16av+459.0
6. Refrigerator-Freezers—automatic defrost with top-mounted freezer with through-the-door ice service	17.6AV+391 0.62av+391	10.20AV+356.0 0.36av+356.0
7. Refrigerator-Freezers—automatic defrost with side-mounted freezer with through-the-door ice service	16.3AV+527 0.58av+527	10.10AV+406.0 0.36av+406.0
8. Upright Freezers with Manual Defrost	10.3AV+264 0.36av+264	7.55AV+258.3 0.27av+258.3
9. Upright Freezers with Automatic Defrost	14.9AV+391 0.53av+391	12.43AV+326.1 0.44av+326.1
10. Chest Freezers and all other Freezers except Compact Freezers	11.0AV+160 0.39av+160	9.88AV+143.7 0.35av+143.7
11. Compact Refrigerators and Refrigerator-Freezers with Manual Defrost	13.5AV+299[a] 0.48av+299[a]	10.70AV+299.0 0.38av+299.0
12. Compact Refrigerator-Freezer—partial automatic defrost	10.4AV+398[a] 0.37av+398[a]	7.00AV+398.0 0.25av+398.0
13. Compact Refrigerator-Freezers—automatic defrost with top-mounted freezer and compact all-refrigerators—automatic defrost	16.0AV+355[a] 0.57av+355[a]	12.70AV+355.0 0.45av+355.0
14. Compact Refrigerator-Freezers—automatic defrost with side-mounted freezer	11.8AV+501[a] 0.42[av]+501[a]	7.60AV+501.0 0.27av+501.0
15. Compact Refrigerator-Freezers—automatic defrost with bottom-mounted freezer	16.5AV+367[a] 0.58av+367[a]	13.10AV+367.0 0.46av+367.0

Product class	Energy standards equations for maximum energy use (kWh/yr)	
	Effective January 1, 1993	Effective July 1, 2001
16. Compact Upright Freezers with Manual Defrost	10.3AV+264[a]	9.78AV+250.8
	0.36av+264[a]	0.35av+250.8
17. Compact Upright Freezers with Automatic Defrost	14.9AV+391[a]	11.40AV+391.0
	0.53av+391[a]	0.40av+391.0
18. Compact Chest Freezers	11.0AV+160[a]	10.45AV+152.0
	0.39av+160[a]	0.37av+152.0

AV=Total adjusted volume, expressed in ft.[3], as determined in Appendices A1 and B1 of subpart B of this part.
av=Total adjusted volume, expressed in Liters.
[a] Applicable standards for compact refrigerator products manufactured before July 1, 2001. Compact refrigerator products are not separate product categories under the standards effective January 1, 1993.

EFFECTIVE DATE NOTE 2: At 62 FR 50148, Sept. 24, 1997, §430.32 was amended by revising paragraph (b), effective Oct. 1, 2000. For the convenience of the user, the superseded text follows.

§430.32 Energy conservation standards and effective dates.

* * * * *

(b) *Room air conditioners.*

Product class	Energy efficiency ratio Jan. 1, 1990
1. Without reverse cycle and with louvered sides less than 6,000 Btu	8.0
2. Without reverse cycle and with louvered sides 6,000 to 7,999 Btu	8.5.
3. Without reverse cycle and with louvered sides 8,000 to 13,999 Btu	9.0
4. Without reverse cycle and with louvered sides 14,000 to 19,999 Btu	8.8
5. Without reverse cycle and with louvered sides 20,000 and more Btu	8.2
6. Without reverse cycle and without louvered sides Less than 6,000 Btu	8.0
7. Without reverse cycle and without louvered sides 6,000 to 7,999 Btu	8.5
8. Without reverse cycle and without louvered sides 8,000 to 13,999 Btu	8.5
9. Without reverse cycle and without louvered sides 14,000 to 19,999 Btu	8.5
10. Without reverse cycle and without louvered sides 20,000 and more Btu	8.2
11. With reverse cycle, and with louvered sides	8.5
12. With reverse cycle, without louvered sides	8.0

§430.33 Preemption of State regulations.

Any State regulation providing for any energy conservation standard, or water conservation standard (in the case of faucets, showerheads, water closets, and urinals), or other requirement with respect to the energy efficiency, energy use, or water use (in the case of faucets, showerheads, water closets, or urinals) of a covered product that is not identical to a Federal standard in effect under this subpart is preempted by that standard, except as provided for in sections 327 (b) and (c) of the Act.

[63 FR 13318, Mar. 18, 1998]

APPENDIX A TO SUBPART C OF PART 430—PROCEDURES, INTERPRETATIONS AND POLICIES FOR CONSIDERATION OF NEW OR REVISED ENERGY CONSERVATION STANDARDS FOR CONSUMER PRODUCTS

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1. Objectives

This Appendix establishes procedures, interpretations and policies to guide the DOE in the consideration and promulgation of new or revised appliance efficiency standards under the Energy Policy and Conservation Act (EPCA). The Department's objectives in establishing these guidelines include:

(a) *Provide for early input from stakeholders.* The Department seeks to provide opportunities for public input early in the rulemaking process so that the initiation and direction

of rulemakings is informed by comment from interested parties. Under the guidelines established by this Appendix, DOE will seek early input from interested parties in setting rulemaking priorities and structuring the analyses for particular products. Interested parties will be invited to provide input for the selection of design options and will help DOE identify analysis, data, and modeling needs. DOE will gather input from interested parties through a variety of mechanisms, including public workshops.

(b) *Increase predictability of the rulemaking timetable.* The Department seeks to make informed, strategic decisions about how to deploy its resources on the range of possible standards development activities, and to announce these prioritization decisions so that all interested parties have a common expectation about the timing of different rulemaking activities. The guidelines in this Appendix provide for setting priorities and timetables for standards development and test procedure modification and reflect these priorities in the Regulatory Agenda.

(c) *Increase use of outside technical expertise.* The Department seeks to expand its use of outside technical experts in evaluating product-specific engineering issues to ensure that decisions on technical issues are fully informed. The guidelines in this Appendix provide for increased use of outside technical experts in developing, performing and reviewing the analyses. Draft analytical results will be distributed for peer and stakeholder review.

(d) *Eliminate problematic design options early in the process.* The Department seeks to eliminate from consideration, early in the process, any design options that present unacceptable problems with respect to manufacturability, consumer utility, or safety, so that the detailed analysis can focus only on viable design options. Under the guidelines in this Appendix, DOE will eliminate from consideration design options if it concludes that manufacture, installation or service of the design will be impractical, or that the design option will adversely affect the utility of the product, or if the design has adverse safety or health impacts. This screening will be done at the outset of a rulemaking.

(e) *Fully consider non-regulatory approaches.* The Department seeks to understand the effects of market forces and voluntary programs on encouraging the purchase of energy efficient products so that the incremental impacts of a new or revised standard can be accurately assessed and the Department can make informed decisions about where standards and voluntary ''market pull'' programs can be used most effectively. Under the guidelines in this Appendix, DOE will solicit information on the effectiveness of market forces and non-regulatory approaches for encouraging the purchase of energy efficient products, and will carefully consider this information in assessing the benefits of standards. In addition, DOE will continue to support voluntary efforts by manufacturers, retailers, utilities and others to increase product efficiency.

(f) *Conduct thorough analysis of impacts.* In addition to understanding the aggregate costs and benefits of standards, the Department seeks to understand the distribution of those costs and benefits among consumers, manufacturers and others, and the uncertainty associated with these analyses of costs and benefits, so that any adverse impacts on significant subgroups and uncertainty concerning any adverse impacts can be fully considered in selecting a standard. Under the guidelines in this Appendix, the analyses will consider the variability of impacts on significant groups of manufacturers and consumers in addition to aggregate costs and benefits, report the range of uncertainty associated with these impacts, and take into account cumulative impacts of regulation on manufacturers.

(g) *Use transparent and robust analytical methods.* The Department seeks to use qualitative and quantitative analytical methods that are fully documented for the public and that produce results that can be explained and reproduced, so that the analytical underpinnings for policy decisions on standards are as sound and well-accepted as possible. Under the guidelines in this Appendix, DOE will solicit input from interested parties in identifying analysis, data, and modeling needs with respect to measurement of impacts on manufacturers and consumers.

(h) *Articulate policies to guide selection of standards.* The Department seeks to adopt policies elaborating on the statutory criteria for selecting standards, so that interested parties are aware of the policies that will guide these decisions. Under the guidelines in this Appendix, policies for screening design options, selecting candidate standard levels, selecting a proposed standard level, and establishing the final standard are established.

(i) *Support efforts to build consensus on standards.* The Department seeks to encourage development of consensus proposals for new or revised standards because standards with such broad-based support are likely to balance effectively the economic, energy, and environmental interests affected by standards. Under the guidelines in this Appendix, DOE will support the development and submission of consensus recommendations for standards by representative groups of interested parties to the fullest extent possible.

(j) *Reduce time and cost of developing standards.* The Department seeks to establish a clear protocol for initiating and conducting standards rulemakings in order to eliminate time-consuming and costly missteps. Under

the guidelines in this Appendix, increased and earlier involvement by interested parties and increased use of technical experts should minimize the need for re-analysis. This process should reduce the period between the publication of an Advance Notice of Proposed Rulemaking (ANOPR) and the publication of a final rule to not more than 18 months, and should decrease the government and private sector resources required to complete the standard development process.

2. Scope

(a) The procedures, interpretations and policies described in this Appendix will be fully applicable to:

(1) Rulemakings concerning new or revised Federal energy conservation standards for consumer products initiated after August 14, 1996, and

(2) Rulemakings concerning new or revised Federal energy conservation standards for consumer products that have been initiated but for which a Notice of Proposed Rulemaking (NOPR) has not been published as of August 14, 1996.

(b) For rulemakings described in paragraph (a)(2) of this section, to the extent analytical work has already been done or public comment on an ANOPR has already been provided, such analyses and comment will be considered, as appropriate, in proceeding under the new process.

(c) With respect to incomplete rulemakings concerning new or revised Federal energy conservation standards for consumer products for which a NOPR was published prior to August 14, 1996, the Department will conduct a case-by-case review to decide whether any of the analytical or procedural steps already completed should be repeated. In any case, the approach described in this Appendix will be used to the extent possible to conduct any analytical or procedural steps that have not been completed.

3. Setting Priorities for Rulemaking Activity

(a) *Priority-setting analysis and development of list of priorities.* At least once a year, the Department will prepare an analysis of each of the factors identified in paragraph (d) of this section based on existing literature, direct communications with interested parties and other experts, and other available information. The results of this analysis will be used to develop rulemaking priorities and proposed schedules for the development and issuance of all rulemakings. The DOE analysis, priorities and proposed rulemaking schedules will be documented and distributed for review and comment.

(b) *Public review and comment.* Each year, DOE will invite public input to review and comment on the priority analysis.

(c) *Issuance of final listing of rulemaking priorities.* Each fall, the Department will issue, simultaneously with the issuance of the Administration's Regulatory Agenda, a final set of rulemaking priorities, the accompanying analysis, and the schedules for all priority rulemakings that it anticipates within the next two years.

(d) *Factors for priority-setting.* The factors to be considered by DOE in developing priorities and establishing schedules for conducting rulemakings will include:

(1) Potential energy savings.

(2) Potential economic benefits.

(3) Potential environmental or energy security benefits.

(4) Applicable deadlines for rulemakings.

(5) Incremental DOE resources required to complete rulemaking process.

(6) Other relevant regulatory actions affecting products.

(7) Stakeholder recommendations.

(8) Evidence of energy efficiency gains in the market absent new or revised standards.

(9) Status of required changes to test procedures.

(10) Other relevant factors.

4. Process for Developing Efficiency Standards and Factors to be Considered

This section describes the process to be used in developing efficiency standards and the factors to be considered in the process. The policies of the Department to guide the selection of standards and the decisions preliminary thereto are described in section 5.

(a) *Identifying and screening design options.* Once the Department has initiated a rulemaking for a specific product but before publishing an ANOPR, DOE will identify the product categories and design options to be analyzed in detail, and identify those design options eliminated from further consideration. Interested parties will be consulted to identify key issues, develop a list of design options, and to help the Department identify the expertise necessary to conduct the analysis.

(1) *Identification of issues for analysis.* The Department, in consultation with interested parties, will identify issues that will be examined in the standards development process.

(2) *Identification of experts and other interested parties for peer review.* DOE, in consultation with interested parties, will identify a group of independent experts and other interested parties who can provide expert review of the results of the engineering analysis and the subsequent impact analysis.

(3) *Identification and screening of design options.* In consultation with interested parties, the Department will develop a list of design options for consideration. Initially, the candidate design options will encompass all

those technologies considered to be technologically feasible. Following the development of this initial list of design options, DOE will review each design option based on the factors described in paragraph (a)(4) of this section and the policies stated in section 5(b). The reasons for eliminating any design option at this stage of the process will be fully documented and published as part of the ANOPR. The technologically feasible design options that are not eliminated in this screening will be considered further in the Engineering Analysis described in paragraph (b) of this section.

(4) *Factors for screening of design options.* The factors for screening design options include:

(i) Technological feasibility. Technologies incorporated in commercial products or in working prototypes will be considered technologically feasible.

(ii) Practicability to manufacture, install and service. If mass production of a technology in commercial products and reliable installation and servicing of the technology could be achieved on the scale necessary to serve the relevant market at the time of the effective date of the standard, then that technology will be considered practicable to manufacture, install and service.

(iii) Adverse Impacts on Product Utility or Product Availability.

(iv) Adverse Impacts on Health or Safety.

(5) *Selection of contractors.* Using the specifications of necessary contractor expertise developed in consultation with interested parties, DOE will select appropriate contractors, subcontractors, and as necessary, expert consultants to perform the engineering analysis and the impact analysis.

(b) *Engineering analysis of design options and selection of candidate standard levels.* After design options are identified and screened, DOE will perform the engineering analysis and the benefit/cost analysis and select the candidate standard levels based on these analyses. The results of the analyses will be published in a Technical Support Document (TSD) to accompany the ANOPR.

(1) *Identification of engineering analytical methods and tools.* DOE, in consultation with outside experts, will select the specific engineering analysis tools (or multiple tools, if necessary to address uncertainty) to be used in the analysis of the design options identified as a result of the screening analysis.

(2) *Engineering and life-cycle cost analysis of design options.* The DOE and its contractor will perform engineering and life-cycle cost analyses of the design options.

(3) *Review by expert group and stakeholders.* The results of the engineering and life-cycle cost analyses will be distributed for review by experts and interested parties. If appropriate, a public workshop will be conducted to review these results. The analyses will be revised as appropriate on the basis of this input.

(4) *New information relating to the factors used for screening design options.* If further information or analysis leads to a determination that a design option, or a combination of design options, has unacceptable impacts based on the policies stated in section 5(b), that design option or combination of design options will not be included in a candidate standard level.

(5) *Selection of candidate standard levels.* Based on the results of the engineering and life-cycle cost analysis of design options and the policies stated in section 5(c), DOE will select the candidate standard levels for further analysis.

(c) *Advance Notice of Proposed Rulemaking.*

(1) *Documentation of decisions on candidate standard selection.* (i) If the screening analysis indicates that continued development of a standard is appropriate, the Department will publish an ANOPR in the FEDERAL REGISTER and will distribute a draft TSD containing the analyses performed to this point. The ANOPR will specify candidate standard levels but will not propose a particular standard. The ANOPR will also include the preliminary analysis of consumer life-cycle costs, national net present value, and energy impacts for the candidate standard levels based on the engineering analysis.

(ii) If the preliminary analysis indicates that no candidate standard level is likely to meet the criteria specified in law, that conclusion will be announced. In such cases, the Department may decide to proceed with a rulemaking that proposes not to adopt new or amended standards, or it may suspend the rulemaking and conclude that further action on such standards should be assigned a low priority under section 3.

(2) *Public comment and hearing.* There will be 75 days for public comment on the ANOPR with at least one public hearing or workshop.

(3) *Revisions based on comments.* Based on consideration of the comments received, any necessary changes to the engineering analysis or the candidate standard levels will be made.

If major changes are required at this stage, interested parties and experts will be given an opportunity to review the revised analysis.

(d) *Analysis of impacts and selection of proposed standard level.* After the ANOPR, economic analyses of the impacts of the candidate standard levels will be conducted. The Department will propose updated standards based on the results of the impact analysis.

(1) *Identification of issues for analysis.* The Department, in consultation with interested parties, will identify issues that will be examined in the impacts analysis.

(2) *Identification of analytical methods and tools.* DOE, in consultation with outside experts, will select the specific economic analysis tools (or multiple tools if necessary to address uncertainty) to be used in the analysis of the candidate standard levels.

(3) *Analysis of impacts.* DOE will conduct the analysis of the impacts of candidate standard levels including analysis of the factors described in paragraphs (d)(7)(ii)–(viii) of this section.

(4) *Review by expert group and stakeholders.* The results of the analysis of impacts will be distributed for review by experts and interested parties. If appropriate, a public workshop will be conducted to review these results. The analysis will be revised as appropriate on the basis of this input.

(5) *Efforts to develop consensus among stakeholders.* If a representative group of interested parties undertakes to develop joint recommendations to the Department on standards, DOE will consider deferring its impact analysis until these discussions are completed or until participants in the efforts indicate that they are unable to reach a timely agreement.

(6) *Selection of proposed standard level based on analysis of impacts.* On the basis of the analysis of the factors described in paragraph (d)(7) of this section and the policies stated in section 5(e), DOE will select a proposed standard level.

(7) *Factors to be considered in selecting a proposed standard.* The factors to be considered in selection of a proposed standard include:

(i) Consensus stakeholder recommendations.

(ii) Impacts on manufacturers. The analysis of manufacturer impacts will include: Estimated impacts on cash flow; assessment of impacts on manufacturers of specific categories of products and small manufacturers; assessment of impacts on manufacturers of multiple product-specific Federal regulatory requirements, including efficiency standards for other products and regulations of other agencies; and impact on manufacturing capacity, plant closures, and loss of capital investment.

(iii) Impacts on consumers. The analysis of consumer impacts will include: Estimated impacts on consumers based on national average energy prices and energy usage; assessments of impacts on subgroups of consumers based on major regional differences in usage or energy prices and significant variations in installation costs or performance; sensitivity analyses using high and low discount rates and high and low energy price forecasts; consideration of changes to product utility and other impacts of likely concern to all or some consumers, based to the extent practicable on direct input from consumers; estimated life-cycle cost with sensitivity analysis; and consideration of the increased first cost to consumers and the time required for energy cost savings to pay back these first costs.

(iv) Impacts on competition.

(v) Impacts on utilities. The analysis of utility impacts will include estimated marginal impacts on electric and gas utility costs and revenues.

(vi) National energy, economic and employment impacts. The analysis of national energy, economic and employment impacts will include: Estimated energy savings by fuel type; estimated net present value of benefits to all consumers; and estimates of the direct and indirect impacts on employment by appliance manufacturers, relevant service industries, energy suppliers and the economy in general.

(vii) Impacts on the environment and energy security. The analysis of environmental and energy security impacts will include estimated impacts on emissions of carbon and relevant criteria pollutants, impacts on pollution control costs, and impacts on oil use.

(viii) Impacts of non-regulatory approaches. The analysis of energy savings and consumer impacts will incorporate an assessment of the impacts of market forces and existing voluntary programs in promoting product efficiency, usage and related characteristics in the absence of updated efficiency standards.

(ix) New information relating to the factors used for screening design options.

(e) *Notice of Proposed Rulemaking.*

(1) *Documentation of decisions on proposed standard selection.* The Department will publish a NOPR in the FEDERAL REGISTER that proposes standard levels and explains the basis for the selection of those proposed levels, and will distribute a draft TSD documenting the analysis of impacts. As required by §325(p)(2) of EPCA, the NOPR also will describe the maximum improvement in energy efficiency or maximum reduction in energy use that is technologically feasible and, if the proposed standards would not achieve these levels, the reasons for proposing different standards.

(2) *Public comment and hearing.* There will be 75 days for public comment on the NOPR, with at least one public hearing or workshop.

(3) *Revisions to impact analyses and selection of final standard.* Based on the public comments received and the policies stated in section 5(f), DOE will review the proposed standard and impact analyses, and make modifications as necessary. If major changes to the analyses are required at this stage, interested parties and experts will be given an opportunity to review the revised analyses.

(f) *Notice of Final Rulemaking.* The Department will publish a Notice of Final Rulemaking in the FEDERAL REGISTER that promulgates standard levels and explains the basis for the selection of those standards, accompanied by a final TSD.

5. Policies on Selection of Standards.

(a) *Purpose.* (1) Section 4 describes the process that will be used to consider new or revised energy efficiency standards and lists a number of factors and analyses that will be considered at specified points in the process. Department policies concerning the selection of new or revised standards, and decisions preliminary thereto, are described in this section.

These policies are intended to elaborate on the statutory criteria provided in section 325 of the EPCA, 42 U.S.C. 6295.

(2) The policies described below are intended to provide guidance for making the determinations required by EPCA. This statement of policy is not intended to preclude consideration of any information pertinent to the statutory criteria. The Department will consider all pertinent information in determining whether a new or revised standard is consistent with the statutory criteria. Moreover, the Department will not be guided by a policy in this section if, in the particular circumstances presented, such a policy would lead to a result inconsistent with the criteria in section 325 of EPCA.

(b) *Screening design options.* Section 4(a)(4) lists factors to be considered in screening design options. These factors will be considered as follows in determining whether a design option will receive any further consideration:

(1) *Technological feasibility*. Technologies that are not incorporated in commercial products or in working prototypes will not be considered further.

(2) *Practicability to manufacture, install and service.* If it is determined that mass production of a technology in commercial products and reliable installation and servicing of the technology could not be achieved on the scale necessary to serve the relevant market at the time of the effective date of the standard, then that technology will not be considered further.

(3) *Impacts on product utility to consumers.* If a technology is determined to have significant adverse impact on the utility of the product to significant subgroups of consumers, or result in the unavailability of any covered product type with performance characteristics (including reliability), features, sizes, capacities, and volumes that are substantially the same as products generally available in the U.S. at the time, it will not be considered further.

(4) *Safety of technologies.* If it is determined that a technology will have significant adverse impacts on health or safety, it will not be considered further.

(c) *Identification of candidate standard levels.* Based on the results of the engineering and cost and benefit analyses of design options, DOE will identify the candidate standard levels for further analysis. Candidate standard levels will be selected as follows:

(1) *Costs and savings of design options.* Design options which have payback periods that exceed the average life of the product or which cause life-cycle cost increases relative to the base case, using typical fuel costs, usage and discount rates, will not be used as the basis for candidate standard levels.

(2) *Further information on factors used for screening design options.* If further information or analysis leads to a determination that a design option, or a combination of design options, has unacceptable impacts under the policies stated in paragraph (b) of this section, that design option or combination of design options will not be included in a candidate standard level.

(3) *Selection of candidate standard levels.* Candidate standard levels, which will be identified in the ANOPR and on which impact analyses will be conducted, will be based on the remaining design options.

(i) The range of candidate standard levels will typically include:

(A) The most energy efficient combination of design options;

(B) The combination of design options with the lowest life-cycle cost; and

(C) A combination of design options with a payback period of not more than three years.

(ii) Candidate standard levels that incorporate noteworthy technologies or fill in large gaps between efficiency levels of other candidate standard levels also may be selected.

(d) *Advance notice of proposed rulemaking.* New information provided in public comments on the ANOPR will be considered to determine whether any changes to the candidate standard levels are needed before proceeding to the analysis of impacts. This review, and any appropriate adjustments, will be based on the policies in paragraph (c) of this section.

(e) *Selection of proposed standard.* Based on the results of the analysis of impacts, DOE will select a standard level to be proposed for public comment in the NOPR. Section 4(d)(7) lists the factors to be considered in selecting a proposed standard level. Section 325(o)(2)(A) of EPCA provides that any new or revised standard must be designed to achieve the maximum improvement in energy efficiency that is determined to be technologically feasible and economically justified.

(1) *Statutory policies.* The fundamental policies concerning selection of standards are established in the EPCA, including the following:

(i) A candidate standard level will not be proposed or promulgated if the Department determines that it is not technologically feasible and economically justified. See EPCA section 325(o)(3)(B). A standard level is economically justified if the benefits exceed the

burdens. See EPCA section 325(o)(2)(B)(i). A standard level is rebuttably presumed to be economically justified if the payback period is three years or less. See EPCA section 325(o)(2)(B)(iii).

(ii) If the Department determines that a standard level is likely to result in the unavailability of any covered product type with performance characteristics (including reliability), features, sizes, capacities, and volumes that are substantially the same as products generally available in the U.S. at the time, that standard level will not be proposed. See EPCA section 325(o)(4).

(iii) If the Department determines that a standard level would not result in significant conservation of energy, that standard level will not be proposed. See EPCA section 325(o)(3)(B).

(2) *Selection of proposed standard on the basis of consensus stakeholder recommendations.* Development of consensus proposals for new or revised standards is an effective mechanism for balancing the economic, energy, and environmental interests affected by standards. Thus, notwithstanding any other policy on selection of proposed standards, a consensus recommendation on an updated efficiency level submitted by a group that represents all interested parties will be proposed by the Department if it is determined to meet the statutory criteria.

(3) *Considerations in assessing economic justification.*

(i) The following policies will guide the application of the economic justification criterion in selecting a proposed standard:

(A) If the Department determines that a candidate standard level would result in a negative return on investment for the industry, would significantly reduce the value of the industry, or would cause significant adverse impacts to a significant subgroup of manufacturers (including small manufacturing businesses), that standard level will be presumed not to be economically justified unless the Department determines that specifically identified expected benefits of the standard would outweigh this and any other expected adverse effects.

(B) If the Department determines that a candidate standard level would be the direct cause of plant closures, significant losses in domestic manufacturer employment, or significant losses of capital investment by domestic manufacturers, that standard level will be presumed not to be economically justified unless the Department determines that specifically identified expected benefits of the standard would outweigh this and any other expected adverse effects.

(C) If the Department determines that a candidate standard level would have a significant adverse impact on the environment or energy security, that standard level will be presumed not to be economically justified unless the Department determines that specifically identified expected benefits of the standard would outweigh this and any other expected adverse effects.

(D) If the Department determines that a candidate standard level would not result in significant energy conservation relative to non-regulatory approaches, that standard level will be presumed not to be economically justified unless the Department determines that other specifically identified expected benefits of the standard would outweigh the expected adverse effects.

(E) If the Department determines that a candidate standard level is not consistent with the policies relating to practicability to manufacture, consumer utility, or safety in paragraphs (b) (2), (3) and (4) of this section, that standard level will be presumed not to be economically justified unless the Department determines that specifically identified expected benefits of the standard would outweigh this and any other expected adverse effects.

(F) If the Department determines that a candidate standard level is not consistent with the policies relating to consumer costs in paragraph (c)(1) of this section, that standard level will be presumed not to be economically justified unless the Department determines that specifically identified expected benefits of the standard would outweigh this and any other expected adverse effects.

(G) If the Department determines that a candidate standard level will have significant adverse impacts on a significant subgroup of consumers (including low-income consumers), that standard level will be presumed not to be economically justified unless the Department determines that specifically identified expected benefits of the standard would outweigh this and any other expected adverse effects.

(H) If the Department or the Department of Justice determines that a candidate standard level would have significant anticompetitive effects, that standard level will be presumed not to be economically justified unless the Department determines that specifically identified expected benefits of the standard would outweigh this and any other expected adverse effects.

(ii) The basis for a determination that triggers any presumption in paragraph (e)(3)(i) of this section and the basis for a determination that an applicable presumption has been rebutted will be supported by substantial evidence in the record and the evidence and rationale for making these determinations will be explained in the NOPR.

(iii) If none of the policies in paragraph (e)(3)(i) of this section is found to be dispositive, the Department will determine whether the benefits of a candidate standard level exceed the burdens considering all the pertinent information in the record.

(f) *Selection of a final standard.* New information provided in the public comments on the NOPR and any analysis by the Department of Justice concerning impacts on competition of the proposed standard will be considered to determine whether any change to the proposed standard level is needed before proceeding to the final rule. The same policies used to select the proposed standard level, as described in section 5(e) above, will be used to guide the selection of the final standard level.

6. Effective Date of a Standard

The effective date for new or revised standards will be established so that the period between the publication of the final rule and the effective date is not less than any period between the dates for publication and effective date provided for in EPCA. The effective date of any revised standard will be established so that the period between the effective date of the prior standard and the effective date of such revised standard is not less than period between the two effective dates provided for in EPCA.

7. Test Procedures

(a) *Identifying the need to modify test procedures.* DOE, in consultation with interested parties, experts, and the National Institute of Standards and Technology, will attempt to identify any necessary modifications to established test procedures when initiating the standards development process.

(b) *Developing and proposing revised test procedures.* Needed modifications to test procedures will be identified in consultation with experts and interested parties early in the screening stage of the standards development process. Any necessary modifications will be proposed before issuance of an ANOPR in the standards development process.

(c) *Issuing final test procedure modification.* Final, modified test procedures will be issued prior to the NOPR on proposed standards.

(d) *Effective date of modified test procedures.* If required only for the evaluation and issuance of updated efficiency standards, modified test procedures typically will not go into effect until the effective date of updated standards.

8. Joint Stakeholder Recommendations

(a) *Joint recommendations.* Consensus recommendations, and supporting analyses, submitted by a representative group of interested parties will be given substantial weight by DOE in the development of a proposed rule. See section 5(e)(2). If the supporting analyses provided by the group addresses all of the statutory criteria and uses valid economic assumptions and analytical methods, DOE expects to use this supporting analyses as the basis of a proposed rule. The proposed rule will explain any deviations from the consensus recommendations from interested parties.

(b) *Breadth of participation.* Joint recommendations will be of most value to the Department if the participants are reasonably representative of those interested in the outcome of the standards development process, including manufacturers, consumers, utilities, states and representatives of environmental or energy efficiency interest groups.

(c) *DOE support of consensus development, including impact analyses.* In order to facilitate such consensus development, DOE will make available, upon request, appropriate technical and legal support to the group and will provide copies of all relevant public documents and analyses. The Department also will consider any requests for its active participation in such discussions, recognizing that the procedural requirements of the Federal Advisory Committee Act may apply to such participation.

9. Principles for the Conduct of Engineering Analysis

(a) The purpose of the engineering analysis is to develop the relationship between efficiency and cost of the subject product. The Department will use the most appropriate means available to determine the efficiency/cost relationship, including an overall system approach or engineering modeling to predict the improvement in efficiency that can be expected from individual design options as discussed in the paragraphs below. From this efficiency/cost relationship, measures such as payback, life cycle cost, and energy savings can be developed. The Department, in consultation with interested parties, will identify issues that will be examined in the engineering analysis and the types of specialized expertise that may be required. With these specifications, DOE will select appropriate contractors, subcontractors, and expert consultants, as necessary, to perform the engineering analysis and the impact analysis. Also, the Department will consider data, information and analyses received from interested parties for use in the analysis wherever feasible.

(b) The engineering analysis begins with the list of design options developed in consultation with the interested parties as a result of the screening process. In consultation with the technology/industry expert peer review group, the Department will establish the likely cost and performance improvement of each design option. Ranges and uncertainties of cost and performance will be established, although efforts will be made to minimize uncertainties by using measures such as test data or component or material supplier information where available. Estimated uncertainties will be carried forward

in subsequent analyses. The use of quantitative models will be supplemented by qualitative assessments as appropriate.

(c) The next step includes identifying, modifying or developing any engineering models necessary to predict the efficiency impact of any one or combination of design options on the product. A base case configuration or starting point will be established as well as the order and combination/blending of the design options to be evaluated. The DOE, utilizing expert consultants, will then perform the engineering analysis and develop the cost efficiency curve for the product. The cost efficiency curve and any necessary models will be subject to peer review before being issued with the ANOPR.

10. Principles for the Analysis of Impacts on Manufacturers

(a) *Purpose.* The purpose of the manufacturer analysis is to identify the likely impacts of efficiency standards on manufacturers. The Department will analyze the impact of standards on manufacturers with substantial input from manufacturers and other interested parties. The use of quantitative models will be supplemented by qualitative assessments by industry experts. This section describes the principles that will be used in conducting future manufacturing impact analysis.

(b) *Issue identification.* In the impact analysis stage (section 4(d)), the Department, in consultation with interested parties, will identify issues that will require greater consideration in the detailed manufacturer impact analysis. Possible issues may include identification of specific types or groups of manufacturers and concerns over access to technology. Specialized contractor expertise, empirical data requirements, and analytical tools required to perform the manufacturer impact analysis also would be identified at this stage.

(c) *Industry characterization.* Prior to initiating detailed impact studies, the Department will seek input on the present and past industry structure and market characteristics. Input on the following issues will be sought:

(1) Manufacturers and their relative market shares;

(2) Manufacturer characteristics, such as whether manufacturers make a full line of models or serve a niche market;

(3) Trends in the number of manufacturers;

(4) Financial situation of manufacturers;

(5) Trends in product characteristics and retail markets; and

(6) Identification of other relevant regulatory actions and a description of the nature and timing of any likely impacts.

(d) *Cost impacts on manufacturers.* The costs of labor, material, engineering, tooling, and capital are difficult to estimate, manufacturer-specific, and usually proprietary. The Department will seek input from interested parties on the treatment of cost issues. Manufacturers will be encouraged to offer suggestions as to possible sources of data and appropriate data collection methodologies. Costing issues to be addressed include:

(1) Estimates of total cost impacts, including product-specific costs (based on cost impacts estimated for the engineering analysis) and front-end investment/conversion costs for the full range of product models.

(2) Range of uncertainties in estimates of average cost, considering alternative designs and technologies which may vary cost impacts and changes in costs of material, labor and other inputs which may vary costs.

(3) Variable cost impacts on particular types of manufacturers, considering factors such as atypical sunk costs or characteristics of specific models which may increase or decrease costs.

(e) *Impacts on product sales, features, prices and cost recovery.* In order to make manufacturer cash flow calculations, it is necessary to predict the number of products sold and their sale price. This requires an assessment of the likely impacts of price changes on the number of products sold and on typical features of models sold. Past analyses have relied on price and shipment data generated by economic models. The Department will develop additional estimates of prices and shipments by drawing on multiple sources of data and experience including: actual shipment and pricing experience, data from manufacturers, retailers and other market experts, financial models, and sensitivity analyses. The possible impacts of candidate standard levels on consumer choices among competing fuels will be explicitly considered where relevant.

(f) *Measures of impact.* The manufacturer impact analysis will estimate the impacts of candidate standard levels on the net cash flow of manufacturers. Computations will be performed for the industry as a whole and for typical and atypical manufacturers. The exact nature and the process by which the analysis will be conducted will be determined by DOE, in conjunction with interested parties. Impacts to be analyzed include:

(1) Industry net present value, with sensitivity analyses based on uncertainty of costs, sales prices and sales volumes;

(2) Cash flows, by year;

(3) Other measures of impact, such as revenue, net income and return on equity, as appropriate;

The characteristics of atypical manufacturers worthy of special consideration will be determined in consultation with manufacturers and other interested parties and may include: manufacturers incurring higher or lower than average costs; and manufacturers experiencing greater or fewer adverse impacts on sales. Alternative scenarios based

on other methods of estimating cost or sales impacts also will be performed, as needed.

(g) *Cumulative impacts of other Federal regulatory actions.* (1) The Department will recognize and seek to mitigate the overlapping effects on manufacturers of new or revised DOE standards and other regulatory actions affecting the same products. DOE will analyze and consider the impact on manufacturers of multiple product-specific regulatory actions. These factors will be considered in setting rulemaking priorities, assessing manufacturer impacts of a particular standard, and establishing the effective date for a new or revised standard. In particular, DOE will seek to propose effective dates for new or revised standards that are appropriately coordinated with other regulatory actions to mitigate any cumulative burden.

(2) If the Department determines that a proposed standard would impose a significant impact on product manufacturers within three years of the effective date of another DOE standard that imposes significant impacts on the same manufacturers (or divisions thereof, as appropriate), the Department will, in addition to evaluating the impact on manufacturers of the proposed standard, assess the joint impacts of both standards on manufacturers.

(3) If the Department is directed to establish or revise standards for products that are components of other products subject to standards, the Department will consider the interaction between such standards in setting rulemaking priorities and assessing manufacturer impacts of a particular standard. The Department will assess, as part of the engineering and impact analyses, the cost of components subject to efficiency standards.

(h) *Summary of quantitative and qualitative assessments.* The summary of quantitative and qualitative assessments will contain a description and discussion of uncertainties. Alternative estimates of impacts, resulting from the different potential scenarios developed throughout the analysis, will be explicitly presented in the final analysis results.

(i) *Key modeling and analytical tools.* In its assessment of the likely impacts of standards on manufacturers, the Department will use models which are clear and understandable, feature accessible calculations, and have assumptions that are clearly explained. As a starting point, the Department will use the Government Regulatory Impact Model (GRIM). The Department will consider any enhancements to the GRIM that are suggested by interested parties. If changes are made to the GRIM methodology, DOE will provide notice and seek public input. The Department will also support the development of economic models for price and volume forecasting. Research required to update key economic data will be considered.

11. Principles for the Analysis of Impacts on Consumers

(a) *Early consideration of impacts on consumer utility.* The Department will consider at the earliest stages of the development of a standard whether particular design options will lessen the utility of the covered products to the consumer. See section 4(a).

(b) *Impacts on product availability.* The Department will determine, based on consideration of information submitted during the standard development process, whether a proposed standard is likely to result in the unavailability of any covered product type with performance characteristics (including reliability), features, sizes, capacities, and volumes that are substantially the same as products generally available in the U.S. at the time. DOE will not promulgate a standard if it concludes that it would result in such unavailability.

(c) *Department of justice review.* As required by law, the Department will solicit the views of the Justice Department on any lessening of competition that is likely to result from the imposition of a proposed standard and will give the views provided full consideration in assessing economic justification of a proposed standard. In addition, DOE may consult with the Department of Justice at earlier stages in the standards development process to seek to obtain preliminary views on competitive impacts.

(d) *Variation in consumer impacts.* The Department will use regional analysis and sensitivity analysis tools, as appropriate, to evaluate the potential distribution of impacts of candidate standards levels among different subgroups of consumers. The Department will consider impacts on significant segments of consumers in determining standards levels. Where there are significant negative impacts on identifiable subgroups, DOE will consider the efficacy of voluntary approaches as a means to achieve potential energy savings.

(e) *Payback period and first cost.* (1) In the assessment of consumer impacts of standards, the Department will consider Life-Cycle Cost, Payback Period and Cost of Conserved Energy to evaluate the savings in operating expenses relative to increases in purchase price. The Department intends to increase the level of sensitivity analysis and scenario analysis for future rulemakings. The results of these analyses will be carried throughout the analysis and the ensuing uncertainty described.

(2) If, in the analysis of consumer impacts, the Department determines that a candidate standard level would result in a substantial increase in the product first costs to consumers or would not pay back such additional first costs through energy cost savings in less than three years, Department will specifically assess the likely impacts of

such a standard on low-income households, product sales and fuel switching.

12. Consideration of Non-Regulatory Approaches

(a) The Department recognizes that voluntary or other non-regulatory efforts by manufacturers, utilities and other interested parties can result in substantial efficiency improvements. The Department intends to consider fully the likely effects of non-regulatory initiatives on product energy use, consumer utility and life cycle costs, manufacturers, competition, utilities and the environment, as well as the distribution of these impacts among different regions, consumers, manufacturers and utilities. DOE will attempt to base its assessment on the actual impacts of such initiatives to date, but also will consider information presented regarding the impacts that any existing initiative might have in the future. Such information is likely to include a demonstration of the strong commitment of manufacturers, distribution channels, utilities or others to such voluntary efficiency improvements. This information will be used in assessing the likely incremental impacts of establishing or revising standards, in assessing appropriate effective dates for new or revised standards and in considering DOE support of non-regulatory initiatives.

(b) DOE believes that non-regulatory approaches are valuable complements to the standards program. In particular, DOE will consider pursuing voluntary programs where it appears that highly efficient products can obtain a significant market share but less efficient products cannot be eliminated altogether because, for instance, of unacceptable adverse impacts on a significant subgroup of consumers. In making this assessment, the Department will consider the success more efficient designs have had in the market, their acceptance to date, and their potential market penetration.

13. Crosscutting Analytical Assumptions

In selecting values for certain crosscutting analytical assumptions, DOE expects to continue relying upon the following sources and general principles:

(a) *Underlying economic assumptions.* The appliance standards analyses will generally use the same economic growth and development assumptions that underlie the most current Annual Energy Outlook (AEO) published by the Energy Information Administration (EIA).

(b) *Energy price and demand trends.* Analyses of the likely impact of appliance standards on typical users will generally adopt the mid-range energy price and demand scenario of the EIA's most current AEO. The sensitivity of such estimated impacts to possible variations in future energy prices are likely to be examined using the EIA's high and low energy price scenarios.

(c) *Product-specific energy-efficiency trends, without updated standards.* Product specific energy-efficiency trends will be based on a combination of the efficiency trends forecast by the EIA's residential and commercial demand model of the National Energy Modeling System (NEMS) and product-specific assessments by DOE and its contractors with input from interested parties.

(d) *Discount rates.* For residential and commercial consumers, ranges of three different real discount rates will be used. For residential consumers, the mid-range discount rate will represent DOE's approximation of the average financing cost (or opportunity costs of reduced savings) experienced by typical consumers. Sensitivity analyses will be performed using discount rates reflecting the costs more likely to be experienced by residential consumers with little or no savings and credit card financing and consumers with substantial savings. For commercial users, a mid-range discount rate reflecting the DOE's approximation of the average real rate of return on commercial investment will be used, with sensitivity analyses being performed using values indicative of the range of real rates of return likely to be experienced by typical commercial businesses. For national net present value calculations, DOE would use the Administration's approximation of the average real rate of return on private investment in the U.S. economy. For manufacturer impacts, DOE plans to use a range of real discount rates which are representative of the real rates of return experienced by typical U.S. manufacturers affected by the program.

(e) *Environmental impacts.* The emission rates of carbon, sulfur oxides and nitrogen oxides used by DOE to calculate the physical quantities of emissions likely to be avoided by candidate standard levels will be based on the current average carbon emissions of the U.S. electric utilities and on the projected rates of emissions of sulfur and nitrogen oxides. Projected rates of emissions, if available, will be used for the estimation of any other environmental impacts. The Department will consider the effects of the proposed standards on these emissions in reaching a decision about whether the benefits of the proposed standards exceed their burdens but will not determine the monetary value of these environmental externalities.

14. Deviations, Revisions, and Judicial Review

(a) *Deviations.* This Appendix specifies procedures, interpretations and policies for the development of new or revised energy efficiency standards in considerable detail. As the approach described in this Appendix is applied to the development of particular standards, the Department may find it necessary or appropriate to deviate from these

procedures, interpretations or policies. If the Department concludes that such deviations are necessary or appropriate in a particular situation, DOE will provide interested parties with notice of the deviation and an explanation.

(b) *Revisions.* If the Department concludes that changes to the procedures, interpretations or policies in this Appendix are necessary or appropriate, DOE will provide notice in the FEDERAL REGISTER of modifications to this Appendix with an accompanying explanation. DOE expects to consult with interested parties prior to any such modification.

(c) *Judicial review.* The procedures, interpretations, and policies stated in this Appendix are not intended to establish any new cause of action or right to judicial review.

[61 FR 36981, July 15, 1996]

Subpart D—Petitions To Exempt State Regulation From Preemption; Petitions to Withdraw Exemption of State Regulation

SOURCE: 54 FR 6078, Feb. 7, 1989, unless otherwise noted.

§ 430.40 Purpose and scope.

(a) This subpart prescribes the procedures to be followed in connection with petitions requesting a rule that a State regulation prescribing an energy conservation standard, water conservation standard (in the case of faucets, showerheads, water closets, and urinals), or other requirement respecting energy efficiency, energy use, or water use (in the case of faucets, showerheads, water closets, and urinals) of a type (or class) of covered product not be preempted.

(b) This subpart also prescribes the procedures to be followed in connection with petitions to withdraw a rule exempting a State regulation prescribing an energy conservation standard, water conservation standard (in the case of faucets, showerheads, water closets, and urinals), or other requirement respecting energy efficiency, energy use, or water use (in the case of faucets, showerheads, water closets, and urinals) of a type (or class) of covered product.

[63 FR 13318, Mar. 18, 1998]

§ 430.41 Prescriptions of a rule.

(a) *Criteria for exemption from preemption.* Upon petition by a State which has prescribed an energy conservation standard, water conservation standard (in the case of faucets, showerheads, water closets, and urinals), or other requirement for a type or class of covered equipment for which a Federal energy conservation standard or water conservation standard is applicable, the Secretary shall prescribe a rule that such standard not be preempted if he determines that the State has established by a preponderance of evidence that such requirement is needed to meet unusual and compelling State or local energy interests or water interests. For the purposes of this section, the term ''unusual and compelling State or local energy interests or water interests'' means interests which are substantially different in nature or magnitude than those prevailing in the U.S. generally, and are such that when evaluated within the context of the State's energy plan and forecast, or water plan and forecast the costs, benefits, burdens, and reliability of energy savings or water savings resulting from the State regulation make such regulation preferable or necessary when measured against the costs, benefits, burdens, and reliability of alternative approaches to energy savings or water savings or production, including reliance on reasonably predictable market-induced improvements in efficiency of all equipment subject to the State regulation. The Secretary may not prescribe such a rule if he finds that interested persons have established, by a preponderance of the evidence, that the State's regulation will significantly burden manufacturing, marketing, distribution, sale or servicing of the covered equipment on a national basis. In determining whether to make such a finding, the Secretary shall evaluate all relevant factors including: the extent to which the State regulation will increase manufacturing or distribution costs of manufacturers, distributors, and others; the extent to which the State regulation will disadvantage smaller manufacturers, distributors, or dealers or lessen competition in the sale of the covered product in the State; the extent to which the

State regulation would cause a burden to manufacturers to redesign and produce the covered product type (or class), taking into consideration the extent to which the regulation would result in a reduction in the current models, or in the projected availability of models, that could be shipped on the effective date of the regulation to the State and within the U.S., or in the current or projected sales volume of the covered product type (or class) in the State and the U.S.; and the extent to which the State regulation is likely to contribute significantly to a proliferation of State appliance efficiency requirements and the cumulative impact such requirements would have. The Secretary may not prescribe such a rule if he finds that such a rule will result in the unavailability in the State of any covered product (or class) of performance characteristics (including reliability), features, sizes, capacities, and volumes that are substantially the same as those generally available in the State at the time of the Secretary's finding. The failure of some classes (or types) to meet this criterion shall not affect the Secretary's determination of whether to prescribe a rule for other classes (or types).

(1) *Requirements of petition for exemption from preemption.* A petition from a State for a rule for exemption from preemption shall include the information listed in paragraphs (a)(1)(i) through (a)(1)(vi) of this section. A petition for a rule and correspondence relating to such petition shall be available for public review except for confidential or proprietary information submitted in accordance with the Department of Energy's Freedom of Information Regulations set forth in 10 CFR part 1004:

(i) The name, address, and telephone number of the petitioner;

(ii) A copy of the State standard for which a rule exempting such standard is sought;

(iii) A copy of the State's energy plan or water plan and forecast;

(iv) Specification of each type or class of covered product for which a rule exempting a standard is sought;

(v) Other information, if any, believed to be pertinent by the petitioner; and

(vi) Such other information as the Secretary may require.

(2) [Reserved]

(b) *Criteria for exemption from preemption when energy emergency conditions or water emergency conditions (in the case of faucets, showerheads, water closets, and urinals) exist within State.* Upon petition by a State which has prescribed an energy conservation standard or water conservation standard (in the case of faucets, showerheads, water closets, and urinals) or other requirement for a type or class of covered product for which a Federal energy conservation standard or water conservation standard is applicable, the Secretary may prescribe a rule, effective upon publication in the FEDERAL REGISTER, that such State regulation not be preempted if he determines that in addition to meeting the requirements of paragraph (a) of this section the State has established that: an energy emergency condition or water emergency condition exists within the State that imperils the health, safety, and welfare of its residents because of the inability of the State or utilities within the State to provide adequate quantities of gas, electric energy, or water to its residents at less than prohibitive costs; and cannot be substantially alleviated by the importation of energy or water or the use of interconnection agreements; and the State regulation is necessary to alleviate substantially such condition.

(1) *Requirements of petition for exemption from preemption when energy emergency conditions or water emergency conditions (in the case of faucets, showerheads, water closets, and urinals) exist within a State.* A petition from a State for a rule for exemption from preemption when energy emergency conditions or water emergency conditions exist within a State shall include the information listed in paragraphs (a)(1)(i) through (a)(1)(vi) of this section. A petition shall also include the information prescribed in paragraphs (b)(1)(i) through (b)(1)(iv) of this section, and shall be available for public

review except for confidential or proprietary information submitted in accordance with the Department of Energy's Freedom of Information Regulations set forth in 10 CFR part 1004:

(i) A description of the energy emergency condition or water emergency condition (in the case of faucets, showerheads, water closets, and urinals) which exists within the State, including causes and impacts.

(ii) A description of emergency response actions taken by the State and utilities within the State to alleviate the emergency condition;

(iii) An analysis of why the emergency condition cannot be alleviated substantially by importation of energy or water or the use of interconnection agreements; and

(iv) An analysis of how the State standard can alleviate substantially such emergency condition.

(2) [Reserved]

(c) *Criteria for withdrawal of a rule exempting a State standard.* Any person subject to a State standard which, by rule, has been exempted from Federal preemption and which prescribes an energy conservation standard or water conservation standard (in the case of faucets, showerheads, water closets, and urinals) or other requirement for a type or class of a covered product, when the Federal energy conservation standard or water conservation standard (in the case of faucets, showerheads, water closets, and urinals) for such product subsequently is amended, may petition the Secretary requesting that the exemption rule be withdrawn. The Secretary shall consider such petition in accordance with the requirements of paragraph (a) of this section, except that the burden shall be on the petitioner to demonstrate that the exemption rule received by the State should be withdrawn as a result of the amendment to the Federal standard. The Secretary shall withdraw such rule if he determines that the petitioner has shown the rule should be withdrawn.

(1) *Requirements of petition to withdraw a rule exempting a State standard.* A petition for a rule to withdraw a rule exempting a State standard shall include the information prescribed in paragraphs (c)(1)(i) through (c)(1)(vii) of this section, and shall be available for public review, except for confidential or proprietary information submitted in accordance with the Department of Energy's Freedom of Information Regulations set forth in 10 CFR part 1004:

(i) The name, address and telephone number of the petitioner;

(ii) A statement of the interest of the petitioner for which a rule withdrawing an exemption is sought;

(iii) A copy of the State standard for which a rule withdrawing an exemption is sought;

(iv) Specification of each type or class of covered product for which a rule withdrawing an exemption is sought;

(v) A discussion of the factors contained in paragraph (a) of this section;

(vi) Such other information, if any, believed to be pertinent by the petitioner; and

(vii) Such other information as the Secretary may require.

(2) [Reserved]

[63 FR 13318, Mar. 18, 1998]

§ 430.42 Filing requirements.

(a) *Service.* All documents required to be served under this subpart shall, if mailed, be served by first class mail. Service upon a person's duly authorized representative shall constitute service upon that person.

(b) *Obligation to supply information.* A person or State submitting a petition is under a continuing obligation to provide any new or newly discovered information relevant to that petition. Such information includes, but is not limited to, information regarding any other petition or request for action subsequently submitted by that person or State.

(c) *The same or related matters.* A person or State submitting a petition or other request for action shall state whether to the best knowledge of that petitioner the same or related issue, act, or transaction has been or presently is being considered or investigated by any State agency, department, or instrumentality.

(d) *Computation of time.* (1) Computing any period of time prescribed by or allowed under this subpart, the day of the action from which the designated

period of time begins to run is not to be included. If the last day of the period is Saturday, or Sunday, or Federal legal holiday, the period runs until the end of the next day that is neither a Saturday, or Sunday or Federal legal holiday.

(2) Saturdays, Sundays, and intervening Federal legal holidays shall be excluded from the computation of time when the period of time allowed or prescribed is 7 days or less.

(3) When a submission is required to be made within a prescribed time, DOE may grant an extension of time upon good cause shown.

(4) Documents received after regular business hours are deemed to have been submitted on the next regular business day. Regular business hours for the DOE's National Office, Washington, DC, are 8:30 a.m. to 4:30 p.m.

(5) DOE reserves the right to refuse to accept, and not to consider, untimely submissions.

(e) *Filing of petitions.* (1) A petition for a rule shall be submitted in triplicate to: The Assistant Secretary for Conservation and Renewable Energy, U.S. Department of Energy, Section 327 Petitions, Appliance Efficiency Standards, Forrestal Building, 1000 Independence Avenue, SW., Washington, DC 20585.

(2) A petition may be submitted on behalf of more than one person. A joint petition shall indicate each person participating in the submission. A joint petition shall provide the information required by §430.41 for each person on whose behalf the petition is submitted.

(3) All petitions shall be signed by the person(s) submitting the petition or by a duly authorized representative. If submitted by a duly authorized representative, the petition shall certify this authorization.

(4) A petition for a rule to withdraw a rule exempting a State regulation, all supporting documents, and all future submissions shall be served on each State agency, department, or instrumentality whose regulation the petitioner seeks to supersede. The petition shall contain a certification of this service which states the name and mailing address of the served parties, and the date of service.

(f) *Acceptance for filing.* (1) Within fifteen (15) days of the receipt of a petition, the Secretary will either accept it for filing or reject it, and the petitioner will be so notified in writing. The Secretary will serve a copy of this notification on each other party served by the petitioner. Only such petitions which conform to the requirements of this subpart and which contain sufficient information for the purposes of a substantive decision will be accepted for filing. Petitions which do not so conform will be rejected and an explanation provided to petitioner in writing.

(2) For purposes of the Act and this subpart, a petition is deemed to be filed on the date it is accepted for filing.

(g) *Docket.* A petition accepted for filing will be assigned an appropriate docket designation. Petitioner shall use the docket designation in all subsequent submissions.

§ 430.43 Notice of petition.

(a) Promptly after receipt of a petition and its acceptance for filing, notice of such petition shall be published in the FEDERAL REGISTER. The notice shall set forth the availability for public review of all data and information available, and shall solicit comments, data and information with respect to the determination on the petition. Except as may otherwise be specified, the period for public comment shall be 60 days after the notice appears in the FEDERAL REGISTER.

(b) In addition to the material required under paragraph (a) of this section, each notice shall contain a summary of the State regulation at issue and the petitioner's reasons for the rule sought.

§ 430.44 Consolidation.

DOE may consolidate any or all matters at issue in two or more proceedings docketed where there exist common parties, common questions of fact and law, and where such consolidation would expedite or simplify consideration of the issues. Consolidation shall not affect the right of any party to raise issues that could have been raised if consolidation had not occurred.

§ 430.45 Hearing.

The Secretary may hold a public hearing, and publish notice in the FEDERAL REGISTER of the date and location of the hearing, when he determines that such a hearing is necessary and likely to result in a timely and effective resolution of the issues. A transcript shall be kept of any such hearing.

§ 430.46 Disposition of petitions.

(a) After the submission of public comments under §430.42(a), the Secretary shall prescribe a final rule or deny the petition within 6 months after the date the petition is filed.

(b) The final rule issued by the Secretary or a determination by the Secretary to deny the petition shall include a written statement setting forth his findings and conclusions, and the reasons and basis therefor. A copy of the Secretary's decision shall be sent to the petitioner and the affected State agency. The Secretary shall publish in the FEDERAL REGISTER a notice of the final rule granting or denying the petition and the reasons and basis therefor.

(c) If the Secretary finds that he cannot issue a final rule within the 6-month period pursuant to paragraph (a) of this section, he shall publish a notice in the FEDERAL REGISTER extending such period to a date certain, but no longer than one year after the date on which the petition was filed. Such notice shall include the reasons for the delay.

§ 430.47 Effective dates of final rules.

(a) A final rule exempting a State standard from Federal preemption will be effective:

(1) Upon publication in the FEDERAL REGISTER if the Secretary determines that such rule is needed to meet an ''energy emergency condition or water emergency condition (in the case of faucets, showerheads, water closets, and urinals)'' within the State.

(2) Three years after such rule is published in the FEDERAL REGISTER; or

(3) Five years after such rule is published in the FEDERAL REGISTER if the Secretary determines that such additional time is necessary due to the burdens of retooling, redesign or distribution.

(b) A final rule withdrawing a rule exempting a State standard will be effective upon publication in the FEDERAL REGISTER.

[54 FR 6078, Feb. 7, 1989, as amended at 63 FR 13319, Mar. 18, 1998]

§ 430.48 Request for reconsideration.

(a) Any petitioner whose petition for a rule has been denied may request reconsideration within 30 days of denial. The request shall contain a statement of facts and reasons supporting reconsideration and shall be submitted in writing to the Secretary.

(b) The denial of a petition will be reconsidered only where it is alleged and demonstrated that the denial was based on error in law or fact and that evidence of the error is found in the record of the proceedings.

(c) If the Secretary fails to take action on the request for reconsideration within 30 days, the request is deemed denied, and the petitioner may seek such judicial review as may be appropriate and available.

(d) A petitioner has not exhausted other administrative remedies until a request for reconsideration has been filed and acted upon or deemed denied.

§ 430.49 Finality of decision.

(a) A decision to prescribe a rule that a State energy conservation standard, water conservation standard (in the case of faucets, showerheads, water closets, and urinals) or other requirement not be preempted is final on the date the rule is issued, i.e., signed by the Secretary. A decision to prescribe such a rule has no effect on other regulations of a covered product of any other State.

(b) A decision to prescribe a rule withdrawing a rule exempting a State standard or other requirement is final on the date the rule is issued, i.e., signed by the Secretary. A decision to deny such a petition is final on the day a denial of a request for reconsideration is issued, i.e., signed by the Secretary.

[54 FR 6078, Feb. 7, 1989, as amended at 63 FR 13319, Mar. 18, 1998]

Subpart E—Small Business Exemptions

SOURCE: 54 FR 6080, Feb. 7, 1989, unless otherwise noted.

§ 430.50 Purpose and scope.

(a) This subpart establishes procedures for the submission and disposition of applications filed by manufacturers of covered consumer products with annual gross revenues that do not exceed $8 million to exempt them temporarily from all or part of energy conservation standards or water conservation standards (in the case of faucets, showerheads, water closets, and urinals) established by this part.

(b) The purpose of this subpart is to provide content and format requirements for manufacturers of covered consumer products with low annual gross revenues who desire to apply for temporary exemptions from applicable energy conservation standards or water conservation standards (in the case of faucets, showerheads, water closets, and urinals) .

[54 FR 6080, Feb. 7, 1989, as amended at 63 FR 13319, Mar. 18, 1998]

§430.51 Eligibility.

Any manufacturer of a covered product with annual gross revenues that do not exceed $8,000,000 from all its operations (including the manufacture and sale of covered products) for the 12-month period preceding the date of application may apply for an exemption. In determining the annual gross revenues of any manufacturer under this subpart, the annual gross revenue of any other person who controls, is controlled, by, or is under common control with, such manufacturer shall be taken into account.

§ 430.52 Requirements for applications.

(a) Each application filed under this subpart shall be submitted in triplicate to: U.S. Department of Energy, Small Business Exemptions, Appliance Efficiency Standards, Assistant Secretary for Conservation and Renewable Energy, Forrestal Building, 1000 Independence Avenue, SW., Washington, DC 20585.

(b) An application shall be in writing and shall include the following:

(1) Name and mailing address of applicant;

(2) Whether the applicant controls, is controlled by, or is under common control with another manufacturer, and if so, the nature of that control relationship;

(3) The text or substance of the standard or portion thereof for which the exemption is sought and the length of time desired for the exemption;

(4) Information showing the annual gross revenue of the applicant for the preceding 12-month period from all of its operations (including the manufacture and sale of covered products):

(5) Information to show that failure to grant an exemption is likely to result in a lessening of competition;

(6) Such other information, if any, believed to be pertinent by the petitioner; and

(7) Such other information as the Secretary may require.

§ 430.53 Processing of applications.

(a) The applicant shall serve a copy of the application, all supporting documents and all subsequent submissions, or a copy from which confidential information has been deleted pursuant to 10 CFR 1004.11, to the Secretary, which may be made available for public review.

(b) Within fifteen (15) days of the receipt of an application, the Secretary will either accept it for filing or reject it, and the applicant will be so notified in writing. Only such applications which conform to the requirements of this subpart and which contain sufficient information for the purposes of a substantive decision will be accepted for filing. Applications which do not so conform will be rejected and an explanation provided to the applicant in writing.

(c) For the purpose of this subpart, an application is deemed to be filed on the date it is accepted for filing.

(d) Promptly after receipt of an application and its acceptance for filing, notice of such application shall be published in the FEDERAL REGISTER. The notice shall set forth the availability

for public review of data and information available, and shall solicit comments, data and information with respect to the determination on the application. Except as may otherwise be specified, the period for public comment shall be 60 days after the notice appears in the FEDERAL REGISTER.

(e) The Secretary on his own initiative may convene a hearing if, in his discretion, he considers such hearing will advance his evaluation of the application.

§ 430.54 Referral to the Attorney General.

Notice of the application for exemption under this subpart shall be transmitted to the Attorney General by the Secretary and shall contain (a) a statement of the facts and of the reasons for the exemption, and (b) copies of all documents submitted.

§ 430.55 Evaluation of application.

The Secretary shall grant an application for exemption submitted under this subpart if the Secretary finds, after obtaining the written views of the Attorney General, that a failure to allow an exemption would likely result in a lessening of competition.

§ 430.56 Decision and order.

(a) Upon consideration of the application and other relevant information received or obtained, the Secretary shall issue an order granting or denying the application.

(b) The order shall include a written statement setting forth the relevant facts and the legal basis of the order.

(c) The Secretary shall serve a copy of the order upon the applicant and upon any other person readily identifiable by the Secretary as one who is interested in or aggrieved by such order. The Secretary also shall publish in the FEDERAL REGISTER a notice of the grant or denial of the order and the reason therefor.

§ 430.57 Duration of temporary exemption.

A temporary exemption terminates according to its terms but not later than twenty-four months after the affective date of the rule for which the exemption is allowed.

Subpart F—Certification and Enforcement

SOURCE: 54 FR 6081, Feb. 7, 1989, unless otherwise noted.

§ 430.60 Purpose and scope.

This subpart sets forth the procedures to be followed for certification and enforcement testing to determine whether a basic model of a covered product complies with the applicable energy conservation standard or water conservation standard (in the case of faucets, showerheads, water closets, and urinals) set forth in subpart C of this part. Energy conservation standards and water conservation standards (in the case of faucets, showerheads, water closets, and urinals) include minimum levels of efficiency and maximum levels of consumption (also referred to as performance standards), and prescriptive energy design requirements (also referred to as design standards).

[63 FR 13319, Mar. 18, 1998]

§ 430.61 Prohibited acts.

(a) Each of the following is a prohibited act pursuant to section 332 of the Act:

(1) Failure to permit access to, or copying of records required to be supplied under the Act and this rule or failure to make reports or provide other information required to be supplied under this Act and this rule;

(2) Failure of a manufacturer to supply at his expense a reasonable number of covered products to a test laboratory designated by the Secretary;

(3) Failure of a manufacturer to permit a representative designated by the Secretary to observe any testing required by the Act and this rule and inspect the results of such testing; and

(4) Distribution in commerce by a manufacturer or private labeler of any new covered product which is not in compliance with an applicable energy efficiency standard or water conservation standard (in the case of faucets, showerheads, water closets, and urinals) prescribed under the Act and this rule.

(b) In accordance with section 333 of the Act, any person who knowingly

violates any provision of paragraph (a) of this section may be subject to assessment of a civil penalty of no more than $110 for each violation. Each violation of paragraph (a) of this section shall constitute a separate violation with respect to each covered product, and each day of noncompliance with paragraphs (a) (1) through (3) of this section shall constitute a separate violation.

[54 FR 6081, Feb. 7, 1989, as amended at 62 FR 46183, Sept. 2, 1997; 63 FR 13319, Mar. 18, 1998]

§ 430.62 Submission of data.

(a) *Certification.* (1) Except as provided in paragraph (a)(2) of this section, each manufacturer or private labeler before distributing in commerce any basic model of a covered product subject to the applicable energy conservation standard or water conservation standard (in the case of faucets, showerheads, water closets, and urinals) set forth in subpart C of this part shall certify by means of a compliance statement and a certification report that each basic model(s) meets the applicable energy conservation standard or water conservation standard (in the case of faucets, showerheads, water closets, and urinals) as prescribed in section 325 of the Act. The compliance statement, signed by the company official submitting the statement, and the certification report(s) shall be sent by certified mail to: Department of Energy, Office of Energy Efficiency and Renewable Energy, Office of Codes and Standards, Forrestal Building, 1000 Independence Avenue, SW, Washington, DC 20585–0121.

(2) Each manufacturer or private labeler of a basic model of a covered clothes washer, clothes dryer, dishwasher, faucet, showerhead, water closet, or urinal shall file a compliance statement and a certification report to DOE before [date 1 year after publication of the Final Rule].

(3) The compliance statement shall include all information specified in the format set forth in appendix A of this subpart and shall certify that:

(i) The basic model(s) complies with the applicable energy conservation standard or water conservation standard (in the case of faucets, showerheads, water closets, and urinals);

(ii) All required testing has been conducted in conformance with the applicable test requirements prescribed in subpart B of this part;

(iii) All information reported in the certification report(s) is true, accurate, and complete; and

(iv) The manufacturer or private labeler is aware of the penalties associated with violations of the Act, the regulations thereunder, and 18 U.S.C. 1001 which prohibits knowingly making false statements to the Federal Government.

(4) A certification report for all basic models of a covered product (a suggested format is set forth in appendix A of this subpart) shall be submitted to DOE. The certification report shall include for each basic model the product type, product class (as denoted in § 430.32), manufacturer's name, private labeler's name(s) (if applicable), the manufacturer's model number(s), and for:

(i) Central air conditioners, the seasonal energy efficiency ratio.

(ii) Central air conditioning heat pumps, the seasonal energy efficiency ratio and heating seasonal performance factor.

(iii) Clothes washers, the energy factor in ft^3/kWh/cycle and capacity in ft^3.

(iv) Clothes dryers, the energy factor in lbs/kWh, capacity in ft^3, and voltage.

(v) Direct heating equipment, the annual fuel utilization efficiency in percent and capacity in Btu/hour.

(vi) Dishwashers, the energy factor in cycles/kWh and exterior width in inches.

(vii) Faucets, the maximum water use in gpm (L/min) or gal/cycle (L/cycle) for each faucet; or the maximum water use in gpm (L/min) or gal/cycle (L/cycle) for each flow control mechanism, with a listing of accompanied faucets by manufacturer's model numbers.

(viii) Furnaces, the annual fuel utilization efficiency in percent.

(ix) General service fluorescent lamps, the testing laboratory's National Voluntary Laboratory Accreditation Program (NVLAP) identification number or other NVLAP-approved

accreditation identification, production date codes (and accompanying decoding scheme), the 12-month average lamp efficacy in lumens per watt, lamp wattage, and the 12-month average Color Rendering Index.

(x) Incandescent reflector lamps, the laboratory's National Voluntary Accreditation Program (NVLAP) identification number or other NVLAP-approved accreditation identification, production date codes (and accompanying decoding scheme), the 12-month average lamp efficacy in lumens per watt, and lamp wattage.

(xi) Pool heaters, the thermal efficiency in percent.

(xii) Refrigerators, refrigerator-freezers, and freezers, the annual energy use in kWh/yr and total adjusted volume in ft^3.

(xiii) Room air conditioners, the energy efficiency ratio and capacity in Btu/hour.

(xiv) Showerheads, the maximum water use in gpm (L/min) with a listing of accompanied showerheads by manufacturer's model numbers.

(xv) Urinals, the maximum water use in gpf (Lpf).

(xvi) Water closets, the maximum water use in gpf (Lpf).

(xvii) Water heaters, the energy factor and rated storage volume in gallons.

(5) Copies of reports to the Federal Trade Commission which include the information specified in paragraph (a)(4) could serve in lieu of the certification report.

(b) *Model Modifications.* (1) Any change to a basic model which affects energy consumption or water consumption (in the case of faucets, showerheads, water closets, and urinals) constitutes the addition of a new basic model. If such change reduces consumption, the new model shall be considered in compliance with the standard without any additional testing. If, however, such change increases consumption while still meeting the standard, all information required by paragraph (a)(4) of this section for the new basic model must be submitted, by certified mail, to: Department of Energy, Office of Energy Efficiency and Renewable Energy, Office of Codes and Standards, Forrestal Building, 1000 Independence Avenue, SW, Washington, DC 20585–0121.

(2) Prior to or concurrent with the distribution of a new model of general service fluorescent lamp or incandescent reflector lamp, each manufacturer and private labeler shall submit a statement signed by a company official stating how the manufacturer or private labeler determined that the lamp meets or exceeds the energy conservation standards, including a description of any testing or analysis the manufacturer or private labeler performed. This statement shall also list the model number or descriptor, lamp wattage and date of commencement of manufacture. Manufacturers and private labelers of general service fluorescent lamps and incandescent reflector lamps shall submit the certification report required by paragraph (a)(4) of this section within one year after the date manufacture of that new model commences.

(c) *Discontinued model.* When production of a basic model has ceased and it is no longer being distributed, this shall be reported, by certified mail, to: Department of Energy, Office of Energy Efficiency and Renewable Energy, Office of Codes and Standards, Forrestal Building, 1000 Independence Avenue, SW, Washington, DC 20585–0121. For each basic model, the report shall include: product type, product class, the manufacturer's name, the private labeler name(s), if applicable, and the manufacturer's model number. If the reporting of discontinued models coincides with the submittal of a certification report, such information can be included in the certification report.

(d) *Maintenance of records.* The manufacturer or private labeler of any covered product subject to any of the energy performance standards, water performance standards (in the case of faucets, showerheads, water closets, and urinals), or procedures prescribed in this part shall establish, maintain, and retain the records of the underlying test data for all certification testing. Such records shall be organized and indexed in a fashion which makes them readily accessible for review by DOE upon request. The records shall include the supporting test data associated with tests performed on any test units

to satisfy the requirements of this subpart. The records shall be retained by the manufacturer (private labeler) for a period of two years from the date that production of the applicable model has ceased.

(e) *Third party representation.* A manufacturer or private labeler may elect to use a third party to submit the certification report to DOE (for example a trade association or other authorized representative). Such certification reports shall include all the information specified in paragraph (a)(4) of this section. Third parties submitting certification reports shall include the names of the manufacturers or private labelers who authorized the submittal of the certification reports to DOE on their behalf. The third party representative also may submit discontinued model information on behalf of an authorizing manufacturer.

[63 FR 13319, Mar. 18, 1998]

§ 430.63 Sampling.

(a) For purposes of a certification of compliance, the determination that a basic model complies with the applicable energy performance standard or water performance standard (in the case of faucets, showerheads, water closets, and urinals) shall be based upon the sampling procedures set forth in § 430.24 of this part. For purposes of a certification of compliance, the determination that a basic model complies with the applicable design standard shall be based upon the incorporation of specific design requirements for clothes dryers, dishwashers, clothes washers and kitchen ranges and ovens specified in section 325 of the Act.

(b) A basic model which meets the following requirements may qualify as an ''other than tested model'' for purposes of the certification testing and sampling requirements:

(1) Central air conditioners: The condenser-evaporator coil combinations manufactured by the condensing unit manufacturer other than the combination likely to have the largest volume of retail sales or the condenser-coil combinations manufactured in part by a component manufacturer using the same condensing unit.

(2) For purposes of certification of ''other than tested models,'' as defined in paragraph (b)(1) of this section, a manufacturer may certify the basic model on the basis of computer simulation or engineering analysis as set forth in § 430.23(m) of this part.

[54 FR 6081, Feb. 7, 1989, as amended at 63 FR 13321, Mar. 18, 1998]

§ 430.64 Imported products.

(a) Pursuant to section 331 of the Act, any person importing any covered product into the United States shall comply with the provisions of the Act and of this part, and is subject to the remedies of this part.

(b) Any covered product offered for importation in violation of the Act and of this part shall be refused admission into the customs territory of the United States under rules issued by the Secretary of the Treasury, except that the Secretary of the Treasury may, by such rules, authorize the importation of such covered product upon such terms and conditions (including the furnishing of a bond) as may appear to the Secretary of Treasury appropriate to ensure that such covered product will not violate the Act and this part, or will be exported or abandoned to the United States.

§ 430.65 Exported products.

Pursuant to section 330 of the Act, this part shall not apply to any covered product if (a) such covered product is manufactured, sold, or held for sale for export from the United States (or such product was imported for export), unless such product is, in fact, distributed in commerce for use in the United States, and (b) such covered product, when distributed in commerce, or any container in which it is enclosed when so distributed, bears a stamp or label stating that such covered product is intended for export.

§ 430.70 Enforcement.

(a) *Performance standard*—(1) *Test notice.* Upon receiving information in writing concerning the energy performance or water performance (in the case of faucets, showerheads, water closets, and urinals) of a particular covered product of a particular manufacturer or private labeler which indicates that the covered product may not be in compliance with the applicable energy

performance standard or water performance standard (in the case of faucets, showerheads, water closets, and urinals), the Secretary may conduct testing of that covered product under this subpart by means of a test notice addressed to the manufacturer in accordance with the following requirements:

(i) Such a procedure will only be followed after the Secretary or his designated representative has examined the underlying test data provided by the manufacturer and after the manufacturer has been offered the opportunity to meet with DOE to verify compliance with the applicable performance standard. A representative designated by the Secretary shall be permitted to observe any reverification procedures by this subpart, and to inspect the results of such reverification.

(ii) The test notice will be signed by the Secretary or his designee. The test notice will be mailed or delivered by DOE to the plant manager or other responsible official, as designated by the manufacturer.

(iii) The test notice will specify the model or basic model to be selected for testing, the method of selecting the test sample, the time at which testing shall be initiated, the date by which testing is scheduled to be completed and the facility at which testing will be conducted. The test notice may also provide for situations in which the selected basic model is unavailable for testing, and may include alternative basic models.

(iv) The Secretary may require in the test notice that the manufacturer of a covered product shall ship at his expense a reasonable number of units of a basic model specified in such test notice to a testing laboratory designated by the Secretary. The number of units of a basic model specified in a test notice shall not exceed twenty (20).

(v) Within 5 working days of the time units are selected, the manufacturer shall ship the specified test units of a basic model to the testing laboratory.

(2) *Testing Laboratory*. Whenever DOE conducts enforcement testing at a designated laboratory in accordance with a test notice under this section, the resulting test data shall constitute official test data for that basic model. Such test data will be used by DOE to make a determination of compliance or noncompliance if a sufficient number of tests have been conducted to satisfy the requirements of appendix B of this subpart.

(3) *Sampling*. The determination that a manufacturer's basic model complies with the applicable energy performance standard or water performance standard (in the case of faucets, showerheads, water closets, and urinals) shall be based on the testing conducted in accordance with the statistical sampling procedures set forth in appendix B of this subpart and the test procedures set forth in subpart B of this part.

(4) *Test unit selection*. A DOE inspector shall select a batch, a batch sample, and test units from the batch sample in accordance with the provisions of this paragraph and the conditions specified in the test notice.

(i) The batch may be subdivided by DOE utilizing criteria specified in the test notice, e.g., date of manufacture, component-supplier, location of manufacturing facility, or other criteria which may differentiate one unit from another within a basic model.

(ii) A batch sample of up to 20 units will then be randomly selected from one or more subdivided groups within the batch. The manufacturer shall keep on hand all units in the batch sample until such time as the basic model is determined to be in compliance or noncompliance.

(iii) Individual test units comprising the test sample shall be randomly selected from the batch sample.

(iv) All random selection shall be achieved by sequentially numbering all of the units in a batch sample and then using a table of random numbers to select the units to be tested.

(5) *Test unit preparation*. (i) Prior to and during testing, a test unit selected in accordance with paragraph (a)(4) of this section shall not be prepared, modified, or adjusted in any manner unless such preparation, modification, or adjustment is allowed by the applicable DOE test procedure. One test shall be conducted for each test unit in accordance with the applicable test procedures prescribed in subpart B.

(ii) No quality control, testing or assembly procedures shall be performed on a test unit, or any parts and subassemblies thereof, that is not performed during the production and assembly of all other units included in the basic model.

(iii) A test unit shall be considered defective if such unit is inoperative or is found to be in noncompliance due to failure of the unit to operate according to the manufacturer's design and operating instructions. Defective units, including those damaged due to shipping or handling, shall be reported immediately to DOE. DOE shall authorize testing of an additional unit on a case-by-case basis.

(6) *Testing at manufacturer's option.* (i) If a manufacturer's basic model is determined to be in noncompliance with the applicable energy performance standard or water performance standard (in the case of faucets, showerheads, water closets, and urinals) at the conclusion of DOE testing in accordance with the double sampling plan specified in appendix B of this subpart, the manufacturer may request that DOE conduct additional testing of the model according to procedures set forth in appendix B of this subpart.

(ii) All units tested under paragraph (a)(6) of this section shall be selected and tested in accordance with the provisions given in paragraphs (a) (1) through (5) of this section.

(iii) The manufacturer shall bear the cost of all testing conducted under paragraph (a)(6) of this section.

(iv) The manufacturer shall cease distribution of the basic model being tested under the provisions of paragraph (a)(6) of this section from the time the manufacturer elects to exercise the option provided in this paragraph until the basic model is determined to be in compliance. DOE may seek civil penalties for all units distributed during such period.

(v) If the additional testing results in a determination of compliance, a notice of allowance to resume distribution shall be issued by the Department.

(b) *Design standard.* In the case of a design standard, a model is determined noncompliant by DOE after the Secretary or his designated representative has examined the underlying design information provided by the manufacturer and after the manufacturer has been offered the opportunity to verify compliance with the applicable design standard.

[54 FR 6080, Feb. 7, 1989, as amended at 63 FR 13321, Mar. 18, 1998]

§ 430.71 Cessation of distribution of a basic model.

(a) In the event that a model is determined noncompliant by DOE in accordance with § 430.70 of this part or if a manufacturer or private labeler determines a model to be in noncompliance, then the manufacturer or private labeler shall:

(1) Immediately cease distribution in commerce of the basic model;

(2) Give immediate written notification of the determination of noncompliance, to all persons to whom the manufacturer has distributed units of the basic model manufactured since the date of the last determination of compliance.

(3) Pursuant to a request made by the Secretary, provide DOE within 30 days of the request, records, reports and other documentation pertaining to the acquisition, ordering, storage, shipment, or sale of a basic model determined to be in noncompliance.

(4) The manufacturer may modify the noncompliant basic model in such manner as to make it comply with the applicable performance standard. Such modified basic model shall then be treated as a new basic model and must be certified in accordance with the provisions of this subpart; except that in addition satisfying all requirements of this subpart, the manufacturer shall also maintain records that demonstrate that modifications have been made to all units of the new basic model prior to distribution in commerce.

(b) If a basic model is not properly certified in accordance with the requirements of this subpart, the Secretary may seek, among other remedies, injunctive action to prohibit distribution in commerce of such basic model.

§ 430.72 Subpoena.

Pursuant to section 329(a) of the Act, for purposes of carrying out this part,

the Secretary or the Secretary's designee, may sign and issue subpoenas for the attendance and testimony of witnesses and the production of relevant books, records, papers, and other documents, and administer the oaths. Witnesses summoned under the provisions of this section shall be paid the same fees and mileage as are paid to witnesses in the courts of the United States. In case of contumacy by, or refusal to obey a subpoena served, upon any persons subject to this part, the Secretary may seek an order from the District Court of the United States for any District in which such person is found or resides or transacts business requiring such person to appear and give testimony, or to appear and produce documents. Failure to obey such order is punishable by such court as a contempt thereof.

§ 430.73 Remedies.

If DOE determines that a basic model of a covered product does not comply with an applicable energy conservation standard or water conservation standard (in the case of faucets, showerheads, water closets, and urinals):

(a) DOE will notify the manufacturer, private labeler or any other person as required, of this finding and of the Secretary's intent to seek a judicial order restraining further distribution in commerce of such basic model unless the manufacturer, private labeler or any other person as required, delivers to DOE within 15 calendar days a statement, satisfactory to DOE, of the steps he will take to insure that the noncompliant model will no longer be distributed in commerce. DOE will monitor the implementation of such statement.

(b) If the manufacturer, private labeler or any other person as required, fails to stop distribution of the noncompliant model, the Secretary may seek to restrain such violation in accordance with section 334 of the Act.

(c) The Secretary shall determine whether the facts of the case warrant the assessment of civil penalties for knowing violations in accordance with section 333 of the Act.

[54 FR 6081, Feb. 7, 1989, as amended at 63 FR 13321, Mar. 18, 1998]

§ 430.74 Hearings and appeals.

(a) Pursuant to section 333(d) of the Act, before issuing an order assessing a civil penalty against any person under this section, the Secretary shall provide to such person notice of the proposed penalty. Such notice shall inform such person of that person's opportunity to elect in writing within 30 days after the date of receipt of such notice to have the procedures of paragraph (c) of this section (in lieu of those in paragraph (b) of this section) apply with respect to such assessment.

(b)(1) Unless an election is made within 30 calendar days after receipt of notice under paragraph (a) of this section to have paragraph (c) of this section apply with respect to such penalty, the Secretary shall assess the penalty, by order, after a determination of violation has been made on the record after an opportunity for an agency hearing pursuant to section 554 of title 5, United States Code, before an administrative law judge appointed under section 3105 of such title 5. Such assessment order shall include the administrative law judge's findings and the basis for such assessment.

(2) Any person against whom a penalty is assessed under this section may, within 60 calendar days after the date of the order of the Secretary assessing such penalty, institute an action in the United States Court of Appeals for the appropriate judicial circuit for judicial review of such order in accordance with chapter 7 of title 5, United States Code. The court shall have jurisdiction to enter a judgment affirming, modifying, or setting aside in whole or in part, the order of the Secretary, or the court may remand the proceeding to the Secretary for such further action as the court may direct.

(c)(1) In the case of any civil penalty with respect to which the procedures of this section have been elected, the Secretary shall promptly assess such penalty, by order, after the date of the receipt of the notice under paragraph (a) of this section of the proposed penalty.

(2) If the civil penalty has not been paid within 60 calendar days after the assessment has been made under paragraph (c)(1) of this section, the Secretary shall institute an action in the appropriate District Court of the

United States for an order affirming the assessment of the civil penalty. The court shall have authority to review de novo the law and the facts involved and shall have jurisdiction to enter a judgment enforcing, modifying, and enforcing as so modified, or setting aside in whole or in part, such assessment.

(3) Any election to have this paragraph apply may not be revoked except with the consent of the Secretary.

(d) If any person fails to pay an assessment of a civil penalty after it has become a final and unappealable order under paragraph (b) of this section, or after the appropriate District Court has entered final judgment in favor of the Secretary under paragraph (c) of this section, the Secretary shall institute an action to recover the amount of such penalty in any appropriate District Court of the United States. In such action, the validity and appropriateness of such final assessment order or judgment shall not be subject to review.

(e)(1) In accordance with the provisions of section 333(d)(5)(A) of the Act and notwithstanding the provisions of title 28, United States Code, or section 502(c) of the Department of Energy Organization Act, the Secretary shall be represented by the General Counsel of the Department of Energy (or any attorney or attorneys within DOE designated by the Secretary) who shall supervise, conduct, and argue any civil litigation to which paragraph (c) of this section applies including any related collection action under paragraph (d) of this section in a court of the United States or in any other court, except the Supreme Court of the United States. However, the Secretary or the General Counsel shall consult with the Attorney General concerning such litigation and the Attorney General shall provide, on request, such assistance in the conduct of such litigation as may be appropriate.

(2) In accordance with the provisions of section 333(d)(5)(B) of the Act, and subject to the provisions of section 502(c) of the Department of Energy Organization Act, the Secretary shall be represented by the Attorney General, or the Solicitor General, as appropriate, in actions under this section, except to the extent provided in paragraph (e)(1) of this section.

(3) In accordance with the provisions of section 333(d)(5)(C) of the Act, section 402(d) of the Department of Energy Organization Act shall not apply with respect to the function of the Secretary under this section.

§ 430.75 Confidentiality.

Pursuant to the provisions of 10 CFR 1004.11, any person submitting information or data which the person believes to be confidential and exempt law from public disclosure should submit one complete copy, and fifteen copies from which the information believed to be confidential has been deleted. In accordance with the procedures established at 10 CFR 1004.11, DOE shall make its own determination with regard to any claim that information submitted be exempt from public disclosure.

OMB Control No. 1910–1400

APPENDIX A TO SUBPART F OF PART 430—COMPLIANCE STATEMENT AND CERTIFICATION REPORT

COMPLIANCE STATEMENT

Product: _____
Manufacturer's or Private Labeler's Name and Address:

_____

_____

_____

This compliance statement and all certification reports submitted are in accordance with 10 CFR Part 430 (Energy or Water Conservation Program for Consumer Products) and the Energy Policy and Conservation Act, as amended. The compliance statement is signed by a responsible official of the above named company. The basic model(s) listed in certification reports comply with the applicable energy conservation standard or water (in the case of faucets, showerheads, water closets, and urinals) conservation standard. All testing on which the certification reports are based was conducted in conformance with applicable test requirements prescribed in 10 CFR part 430 subpart B. All information reported in the certification report(s) is true, accurate, and complete. The company is aware of the penalties associated with violations of the Act, the regulations thereunder, and is also aware of the provisions contained in 18 U.S.C. 1001, which prohibits knowingly making false statements to the Federal Government.

Name of Company Official: _____
Signature: _____
Title: _____
Firm or Organization: _____
Address: _____
Telephone Number: _____
Facsimile Number: _____
Date: _____

Third Party Representation (if applicable)

For certification reports prepared and submitted by a third party organization under the provisions of §430.62 of 10 CFR part 430, the company official who authorized said third party representation is:

Name: _____
Title: _____
Address: _____
Telephone Number: _____
Facsimile Number: _____

The third party organization submitting the certification report on behalf of the company is:

Third Party Organization: _____
Address: _____
Telephone Number: _____
Facsimile Number: _____

CERTIFICATION REPORT

Date: _____
Product Type: _____
Product Class: _____
Manufacturer: _____
Private Labeler (if applicable): _____
Name: _____
Title: _____
Address: _____
Telephone Number: _____
Facsimile Number: _____

For Existing, New, or Modified Models[1]:
For Discontinued Models[2]:

[63 FR 13321, Mar. 18, 1998]

APPENDIX B TO SUBPART F OF PART 430—SAMPLING PLAN FOR ENFORCEMENT TESTING

Double Sampling

Step 1. The first sample size (N_1) must be four or more units.

Step 2. Compute the mean ($\bar{x}_1$) of the measured energy performance or water performance (in the case of faucets, showerheads, water closets, and urinals) of the N_1 units in the first sample as follows:

$$\bar{x}_1 = \frac{1}{n_1}\left(\sum_{i=1}^{n_1} x_i\right) \qquad (1)$$

where (x_1) is the measured energy efficiency, energy or water (in the case of faucets, showerheads, water closets, and urinals) consumption of unit I.

Step 3. Compute the standard deviation (s_1) of the measured energy or water performance of the (N_1) units in the first sample as follows:

$$s_1 = \sqrt{\frac{\sum_{i=1}^{n_1}\left(x_i - \bar{x}_1\right)^2}{n_1 - 1}} \qquad (2)$$

Step 4. Compute the standard error ($s_{\bar{x}_1}$) of the measured energy or water performance of the N_1 units in the first sample as follows:

$$s_{\bar{x}_1} = \frac{s_1}{\sqrt{n_1}} \qquad (3)$$

Step 5. Compute the upper control limit (UCL_1) and lower control limit (LCL_1) for the mean of the first sample using the applicable DOE energy or water performance standard (EPS) as the desired mean and a probability level of 95 percent (two-tailed test) as follows:

$$LCL_1 = EPS - ts_{\bar{x}_1} \qquad (4)$$

$$UCL_1 = EPS + ts_{\bar{x}_1} \qquad (5)$$

where t is a statistic based on a 95 percent two-tailed probability level and a sample size of N_1.

Step 6(a). For an Energy Efficiency Standard, compare the mean of the first sample (x_1) with the upper and lower control limits (UCL_1 and LCL_1) to determine one of the following:

(1) If the mean of the first sample is below the lower control limit, then the basic model is in noncompliance and testing is at an end. (Do not go on to any of the steps below.)

(2) If the mean of the first sample is equal to or greater than the upper control limit, then the basic model is in compliance and testing is at an end. (Do not go on to any of the steps below.)

(3) If the sample mean is equal to or greater than the lower control limit but less than the upper control limit, then no determination of compliance or noncompliance can be made and a second sample size is determined by Step 7(a).

Step 6(b). For an Energy or Water Consumption Standard, compare the mean of the first sample (x_1) with the upper and lower

[1] Provide specific product information including, for each basic model, the manufacturer's model numbers and the information required in §430.62(a)(4)(i) through (a)(4)(xvii)).

[2] Provide manufacturer's model number.

control limits (UCL_1 and LCL_1) to determine one of the following:

(1) If the mean of the first sample is above the upper control limit, then the basic model is in noncompliance and testing is at an end. (Do not go on to any of the steps below.)

(2) If the mean of the first sample is equal to or less than the lower control limit, then the basic model is in compliance and testing is at an end. (Do not go on to any of the steps below.)

(3) If the sample mean is equal to or less than the upper control limit but greater than the lower control limit, then no determination of compliance or noncompliance can be made and a second sample size is determined by Step 7(b).

Step 7(a). For an Energy Efficiency Standard, determine the second sample size (N_2) as follows:

$$n_2 = \left(\frac{ts_1}{0.05\ EPS} \right)^2 - n_1 \qquad (6a)$$

where s_1 and t have the values used in Steps 4 and 5, respectively. The term ''0.05 EPS'' is the difference between the applicable energy efficiency standard and 95 percent of the standard, where 95 percent of the standard is taken as the lower control limit. This procedure yields a sufficient combined sample size (N_1+N_2) to give an estimated 97.5 percent probability of obtaining a determination of compliance when the true mean efficiency is equal to the applicable standard. Given the solution value of N_2, determine one of the following:

(1) If the value of N_2 is less than or equal to zero and if the mean energy efficiency of the first sample (X_1) is either equal to or greater than the lower control limit (LCL_1) or equal to or greater than 95 percent of the applicable energy efficiency standard (EES), whichever is greater, i.e., if $N_2 \leq 0$ and $X_1 \geq \max$ (LCL_1, 0.95 EES), the basic model is in compliance and testing is at an end.

(2) If the value of N_2 is less than or equal to zero and the mean energy efficiency of the first sample (X_1) is less than the lower control limit (LCL_1) or less than 95 percent of the applicable energy efficiency standard (EES), whichever is greater, i.e., if $N_2 \leq 0$ and $X_1 \geq \max$ (LCL_1, 0.95 EES), the basic model is in noncompliance and testing is at an end.

(3) If the value of N_2 is greater than zero, then value of the second sample size is determined to be the smallest integer equal to or greater than the solution value of N_2 for equation (6a). If the value of N_2 so calculated is greater than $20-N_1$, set N_2 equal to $20-N_1$.

Step 7(b). For an Energy or Water Consumption Standard, determine the second sample size (N_2) as follows:

$$n_2 = \left(\frac{ts_1}{0.05\ EPS} \right)^2 - n_1 \qquad (6b)$$

where s_1 and t have the values used in Steps 4 and 5, respectively. The term ''0.05 EPS'' is the difference between the applicable energy or water consumption standard and 105 percent of the standard, where 105 percent of the standard is taken as the upper control limit. This procedure yields a sufficient combined sample size (N_1+N_2) to give an estimated 97.5 percent probability of obtaining a determination of compliance when the true mean consumption is equal to the applicable standard. Given the solution value of N_2, determine one of the following:

(1) If the value of N_2 is less than or equal to zero and if the mean energy or water consumption of the first sample (X_1) is either equal to or less than the upper control limit (UCL_1) or equal to or less than 105 percent of the applicable energy or water performance standard (EPS), whichever is less, i.e., if $N_2 \leq 0$ and $X_1 \leq \min$ (UCL_1, 1.05 EPS), the basic model is in compliance and testing is at an end.

(2) If the value of N_2 is less than or equal to zero and the mean energy or water consumption of the first sample (X_1) is greater than the upper control limit (UCL_1) or more than 105 percent of the applicable energy or water performance standard (EPS), whichever is less, i.e., if $N_2 \leq 0$ and $X_1 > \min$ (UCL_1, 1.05 EPS), the basic model is in noncompliance and testing is at an end.

(3) If the value of N_2 is greater than zero, then the value of the second sample size is determined to be the smallest integer equal to or greater than the solution value of N_2 for equation (6b). If the value of N_2 so calculated is greater than $20-N_1$, set N_2 equal to $20-N_1$.

Step 8. Compute the combined mean (X_2) of the measured energy or water performance of the N_1 and N_2 units of the combined first and second samples as follows:

$$\bar{x}_2 = \frac{1}{n_1+n_2} \left(\sum_{i=1}^{n_1+n_2} x_i \right) \qquad (7)$$

Step 9. Compute the standard error ($S_{\bar{x}}$) of the measured energy or water performance of the N_1 and N_2 units in the combined first and second samples as follows:

$$s_{\bar{x}_2} = \frac{s_1}{\sqrt{n_1+n_2}} \qquad (8)$$

NOTE: S_1 is the value obtained in Step 3.

Step 10(a). For an Energy Efficiency Standard, compute the lower control limit (LCL_2) for the mean of the combined first and second samples using the DOE energy efficiency standard (EES) as the desired mean and a

one-tailed probability level of 97.5 percent (equivalent to the two-tailed probability level of 95 percent used in Step 5) as follows:

$$LCL_2 = EES - ts_{\bar{x}_2} \qquad (9a)$$

where the t-statistic has the value obtained in Step 5.

Step 10(b). For an Energy or Water Consumption Standard, compute the upper control limit (UCL_2) for the mean of the combined first and second samples using the DOE energy or water performance standard (EPS) as the desired mean and a one-tailed probability level of 102.5 percent (equivalent to the two-tailed probability level of 95 percent used in Step 5) as follows:

$$UCL_2 = EPS + ts_{\bar{x}_2} \qquad (9b)$$

where the t-statistic has the value obtained in Step 5.

Step 11(a). For an Energy Efficiency Standard, compare the combined sample mean ($\bar{x}_2$) to the lower control limit (LCL_2) to find one of the following:

(1) If the mean of the combined sample ($\bar{x}_2$) is less than the lower control limit (LCL_2) or 95 percent of the applicable energy efficiency standard (EES), whichever is greater, i.e., if $\bar{x}_2 < \max(LCL_2, 0.95\ EES)$, the basic model is in noncompliance and testing is at an end.

(2) If the mean of the combined sample ($\bar{x}_2$) is equal to or greater than the lower control limit (LCL_2) or 95 percent of the applicable energy efficiency standard (EES), whichever is greater, i.e., if $\bar{x}_2 \geq \max(LCL_2, 0.95\ EES)$, the basic model is in compliance and testing is at an end.

Step 11(b). For an Energy or Water Consumption Standard, compare the combined sample mean ($\bar{x}_2$) to the upper control limit (UCL_2) to find one of the following:

(1) If the mean of the combined sample ($\bar{x}_2$) is greater than the upper control limit (UCL_2) or 105 percent of the applicable energy or water performance standard (EPS), whichever is less, i.e., if $\bar{x}_2 > \min(UCL_2, 1.05\ EPS)$, the basic model is in noncompliance and testing is at an end.

(2) If the mean of the combined sample ($\bar{x}_2$) is equal to or less than the upper control limit (UCL_2) or 105 percent of the applicable energy or water performance standard (EPS), whichever is less, i.e., if $\bar{x}_2 \leq \min(UCL_2, 1.05\ EPS)$, the basic model is in compliance and testing is at an end.

Manufacturer-Option Testing

If a determination of non-compliance is made in Steps 6, 7 or 11, the manufacturer may request that additional testing be conducted, in accordance with the following procedures.

Step A. The manufacturer requests that an additional number, N_3, of units be tested, with N_3 chosen such that $N_1+N_2+N_3$ does not exceed 20.

Step B. Compute the mean energy or water performance, standard error, and lower or upper control limit of the new combined sample in accordance with the procedures prescribed in Steps 8, 9, and 10, above.

Step C. Compare the mean performance of the new combined sample to the revised lower or upper control limit to determine one of the following:

a.1. For an Energy Efficiency Standard, if the new combined sample mean is equal to or greater than the lower control limit or 95 percent of the applicable energy efficiency standard, whichever is greater, the basic model is in compliance and testing is at an end.

a.2. For an Energy or Water Consumption Standard, if the new combined sample mean is equal to or less than the upper control limit or 105 percent of the applicable energy or water consumption standard, whichever is less, the basic model is in compliance and testing is at an end.

b.1. For an Energy Efficiency Standard, if the new combined sample mean is less than the lower control limit or 95 percent of the applicable energy efficiency standard, whichever, is greater, and the value of $N_1+N_2+N_3$ is less than 20, the manufacturer may request that additional units be tested. The total of all units tested may not exceed 20. Steps A, B, and C are then repeated.

b.2. For an Energy or Water Consumption Standard, if the new combined sample mean is greater than the upper control limit or 105 percent of the applicable energy or water consumption standard, whichever is less, and the value of $N_1+N_2+N_3$ is less than 20, the manufacturer may request that additional units be tested. The total of all units tested may not exceed 20. Steps A, B, and C are then repeated.

c. Otherwise, the basic model is determined to be in noncompliance.

[63 FR 13321, Mar. 18, 1998]

PART 431—ENERGY EFFICIENCY PROGRAM FOR CERTAIN COMMERCIAL AND INDUSTRIAL EQUIPMENT

Subpart A—General Provisions

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AUTHORITY: 42 U.S.C. 6311–6316

SOURCE: 64 FR 54141, Oct. 5, 1999, unless otherwise noted.

Subpart A—General Provisions

§ 431.1 Purpose and scope.

This part establishes the regulations for the implementation of Part C of Title III of the Energy Policy and Conservation Act, as amended, 42 U.S.C. 6311–6316, which establishes an energy conservation program for certain industrial equipment.

§ 431.2 Definitions.

For purposes of this part, words shall be defined as provided for in section 340 of the Act and as follows—

Accreditation means recognition by an accreditation body that a laboratory is competent to test the efficiency of electric motors according to the scope and procedures given in Test Method B of IEEE Standard 112–1996, *Test Procedure for Polyphase Induction Motors and Generators,* and Test Method (1) of CSA Standard C390–93, *Energy Efficient Test Methods for Three-Phase Induction Motors.*

Accreditation body means an organization or entity that conducts and administers an accreditation system and grants accreditation.

Accreditation system means a set of requirements to be fulfilled by a testing laboratory, as well as rules of procedure and management, that are used to accredit laboratories.

Accredited laboratory means a testing laboratory to which accreditation has been granted.

Act means the Energy Policy and Conservation Act of 1975, as amended (42 U.S.C. 6291 *et seq.*).

Alternative efficiency determination method or *AEDM* means a method of calculating the total power loss and average full load efficiency of an electric motor.

Average full load efficiency means the arithmetic mean of the full load efficiencies of a population of electric motors of duplicate design, where the full load efficiency of each motor in the population is the ratio (expressed as a percentage) of the motor's useful power output to its total power input when the motor is operated at its full rated load, rated voltage, and rated frequency.

Basic model means all units of a given type of covered equipment (or class thereof) manufactured by a single manufacturer, and, with respect to electric motors, which have the same rating, have electrical characteristics that are essentially identical, and do not have any differing physical or functional characteristics which affect energy consumption or efficiency. For the purpose of this definition, ''rating'' means one of the 113 combinations of an electric motor's horsepower (or standard kilowatt equivalent), number of poles, and open or enclosed construction, with respect to which § 431.42 prescribes nominal full load efficiency standards.

Certificate of conformity means a document that is issued by a certification program, and that gives written assurance that an electric motor complies with the energy efficiency standard applicable to that motor, as specified in 10 CFR 431.42.

Certification program means a certification system that determines conformity by electric motors with the energy efficiency standards prescribed by and pursuant to the Act.

Certification system means a system, that has its own rules of procedure and management, for giving written assurance that a product, process, or service conforms to a specific standard or other specified requirements, and that is operated by an entity independent of both the party seeking the written assurance and the party providing the product, process or service.

Covered equipment means industrial equipment of a type specified in section 340 of the Act.

CSA means CSA International.

Definite purpose motor means any motor designed in standard ratings with standard operating characteristics or standard mechanical construction for use under service conditions other than usual, such as those specified in NEMA Standards Publication MG1–1993, *Motors and Generators*, paragraph 14.03, ''Unusual Service Conditions,'' or for use on a particular type of application, and which cannot be used in most general purpose applications.

DOE or *the Department* means the Department of Energy.

Electric motor is defined as follows:

(1) ''Electric motor'' means a machine which converts electrical power into rotational mechanical power and which:

(i) is a general purpose motor, including but not limited to motors with explosion-proof construction;

(ii) is a single speed, induction motor (MG1);

(iii) is rated for continuous duty (MG1) operation, or is rated duty type S1 (IEC);

(iv) contains a squirrel-cage (MG1) or cage (IEC) rotor, and has foot-mounting, including foot-mounting with flanges or detachable feet;

(v) is built in accordance with NEMA T-frame dimensions (MG1), or IEC metric equivalents (IEC);

(vi) has performance in accordance with NEMA Design A (MG1) or B (MG1) characteristics, or equivalent designs such as IEC Design N (IEC); and

(vii) operates on polyphase alternating current 60-Hertz sinusoidal power, and:

(A) is rated 230 volts or 460 volts, or both, including any motor that is rated at multi-voltages that include 230 volts or 460 volts, or

(B) can be operated on 230 volts or 460 volts, or both.

(2) Terms in this definition followed by the parenthetical ''MG1'' must be construed with reference to provisions in NEMA Standards Publication MG1–1993, *Motors and Generators*, with Revisions 1, 2, 3 and 4, as follows:

(i) Section I, *General Standards Applying to All Machines*, Part 1, *Referenced Standards and Definitions*, paragraphs 1.16.1, 1.16.1.1, 1.17.1.1, 1.17.1.2, and 1.40.1 pertain to the terms ''induction motor,'' ''squirrel-cage,'' ''NEMA Design A,'' ''NEMA Design B,'' and ''continuous duty'' respectively;

(ii) Section I, *General Standards Applying to All Machines,* Part 4, *Dimensions, Tolerances, and Mounting,* paragraph 4.01 and Figures 4–1, 4–2, 4–3, and 4–4 pertain to ''NEMA T-frame dimensions;''

(iii) Section II, *Small (Fractional) and Medium (Integral) Machines,* Part 11, *Dimensions—AC and DC Small and Medium Machines,* paragraphs 11.01.2, 11.31 (except the lines for frames 447T, 447TS, 449T and 449TS), 11.32, 11.34 (except the line for frames 447TC and 449TC, and the line for frames 447TSC and 449TSC), 11.35, and 11.36 (except the line for frames 447TD and 449TD, and the line for frames 447TSD and 449TSD), and Table 11–1, pertain to ''NEMA T-frame dimensions;'' and

(iv) Section II, *Small (Fractional) and Medium (Integral) Machines,* Part 12, *Tests and Performance—AC and DC Motors,* paragraphs 12.35.1, 12.35.5, 12.38.1, 12.39.1, and 12.40.1, and Table 12–2, pertain both to ''NEMA Design A'' and ''NEMA Design B.''

(3) Terms in this definition followed by the parenthetical ''IEC'' must be construed with reference to provisions in IEC Standards as follows:

(i) IEC Standard 60034–1 (1996), *Rotating electrical machines,* Part 1: *Rating and performance,* with Amendment 1 (1997), Section 3: *Duty,* clause 3.2.1 and figure 1 pertain to ''duty type S1'';

(ii) IEC Standard 60050–411 (1996), *International Electrotechnical Vocabulary Chapter 411: Rotating machines,* sections 411–33–07 and 411–37–26, pertain to ''cage'';

(iii) IEC Standard 60072–1 (1991), *Dimensions and output series for rotating electrical machines—Part 1: Frame numbers 56 to 400 and flange numbers 55 to 1080,* clauses 2, 3, 4.1, 6.1, 7, and 10, and Tables 1, 2 and 4, pertain to ''IEC metric equivalents'' to ''T-frame'' dimensions; and

(iv) IEC Standard 60034–12 (1980), *Rotating electrical machines, Part 12: Starting performance of single-speed three-phase cage induction motors for voltages up to and including 660 V,* with Amendment 1 (1992) and Amendment 2 (1995), clauses 1, 2, 3.1, 4, 5, and 6, and Tables I, II, and III, pertain to ''IEC Design N.''

Enclosed motor means an electric motor so constructed as to prevent the free exchange of air between the inside and outside of the case but not sufficiently enclosed to be termed airtight.

EPCA means the Energy Policy and Conservation Act of 1975, as amended (42 U.S.C. 6291 *et seq.*).

General purpose motor means any motor which is designed in standard ratings with either:

(1) Standard operating characteristics and standard mechanical construction for use under usual service conditions, such as those specified in NEMA Standards Publication MG1–1993, paragraph 14.02, ''Usual Service Conditions,'' and without restriction to a particular application or type of application; or

(2) Standard operating characteristics or standard mechanical construction for use under unusual service conditions, such as those specified in NEMA Standards Publication MG1–1993, paragraph 14.03, ''Unusual Service Conditions,'' or for a particular type of application, and which can be used in most general purpose applications.

IEC means the International Electrotechnical Commission.

IEEE means the Institute of Electrical and Electronics Engineers, Inc.

ISO means International Organization for Standardization.

Manufacture means to manufacture, produce, assemble, or import.

NEMA means the National Electrical Manufacturers Association.

Nominal full load efficiency of an electric motor means a representative value of efficiency selected from Column A of Table 12–8, NEMA Standards Publication MG1–1993, that is not greater than the average full load efficiency of a population of motors of the same design.

Open motor means an electric motor having ventilating openings which permit passage of external cooling air over and around the windings of the machine.

Secretary means the Secretary of the Department of Energy.

Special purpose motor means any motor, other than a general purpose motor or definite purpose motor, which has special operating characteristics or special mechanical construction, or both, designed for a particular application.

Total power loss means that portion of the energy used by an electric motor not converted to rotational mechanical power, expressed in percent.

APPENDIX A TO SUBPART A OF 10 CFR PART 431, POLICY STATEMENT FOR ELECTRIC MOTORS COVERED UNDER THE ENERGY POLICY AND CONSERVATION ACT

This is a reprint of a policy statement which was published on November 5, 1997 at 62 FR 59978.

POLICY STATEMENT FOR ELECTRIC MOTORS COVERED UNDER THE ENERGY POLICY AND CONSERVATION ACT

I. INTRODUCTION

The Energy Policy and Conservation Act (EPCA), 42 U.S.C. 6311, *et seq.*, establishes energy efficiency standards and test procedures for certain commercial and industrial electric motors manufactured (alone or as a component of another piece of equipment) after October 24, 1997, or, in the case of an electric motor which requires listing or certification by a nationally recognized safety testing laboratory, after October 24, 1999.[1] EPCA also directs the Department of Energy (DOE or Department) to implement the statutory test procedures prescribed for motors, and to require efficiency labeling of motors and certification that covered motors comply with the standards.

Section 340(13)(A) of EPCA defines the term ''electric motor'' based essentially on the construction and rating system in the National Electrical Manufacturers Association (NEMA) Standards Publication MG1. Sections 340(13)(B) and (C) of EPCA define the terms ''definite purpose motor'' and ''special purpose motor,'' respectively, for which the statute prescribes no efficiency standards.

In its proposed rule to implement the EPCA provisions that apply to motors (61 FR 60440, November 27, 1996), DOE has proposed to clarify the statutory definition of ''electric motor,'' to mean a machine which converts electrical power into rotational mechanical power and which: (1) is a general purpose motor, including motors with explosion-proof construction;[2] (2) is a single speed, induction motor; (3) is rated for continuous duty operation, or is rated duty type S–1 (IEC)[3]; (4) contains a squirrel-cage or cage (IEC) rotor; (5) has foot-mounting, including foot-mounting with flanges or detachable feet; (6) is built in accordance with NEMA T-frame dimensions, or IEC metric equivalents (IEC); (7) has performance in accordance with NEMA Design A or B characteristics, or equivalent designs such as IEC Design N (IEC); and (8) operates on polyphase alternating current 60-Hertz sinusoidal power, and is (i) rated 230 volts or 460 volts, or both, including any motor that is rated at multi-voltages that include 230 volts or 460 volts, or (ii) can be operated on 230 volts or 460 volts, or both.

Notwithstanding the clarification provided in the proposed rule, there still appears to be uncertainty as to which motors EPCA covers. It is widely understood that the statute covers ''general purpose'' motors that are manufactured for a variety of applications, and that meet EPCA's definition of ''electric motor.'' Many modifications, however, can be made to such generic motors. Motor manufacturers have expressed concern as to precisely which motors with such modifications are covered under the statute, and as to whether manufacturers will be able to comply with the statute by October 25, 1997 with respect to all of these covered motors. Consequently, motor manufacturers have requested that the Department provide additional guidance as to which types of motors are ''electric motors,'' ''definite purpose motors,'' and ''special purpose motors'' under EPCA. The policy statement that follows is based upon input from motor manufacturers and energy efficiency advocates, and provides such guidance.

II. GUIDELINES FOR DETERMINING WHETHER A MOTOR IS COVERED BY EPCA

A. General

EPCA specifies minimum nominal full-load energy efficiency standards for 1 to 200 horsepower electric motors, and, to measure

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[1] The term ''manufacture'' means ''to manufacture, produce, assemble or import.'' EPCA section 321(10). Thus, the standards apply to motors produced, assembled, imported or manufactured after these statutory deadlines.

[2] Section 342(b)(1) of EPCA recognizes that EPCA's efficiency standards cover ''motors which require listing or certification by a nationally recognized safety testing laboratory.'' This applies, for example, to explosion-proof motors which are otherwise general purpose motors.

[3] Terms followed by the parenthetical ''IEC'' are referred to in the International Electrotechnical Commission (IEC) Standard 34–1. Such terms are included in DOE's proposed definition of ''electric motor'' because DOE believes EPCA's efficiency requirements apply to metric system motors that conform to IEC Standard 34, and that are identical or equivalent to motors constructed in accordance with NEMA MG1 and covered by the statute.

compliance with those standards, prescribes use of the test procedures in NEMA Standard MG1 and Institute of Electrical and Electronics Engineers, Inc., (IEEE) Standard 112. In DOE's view, as stated in Assistant Secretary Ervin's letter of May 9, 1996, to NEMA's Malcolm O'Hagan, until DOE's regulations become effective, manufacturers can establish compliance with these EPCA requirements through use of competent and reliable procedures or methods that give reasonable assurance of such compliance. So long as these criteria are met, manufacturers may conduct required testing in their own laboratories or in independent laboratories, and may employ alternative correlation methods (in lieu of actual testing) for some motors. Manufacturers may also establish their compliance with EPCA standards and test procedures through use of third party certification or verification programs such as those recognized by Natural Resources Canada. Labeling and certification requirements will become effective only after DOE has promulgated a final rule prescribing such requirements.

Motors with features or characteristics that do not meet the statutory definition of ''electric motor'' are not covered, and therefore are not required to meet EPCA requirements. Examples include motors without feet and without provisions for feet, and variable speed motors operated on a variable frequency power supply. Similarly, multi-speed motors and variable speed motors, such as inverter duty motors, are not covered equipment, based on their intrinsic design for use at variable speeds. However, NEMA Design A or B motors that are single speed, meet all other criteria under the definitions in EPCA for covered equipment, and can be used with an inverter in variable speed applications as an additional feature, are covered equipment under EPCA. In other words, being suitable for use on an inverter by itself does not exempt a motor from EPCA requirements.

Section 340(13)(F) of EPCA, defines a ''small electric motor'' as ''a NEMA general purpose alternating current single-speed induction motor, built in a two-digit frame number series in accordance with NEMA Standards Publication MG 1–1987.'' Section 346 of EPCA requires DOE to prescribe testing requirements and efficiency standards only for those small electric motors for which the Secretary determines that standards are warranted. The Department has not yet made such a determination.

B. Electrical Features

As noted above, the Department's proposed definition of ''electric motor'' provides in part that it is a motor that ''operates on polyphase alternating current 60-Hertz sinusoidal power, and * * * can be operated on 230 volts or 460 volts, or both.'' In DOE's view, ''can be operated'' implicitly means that the motor can be operated successfully. According to NEMA Standards Publication MG1–1993, paragraph 12.44, ''Variations from Rated Voltage and Rated Frequency,'' alternating-current motors must operate successfully under running conditions at rated load with a variation in the voltage or the frequency up to the following: plus or minus 10 percent of rated voltage, with rated frequency for induction motors;[4] plus or minus 5 percent of rated frequency, with rated voltage; and a combined variation in voltage and frequency of 10 percent (sum of absolute values) of the rated values, provided the frequency variation does not exceed plus or minus 5 percent of rated frequency. DOE believes that, for purposes of determining whether a motor meets EPCA's definition of ''electric motor,'' these criteria should be used to determine when a motor that is not rated at 230 or 460 volts or 60 Hertz can be operated at such voltage and frequency.[5]

NEMA Standards Publication MG1 categorizes electrical modifications to motors according to performance characteristics that include locked rotor torque, breakdown torque, pull-up torque, locked rotor current, and slip at rated load, and assigns design letters, such as Design A, B, C, D, or E, to identify various combinations of such electrical performance characteristics. Under section 340(13)(A) of EPCA, electric motors subject to EPCA efficiency requirements include only motors that fall within NEMA ''Design A and B * * * as defined in [NEMA] Standards Publication MG1–1987.'' As to locked rotor torque, for example, MG1 specifies a minimum performance value for a Design A

[4] For example, a motor that is rated at 220 volts should operate successfully on 230 volts, since 220 + .10(220) = 242 volts. A 208 volt motor, however, would not be expected to operate successfully on 230 volts, since 208 + .10(208) = 228.8 volts.

[5] The Department understands that a motor that can operate at such voltage and frequency, based on variations defined for successful operation, will not necessarily perform in accordance with the industry standards established for operation at the motor's *rated* voltage and frequency. In addition, under the test procedures prescribed by EPCA, motors are to be tested at their rated values. Therefore, in DOE's view a motor that is not rated for 230 or 460 volts, or 60 Hertz, but that can be successfully operated at these levels, must meet the energy efficiency requirements at its rated voltage(s) and frequency. DOE also notes that when a motor is rated to include a wider voltage range that includes 230/460 volts, the motor should meet the energy efficiency requirements at 230 volts or 460 volts.

or B motor of a given speed and horsepower, and somewhat higher minimum values for Design C and D motors of the same speed and horsepower. The Department understands that, under MG1, the industry classifies a motor as Design A or B if it has a locked rotor torque at or above the minimum for A and B but below the minimum for Design C, so long as it otherwise meets the criteria for Design A or B. Therefore, in the Department's view, such a motor is covered by EPCA's requirements for electric motors. By contrast a motor that meets or exceeds the minimum locked rotor torque for Design C or D is not covered by EPCA. In sum, if a motor has electrical modifications that meet Design A or B performance requirements it is covered by EPCA, and if its characteristics meet Design C, D or E it is not covered.

C. Size

Motors designed for use on a particular type of application which are in a frame size that is one or more frame *series* larger than the frame size assigned to that rating by sections 1.2 and 1.3 of NEMA Standards Publication MG 13–1984 (R1990), ''Frame Assignments for Alternating Current Integral-Horsepower Induction Motors,'' are not, in the Department's view, usable in most general purpose applications. This is due to the physical size increase associated with a frame series change. A frame series is defined as the first two digits of the frame size designation. For example, 324T and 326T are both in the same frame series, while 364T is in the next larger frame series. Hence, in the Department's view, a motor that is of a larger frame series than normally assigned to that standard rating of motor is not covered by EPCA. A physically larger motor within the same frame series would be covered, however, because it would be usable in most general purpose applications.

Motors built in a T-frame series or a T-frame size *smaller* than that assigned by MG 13–1984 (R1990) are also considered usable in most general purpose applications. This is because simple modifications can generally be made to fit a smaller motor in place of a motor with a larger frame size assigned in conformity with NEMA MG 13. Therefore, DOE believes that such smaller motors are covered by EPCA.

D. Motors with Seals

Some electric motors have seals to prevent ingress of water, dust, oil, and other foreign materials into the motor. DOE understands that, typically, a manufacturer will add seals to a motor that it manufactures, so that it will sell two motors that are identical except that one has seals and the other does not. In such a situation, if the motor without seals is ''general purpose'' and covered by EPCA's efficiency requirements, then the motor with seals will also be covered because it can still be used in most general purpose applications. DOE understands, however, that manufacturers previously believed motors with seals were not covered under EPCA, in part because IEEE Standard 112, ''Test Procedure for Polyphase Induction Motors and Generators,'' prescribed by EPCA, does not address how to test a motor with seals installed.

The efficiency rating of such a motor, if determined with seals installed and when the motor is new, apparently would significantly understate the efficiency of the motor as operated. New seals are stiff, and provide friction that is absent after their initial break-in period. DOE understands that, after this initial period, the efficiency ratings determined for the same motor with and without seals would be virtually identical. To construe EPCA, therefore, as requiring such separate efficiency determinations would impose an unnecessary burden on manufacturers.

In light of the foregoing, the Department believes that EPCA generally permits the efficiency of a motor with seals to be determined without the seals installed. Furthermore, notwithstanding the prior belief that such motors are not covered by EPCA, use of this approach to determining efficiency will enable manufacturers to meet EPCA's standards with respect to covered motors with seals by the date the standards go into effect on October 25, 1997.

III. Discussion of How DOE Would Apply EPCA Definitions, Using the Foregoing Guidelines

Using the foregoing guidelines, the attached matrix provides DOE's view as to which motors with common features are covered by EPCA. Because manufacturers produce many basic models that have many modifications of generic general purpose motors, the Department does not represent that the matrix is all-inclusive. Rather it is a set of examples demonstrating how DOE would apply EPCA definitions, as construed by the above guidelines, to various motor types. By extension of these examples, most motors currently in production, or to be designed in the future, could probably be classified. The matrix classifies motors into five categories, which are discussed in the following passages.

Category I—For ''electric motors'' (manufactured alone or as a component of another piece of equipment) in Category I, DOE will enforce EPCA efficiency standards and test procedures beginning on October 25, 1997

The Department understands that some motors essentially are relatively simple

modifications of generic general purpose motors. Modifications could consist, for example, of minor changes such as the addition of temperature sensors or a heater, the addition of a shaft extension and a brake disk from a kit, or changes in exterior features such as the motor housing. Such motors can still be used for most general purpose applications, and the modifications have little or no effect on motor performance. Nor do the modifications affect energy efficiency.

Category II—For certain motors that are ''definite purpose'' according to present industry practice, but that can be used in most general purpose applications, DOE will generally enforce EPCA efficiency standards and test procedures beginning no later than October 25, 1999

General Statement

EPCA does not prescribe standards and test procedures for ''definite purpose motors.'' Section 340(13)(B) of EPCA defines the term ''definite purpose motor'' as ''any motor designed in standard ratings with standard operating characteristics or standard mechanical construction for use under service conditions other than usual or for use on a particular type of application *and which cannot be used in most general purpose applications*.'' [Emphasis added.] Except, significantly, for exclusion of the italicized language, the industry definition of ''definite purpose motor,'' set forth in NEMA MG1, is identical to the foregoing.

Category II consists of electric motors with horsepower ratings that fall between the horsepower ratings in section 342(b)(1) of EPCA, thermally protected motors, and motors with roller bearings. As with motors in Category I, these motors are essentially modifications of generic general purpose motors. Generally, however, the modifications contained in these motors are more extensive and complex than the modifications in Category I motors. These Category II motors have been considered ''definite purpose'' in common industry parlance, but are covered equipment under EPCA because they *can be used in most general purpose applications.*

According to statements provided during the January 15, 1997, Public Hearing, Tr. pgs. 238–239, Category II motors were, until recently, viewed by most manufacturers as definite purpose motors, consistent with the industry definition that did not contain the clause ''which cannot be used in most general purpose applications.'' Hence, DOE understands that many manufacturers assumed these motors were not subject to EPCA's efficiency standards. During the period prior and subsequent to the hearing, discussions among manufacturers resulted in a new understanding that such motors are general purpose under EPCA, since they *can* be used in most general purpose applications. Thus, the industry only recently recognized that such motors are covered under EPCA. Although the statutory definition adopted in 1992 contained the above-quoted definition of ''definite purpose,'' the delay in issuing regulations which embody this definition may have contributed to industry's delay in recognizing that these motors are covered.

The Department understands that redesign and testing these motors in order to meet the efficiency standards in the statute may require a substantial amount of time. Given the recent recognition that they are covered, it is not realistic to expect these motors will be able to comply by October 25, 1997. A substantial period beyond that will be required. Moreover, the Department believes different manufacturers will need to take different approaches to achieving compliance with respect to these motors, and that, for a particular type of motor, some manufacturers will be able to comply sooner than others. Thus, the Department intends to refrain from taking enforcement action for two years, until October 25, 1999, with respect to motors with horsepower ratings that fall between the horsepower ratings in section 342(b)(1) of EPCA, thermally protected motors, and motors with roller bearings. Manufacturers are encouraged, however, to manufacture these motors in compliance with EPCA at the earliest possible date.

The following sets forth in greater detail, for each of these types of motors, the basis for the Department's policy to refrain from enforcement for two years. Also set forth is additional explanation of the Department's understanding as to why manufacturers previously believed intermediate horsepower motors were not covered by EPCA.

Intermediate Horsepower Ratings

Section 342(b)(1) of EPCA specifies efficiency standards for electric motors with 19 specific horsepower ratings, ranging from one through 200 horsepower. Each is a preferred or standardized horsepower rating as reflected in the table in NEMA Standards Publication MG1–1993, paragraph 10.32.4, *Polyphase Medium Induction Motors.* However, an ''electric motor,'' as defined by EPCA, can be built at other horsepower ratings, such as 6 horsepower, 65 horsepower, or 175 horsepower. Such motors, rated at horsepower levels between any two adjacent horsepower ratings identified in section 342(b)(1) of EPCA will be referred to as ''intermediate horsepower motors.'' In the Department's view, efficiency standards apply to every motor that has a rating from one through 200 horsepower (or kilowatt equivalents), and that otherwise meets the criteria for an ''electric motor'' under EPCA, including an electric motor with an intermediate horsepower (or kW) rating.

To date, these motors have typically been designed in conjunction with and supplied to

a specific customer to fulfill certain performance and design requirements of a particular application, as for example to run a certain type of equipment. See the discussion in Section IV below on ''original equipment'' and ''original equipment manufacturers.'' In large part for these reasons, manufacturers believed intermediate horsepower motors to be ''definite purpose motors'' that were not covered by EPCA. Despite their specific uses, however, these motors are electric motors under EPCA when they are capable of being used in most general purpose applications.

Features of a motor that are directly related to its horsepower rating include its physical size, and the ratings of its controller and protective devices. These aspects of a 175 horsepower motor, for example, which is an intermediate horsepower motor, must be appropriate to that horsepower, and would generally differ from the same aspects of 150 and 200 horsepower motors, the two standard horsepower ratings closest to 175. To re-design an existing intermediate horsepower electric motor so that it complies with EPCA could involve all of these elements of a motor's design. For example, the addition of material necessary to achieve EPCA's prescribed level of efficiency could cause the size of the motor to increase. The addition of magnetic material would invite higher inrush current that could cause an incorrectly sized motor controller to malfunction, or the circuit breaker with a standard rating to trip unnecessarily, or both. The Department believes motor manufacturers will require a substantial amount of time to redesign and retest each intermediate horsepower electric motor they manufacture.

To the extent such intermediate horsepower electric motors become unavailable because motor manufacturers have recognized only recently that they are covered by EPCA, equipment in which they are incorporated would temporarily become unavailable also. Moreover, re-design of such a motor to comply with EPCA could cause changes in the motor that require re-design of the equipment in which the motor is used. For example, if an intermediate horsepower electric motor becomes larger, it might no longer fit in the equipment for which it was designed. In such instances, the equipment would have to be re-designed. Because these motors were previously thought not to be covered, equipment manufacturers may not have had sufficient lead time to make the necessary changes to the equipment without interrupting its production.

With respect to intermediate horsepower motors, the Department intends to refrain from enforcing EPCA for a period of 24 months only as to such motor designs that were being manufactured prior to the date this Policy Statement was issued. The Department is concerned that small adjustments could be made to the horsepower rating of an existing electric motor, in an effort to delay compliance with EPCA, if it delayed enforcement as to all intermediate horsepower motors produced during the 24 month period. For example, a 50 horsepower motor that has a service factor of 1.15 could be renameplated as a 57½ horsepower motor that has a 1.0 service factor. By making this delay in enforcement applicable only to preexisting designs of intermediate horsepower motors, the Department believes it has made adequate provision for the manufacture of bona fide intermediate horsepower motor designs that cannot be changed to be in compliance with EPCA by October 25, 1997.

Thermally Protected Motors

The Department understands that in order to redesign a thermally protected motor to improve its efficiency so that it complies with EPCA, various changes in the windings must be made which will require the thermal protector to be re-selected. Such devices sense the inrush and running current of the motor, as well as the operating temperature. Any changes to a motor that affect these characteristics will prevent the protector from operating correctly. When a new protector is selected, the motor must be tested to verify proper operation of the device in the motor. The motor manufacturer would test the locked rotor and overload conditions, which could take several days, and the results may dictate that a second selection is needed with additional testing. When the manufacturer has finished testing, typically the manufacturer will have a third party conduct additional testing. This testing may include cycling the motor in a locked-rotor condition to verify that the protector functions properly. This testing may take days or even weeks to perform for a particular model of motor.

Since it was only recently recognized by industry that these motors are covered by EPCA, in the Department's view the total testing program makes it impossible for manufacturers to comply with the EPCA efficiency levels in thermally protected motors by October 25, 1997, especially since each different motor winding must be tested and motor winding/thermal protector combinations number in the thousands.

Motors With Roller Bearings

Motors with roller bearings fit within the definition of electric motor under the statute. However, because the IEEE Standard 112 Test Method B does not provide measures to test motors with roller bearings installed, manufacturers mistakenly believed such motors were not covered. Under IEEE Standard 112, a motor with roller bearings could only

be tested for efficiency with the roller bearings removed and standard ball bearings installed as temporary substitutes. Then on the basis of the energy efficiency information gained from that test, the manufacturer may need to redesign the motor in order to comply with the statute. In this situation, the Department understands that testing, redesigning, and retesting lines of motors with roller bearings, to establish compliance, would be difficult and time consuming.

Categories III, IV and V—Motors not within EPCA's definition of ''electric motor,'' and not covered by EPCA

Close-coupled Pump Motors

NEMA Standards Publication MG1–1993, with revisions one through three, Part 18, ''Definite-Purpose Machines,'' defines ''a face-mounting close-coupled pump motor'' as ''a medium alternating-current squirrel-cage induction open or totally enclosed motor, with or without feet, having a shaft suitable for mounting an impeller and sealing device.'' Paragraphs MG1–18.601–18.614 specify its performance, face and shaft mounting dimensions, and frame assignments that replace the suffix letters T and TS with the suffix letters JM and JP.

The Department understands that such motors are designed in standard ratings with standard operating characteristics for use in certain close-coupled pumps and pumping applications, but cannot be used in non-pumping applications, such as, for example, conveyors. Consequently, the Department believes close-coupled pump motors are definite-purpose motors not covered by EPCA. However, a motor that meets EPCA's definition of ''electric motor,'' and which can be coupled to a pump, for example by means of a C-face or D-flange endshield, as depicted in NEMA Standards Publication MG1, Part 4, ''Dimensions, Tolerances, and Mounting,'' is covered.

Totally-enclosed Non-ventilated (TENV) and Totally-enclosed Air-over (TEAO) Motors

A motor designated in NEMA MG1–1993, paragraph MG1–1.26.1, as ''totally-enclosed non-ventilated (IP54, IC410)''[6] is ''not equipped for cooling by means external to the enclosing parts.'' This means that the motor, when properly applied, does not require the use of any additional means of cooling installed external to the motor enclosure. The TENV motor is cooled by natural conduction and natural convection of the motor heat into the surrounding environment. As stated in NEMA MG1–1993, Suggested Standard for Future Design, paragraph MG1–1.26.1a, a TENV motor ''is only equipped for cooling by free convection.'' The general requirement for the installation of the TENV motor is that it not be placed in a restricted space that would inhibit this natural dissipation of the motor heat. Most general purpose applications use motors which include a means for forcing air flow through or around the motor and usually through the enclosed space and, therefore, can be used in spaces that are more restrictive than those required for TENV motors. Placing a TENV motor in such common restricted areas is likely to cause the motor to overheat. The TENV motor may also be larger than the motors used in most general purpose applications, and would take up more of the available space, thus reducing the size of the open area surrounding the motor. Installation of a TENV motor might require, therefore, an additional means of ventilation to continually exchange the ambient around the motor.

A motor designated in NEMA MG1–1993 as ''totally-enclosed air-over (IP54, IC417)'' is intended to be cooled by ventilation means external to (i.e., separate and independent from) the motor, such as a fan. The motor must be provided with the additional ventilation to prevent it from overheating.

Consequently, neither the TENV motor nor the TEAO motor would be suitable for most general purpose applications, and, DOE believes they are definite-purpose motors not covered by EPCA.

Integral Gearmotors

An ''integral gearmotor'' is an assembly of a motor and a specific gear drive or assembly of gears, such as a gear reducer, as a unified package. The motor portion of an integral gearmotor is not necessarily a complete motor, since the end bracket or mounting flange of the motor portion is also part of the gear assembly and cannot be operated when separated from the complete gear assembly. Typically, an integral gearmotor is not manufactured to standard T-frame dimensions specified in NEMA MG1. Moreover, neither the motor portion, nor the entire integral gearmotor, are capable of being used in most general purpose applications without significant modifications. An integral

[6] IP refers to the IEC Standard 34–5: Classification of degrees of protection provided by enclosures for rotating machines. IC refers to the IEC Standard 34–6: Methods of cooling rotating machinery. The IP and IC codes are referenced in the NEMA designations for TENV and TEAO motors in MG1–1993 Part 1, ''Classification According to Environmental Protection and Methods of Cooling,'' as a Suggested Standard for Future Design, since the TENV and TEAO motors conform to IEC Standards. Details of protection (IP) and methods of cooling (IC) are defined in MG1 Part 5 and Part 6, respectively.

gearmotor is also designed for a specific purpose and can have unique performance characteristics, physical dimensions, and casing, flange and shafting configurations. Consequently, integral gearmotors are outside the scope of the EPCA definition of ''electric motor'' and are not covered under EPCA.

However, an ''electric motor,'' as defined by EPCA, which is connected to a stand alone mechanical gear drive or an assembly of gears, such as a gear reducer connected by direct coupling, belts, bolts, a kit, or other means, is covered equipment under EPCA.

IV. Electric Motors That Are Components in Certain Equipment

The primary function of an electric motor is to convert electrical energy to mechanical energy which then directly drives machinery such as pumps, fans, or compressors. Thus, an electric motor is always connected to a driven machine or apparatus. Typically the motor is incorporated into a finished product such as an air conditioner, a refrigerator, a machine tool, food processing equipment, or other commercial or industrial machinery. These products are commonly known as ''original equipment'' or ''end-use equipment,'' and are manufactured by firms known as ''original equipment manufacturers'' (OEMs).

Many types of motors used in original equipment are covered under EPCA. As noted above, EPCA prescribes efficiency standards to be met by all covered electric motors manufactured after October 24, 1997, except that covered motors which require listing or certification by a nationally recognized safety testing laboratory need not meet the standards until after October 24, 1999. Thus, for motors that must comply after October 24, 1997, once inventories of motors manufactured before the deadline have been exhausted, only complying motors would be available for purchase and use by OEMs in manufacturing original equipment. Any non-complying motors previously included in such equipment would no longer be available.

The physical, and sometimes operational, characteristics of motors that meet EPCA efficiency standards normally differ from the characteristics of comparable existing motors that do not meet those standards. In part because of such differences, the Department is aware of two types of situations where strict application of the October 24, 1997 deadline could temporarily prevent the manufacture of, and remove from the marketplace, currently available original equipment.

One such situation is where an original equipment manufacturer uses an electric motor as a component in end-use equipment that requires listing or certification by a nationally recognized safety testing laboratory, even though the motor itself does not require listing or certification. In some of these instances, the file for listing or certification specifies the particular motor to be used. No substitution could be made for the motor without review and approval of the new motor and the entire system by the safety testing laboratory. Consequently, a specified motor that does not meet EPCA standards could not be replaced by a complying motor without such review and approval.

This re-listing or re-certification process is subject to substantial variation from one piece of original equipment to the next. For some equipment, it could be a simple paperwork transaction between the safety listing or certification organization and the OEM, taking approximately four to eight weeks to complete. But the process could raise more complex system issues involving redesign of the motor or piece of equipment, or both, and actual testing to assure that safety and performance criteria are met, and could take several months to complete. The completion time could also vary depending on the response time of the particular safety approval agency. Moreover, in the period immediately after October 24, the Department believes wholesale changes could occur in equipment lines when OEMs must begin using motors that comply with EPCA. These changes are likely to be concentrated in the period immediately after EPCA goes into effect on October 24, and if many OEMs seek to re-list or re-certify equipment at the same time, substantial delays in the review and approval process at the safety approval agencies could occur. For these reasons, the Department is concerned that certain end-user equipment that requires safety listing or certification could become unavailable in the marketplace, because an electric motor specifically identified in a listing or certification is covered by EPCA and will become unavailable, and the steps have not been completed to obtain safety approval of the equipment when manufactured with a complying motor.

Second, a situation could exist where an electric motor covered by EPCA is constructed in a T-frame series or T-frame size that is smaller (but still standard) than that assigned by NEMA Standards Publication MG 13–1984 (R1990), sections 1.2 and 1.3, in order to fit into a restricted mounting space that is within certain end-use equipment. (Motors in IEC metric frame sizes and kilowatt ratings could also be involved in this type of situation.) In such cases, the manufacturer of the end-use equipment might need to redesign the equipment containing the mounting space to accommodate a larger motor that complies with EPCA. These circumstances as well could result in certain currently available equipment becoming temporarily unavailable in the market, since the smaller size motor would become unavailable before the original equipment had

been re-designed to accommodate the larger, complying motor.

The Department understands that many motor manufacturers and OEMs became aware only recently that the electric motors addressed in the preceding paragraphs were covered by EPCA. This is largely for the same reasons, discussed above, that EPCA coverage of Category II motors was only recently recognized. In addition, the Department understands that some motor manufacturers and original equipment manufacturers confused motors that themselves require safety listing or certification, which need not comply until October 25, 1999, with motors that, while not subject to such requirements, are included in *original equipment* that requires safety listing or certification. Consequently, motor manufacturers and original equipment manufacturers took insufficient action to assure that appropriate complying motors would be available for the original equipment involved, and that the equipment could accommodate such motors. OEMs involved in such situations may often be unable to switch to motors that meet EPCA standards in the period immediately following October 24. To mitigate any hardship to purchasers of the original equipment, the Department intends to refrain from enforcing EPCA in certain limited circumstances, under the conditions described below.

Where a particular electric motor is specified in an approved safety listing or certification for a piece of original equipment, and the motor does not meet the applicable efficiency standard in EPCA, the Department's policy will be as follows: For the period of time necessary for the OEM to obtain a revised safety listing or certification for that piece of equipment, with a motor specified that complies with EPCA, but in no event beyond October 24, 1999, the Department would refrain from taking enforcement action under EPCA with respect to manufacture of the motor for installation in such original equipment. This policy would apply only where the motor has been manufactured and specified in the approved safety listing or certification prior to October 25, 1997.

Where a particular electric motor is used in a piece of original equipment and manufactured in a smaller than assigned frame size or series, and the motor does not meet the applicable efficiency standard in EPCA, the Department's policy will be as follows: For the period of time necessary for the OEM to re-design the piece of equipment to accommodate a motor that complies with EPCA, but in no event beyond October 24, 1999, the Department would refrain from enforcing the standard with respect to manufacture of the motor for installation in such original equipment. This policy would apply only to a model of motor that has been manufactured and included in the original equipment prior to October 25, 1997.

To allow the Department to monitor application of the policy set forth in the prior two paragraphs, the Department needs to be informed as to the motors being manufactured under the policy. Therefore, each motor manufacturer and OEM should jointly notify the Department as to each motor they will be manufacturing and using, respectively, after October 24, 1997, in the belief that it is covered by the policy. The notification should set forth: (1) the name of the motor manufacturer, and a description of the motor by type, model number, and date of design or production; (2) the name of the original equipment manufacturer, and a description of the application where the motor is to be used; (3) the safety listing or safety certification organization and the existing listing or certification file or document number for which re-listing or re-certification will be requested, if applicable; (4) the reason and amount of time required for continued production of the motor, with a statement that a substitute electric motor that complies with EPCA could not be obtained by an earlier date; and (5) the name, address, and telephone number of the person to contact for further information. The joint request should be signed by a responsible official of each requesting company, and sent to: U.S. Department of Energy, Assistant Secretary for Energy Efficiency and Renewable Energy, Office of Building Research and Standards, EE–41, Forrestal Building, 1000 Independence Avenue, SW, Room 1J–018, Washington, DC 20585–0121. The Department does not intend to apply this policy to any motor for which it does not receive such a notification. Moreover, the Department may use the notification, and make further inquiries, to be sure motors listed in the notification meet the criteria for application of the policy.

This part of the Policy Statement will not apply to a motor in Category II, discussed above in section III. Because up to 24 months is contemplated for compliance by Category II motors, the Department believes any issues that might warrant a delay of enforcement for such motors can be addressed during that time period.

V. Further Information

The Department intends to incorporate this Policy Statement into an appendix to its final rule to implement the EPCA provisions that apply to motors. Any comments or suggestions with respect to this Policy Statement, as well as requests for further information, should be addressed to the Director, Office of Building Research and Standards, EE–41, U.S. Department of Energy, 1000 Independence Avenue, SW, Washington, DC 20585–0121.

EXAMPLES OF MANY COMMON FEATURES OR MOTOR MODIFICATIONS TO ILLUSTRATE HOW THE EPCA DEFINITIONS AND DOE GUIDELINES WOULD BE APPLIED TO MOTOR CATEGORIES: GENERAL PURPOSE; DEFINITE PURPOSE; AND SPECIAL PURPOSE							
MOTOR MODIFICATION		CATEGORY[7]					EXPLANATION
		I	II	III	IV	V	
A. ELECTRICAL MODIFICATIONS							
1	ALTITUDE	X					General purpose up to a frame series change larger.
2	AMBIENT	X					General purpose up to a frame series change larger.
3	MULTISPEED					X	EPCA applies to single speed only.
4	SPECIAL LEADS	X					
5	SPECIAL INSULATION	X					
6	ENCAPSULATION				X		Due to special construction.
7	HIGH SERVICE FACTOR	X					General purpose up to a frame series change larger.
8	SPACE HEATERS	X					
9	WYE DELTA START	X					
10	PART WINDING START	X					
11	TEMPERATURE RISE	X					General purpose up to a frame series change larger.
12	THERMALLY PROTECTED		X				Requires retesting and third party agency approval.
13	THERMOSTAT/THERMISTOR	X					
14	SPECIAL VOLTAGES					X	EPCA applies to motors operating on 230/460 voltages at 60 Hertz.
15	INTERMEDIATE HORSEPOWERS		X				Round horsepower according to 10 CFR 431.42 for efficiency.
16	FREQUENCY					X	EPCA applies to motors operating on 230/460 voltages at 60 Hertz.
17	FUNGUS/TROP INSULATION	X					

[7]Category I - General purpose electric motors as defined in EPCA.
Category II - Definite purpose electric motors that can be used in most general purpose applications as defined in EPCA.
Category III - Definite purpose motors as defined in EPCA.
Category IV - Special purpose motors as defined in EPCA.
Category V - Outside the scope of "electric motor" as defined in EPCA.

B. MECHANICAL MODIFICATIONS							
18	SPECIAL BALANCE	X					
19	BEARING TEMP. DETECTOR	X					
20	SPECIAL BASE/FEET				X	Does not meet definition of T-frame	
21	SPECIAL CONDUIT BOX	X					
22	AUXILIARY CONDUIT BOX	X					
23	SPECIAL PAINT/COATING	X					
24	DRAINS	X					
25	DRIP COVER	X					
26	GROUND. LUG/HOLE	X					
27	SCREENS ON ODP ENCLOSURE	X					
28	MOUNTING F1,F2; W1-4; C1,2	X				Foot-mounting, rigid base, and resilient base.	
C. BEARINGS							
29	BEARING CAPS	X					
30	ROLLER BEARINGS		X			Test with a standard bearing.	
31	SHIELDED BEARINGS	X					
32	SEALED BEARINGS	X				Test with a standard bearing.	
33	THRUST BEARINGS				X	Special mechanical construction.	
34	CLAMPED BEARINGS	X					
35	SLEEVE BEARINGS				X	Special mechanical construction.	
D. SPECIAL ENDSHIELDS							
36	C FACE	X				As defined in NEMA MG-1.	
37	D FLANGE	X				As defined in NEMA MG-1.	
38	CUSTOMER DEFINED				X	Special design for a particular application.	
E. SEALS							
39	CONTACT SEALS	X				Includes lip seals and taconite seals - test with seals removed.	
40	NON-CONTACT SEAL	X				Includes labyrinth and slinger seals - test with seals installed.	

F. SHAFTS							
41	STANDARD SHAFTS/NEMA MG-1	X					Includes single and double, cylindrical, tapered, and short shafts.
42	NON STANDARD MATERIAL	X					
G. FANS							
43	SPECIAL MATERIAL	X					
44	QUIET DESIGN	X					
H. OTHER MOTORS							
45	WASHDOWN	X					Test with seals removed.
46	CLOSE- COUPLED PUMP			X			JM and JP frame assignments.
47	INTEGRAL GEAR MOTOR					X	Typically special mechanical design, and not a T-frame; motor and gearbox inseparable and operate as one system.
48	VERTICAL - NORMAL THRUST				X		EPCA covers foot-mounting.
49	SAW ARBOR			X			Special electrical/mechanical design.
50	TENV			X			Totally-enclosed non-ventilated not equipped for cooling (IP54, IC410).
51	TEAO			X			Totally-enclosed air-over requires airflow from external source (IP54, IC417).
52	FIRE PUMP	X					When safety certification is not required. See also EPCA §342(b)(1).
53	NON-CONTINUOUS				X		EPCA covers continuous ratings.
54	INTEGRAL BRAKE MOTOR			X			Integral brake design factory built within the motor.

9/10/97

Subpart B—Test Procedures and Materials Incorporated

§ 431.21 Purpose and scope.

This subpart contains test procedures for electric motors, required to be prescribed by DOE pursuant to section 343 of EPCA, 42 U.S.C. 6314, and identifies materials incorporated by reference in this Part.

§ 431.22 Reference sources.

(a) *Materials incorporated by reference.* (1) *General.* The following standards which are not otherwise set forth in this part 431 are incorporated by reference. The material listed in paragraph (a)(2) of this section has been approved for incorporation by reference by the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR Part 51. Any subsequent amendment to a standard by the standard-setting organization will not affect the DOE test procedures unless and until amended by DOE. Material is incorporated as it exists on the date of the approval and a notice of any change in the material will be published in the FEDERAL REGISTER.

(2) *List of standards incorporated by reference.* (i) The following provisions of National Electrical Manufacturers Association Standards Publication MG1–1993, *Motors and Generators,* with Revisions 1, 2, 3 and 4:

(A) Section I, *General Standards Applying to All Machines,* Part 1, *Referenced Standards and Definitions,* paragraphs 1.16.1, 1.16.1.1, 1.17.1.1, 1.17.1.2, and 1.40.1;

(B) Section I, *General Standards Applying to All Machines,* Part 4, *Dimensions, Tolerances, and Mounting,* paragraph 4.01 and Figures 4–1, 4–2, 4–3, and 4–4;

(C) Section II, *Small (Fractional) and Medium (Integral) Machines,* Part 11, *Dimensions-AC and DC Small and Medium Machines,* paragraphs 11.01.2, 11.31 (except the lines for frames 447T, 447TS, 449T and 449TS), 11.32, 11.34 (except the line for frames 447TC and 449TC, and the line for frames 447TSC and 449TSC), 11.35, and 11.36 (except the line for frames 447TD and 449TD, and the line for frames 447TSD and 449TSD), and Table 11–1;

(D) Section II, *Small (Fractional) and Medium (Integral) Machines,* Part 12, *Tests and Performance-AC and DC Motors,* paragraphs 12.35.1, 12.35.5, 12.38.1, 12.39.1, and 12.40.1, 12.58.1, and Tables 12–2 and 12–8; and

(E) Section II, *Small (Fractional) and Medium (Integral) Machines,* Part 14, *Application Data-AC and DC Small and Medium Machines,* paragraphs 14.02 and 14.03.

(ii) Institute of Electrical and Electronics Engineers, Inc., Standard 112–1996, *Test Procedure for Polyphase Induction Motors and Generators,* Test Method B, and the correction to the calculation at item (28) in section 10.2 Form B-Test Method B issued by IEEE on January 20, 1998. (Note: Paragraph 2 of Appendix A to Subpart B of Part 431 sets forth modifications to this Standard when it is used for purposes of Part 431 and EPCA.)

(iii) CSA International Standard C390–93, *Energy Efficiency Test Methods for Three-Phase Induction Motors,* Test Method (1).

(iv) International Electrotechnical Commission Standard 60034–1 (1996), *Rotating electrical machines,* Part 1: *Rating and performance,* with Amendment 1 (1997), Section 3: Duty, clause 3.2.1 and figure 1.

(v) International Electrotechnical Commission Standard 60050–411 (1996), *International Electrotechnical Vocabulary Chapter 411: Rotating machines,* sections 411–33–07 and 411–37–26.

(vi) International Electrotechnical Commission Standard 60072–1 (1991), *Dimensions and output series for rotating electrical machines—Part 1: Frame numbers 56 to 400 and flange numbers 55 to 1080,* clauses 2, 3, 4.1, 6.1, 7, and 10, and Tables 1, 2 and 4.

(vii) International Electrotechnical Commission Standard 60034–12 (1980), *Rotating electrical machines, Part 12: Starting performance of single-speed three-phase cage induction motors for voltages up to and including 660 V,* with Amendment 1 (1992) and Amendment 2 (1995), clauses 1, 2, 3.1, 4, 5, and 6, and Tables I, II, and III.

(3) *Inspection of standards.* The standards incorporated by reference are available for inspection at:

(i) Office of the Federal Register Information Center, 800 North Capitol Street, NW, Suite 700, Washington, DC;

(ii) U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, Hearings and Dockets, ''Test Procedures, Labeling, and Certification Requirements for Electric Motors,'' Docket No. EE–RM–96–400, Forrestal Building, 1000 Independence Avenue, SW, Washington, DC.

(4) *Availability of standards.* Standards incorporated by reference may be obtained from the following sources:

(i) Copies of IEEE Standard 112–1996 can be obtained from the Institute of Electrical and Electronics Engineers, Inc., 445 Hoes Lane, P.O. Box 1331, Piscataway, NJ 08855–1331, 1–800–678–IEEE;

(ii) Copies of NEMA Standards Publication MG1–1993 with Revisions 1, 2, 3, and 4, and copies of International Electrotechnical Commission standards can be obtained from Global Engineering Documents, 15 Inverness Way East, Englewood, Colorado 80112–5776, 1–800–854–7179 (within the U.S.) or (303) 397–7956 (international).

(iii) Copies of CSA International Standard C390–93 can be obtained from CSA International, 178 Rexdale Boulevard, Etobicoke (Toronto), Ontario, Canada M9W 1R3, (416) 747–4044;

(b) *Reference Standards*—(1) *General.* The standards listed in this paragraph are referred to in the DOE procedures for testing laboratories, and recognition of accreditation bodies and certification programs but are not incorporated by reference. These sources are given here for information and guidance.

(2) *List of References.* (i) National Voluntary Laboratory Accreditation Program Handbooks 150, ''Procedures and General Requirements,'' March 1994, and 150–10, ''Efficiency of Electric Motors,'' August 1995. National Voluntary Laboratory Accreditation Program, National Institute of Standards and Technology, Gaithersburg, MD 20899.

(ii) ISO/IEC Guide 25, ''General requirements for the competence of calibration and testing laboratories.''

(iii) ISO Guide 27, ''Guidelines for corrective action to be taken by a certification body in the event of either misapplication of its mark of conformity to a product, or products which bear the mark of the certification body being found to subject persons or property to risk.''

(iv) ISO/IEC Guide 28, ''General rules for a model third-party certification system for products.''

(v) ISO/IEC Guide 58, ''Calibration and testing laboratory accreditation systems—General requirements for operation and recognition.''

(vi) ISO/IEC Guide 65, ''General requirements for bodies operating product certification systems.''

§ 431.23 Test procedures for the measurement of energy efficiency.

For purposes of 10 CFR Part 431 and EPCA, the test procedures for measuring the energy efficiency of an electric motor shall be the test procedures specified in appendix A to this subpart B.

§ 431.24 Determination of efficiency.

When a party determines the energy efficiency of an electric motor in order to comply with an obligation imposed on it by or pursuant to Part C of Title III of EPCA, 42 U.S.C. 6311-6316, this section applies. This section does not apply to enforcement testing conducted pursuant to § 431.127.

(a) *Provisions applicable to all electric motors.* (1) *General Requirements.* The average full load efficiency of each basic model of electric motor must be determined either by testing in accordance with § 431.23 of this subpart, or by application of an alternative efficiency determination method (AEDM) that meets the requirements of paragraphs (a)(2) and (3) of this section, provided, however, that an AEDM may be used to determine the average full load efficiency of one or more of a manufacturer's basic models only if the average full load efficiency of at least five of its other basic models is determined through testing.

(2) *Alternative efficiency determination method.* An AEDM applied to a basic model must be:

(i) Derived from a mathematical model that represents the mechanical and electrical characteristics of that basic model, and

(ii) Based on engineering or statistical analysis, computer simulation or

modeling, or other analytic evaluation of performance data.

(3) *Substantiation of an alternative efficiency determination method.* Before an AEDM is used, its accuracy and reliability must be substantiated as follows:

(i) The AEDM must be applied to at least five basic models that have been tested in accordance with § 431.23 of this subpart, and

(ii) The predicted total power loss for each such basic model, calculated by applying the AEDM, must be within plus or minus ten percent of the mean total power loss determined from the testing of that basic model.

(4) *Subsequent verification of an AEDM.* (i) Each manufacturer shall periodically select basic models representative of those to which it has applied an AEDM, and for each basic model selected shall either:

(A) Subject a sample of units to testing in accordance with §§ 431.23 and 431.24(b)(2) by an accredited laboratory that meets the requirements of § 431.25,

(B) Have a certification body recognized under § 431.27 certify its nominal full load efficiency, or

(C) Have an independent state-registered professional engineer, who is qualified to perform an evaluation of electric motor efficiency in a highly competent manner and who is not an employee of the manufacturer, review the manufacturer's representations and certify that the results of the AEDM accurately represent the total power loss and nominal full load efficiency of the basic model.

(ii) Each manufacturer that has used an AEDM under this section shall have available for inspection by the Department of Energy records showing: the method or methods used; the mathematical model, the engineering or statistical analysis, computer simulation or modeling, and other analytic evaluation of performance data on which the AEDM is based; complete test data, product information, and related information that the manufacturer has generated or acquired pursuant to §§ 431.24(a)(3) and (a)(4)(i); and the calculations used to determine the average full load efficiency and total power losses of each basic model to which the AEDM was applied.

(iii) If requested by the Department, the manufacturer shall conduct simulations to predict the performance of particular basic models of electric motors specified by the Department, analyses of previous simulations conducted by the manufacturer, sample testing of basic models selected by the Department, or a combination of the foregoing.

(5) *Use of a certification program or accredited laboratory.* (i) A manufacturer may have a certification program, that DOE has classified as nationally recognized under § 431.27, certify the nominal full load efficiency of a basic model of electric motor, and issue a certificate of conformity for the motor.

(ii) For each basic model for which a certification program is not used as described in paragraph (a)(5)(i) of this section, any testing of the motor pursuant to § 431.24(a)(1) through (3) to determine its energy efficiency must be carried out in accordance with § 431.24(b), in an accredited laboratory that meets the requirements of § 431.25. (This includes testing of the basic model, pursuant to § 431.24(a)(3)(i), to substantiate an AEDM.)

(b) *Additional testing requirements applicable when a certification program is not used.* (1) *Selection of basic models for testing.* (i) Basic models must be selected for testing in accordance with the following criteria:

(A) Two of the basic models must be among the five basic models with the highest unit volumes of production by the manufacturer in the prior year, or during the prior 12 calendar month period beginning in 1997,[1] whichever is later;

(B) The basic models should be of different horsepowers without duplication;

(C) The basic models should be of different frame number series without duplication; and

(D) Each basic model should be expected to have the lowest nominal full load efficiency among the basic models with the same rating (''rating'' as used here has the same meaning as it has in the definition of ''basic model'').

[1] In identifying these five basic models, any electric motor that does not comply with § 431.42, shall be excluded from consideration.

(ii) In any instance where it is impossible for a manufacturer to select basic models for testing in accordance with all of these criteria, the criteria shall be given priority in the order in which they are listed. Within the limits imposed by the criteria, basic models shall be selected randomly.

(2) *ection of units for testing.* For each basic model selected for testing,[2] a sample of units shall be selected at random and tested. The sample shall be comprised of production units of the basic model, or units that are representative of such production units. The sample size shall be not fewer than five units, except that when fewer than five units of a basic model would be produced over a reasonable period of time (approximately 180 days), then each unit shall be tested. In a test of compliance with a represented average or nominal efficiency:

(i) The average full-load efficiency of the sample X which is defined by

$$\overline{X} = \frac{1}{n}\sum_{i=1}^{n} X_i,$$

where X_i is the measured full-load efficiency of unit i and n is the number of units tested, shall satisfy the condition:

$$\overline{X} \geq \frac{100}{1 + 1.05\left(\frac{100}{RE} - 1\right)}$$

where RE is the represented nominal full-load efficiency, and

(ii) The lowest full-load efficiency in the sample X_{min}, which is defined by

$$X_{min} = \min(X_i)$$

shall satisfy the condition

$$X_{min} \geq \frac{100}{1 + 1.15\left(\frac{100}{RE} - 1\right)}$$

(3) *Substantiation of an alternative efficiency determination method.* The basic models tested under §431.24(a)(3)(i) must be selected for testing in accordance with paragraph (b)(1), and units of each such basic model must be tested in accordance with paragraph (b)(2) by an accredited laboratory that meets the requirements of §431.25.

[2] Components of similar design may be substituted without requiring additional testing if the represented measures of energy consumption continue to satisfy the applicable sampling provision.

§431.25 Testing laboratories.

(a) Testing pursuant to §431.24(a)(5)(ii) must be conducted in an accredited laboratory for which the accreditation body was:

(1) The National Institute of Standards and Technology/National Voluntary Laboratory Accreditation Program (NIST/NVLAP), or

(2) A laboratory accreditation body having a mutual recognition arrangement with NIST/NVLAP, or

(3) An organization classified by the Department, pursuant to section 431.26, as an accreditation body.

(b) NIST/NVLAP is under the auspices of the National Institute of Standards and Technology (NIST) which is part of the U.S. Department of Commerce. NIST/NVLAP accreditation is granted on the basis of conformance with criteria published in 15 CFR Part 285, *The National Voluntary Laboratory Accreditation Program Procedures and General Requirements.* NIST Handbook 150–10, August 1995, presents the technical requirements of the National Voluntary Laboratory Accreditation Program for the Efficiency of Electric Motors field of accreditation. This handbook supplements NIST Handbook 150, *National Voluntary Laboratory Accreditation Program Procedures and General Requirements,* which contains 15 CFR Part 285 of the U.S. Code of Federal Regulations plus all general NIST/NVLAP procedures, criteria, and policies. Changes in NIST/NVLAP's criteria, procedures, policies, standards or other bases for granting accreditation, occurring subsequent to the initial effective date of 10 CFR part 431 shall not apply to accreditation under this part unless approved in writing by the Department of Energy. Copies of NIST Handbooks 150 and 150–10 and information regarding NIST/NVLAP and its Efficiency of Electric Motors Program (EEM) can be obtained from NIST/NVLAP, 100 Bureau Drive, Mail Stop

2140, Gaithersburg, MD 20899–2140, telephone (301) 975–4016, or telefax (301) 926–2884.

§ 431.26 Department of Energy recognition of accreditation bodies.

(a) *Petition.* To be classified by the Department of Energy as an accreditation body, an organization must submit a petition to the Department requesting such classification, in accordance with paragraph (c) of this section and § 431.28 of this part. The petition must demonstrate that the organization meets the criteria in paragraph (b) of this section.

(b) *Evaluation criteria.* To be classified as an accreditation body by the Department, the organization must meet the following criteria:

(1) It must have satisfactory standards and procedures for conducting and administering an accreditation system and for granting accreditation. This must include provisions for periodic audits to verify that the laboratories receiving its accreditation continue to conform to the criteria by which they were initially accredited, and for withdrawal of accreditation where such conformance does not occur, including failure to provide accurate test results.

(2) It must be independent of electric motor manufacturers, importers, distributors, private labelers or vendors. It cannot be affiliated with, have financial ties with, be controlled by, or be under common control with any such entity.

(3) It must be qualified to perform the accrediting function in a highly competent manner.

(4) It must be expert in the content and application of the test procedures and methodologies in IEEE Standard 112–1996 Test Method B and CSA Standard C390–93 Test Method (1), or similar procedures and methodologies for determining the energy efficiency of electric motors.

(c) *Petition format.* Each petition requesting classification as an accreditation body must contain a narrative statement as to why the organization meets the criteria set forth in paragraph (b) of this section, must be signed on behalf of the organization by an authorized representative, and must be accompanied by documentation that supports the narrative statement. The following provides additional guidance:

(1) *Standards and procedures.* A copy of the organization's standards and procedures for operating an accreditation system and for granting accreditation should accompany the petition.

(2) *Independent status.* The petitioning organization should identify and describe any relationship, direct or indirect, that it has with an electric motor manufacturer, importer, distributor, private labeler, vendor, trade association or other such entity, as well as any other relationship it believes might appear to create a conflict of interest for it in performing as an accreditation body for electric motor testing laboratories. It should explain why it believes such relationship(s) would not compromise its independence as an accreditation body.

(3) *Qualifications to do accrediting.* Experience in accrediting should be discussed and substantiated by supporting documents. Of particular relevance would be documentary evidence that establishes experience in the application of guidelines contained in the ISO/IEC Guide 58, *Calibration and testing laboratory accreditation systems—General requirements for operation and recognition,* as well as experience in overseeing compliance with the guidelines contained in the ISO/IEC Guide 25, *General Requirements for the Competence of Calibration and Testing Laboratories.*

(4) *Expertise in electric motor test procedures.* The petition should set forth the organization's experience with the test procedures and methodologies in IEEE Standard 112–1996 Test Method B and CSA Standard C390–93 Test Method (1), and with similar procedures and methodologies. This part of the petition should include description of prior projects, qualifications of staff members, and the like. Of particular relevance would be documentary evidence that establishes experience in applying the guidelines contained in the ISO/IEC Guide 25, *General Requirements for the Competence of Calibration and Testing Laboratories,* to energy efficiency testing for electric motors.

(d) *Disposition.* The Department will evaluate the petition in accordance with section 431.28, and will determine

whether the applicant meets the criteria in paragraph (b) of this section to be classified as an accrediting body.

§ 431.27 Department of Energy recognition of nationally recognized certification programs.

(a) *Petition.* For a certification program to be classified by the Department of Energy as being nationally recognized in the United States for the purposes of section 345 of EPCA (''nationally recognized''), the organization operating the program must submit a petition to the Department requesting such classification, in accordance with paragraph (c) of this section and section 431.28 of this part. The petition must demonstrate that the program meets the criteria in paragraph (b) of this section.

(b) *Evaluation criteria.* For a certification program to be classified by the Department as nationally recognized, it must meet the following criteria:

(1) It must have satisfactory standards and procedures for conducting and administering a certification system, including periodic follow up activities to assure that basic models of electric motor continue to conform to the efficiency levels for which they were certified, and for granting a certificate of conformity.

(2) It must be independent of electric motor manufacturers, importers, distributors, private labelers or vendors. It cannot be affiliated with, have financial ties with, be controlled by, or be under common control with any such entity.

(3) It must be qualified to operate a certification system in a highly competent manner.

(4) It must be expert in the content and application of the test procedures and methodologies in IEEE Standard 112–1996 Test Method B and CSA Standard C390–93 Test Method (1), or similar procedures and methodologies for determining the energy efficiency of electric motors. It must have satisfactory criteria and procedures for the selection and sampling of electric motors tested for energy efficiency.

(c) *Petition format.* Each petition requesting classification as a nationally recognized certification program must contain a narrative statement as to why the program meets the criteria listed in paragraph (b) of this section, must be signed on behalf of the organization operating the program by an authorized representative, and must be accompanied by documentation that supports the narrative statement. The following provides additional guidance as to the specific criteria:

(1) *Standards and procedures.* A copy of the standards and procedures for operating a certification system and for granting a certificate of conformity should accompany the petition.

(2) *Independent status.* The petitioning organization should identify and describe any relationship, direct or indirect, that it or the certification program has with an electric motor manufacturer, importer, distributor, private labeler, vendor, trade association or other such entity, as well as any other relationship it believes might appear to create a conflict of interest for the certification program in operating a certification system for compliance by electric motors with energy efficiency standards. It should explain why it believes such relationship would not compromise its independence in operating a certification program.

(3) *Qualifications to operate a certification system.* Experience in operating a certification system should be discussed and substantiated by supporting documents. Of particular relevance would be documentary evidence that establishes experience in the application of guidelines contained in the ISO/IEC Guide 65, *General requirements for bodies operating product certification systems,* ISO/IEC Guide 27, *Guidelines for corrective action to be taken by a certification body in the event of either misapplication of its mark of conformity to a product, or products which bear the mark of the certification body being found to subject persons or property to risk,* and ISO/IEC Guide 28, *General rules for a model third-party certification system for products,* as well as experience in overseeing compliance with the guidelines contained in the ISO/IEC Guide 25, *General requirements for the competence of calibration and testing laboratories.*

(4) *Expertise in electric motor test procedures.* The petition should set forth the

program's experience with the test procedures and methodologies in IEEE Standard 112–1996 Test Method B and CSA Standard C390–93 Test Method (1), and with similar procedures and methodologies. This part of the petition should include description of prior projects, qualifications of staff members, and the like. Of particular relevance would be documentary evidence that establishes experience in applying guidelines contained in the ISO/IEC Guide 25, *General requirements for the competence of calibration and testing laboratories,* to energy efficiency testing for electric motors.

(d) *Disposition.* The Department will evaluate the petition in accordance with § 431.28, and will determine whether the applicant meets the criteria in paragraph (b) of this section for classification as a nationally recognized certification program.

§ 431.28 Procedures for recognition and withdrawal of recognition of accreditation bodies and certification programs.

(a) *Filing of petition.* Any petition submitted to the Department pursuant to § 431.26(a) or 431.27(a) of this part, shall be entitled ''Petition for Recognition'' (''Petition'') and must be submitted, in triplicate to the Assistant Secretary for Energy Efficiency and Renewable Energy, United States Department of Energy, 1000 Independence Avenue, SW, Washington, DC 20585. In accordance with the provisions set forth in 10 CFR 1004.11, any request for confidential treatment of any information contained in such a Petition or in supporting documentation must be accompanied by a copy of the Petition or supporting documentation from which the information claimed to be confidential has been deleted.

(b) *Public notice and solicitation of comments.* DOE shall publish in the FEDERAL REGISTER the Petition from which confidential information, as determined by DOE, has been deleted in accordance with 10 CFR 1004.11 and shall solicit comments, data and information on whether the Petition should be granted. The Department shall also make available for inspection and copying the Petition's supporting documentation from which confidential information, as determined by DOE, has been deleted in accordance with 10 CFR 1004.11. Any person submitting written comments to DOE with respect to a Petition shall also send a copy of such comments to the petitioner.

(c) *Responsive statement by the petitioner.* A petitioner may, within 10 working days of receipt of a copy of any comments submitted in accordance with paragraph (b) of this section, respond to such comments in a written statement submitted to the Assistant Secretary for Energy Efficiency and Renewable Energy. A petitioner may address more than one set of comments in a single responsive statement.

(d) *Public announcement of interim determination and solicitation of comments.* The Assistant Secretary for Energy Efficiency and Renewable Energy shall issue an interim determination on the Petition as soon as is practicable following receipt and review of the Petition and other applicable documents, including, but not limited to, comments and responses to comments. The petitioner shall be notified in writing of the interim determination. DOE shall also publish in the FEDERAL REGISTER the interim determination and shall solicit comments, data and information with respect to that interim determination. Written comments and responsive statements may be submitted as provided in paragraphs (b) and (c) of this section.

(e) *Public announcement of final determination.* The Assistant Secretary for Energy Efficiency and Renewable Energy shall as soon as practicable, following receipt and review of comments and responsive statements on the interim determination, publish in the FEDERAL REGISTER a notice of final determination on the Petition.

(f) *Additional information.* The Department may, at any time during the recognition process, request additional relevant information or conduct an investigation concerning the Petition. The Department's determination on a Petition may be based solely on the Petition and supporting documents, or may also be based on such additional information as the Department deems appropriate.

(g) *Withdrawal of recognition.* (1) *Withdrawal by the Department.* If the Department believes that an accreditation body or certification program that has been recognized under § 431.26 or 431.27, respectively, is failing to meet the criteria of paragraph (b) of the section under which it is recognized, the Department will so advise such entity and request that it take appropriate corrective action. The Department will give the entity an opportunity to respond. If after receiving such response, or no response, the Department believes satisfactory correction has not been made, the Department will withdraw its recognition from that entity.

(2) *Voluntary withdrawal.* An accreditation body or certification program may withdraw itself from recognition by the Department by advising the Department in writing of such withdrawal. It must also advise those that use it (for an accreditation body, the testing laboratories, and for a certification organization, the manufacturers) of such withdrawal.

(3) *Notice of withdrawal of recognition.* The Department will publish in the FEDERAL REGISTER a notice of any withdrawal of recognition that occurs pursuant to this paragraph (g).

§ 431.29 Petitions for waiver, and applications for interim waiver, of test procedure.

(a) *General criteria.* (1) Any interested person may submit a petition to waive for a particular basic model any requirements of § 431.23 of this subpart, upon the grounds that either the basic model contains one or more design characteristics which either prevent testing of the basic model according to the prescribed test procedures, or the prescribed test procedures may evaluate the basic model in a manner so unrepresentative of its true energy consumption characteristics as to provide materially inaccurate comparative data.

(2) Any interested person who has submitted a Petition for Waiver as provided in this subpart may also file an Application for Interim Waiver of the applicable test procedure requirements.

(b) *Submission, content, and publication.* (1) A Petition for Waiver must be submitted, in triplicate, to the Assistant Secretary for Energy Efficiency and Renewable Energy, United States Department of Energy. Each Petition for Waiver shall:

(i) Identify the particular basic model(s) for which a waiver is requested, the design characteristic(s) constituting the grounds for the petition, and the specific requirements sought to be waived and shall discuss in detail the need for the requested waiver;

(ii) Identify manufacturers of all other basic models marketed in the United States and known to the petitioner to incorporate similar design characteristic(s);

(iii) Include any alternate test procedures known to the petitioner to evaluate in a manner representative of the energy consumption characteristics of the basic model; and

(iv) Be signed by the petitioner or by an authorized representative. In accordance with the provisions set forth in 10 CFR 1004.11, any request for confidential treatment of any information contained in a Petition for Waiver or in supporting documentation must be accompanied by a copy of the petition, application or supporting documentation from which the information claimed to be confidential has been deleted. DOE shall publish in the FEDERAL REGISTER the petition and supporting documents from which confidential information, as determined by DOE, has been deleted in accordance with 10 CFR 1004.11 and shall solicit comments, data and information with respect to the determination of the petition.

(2) An Application for Interim Waiver must be submitted in triplicate, with the required three copies of the Petition for Waiver, to the Assistant Secretary for Energy Efficiency and Renewable Energy, U.S. Department of Energy. Each Application for Interim Waiver shall reference the Petition for Waiver by identifying the particular basic model(s) for which a waiver and temporary exception are being sought. Each Application for Interim Waiver shall demonstrate likely success of the Petition for Waiver and shall address

what economic hardship and/or competitive disadvantage is likely to result absent a favorable determination on the Application for Interim Waiver. Each Application for Interim Waiver shall be signed by the applicant or by an authorized representative.

(c) *Notification to other manufacturers.* (1) Each petitioner, after filing a Petition for Waiver with DOE, and after the Petition for Waiver has been published in the FEDERAL REGISTER, must, within five working days of such publication, notify in writing all known manufacturers of domestically marketed units of the same product type (as listed in section 340(1) of the Act) and must include in the notice a statement that DOE has published in the FEDERAL REGISTER on a certain date the Petition for Waiver and supporting documents from which confidential information, if any, as determined by DOE, has been deleted in accordance with 10 CFR 1004.11. Each petitioner, in complying with the requirements of this paragraph, must file with DOE a statement certifying the names and addresses of each person to whom a notice of the Petition for Waiver has been sent.

(2) Each applicant for Interim Waiver, whether filing jointly with, or subsequent to, a Petition for Waiver with DOE, must concurrently notify in writing all known manufacturers of domestically marketed units of the same product type (as listed in Section 340(1) of the Act) and must include in the notice a copy of the Petition for Waiver and a copy of the Application for Interim Waiver. In complying with this section, each applicant must in the written notification include a statement that the Assistant Secretary for Energy Efficiency and Renewable Energy will receive and consider timely written comments on the Application for Interim Waiver. Each applicant, upon filing an Application for Interim Waiver, must in complying with the requirements of this paragraph certify to DOE that a copy of these documents have been sent to all known manufacturers of domestically marked units of the same product type (as listed in section 340(1) of the Act). Such certification must include the names and addresses of such persons. Each applicant also must comply with the provisions of paragraph (c)(1) of this section with respect to the petition for waiver.

(d) *Comments; responses to comments.* (1) Any person submitting written comments to DOE with respect to an Application for Interim Waiver must also send a copy of the comments to the applicant.

(2) Any person submitting written comments to DOE with the respect to a Petition for Waiver must also send a copy of such comments to the petitioner. In accordance with subparagraph (b)(1) of this section, a petitioner may submit a rebuttal statement to the Assistant Secretary for Energy Efficiency and Renewable Energy.

(e) *Provisions specific to interim waivers.* (1) *Disposition of application*. If administratively feasible, applicant will be notified in writing of the disposition of the Application for Interim Waiver within 15 business days of receipt of the application. Notice of DOE's determination on the Application for Interim Waiver must be published in the FEDERAL REGISTER.

(2) *Consequences of filing application*. The filing of an Application for Interim Waiver shall not constitute grounds for noncompliance with any requirements of this subpart, until an Interim Waiver has been granted.

(3) *Criteria for granting.* An Interim Waiver from test procedure requirements will be granted by the Assistant Secretary for Energy Efficiency and Renewable Energy if it is determined that the applicant will experience economic hardship if the Application for Interim Waiver is denied, if it appears likely that the Petition for Waiver will be granted, and/or the Assistant Secretary determines that it would be desirable for public policy reasons to grant immediate relief pending a determination on the Petition for Waiver.

(4) *Duration*. An interim waiver will terminate 180 days after issuance or upon the determination on the Petition for Waiver, whichever occurs first. An interim waiver may be extended by DOE for 180 days. Notice of such extension and/or any modification of the terms or duration of the interim waiver shall be published in the FEDERAL REGISTER, and shall be based on relevant information contained in the

record and any comments received subsequent to issuance of the interim waiver.

(f) *Provisions specific to waivers*—(1) *Rebuttal by petitioner.* Following publication of the Petition for Waiver in the FEDERAL REGISTER, a petitioner may, within 10 working days of receipt of a copy of any comments submitted in accordance with paragraph (b)(1) of this section, submit a rebuttal statement to the Assistant Secretary for Energy Efficiency and Renewable Energy. A petitioner may rebut more than one response in a single rebuttal statement.

(2) *Disposition of petition.* The petitioner will be notified in writing as soon as practicable of the disposition of each Petition for Waiver. The Assistant Secretary for Energy Efficiency and Renewable Energy will issue a decision on the petition as soon as is practicable following receipt and review of the Petition for Waiver and other applicable documents, including, but not limited to, comments and rebuttal statements.

(3) *Consequence of filing petition.* The filing of a Petition for Waiver will not constitute grounds for noncompliance with any requirements of this subpart, until a waiver or interim waiver has been granted.

(4) *Granting of waivers: criteria, conditions, and publication.* Waivers will be granted by the Assistant Secretary for Energy Efficiency and Renewable Energy, if it is determined that the basic model for which the waiver was requested contains a design characteristic which either prevents testing of the basic model according to the prescribed test procedures, or the prescribed test procedures may evaluate the basic model in a manner so unrepresentative of its true energy consumption characteristics as to provide materially inaccurate comparative data. Waivers may be granted subject to conditions, which may include adherence to alternate test procedures specified by the Assistant Secretary for Energy Efficiency and Renewable Energy. The Assistant Secretary will promptly publish in the FEDERAL REGISTER notice of each waiver granted or denied, and any limiting conditions of each waiver granted.

(g) *Revision of regulation.* Within one year of the granting of any waiver, the Department of Energy will publish in the FEDERAL REGISTER a notice of proposed rulemaking to amend its regulations so as to eliminate any need for the continuation of such waiver. As soon thereafter as practicable, the Department of Energy will publish in the FEDERAL REGISTER a final rule. Such waiver will terminate on the effective date of such final rule.

(h) *Exhaustion of remedies.* In order to exhaust administrative remedies, any person aggrieved by an action under this section must file an appeal with the DOE's Office of Hearings and Appeals as provided in 10 CFR Part 1003, subpart C.

APPENDIX A TO SUBPART B OF PART 431—UNIFORM TEST METHOD FOR MEASURING NOMINAL FULL LOAD EFFICIENCY OF ELECTRIC MOTORS

1. *Definitions.*

Definitions contained in section 431.2 are applicable to this appendix.

2. *Test procedures.*

Efficiency and losses shall be determined in accordance with NEMA MG1–1993 with Revisions 1 through 4, paragraph 12.58.1, ''Determination of Motor Efficiency and Losses,'' and either

(1) CSA International (or Canadian Standards Association) Standard C390–93 Test Method (1), *Input-Output Method with Indirect Measurement of the Stray-Load Loss and Direct Measurement of the Stator Winding* (I^2R), *Rotor Winding* (I^2R), *Core and Windage-Friction Losses,* or

(2) IEEE Standard 112–1996 Test Method B, *Input-Output with Loss Segregation,* with IEEE correction notice of January 20, 1998, except as follows:

(i) Page 8, subclause 5.1.1, *Specified temperature,* the introductory clause does not apply. Instead the following applies:

The specified temperature used in making resistance corrections should be determined by one of the following (Test Method B only allows the use of preference a) or b).), which are listed in order of preference.

(ii) Page 17, subclause 6.4.1.3, *No-load test,* the text does not apply. Instead, the following applies:

See 5.3 including 5.3.3, the separation of core loss from friction and windage loss. Prior to making this test, the machine shall be operated at no-load until the input has stabilized.

(iii) Page 40, subclause 8.6.3, *Termination of test,* the third sentence does not apply. Instead, the following applies:

For continuous rated machines, the temperature test shall continue until there is 1°C or less change in temperature rise over a 30-minute time period.

(iv) Page 47, at the top of 10.2 Form B, immediately after the line that reads ''Rated Load Heat Run Stator Winding Resistance Between Terminals,'' the following additional line applies:

Temperature for Resistance Correction (t_s) =_____ °C (See 6.4.3.2).

(v) Page 47, at the bottom of 10.2 Form B, after the first sentence to footnote t_t, the following additional sentence applies:

The values for t_s and t_t shall be based on the same method of temperature measurement, selected from the four methods in subclause 8.3.

(vi) Page 47, at the bottom of 10.2 Form B, below the footnotes and above ''Summary of Characteristics,'' the following additional note applies:

NOTE: The temperature for resistance correction (t_s) is equal to [(4) − (5) + 25°C].

(vii) Page 48, item (22), the torque constants ''k = 9.549 for torque, in N·m'' and ''k = 7.043 for torque, in lbf·ft'' do not apply. Instead, the following applies:

''k_2 = 9.549 for torque, in N·m'' and ''k_2 = 7.043 for torque, in lbf·ft.''

(viii) Page 48, at the end of item (27), the following additional reference applies:

''See 6.4.3.2''.

(ix) Page 48, item (29), ''See 4.3.2.2, Eq. 4,'' does not apply. Instead the following applies:

Is equal to (10) · [k_1 + (4) − (5) + 25°C] / [k_1 + (7)], see 6.4.3.3''.

3. *Amendments to test procedures.*

Any revision to IEEE Std 112–1996 Test Method B with correction notice of January 20, 1998, to NEMA Standards Publication MG1–1993 with Revisions 1 through 4, or to CSA Standard C390–93 Test Method (1), subsequent to promulgation of this appendix A, shall not be effective for purposes of test procedures required under part 431 and this appendix A, unless and until part 431 and this appendix A are amended.

Subpart C—Energy Conservation Standards

§ 431.41 Purpose and scope.

This subpart contains energy conservation standards for certain types of covered equipment pursuant to Part C–Certain Industrial Equipment, Energy Policy and Conservation Act, as amended (42 U.S.C. 6211 *et seq.*).

§ 431.42 Energy conservation standards and effective dates.

(a) Each electric motor manufactured (alone or as a component of another piece of equipment) after October 24, 1997, or in the case of an electric motor which requires listing or certification by a nationally recognized safety testing laboratory, after October 24, 1999, shall have a nominal full load efficiency of not less than the following:

Number of poles	Nominal Full Load Efficiency					
	Open Motors			Enclosed Motors		
	6	4	2	6	4	2
Motor Horsepower/Standard Kilowatt Equivalent						
1/.75	80.0	82.5	.....	80.0	82.5	75.5
1.5/1.1	84.0	84.0	82.5	85.5	84.0	82.5
2/1.5	85.5	84.0	84.0	86.5	84.0	84.0
3/2.2	86.5	86.5	84.0	87.5	87.5	85.5
5/3.7	87.5	87.5	85.5	87.5	87.5	87.5
7.5/5.5	88.5	88.5	87.5	89.5	89.5	88.5
10/7.5	90.2	89.5	88.5	89.5	89.5	89.5
15/11	90.2	91.0	89.5	90.2	91.0	90.2
20/15	91.0	91.0	90.2	90.2	91.0	90.2
25/18.5	91.7	91.7	91.0	91.7	92.4	91.0
30/22	92.4	92.4	91.0	91.7	92.4	91.0
40/30	93.0	93.0	91.7	93.0	93.0	91.7
50/37	93.0	93.0	92.4	93.0	93.0	92.4
60/45	93.6	93.6	93.0	93.6	93.6	93.0
75/55	93.6	94.1	93.0	93.6	94.1	93.0
100/75	94.1	94.1	93.0	94.1	94.5	93.6
125/90	94.1	94.5	93.6	94.1	94.5	94.5
150/110	94.5	95.0	93.6	95.0	95.0	94.5
200/150	94.5	95.0	94.5	95.0	95.0	95.0

(b) For purposes of determining the required minimum nominal full load efficiency of an electric motor that has a horsepower or kilowatt rating between two horsepowers or kilowattages listed consecutively in paragraph (a) of this section, each such motor shall be deemed to have a horsepower or kilowatt rating that is listed in paragraph (a). The rating that the motor is deemed to have shall be determined as follows:

(1) A horsepower at or above the midpoint between the two consecutive horsepowers shall be rounded up to the higher of the two horsepowers;

(2) A horsepower below the midpoint between the two consecutive horsepowers shall be rounded down to the lower of the two horsepowers, or

(3) A kilowatt rating shall be directly converted from kilowatts to horsepower using the formula, 1 kilowatt = (1/0.746) horsepower, without calculating beyond three significant decimal places, and the resulting horsepower shall be rounded in accordance with subparagraph (b)(1) or (b)(2) of this section, whichever applies.

(c) This section does not apply to definite purpose motors, special purpose motors, and those motors exempted by the Secretary.

§ 431.43 Preemption of state regulations.

Any state regulation providing for any energy conservation standard, or other requirement with respect to the energy efficiency or energy use, of an electric motor that is not identical to a Federal standard in effect under this subpart is preempted by that standard, except as provided for in sections 345(a) and 327(b) and (c) of the Act.

Subpart D—Petitions To Exempt State Regulation From Preemption; Petitions To Withdraw Exemption of State Regulation

§ 431.61 Purpose and scope.

(a) The regulations in this subpart prescribe the procedures to be followed in connection with petitions requesting a rule that a State regulation prescribing an energy conservation standard or other requirement respecting energy use or energy efficiency of a type (or class) of covered equipment not be preempted.

(b) The regulations in this subpart also prescribe the procedures to be followed in connection with petitions to withdraw a rule exempting a State regulation prescribing an energy conservation standard or other requirement respecting energy use or energy efficiency of a type (or class) of covered equipment.

§ 431.62 Prescriptions of a rule.

(a) *Criteria for exemption from preemption.* Upon petition by a State which has prescribed an energy conservation standard or other requirement for a type or class of covered equipment for which a Federal energy conservation standard is applicable, the Secretary shall prescribe a rule that such standard not be preempted if he/she determines that the State has established by a preponderance of evidence that such requirement is needed to meet unusual and compelling State or local energy interests. For the purposes of this regulation, the term ''unusual and compelling State or local energy interests'' means interests which are substantially different in nature or magnitude from those prevailing in the U.S. generally, and are such that when evaluated within the context of the State's energy plan and forecast, the costs, benefits, burdens, and reliability of energy savings resulting from the State regulation make such regulation preferable or necessary when measured against the costs, benefits, burdens, and reliability of alternative approaches to energy savings or production, including reliance on reasonably predictable market-induced improvements in efficiency of all equipment subject to the State regulation. The Secretary may not prescribe such a rule if he finds that interested persons have established, by a preponderance of the evidence, that the State's regulation will significantly burden manufacturing, marketing, distribution, sale or servicing of the covered equipment on a national basis. In determining whether to make such a finding, the Secretary shall evaluate all relevant factors including: The extent to which the

State regulation will increase manufacturing or distribution costs of manufacturers, distributors, and others; the extent to which the State regulation will disadvantage smaller manufacturers, distributors, or dealers or lessen competition in the sale of the covered equipment in the State; the extent to which the State regulation would cause a burden to manufacturers to redesign and produce the covered equipment type (or class), taking into consideration the extent to which the regulation would result in a reduction in the current models, or in the projected availability of models, that could be shipped on the effective date of the regulation to the State and within the U.S., or in the current or projected sales volume of the covered equipment type (or class) in the State and the U.S.; and the extent to which the State regulation is likely to contribute significantly to a proliferation of State commercial and industrial equipment efficiency requirements and the cumulative impact such requirements would have. The Secretary may not prescribe such a rule if he/she finds that such a rule will result in the unavailability in the State of any covered equipment (or class) of performance characteristics (including reliability), features, sizes, capacities, and volumes that are substantially the same as those generally available in the State at the time of the Secretary's finding. The failure of some classes (or types) to meet this criterion shall not affect the Secretary's determination of whether to prescribe a rule for other classes (or types).

(1) Requirements of petition for exemption from preemption. A petition from a State for a rule for exemption from preemption shall include the information listed in paragraphs (a)(1)(i) through (a)(1)(vi) of this section. A petition for a rule and correspondence relating to such petition shall be available for public review except for confidential or proprietary information submitted in accordance with the Department of Energy's Freedom of Information Regulations set forth in 10 CFR Part 1004.

(i) The name, address, and telephone number of the petitioner;

(ii) A copy of the State standard for which a rule exempting such standard is sought;

(iii) A copy of the State's energy plan and forecast;

(iv) Specification of each type or class of covered product for which a rule exempting a standard is sought;

(v) Other information, if any, believed to be pertinent by the petitioner; and

(vi) Such other information as the Secretary may require.

(b) *Criteria for exemption from preemption when energy emergency conditions exist within State.* Upon petition by a State which has prescribed an energy conservation standard or other requirement for a type or class of covered equipment for which a Federal energy conservation standard is applicable, the Secretary may prescribe a rule, effective upon publication in the FEDERAL REGISTER, that such regulation not be preempted if he determines that in addition to meeting the requirements of paragraph (a) of this section the State has established that: an energy emergency condition exists within the State that imperils the health, safety, and welfare of its residents because of the inability of the State or utilities within the State to provide adequate quantities of gas or electric energy to its residents at less than prohibitive costs; and cannot be substantially alleviated by the importation of energy or the use of interconnection agreements; and the State regulation is necessary to alleviate substantially such condition.

(1) Requirements of petition for exemption from preemption when energy emergency conditions exist within a State. A petition from a State for a rule for exemption from preemption when energy emergency conditions exist within a State shall include the information listed in paragraphs (a)(1)(i) through (a)(1)(vi) of this section. A petition shall also include the information prescribed in paragraphs (b)(1)(i) through (b)(1)(iv) of this section, and shall be available for public review except for confidential or proprietary information submitted in accordance with the Department of Energy's Freedom of Information Regulations set forth in 10 CFR Part 1004:

(i) A description of the energy emergency condition which exists within the State, including causes and impacts.

(ii) A description of emergency response actions taken by the State and utilities within the State to alleviate the emergency condition;

(iii) An analysis of why the emergency condition cannot be alleviated substantially by importation of energy or the use of interconnection agreements;

(iv) An analysis of how the State standard can alleviate substantially such emergency condition.

(c) *Criteria for withdrawal of a rule exempting a State standard.* Any person subject to a State standard which, by rule, has been exempted from Federal preemption and which prescribes an energy conservation standard or other requirement for a type or class of covered equipment, when the Federal energy conservation standard for such product subsequently is amended, may petition the Secretary requesting that the exemption rule be withdrawn. The Secretary shall consider such petition in accordance with the requirements of paragraph (a) of this section, except that the burden shall be on the petitioner to demonstrate that the exemption rule received by the State should be withdrawn as a result of the amendment to the Federal standard. The Secretary shall withdraw such rule if he determines that the petitioner has shown the rule should be withdrawn.

(1) Requirements of petition to withdraw a rule exempting a State standard. A petition for a rule to withdraw a rule exempting a State standard shall include the information prescribed in paragraphs (c)(1)(i) through (c)(1)(vii) of this section, and shall be available for public review, except for confidential or proprietary information submitted in accordance with the Department of Energy's Freedom of Information Regulations set forth in 10 CFR Part 1004:

(i) The name, address and telephone number of the petitioner;

(ii) A statement of the interest of the petitioner for which a rule withdrawing an exemption is sought;

(iii) A copy of the State standard for which a rule withdrawing an exemption is sought;

(iv) Specification of each type or class of covered equipment for which a rule withdrawing an exemption is sought;

(v) A discussion of the factors contained in paragraph (a) of this section;

(vi) Such other information, if any, believed to be pertinent by the petitioner; and

(vii) Such other information as the Secretary may require.

§ 431.63 Filing requirements.

(a) *Service.* All documents required to be served under this subpart shall, if mailed, be served by first class mail. Service upon a person's duly authorized representative shall constitute service upon that person.

(b) *Obligation to supply information.* A person or State submitting a petition is under a continuing obligation to provide any new or newly discovered information relevant to that petition. Such information includes, but is not limited to, information regarding any other petition or request for action subsequently submitted by that person or State.

(c) *The same or related matters.* A person or State submitting a petition or other request for action shall state whether to the best knowledge of that petitioner the same or related issue, act, or transaction has been or presently is being considered or investigated by any State agency, department, or instrumentality.

(d) *Computation of time.* (1) Computing any period of time prescribed by or allowed under this subpart, the day of the action from which the designated period of time begins to run is not to be included. If the last day of the period is Saturday, or Sunday, or Federal legal holiday, the period runs until the end of the next day that is neither a Saturday, or Sunday or Federal legal holiday.

(2) Saturdays, Sundays, and intervening Federal legal holidays shall be excluded from the computation of time when the period of time allowed or prescribed is 7 days or less.

(3) When a submission is required to be made within a prescribed time, DOE

may grant an extension of time upon good cause shown.

(4) Documents received after regular business hours are deemed to have been submitted on the next regular business day. Regular business hours for the DOE's National Office, Washington, DC, are 8:30 a.m. to 4:30 p.m.

(5) DOE reserves the right to refuse to accept, and not to consider, untimely submissions.

(e) *Filing of petitions.* (1) A petition for a rule shall be submitted in triplicate to: The Assistant Secretary for Energy Efficiency and Renewable Energy, U.S. Department of Energy, Section 327 Petitions, Appliance Efficiency Standards, Forrestal Building, 1000 Independence Avenue, SW., Washington, DC 20585.

(2) A petition may be submitted on behalf of more than one person. A joint petition shall indicate each person participating in the submission. A joint petition shall provide the information required by §431.62 for each person on whose behalf the petition is submitted.

(3) All petitions shall be signed by the person(s) submitting the petition or by a duly authorized representative. If submitted by a duly authorized representative, the petition shall certify this authorization.

(4) A petition for a rule to withdraw a rule exempting a State regulation, all supporting documents, and all future submissions shall be served on each State agency, department, or instrumentality whose regulation the petitioner seeks to supersede. The petition shall contain a certification of this service which states the name and mailing address of the served parties, and the date of service.

(f) *Acceptance for filing.* (1) Within fifteen (15) days of the receipt of a petition, the Secretary will either accept it for filing or reject it, and the petitioner will be so notified in writing. The Secretary will serve a copy of this notification on each other party served by the petitioner. Only such petitions which conform to the requirements of this subpart and which contain sufficient information for the purposes of a substantive decision will be accepted for filing. Petitions which do not so conform will be rejected and an explanation provided to petitioner in writing.

(2) For purposes of the Act and this subpart, a petition is deemed to be filed on the date it is accepted for filing.

(g) *Docket.* A petition accepted for filing will be assigned an appropriate docket designation. Petitioner shall use the docket designation in all subsequent submissions.

§431.64 Notice of petition.

(a) Promptly after receipt of a petition and its acceptance for filing, notice of such petition shall be published in the FEDERAL REGISTER. The notice shall set forth the availability for public review of all data and information available, and shall solicit comments, data and information with respect to the determination on the petition. Except as may otherwise be specified, the period for public comment shall be 60 days after the notice appears in the FEDERAL REGISTER.

(b) In addition to the material required under paragraph (a) of this section, each notice shall contain a summary of the State regulation at issue and the petitioner's reasons for the rule sought.

§431.65 Consolidation.

DOE may consolidate any or all matters at issue in two or more proceedings docketed where there exist common parties, common questions of fact and law, and where such consolidation would expedite or simplify consideration of the issues. Consolidation shall not affect the right of any party to raise issues that could have been raised if consolidation had not occurred.

§431.66 Hearing.

The Secretary may hold a public hearing, and publish notice in the FEDERAL REGISTER of the date and location of the hearing, when he determines that such a hearing is necessary and likely to result in a timely and effective resolution of the issues. A transcript shall be kept of any such hearing.

§ 431.67 Disposition of petitions.

(a) After the submission of public comments under Sec. 431.63(a), the Secretary shall prescribe a final rule or deny the petition within 6 months after the date the petition is filed.

(b) The final rule issued by the Secretary or a determination by the Secretary to deny the petition shall include a written statement setting forth his findings and conclusions, and the reasons and basis therefor. A copy of the Secretary's decision shall be sent to the petitioner and the affected State agency. The Secretary shall publish in the FEDERAL REGISTER a notice of the final rule granting or denying the petition and the reasons and basis therefor.

(c) If the Secretary finds that he cannot issue a final rule within the 6-month period pursuant to paragraph (a) of this section, he shall publish a notice in the FEDERAL REGISTER extending such period to a date certain, but no longer than one year after the date on which the petition was filed. Such notice shall include the reasons for the delay.

§ 431.68 Effective dates of final rules.

(a) A final rule exempting a State standard from Federal preemption will be effective:

(1) Upon publication in the FEDERAL REGISTER if the Secretary determines that such rule is needed to meet an ''energy emergency condition'' within the State.

(2) Three years after such rule is published in the FEDERAL REGISTER; or

(3) Five years after such rule is published in the FEDERAL REGISTER if the Secretary determines that such additional time is necessary due to the burdens of retooling, redesign or distribution.

(b) A final rule withdrawing a rule exempting a State standard will be effective upon publication in the FEDERAL REGISTER.

§ 431.69 Request for reconsideration.

(a) Any petitioner whose petition for a rule has been denied may request reconsideration within 30 days of denial. The request shall contain a statement of facts and reasons supporting reconsideration and shall be submitted in writing to the Secretary.

(b) The denial of a petition will be reconsidered only where it is alleged and demonstrated that the denial was based on error in law or fact and that evidence of the error is found in the record of the proceedings.

(c) If the Secretary fails to take action on the request for reconsideration within 30 days, the request is deemed denied, and the petitioner may seek such judicial review as may be appropriate and available.

(d) A petitioner has not exhausted other administrative remedies until a request for reconsideration has been filed and acted upon or deemed denied.

§ 431.70 Finality of decision.

(a) A decision to prescribe a rule that a State energy conservation standard or other requirement not be preempted is final on the date the rule is issued, i.e., signed by the Secretary. A decision to prescribe such a rule has no effect on other regulations of a covered product of any other State.

(b) A decision to prescribe a rule withdrawing a rule exempting a State standard or other requirement is final on the date the rule is issued, i.e., signed by the Secretary. A decision to deny such a petition is final on the day a denial of a request for reconsideration is issued, i.e., signed by the Secretary.

Subpart E—Labeling

§ 431.81 Purpose and scope.

This subpart establishes labeling rules for electric motors pursuant to section 344 of EPCA, 42 U.S.C. 6315. It addresses labeling and marking the equipment with information indicating its energy efficiency and compliance with applicable standards under section 342 of EPCA, 42 U.S.C. 6313, and the inclusion of such information in other material used to market the equipment. This subpart applies only to electric motors manufactured after [ONE YEAR AFTER PUBLICATION OF THIS RULE IN THE FEDERAL REGISTER].

§ 431.82 Labeling requirements.

(a) *Electric motor nameplate.* (1) *Required information.* The permanent nameplate of an electric motor for

which standards are prescribed in §431.42 must be marked clearly with the following information:

(i) The motor's nominal full load efficiency (as of the date of manufacture), derived from the motor's average full load efficiency as determined pursuant to subpart B of this Part; and

(ii) A Compliance Certification number (''CC number'') supplied by DOE to the manufacturer or private labeler, pursuant to section 431.123(e), and applicable to that motor. Such CC number must be on the nameplate of a motor beginning 90 days after either:

(ii) A Compliance Certification number (''CC number'') supplied by DOE to the manufacturer or private labeler, pursuant to §431.123(e), and applicable to that motor. Such CC number must be on the nameplate of a motor beginning 90 days after either:

(A) The manufacturer or private labeler has received the number upon submitting a Compliance Certification covering that motor, or

(B) The expiration of 21 days from DOE's receipt of a Compliance Certification covering that motor, if the manufacturer or private labeler has not been advised by DOE that the Compliance Certification fails to satisfy §431.123.

(2) *Display of required information.* All orientation, spacing, type sizes, type faces, and line widths to display this required information shall be the same as or similar to the display of the other performance data on the motor's permanent nameplate. The nominal full load efficiency shall be identified either by the term ''Nominal Efficiency'' or ''Nom. Eff.'' or by the terms specified in paragraph 12.58.2 of NEMA MG1–1993, as for example ''NEMA Nom. Eff. _____.'' The DOE number shall be in the form ''CC_____.''

(3) *Optional display.* The permanent nameplate of an electric motor, a separate plate, or decalcomania, may be marked with the encircled lower case letters ''ee'', for example,

or with some comparable designation or logo, if the motor meets the applicable standard prescribed in §431.42, as determined pursuant to subpart B of this part, and is covered by a Compliance Certification that satisfies §431.123.

(b) *Disclosure of efficiency information in marketing materials.* (1) The same information that must appear on an electric motor's permanent nameplate pursuant to paragraph (a)(1) of this section, shall be prominently displayed:

(i) on each page of a catalog that lists the motor, and

(ii) in other materials used to market the motor.

(2) The ''ee'' logo, or other similar logo or designations, may also be used in catalogs and other materials to the same extent they may be used on labels under paragraph (a)(3) of this section.

§431.83 Preemption of state regulations.

The provisions of this subpart E supersede any State regulation to the extent required by section 327 of the Act. Pursuant to the Act, all State regulations that require the disclosure for any electric motor of information with respect to energy consumption, other than the information required to be disclosed in accordance with this part, are superseded.

Subpart F [Reserved]

Subpart G—Certification and Enforcement

§431.121 Purpose and scope.

The regulations in this subpart set forth the procedures for manufacturers to certify that electric motors comply with the applicable energy efficiency standards set forth in subpart C of this part, and set forth standards and procedures for enforcement of this part and the underlying provisions of the Act.

§431.122 Prohibited acts.

(a) Each of the following is a prohibited act pursuant to sections 332 and 345 of the Act:

(1) Distribution in commerce by a manufacturer or private labeler of any new covered equipment which is not labeled in accordance with an applicable labeling rule prescribed in accordance with section 344 of the Act, and in this part;

(2) Removal from any new covered equipment or rendering illegible, by a manufacturer, distributor, retailer, or private labeler, of any label required under this part to be provided with such equipment;

(3) Failure to permit access to, or copying of records required to be supplied under the Act and this part, or failure to make reports or provide other information required to be supplied under the Act and this part;

(4) Advertisement of covered equipment, by a manufacturer, distributor, retailer, or private labeler, in a catalog from which the equipment may be purchased, without including in the catalog all information as required by § 431.82(b)(1), provided, however, that this shall not apply to an advertisement of covered equipment in a catalog if distribution of the catalog began before the effective date of the labeling rule applicable to that equipment;

(5) Failure of a manufacturer to supply at his expense a reasonable number of units of an electric motor to a test laboratory designated by the Secretary;

(6) Failure of a manufacturer to permit a representative designated by the Secretary to observe any testing required by the Act and this part, and to inspect the results of such testing; and

(7) Distribution in commerce by a manufacturer or private labeler of any new covered equipment which is not in compliance with an applicable energy efficiency standard prescribed under the Act and this part.

(b) In accordance with sections 333 and 345 of the Act, any person who knowingly violates any provision of paragraph (a) of this section may be subject to assessment of a civil penalty of no more than $110 for each violation. Each violation of paragraphs (a)(1), (2), and (7) of this section shall constitute a separate violation with respect to each unit of covered equipment, and each day of noncompliance with paragraphs (a)(3) through (6) of this section shall constitute a separate violation.

(c) For purposes of this section:

(1) the term ''new covered equipment'' means covered equipment the title of which has not passed to a purchaser who buys such equipment for purposes other than:

(i) reselling such equipment, or

(ii) leasing such equipment for a period in excess of one year; and

(2) The term ''knowingly'' means:

(i) the having of actual knowledge, or

(ii) the presumed having of knowledge deemed to be possessed by a reasonable person who acts in the circumstances, including knowledge obtainable upon the exercise of due care.

§ 431.123 Compliance certification.

(a) *General.* Beginning 24 months after [insert date 30 days after publication in the FEDERAL REGISTER], a manufacturer or private labeler shall not distribute in commerce any basic model of an electric motor which is subject to an energy efficiency standard set forth in subpart C of this part unless it has submitted to the Department a Compliance Certification certifying, in accordance with the provisions of this section, that the basic model meets the requirements of the applicable standard. The representations in the Compliance Certification must be based upon the basic model's energy efficiency as determined in accordance with the applicable requirements of subpart B of this part. This means, in part, that either:

(1) the representations as to the basic model must be based on use of a certification organization, or

(2) any testing of the basic model on which the representations are based must be conducted at an accredited laboratory.

(b) *Required contents.* (1) *General representations.* Each Compliance Certification must certify that:

(i) The nominal full load efficiency for each basic model of electric motor distributed is not less than the minimum nominal full load efficiency required for that motor by section § 431.42;

(ii) All required determinations on which the Compliance Certification is based were made in compliance with the applicable requirements prescribed in subpart B of this part;

(iii) All information reported in the Compliance Certification is true, accurate, and complete; and

(iv) The manufacturer or private labeler is aware of the penalties associated with violations of the Act and the

regulations thereunder, and of 18 U.S.C. 1001 which prohibits knowingly making false statements to the Federal Government.

(2) *Specific data.* (i) For each rating of electric motor (as the term ''rating'' is defined in the definition of basic model) which a manufacturer or private labeler distributes, the Compliance Certification must report the nominal full load efficiency, determined pursuant to §§ 431.23 and 431.24, of the least efficient basic model within that rating.

(ii) The Compliance Certification must identify the basic models on which actual testing has been performed to meet the requirements of section 431.24.

(iii) The format for a Compliance Certification is set forth in appendix A of this subpart.

(c) *Optional contents.* In any Compliance Certification, a manufacturer or private labeler may at its option request that DOE provide it with a unique Compliance Certification number (''CC number'') for any brand name, trademark or other label name under which the manufacturer or private labeler distributes electric motors covered by the Certification. Such a Compliance Certification must also identify all other names, if any, under which the manufacturer or private labeler distributes electric motors, and to which the request does not apply.

(d) *Signature and submission.* A manufacturer or private labeler must submit the Compliance Certification either on its own behalf, signed by a corporate officer of the company, or through a third party (for example, a trade association or other authorized representative) acting on its behalf. Where a third party is used, the Compliance Certification must identify the official of the manufacturer or private labeler who authorized the third party to make representations on the company's behalf, and must be signed by a corporate official of the third party. The Compliance Certification must be submitted to the Department by certified mail, to Department of Energy, Assistant Secretary for Energy Efficiency and Renewable Energy, Office of Building Research and Standards, Forrestal Building, 1000 Independence Avenue, SW, Washington, DC 20585–0121.

(e) *New basic models.* For electric motors, a Compliance Certification must be submitted for a new basic model only if the manufacturer or private labeler has not previously submitted to DOE a Compliance Certification, that meets the requirements of section 431.123, for a basic model that has the same rating as the new basic model, and that has a lower nominal full load efficiency than the new basic model.

(f) *Response to Compliance Certification; Compliance Certification Number (CC number).* (1) *DOE processing of Certification.* Promptly upon receipt of a Compliance Certification, the Department will determine whether the document contains all of the elements required by this section, and may, in its discretion, determine whether all or part of the information provided in the document is accurate. The Department will then advise the submitting party in writing either that the Compliance Certification does not satisfy the requirements of this section, in which case the document will be returned, or that the Compliance Certification satisfies this section. The Department will also advise the submitting party of the basis for its determination.

(2) *Issuance of CC number(s).* (i) Initial Compliance Certification. When DOE advises that the initial Compliance Certification submitted by or on behalf of a manufacturer or private labeler is acceptable, either:

(A) DOE will provide a single unique CC number, ''CC_____,'' to the manufacturer or private labeler, and such CC number shall be applicable to all electric motors distributed by the manufacturer or private labeler, or

(B) When required by paragraph (f)(2) of this section, DOE will provide more than one CC number to the manufacturer or private labeler.

(ii) Subsequent Compliance Certification. When DOE advises that any other Compliance Certification is acceptable, it will provide a unique CC number for any brand name, trademark or other name when required by paragraph (f)(3) of this section.

(iii) When DOE declines to provide a CC number as requested by a manufacturer or private labeler in accordance

with § 431.123(c), DOE will advise the requester of the reasons for such refusal.

(3) *Issuance of two or more CC numbers.* (i) DOE will provide a unique CC number for each brand name, trademark or other label name for which a manufacturer or private labeler requests such a number in accordance with § 431.123(c), except as follows. DOE will not provide a CC number for any brand name, trademark or other label name:

(A) For which DOE has previously provided a CC number, or

(B) That duplicates or overlaps with other names under which the manufacturer or private labeler sells electric motors.

(ii) Once DOE has provided a CC number for a particular name, that shall be the only CC number applicable to all electric motors distributed by the manufacturer or private labeler under that name.

(iii) If the Compliance Certification in which a manufacturer or private labeler requests a CC number is the initial Compliance Certification submitted by it or on its behalf, and it distributes electric motors not covered by the CC number(s) DOE provides in response to the request(s), DOE will also provide a unique CC number that shall be applicable to all of these other motors.

§ 431.124 Maintenance of records.

(a) The manufacturer of any electric motor subject to energy efficiency standards prescribed under section 342 of the Act must establish, maintain and retain records of the following: the underlying test data for all testing conducted under this part; the development, substantiation, application, and subsequent verification of any AEDM used under this part; and any written certification received from a certification program, including a certificate of conformity, relied on under the provisions of this part. Such records must be organized and indexed in a fashion which makes them readily accessible for review. The records must include the supporting test data associated with tests performed on any test units to satisfy the requirements of this subpart (except tests performed by the Department directly).

(b) All such records must be retained by the manufacturer for a period of two years from the date that production of the applicable basic model of electric motor has ceased. Records must be retained in a form allowing ready access to the Department upon request.

§ 431.125 Imported equipment.

(a) Pursuant to sections 331 and 345 of the Act, any person importing any covered equipment into the United States shall comply with the provisions of the Act and of this part, and is subject to the remedies of this part.

(b) Any covered equipment offered for importation in violation of the Act and of this part shall be refused admission into the customs territory of the United States under rules issued by the Secretary of the Treasury, except that the Secretary of the Treasury may, by such rules, authorize the importation of such covered equipment upon such terms and conditions (including the furnishing of a bond) as may appear to the Secretary of Treasury appropriate to ensure that such covered equipment will not violate the Act and this part, or will be exported or abandoned to the United States.

§ 431.126 Exported equipment.

Pursuant to sections 330 and 345 of the Act, this part shall not apply to any covered equipment if (a) such covered equipment is manufactured, sold, or held for sale for export from the United States (or such product was imported for export), unless such equipment is, in fact, distributed in commerce for use in the United States, and (b) such covered equipment, when distributed in commerce, or any container in which it is enclosed when so distributed, bears a stamp or label stating that such covered equipment is intended for export.

§ 431.127 Enforcement.

(a) *Test notice.* Upon receiving information in writing, concerning the energy performance of a particular electric motor sold by a particular manufacturer or private labeler, which indicates that the electric motor may not be in compliance with the applicable energy efficiency standard, or upon undertaking to ascertain the accuracy of

the efficiency rating on the nameplate or in marketing materials for an electric motor, disclosed pursuant to subpart E of this part, the Secretary may conduct testing of that covered equipment under this subpart by means of a test notice addressed to the manufacturer in accordance with the following requirements:

(1) The test notice procedure will only be followed after the Secretary or his/her designated representative has examined the underlying test data (or, where appropriate, data as to use of an alternative efficiency determination method) provided by the manufacturer and after the manufacturer has been offered the opportunity to meet with the Department to verify, as applicable, compliance with the applicable efficiency standard, or the accuracy of labeling information, or both. In addition, where compliance of a basic model was certified based on an AEDM, the Department shall have the discretion to pursue the provisions of section 431.24(a)(4)(iii) prior to invoking the test notice procedure. A representative designated by the Secretary shall be permitted to observe any reverification procedures undertaken pursuant to this subpart, and to inspect the results of such reverification.

(2) The test notice will be signed by the Secretary or his/her designee. The test notice will be mailed or delivered by the Department to the plant manager or other responsible official, as designated by the manufacturer.

(3) The test notice will specify the model or basic model to be selected for testing, the method of selecting the test sample, the date and time at which testing shall be initiated, the date by which testing is scheduled to be completed and the facility at which testing will be conducted. The test notice may also provide for situations in which the specified basic model is unavailable for testing, and may include alternative basic models.

(4) The Secretary may require in the test notice that the manufacturer of an electric motor shall ship at his expense a reasonable number of units of a basic model specified in such test notice to a testing laboratory designated by the Secretary. The number of units of a basic model specified in a test notice shall not exceed twenty (20).

(5) Within five working days of the time the units are selected, the manufacturer shall ship the specified test units of a basic model to the testing laboratory.

(b) *Testing laboratory.* Whenever the Department conducts enforcement testing at a designated laboratory in accordance with a test notice under this section, the resulting test data shall constitute official test data for that basic model. Such test data will be used by the Department to make a determination of compliance or noncompliance if a sufficient number of tests have been conducted to satisfy the requirements of appendix B of this subpart.

(c) *Sampling.* The determination that a manufacturer's basic model complies with its labeled efficiency, or the applicable energy efficiency standard, shall be based on the testing conducted in accordance with the statistical sampling procedures set forth in appendix B of this subpart and the test procedures set forth in appendix A to subpart B of this part.

(d) *Test unit selection.* A Department inspector shall select a batch, a batch sample, and test units from the batch sample in accordance with the provisions of this paragraph and the conditions specified in the test notice.

(1) The batch may be subdivided by the Department utilizing criteria specified in the test notice.

(2) A batch sample of up to 20 units will then be randomly selected from one or more subdivided groups within the batch. The manufacturer shall keep on hand all units in the batch sample until such time as the basic model is determined to be in compliance or noncompliance.

(3) Individual test units comprising the test sample shall be randomly selected from the batch sample.

(4) All random selection shall be achieved by sequentially numbering all of the units in a batch sample and then using a table of random numbers to select the units to be tested.

(e) *Test unit preparation.* (1) Prior to and during the testing, a test unit selected in accordance with paragraph (d) of this section shall not be prepared,

modified, or adjusted in any manner unless such preparation, modification, or adjustment is allowed by the applicable Department of Energy test procedure. One test shall be conducted for each test unit in accordance with the applicable test procedures prescribed in appendix A to subpart B.

(2) No quality control, testing, or assembly procedures shall be performed on a test unit, or any parts and sub-assemblies thereof, that is not performed during the production and assembly of all other units included in the basic model.

(3) A test unit shall be considered defective if such unit is inoperative or is found to be in noncompliance due to failure of the unit to operate according to the manufacturer's design and operating instructions. Defective units, including those damaged due to shipping or handling, shall be reported immediately to the Department. The Department shall authorize testing of an additional unit on a case-by-case basis.

(f) *Testing at manufacturer's option.* (1) If a manufacturer's basic model is determined to be in noncompliance with the applicable energy performance standard at the conclusion of Department testing in accordance with the sampling plan specified in appendix B of this subpart, the manufacturer may request that the Department conduct additional testing of the basic model according to procedures set forth in appendix B of this subpart.

(2) All units tested under this paragraph shall be selected and tested in accordance with the provisions given in paragraphs (a) through (e) of this section.

(3) The manufacturer shall bear the cost of all testing conducted under this paragraph.

(4) The manufacturer shall cease distribution of the basic model tested under the provisions of this paragraph from the time the manufacturer elects to exercise the option provided in this paragraph until the basic model is determined to be in compliance. The Department may seek civil penalties for all units distributed during such period.

(5) If the additional testing results in a determination of compliance, a notice of allowance to resume distribution shall be issued by the Department.

§ 431.128 Cessation of distribution of a basic model.

(a) In the event that a model is determined non-compliant by the Department in accordance with § 431.127 of this part or if a manufacturer or private labeler determines a model to be in noncompliance, then the manufacturer or private labeler shall:

(1) Immediately cease distribution in commerce of the basic model.

(2) Give immediate written notification of the determination of noncompliance, to all persons to whom the manufacturer has distributed units of the basic model manufactured since the date of the last determination of compliance.

(3) Pursuant to a request made by the Secretary, provide the Department within 30 days of the request, records, reports, and other documentation pertaining to the acquisition, ordering, storage, shipment, or sale of a basic model determined to be in noncompliance.

(4) The manufacturer may modify the non-compliant basic model in such manner as to make it comply with the applicable performance standard. Such modified basic model shall then be treated as a new basic model and must be certified in accordance with the provisions of this subpart; except that in addition to satisfying all requirements of this subpart, the manufacturer shall also maintain records that demonstrate that modifications have been made to all units of the new basic model prior to distribution in commerce.

(b) If a basic model is not properly certified in accordance with the requirements of this subpart, the Secretary may seek, among other remedies, injunctive action to prohibit distribution in commerce of such basic model.

§ 431.129 Subpoena.

Pursuant to sections 329(a) and 345 of the Act, for purposes of carrying out this part, the Secretary or the Secretary's designee, may sign and issue subpoenas for the attendance and testimony of witnesses and the production

of relevant books, records, papers, and other documents, and administer the oaths. Witnesses summoned under the provisions of this section shall be paid the same fees and mileage as are paid to witnesses in the courts of the United States. In case of contumacy by, or refusal to obey a subpoena served upon any persons subject to this part, the Secretary may seek an order from the District Court of the United States for any District in which such person is found or resides or transacts business requiring such person to appear and give testimony, or to appear and produce documents. Failure to obey such order is punishable by such court as a contempt thereof.

§431.130 Remedies.

If the Department determines that a basic model of a covered equipment does not comply with an applicable energy conservation standard:

(a) The Department will notify the manufacturer, private labeler, or any other person as required of this finding and of the Secretary's intent to seek a judicial order restraining further distribution in commerce of such basic model unless the manufacturer, private labeler or any other person as required, delivers to the Department within 15 calendar days a statement, satisfactory to the Department, of the steps he will take to ensure that the non-compliant model will no longer be distributed in commerce. The Department will monitor the implementation of such statement.

(b) If the manufacturer, private labeler, or any other person as required, fails to stop distribution of the non-compliant model, the Secretary may seek to restrain such violation in accordance with sections 334 and 345 of the Act.

(c) The Secretary shall determine whether the facts of the case warrant the assessment of civil penalties for knowing violations in accordance with sections 333 and 345 of the Act.

§431.131 Hearings and appeals.

(a) Pursuant to sections 333(d) and 345 of the Act, before issuing an order assessing a civil penalty against any person under this section, the Secretary shall provide to such person notice of the proposed penalty. Such notice shall inform such person of that person's opportunity to elect in writing within 30 days after the date of receipt of such notice to have the procedures of paragraph (c) of this section (in lieu of those in paragraph (b) of this section) apply with respect to such assessment.

(b)(1) Unless an election is made within 30 calendar days after receipt of notice under paragraph (a) of this section to have paragraph (c) of this section apply with respect to such penalty, the Secretary shall assess the penalty, by order, after a determination of violation has been made on the record after an opportunity for an agency hearing pursuant to section 554 of title 5, United States Code, before an administrative law judge appointed under section 3195 of such title 5. Such assessment order shall include the administrative law judge's findings and the basis for such assessment.

(2) Any person against whom a penalty is assessed under this section may, within 60 calendar days after the date of the order of the Secretary assessing such penalty, institute an action in the United States Court of Appeals for the appropriate judicial circuit for judicial review of such order in accordance with chapter 7 of title 5, United States Code. The court shall have jurisdiction to enter a judgment affirming, modifying, or setting aside in whole or in part, the order of the Secretary, or the court may remand the proceeding to the Secretary for such further action as the court may direct.

(c)(1) In the case of any civil penalty with respect to which the procedures of this section have been elected, the Secretary shall promptly assess such penalty, by order, after the date of the receipt of the notice under paragraph (a) of this section of the proposed penalty.

(2) If the civil penalty has not been paid within 60 calendar days after the assessment has been made under paragraph (c)(1) of this section, the Secretary shall institute an action in the appropriate District Court of the United States for an order affirming the assessment of the civil penalty. The court shall have authority to review de novo the law and the facts involved and shall have jurisdiction to enter a judgment enforcing, modifying,

and enforcing as so modified, or setting aside in whole or in part, such assessment.

(3) Any election to have this paragraph apply may not be revoked except with the consent of the Secretary.

(d) If any person fails to pay an assessment of a civil penalty after it has become a final and unappealable order under paragraph (b) of this section, or after the appropriate District Court has entered final judgment in favor of the Secretary under paragraph (c) of this section, the Secretary shall institute an action to recover the amount of such penalty in any appropriate District Court of the United States. In such action, the validity and appropriateness of such final assessment order or judgment shall not be subject to review.

(e)(1) In accordance with the provisions of sections 333(d)(5)(A) and 345 of the Act and notwithstanding the provisions of title 28, United States Code, or section 502(c) of the Department of Energy Organization Act, the Secretary shall be represented by the General Counsel of the Department of Energy (or any attorney or attorneys within the Department designated by the Secretary) who shall supervise, conduct, and argue any civil litigation to which paragraph (c) of this section applies including any related collection action under paragraph (d) of this section in a court of the United States or in any other court, except the Supreme Court of the United States. However, the Secretary or the General Counsel shall consult with the Attorney General concerning such litigation and the Attorney General shall provide, on request, such assistance in the conduct of such litigation as may be appropriate.

(2) In accordance with the provisions of sections 333(d)(5)(B) and 345 of the Act, and subject to the provisions of section 502(c) of the Department of Energy Organization Act, the Secretary shall be represented by the Attorney General, or the Solicitor General, as appropriate, in actions under this section, except to the extent provided in paragraph (e)(1) of this section.

(3) In accordance with the provisions of sections 333(d)(5)(C) and 345 of the Act, section 402(d) of the Department of Energy Organization Act shall not apply with respect to the function of the Secretary under this section.

§ 431.132 Confidentiality.

Pursuant to the provisions of 10 CFR 1004.11, any person submitting information or data which the person believes to be confidential and exempt from public disclosure should submit one complete copy, and fifteen copies from which the information believed to be confidential has been deleted. In accordance with the procedures established at 10 CFR 1004.11, the Department shall make its own determination with regard to any claim that information submitted be exempt from public disclosure.

APPENDIX A TO SUBPART G OF PART 431 — COMPLIANCE CERTIFICATION

CERTIFICATION OF COMPLIANCE
WITH ENERGY EFFICIENCY STANDARDS FOR ELECTRIC MOTORS

(Office of Management and Budget Control Number: 1910-5104. Expires 02/28/2001)

1. Name and Address of Company (the "company"):

_____

_____

_____

_____

2. Name(s) to be Marked on Electric Motors to Which this Compliance Certification Applies:

_____

_____

_____

_____

3. If manufacturer or private labeler wishes to receive a unique Compliance Certification number for use with any particular brand name, trademark, or other label name, fill out the following two items:

A. List each brand name, trademark, or other label name for which the company requests a Compliance Certification number:

_____

_____

_____

B. List other name(s), if any, under which the company sells electric motors (if not listed in item 2 above):

_____

_____

_____

Submit by Certified Mail to: U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, Office of Building Research and Standards, Forrestal Building, 1000 Independence Avenue, SW, Washington, DC 20585-0121.

This Compliance Certification reports on and certifies compliance with requirements contained in 10 CFR Part 431 (Energy Conservation Program for Certain Commercial and Industrial Equipment) and Part C of the Energy Policy and Conservation Act (Public Law 94-163), and amendments thereto. It is signed by a responsible official of the above named company. Attached and incorporated as part of this Compliance Certification is a Listing of Electric Motor Efficiencies. For each rating of electric motor* for which the Listing specifies the nominal full load efficiency of a basic model, the company distributes no less efficient basic model with that rating and all basic models with that rating comply with the applicable energy efficiency standard.

* For this purpose, the term "rating" means one of the 113 combinations of an electric motor's horsepower (or standard kilowatt equivalent), number of poles, and open or enclosed construction, with respect to which section 431.42 of 10 CFR Part 431 prescribes nominal full load efficiency standards.

Person to Contact for Further Information:

Name: _____

Address: _____

_____

_____

_____

Telephone Number: _____

Facsimile Number: _____

If any part of this Compliance Certification, including the Attachment, was prepared by a third party organization under the provisions of section 431.123 of 10 CFR Part 431, the company official authorizing third party representations:

Name: _____

Address: _____

_____

_____

_____

Telephone Number: _____

Facsimile Number: _____

Third Party Organization Officially Acting as Representative:

Third Party Organization: _____

Responsible Person at that Organization: _____

Address: _____

_____

_____

_____

Telephone Number: _____

Facsimile Number: _____

All required determinations on which this Compliance Certification is based were made in conformance with the applicable requirements in 10 CFR Part 431, subpart B. All information reported in this Compliance Certification is true, accurate, and complete. The company is aware of the penalties associated with violations of the Act and the regulations thereunder, and is also aware of the provisions contained in 18 U.S.C. 1001, which prohibits knowingly making false statements to the Federal Government.

Signature: _____ Date: _____

Name: _____

Title: _____

Firm or Organization: _____

ATTACHMENT TO CERTIFICATION OF COMPLIANCE WITH ENERGY EFFICIENCY STANDARDS FOR ELECTRIC MOTORS: LISTING OF ELECTRIC MOTOR EFFICIENCIES

Date: _____

Name of Company: _____

_____

Rating of Electric Motor

Motor Horsepower/ Kilowatts	Number of Poles	Open or Enclosed Motor	Least Efficient Basic Model - (Model Number(s))	Nominal Full Load Efficiency
1 or .75	6	Open		
1 or .75	4	Open		
1 or .75	6	Enclosed		
1 or .75	4	Enclosed		
1 or .75	2	Enclosed		
1.5 or 1.1	6	Open		
1.5 or 1.1	4	Open		
1.5 or 1.1	2	Open		
1.5 or 1.1	6	Enclosed		
1.5 or 1.1	4	Enclosed		
1.5 or 1.1	2	Enclosed		
...	...	...		
etc.	etc.	etc.		

Note: Place an asterisk beside each reported nominal full load efficiency that is determined by actual testing rather than by application of an alternative efficiency determination method. Also list below additional basic models that were subjected to actual testing.

Basic Model means all units of a given type of covered equipment (or class thereof) manufactured by a single manufacturer, and, with respect to electric motors, which (i) have the same rating, (ii) have electrical design characteristics that are essentially identical, and (iii) do not have any differing physical or functional characteristics that affect energy consumption or efficiency.

Rating means one of the 113 combinations of an electric motor's horsepower (or standard kilowatt equivalent), number of poles, and open or enclosed construction, with respect to which section 431.42 of 10 CFR Part 431 prescribes nominal full load efficiency standards.

Models Actually Tested and Not Previously Identified:

Rating of Electric Motor				
Motor Power Output (e.g. 1 hp or .75 kW)	**Number of Poles**	**Open or Enclosed Motor**	**Basic Model(s) (Model Number(s))**	**Nominal Full Load Efficiency**
...	...	...	...	...
etc.	etc.	etc.	etc.	etc.

APPENDIX B TO SUBPART G OF PART 431—SAMPLING PLAN FOR ENFORCEMENT TESTING

Step 1. The first sample size (n_1) must be five or more units.

Step 2. Compute the mean (X_1) of the measured energy performance of the n_1 units in the first sample as follows:

$$\overline{X}_1 = \frac{1}{n_1}\sum_{i=1}^{n_1} X_i \qquad (1)$$

where X_i is the measured full-load efficiency of unit i.

Step 3. Compute the sample standard deviation (S_1) of the measured full-load efficiency of the n_1 units in the first sample as follows:

$$S_1 = \sqrt{\frac{\sum_{i=1}^{n_1}\left(X_i - \overline{X}_1\right)^2}{n_1 - 1}} \qquad (2)$$

Step 4. Compute the standard error ($SE(X_1)$) of the mean full-load efficiency of the first sample as follows:

$$SE\left(\overline{X}_1\right) = \frac{S_1}{\sqrt{n_1}} \qquad (3)$$

Step 5. Compute the lower control limit (LCL_1) for the mean of the first sample using RE as the desired mean as follows:

$$LCL_1 = RE - tSE\left(\overline{X}_1\right) \qquad (4)$$

where:

RE is the applicable EPCA nominal full-load efficiency when the test is to determine compliance with the applicable statutory standard, or is the labeled nominal full-load efficiency when the test is to determine compliance with the labeled efficiency value, and

t is the 2.5th percentile of a t-distribution for a sample size of n_1, which yields a 97.5 percent confidence level for a one-tailed t-test.

Step 6. Compare the mean of the first sample (X_1) with the lower control limit (LCL_1) to determine one of the following:

(i) If the mean of the first sample is below the lower control limit, then the basic model is in non-compliance and testing is at an end.

(ii) If the mean is equal to or greater than the lower control limit, no final determination of compliance or non-compliance can be made; proceed to Step 7.

Step 7. Determine the recommended sample size (n) as follows:

$$n = \left[\frac{tS_1(120 - 0.2RE)}{RE(20 - 0.2RE)}\right]^2 \qquad (5)$$

where S_1, RE and t have the values used in Steps 3 and 5, respectively. The factor

$$\frac{120 - 0.2RE}{RE(20 - 0.2RE)}$$

is based on a 20 percent tolerance in the total power loss at full-load and fixed output power.

Given the value of n, determine one of the following:

(i) If the value of n is less than or equal to n_1 and if the mean energy efficiency of

the first sample (X_1) is equal to or greater than the lower control limit (LCL_1), the basic model is in compliance and testing is at an end.

(ii) If the value of n is greater than n_1, the basic model is in non-compliance. The size of a second sample n_2 is determined to be the smallest integer equal to or greater than the difference $n-n_1$. If the value of n_2 so calculated is greater than $20-n_1$, set n_2 equal to $20-n_1$.

Step 8. Compute the combined mean (X_2) of the measured energy performance of the n_1 and n_2 units of the combined first and second samples as follows:

$$\overline{X}_2 = \frac{1}{n_1 + n_2} \sum_{i=1}^{n_1+n_2} X_i \qquad (6)$$

Step 9. Compute the standard error ($SE(X_2)$) of the mean full-load efficiency of the n_1 and n_2 units in the combined first and second samples as follows:

$$SE\left(\overline{X}_2\right) = \frac{S_1}{\sqrt{n_1 + n_2}} \qquad (7)$$

(Note that S_1 is the value obtained above in Step 3.)

Step 10. Set the lower control limit (LCL_2) to,

$$LCL_2 = RE - tSE\left(\overline{X}_2\right) \qquad (8)$$

where t has the value obtained in Step 5, and compare the combined sample mean (X_2) to the lower control limit (LCL_2) to find one of the following:

(i) If the mean of the combined sample (X_2) is less than the lower control limit (LCL_2), the basic model is in non-compliance and testing is at an end.

(ii) If the mean of the combined sample (X_2) is equal to or greater than the lower control limit (LCL_2), the basic model is in compliance and testing is at an end.

MANUFACTURER-OPTION TESTING

If a determination of non-compliance is made in Steps 6, 7 or 10, above, the manufacturer may request that additional testing be conducted, in accordance with the following procedures.

Step A. The manufacturer requests that an additional number, n_3, of units be tested, with n_3 chosen such that $n_1 + n_2 + n_3$ does not exceed 20.

Step B. Compute the mean full-load efficiency, standard error, and lower control limit of the new combined sample in accordance with the procedures prescribed in Steps 8, 9, and 10, above.

Step C. Compare the mean performance of the new combined sample to the lower control limit (LCL_2) to determine one of the following:

(a) If the new combined sample mean is equal to or greater than the lower control limit, the basic model is in compliance and testing is at an end.

(b) If the new combined sample mean is less than the lower control limit and the value of $n_1 + n_2 + n_3$ is less than 20, the manufacturer may request that additional units be tested. The total of all units tested may not exceed 20. Steps A, B, and C are then repeated.

(c) Otherwise, the basic model is determined to be in non-compliance.

PART 435—ENERGY CONSERVATION VOLUNTARY PERFORMANCE STANDARDS FOR NEW BUILDINGS; MANDATORY FOR FEDERAL BUILDINGS

Subpart A—Voluntary Performance Standards for New Commercial and Multi-Family High Rise Residential Buildings; Mandatory for Federal Buildings

Sec.

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435.106 Electric power and distribution.
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Subpart B—Voluntary Performance Standards for New Non-Federal Residential Buildings [Reserved]

Subpart C—Mandatory Performance Standards for New Federal Residential Buildings

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435.306 Selecting a life cycle effective proposed building design.

AUTHORITY: 42 U.S.C. 6831–6870; 42 U.S.C. 8254; 42 U.S.C. 7101, *et seq.*

SOURCE: 53 FR 32545, Aug. 25, 1988, unless otherwise noted.

Subpart A—Voluntary Performance Standards for New Commercial and Multi-Family High Rise Residential Buildings; Mandatory for Federal Buildings

SOURCE: 54 FR 4554, January 30, 1989, unless otherwise noted.

§ 435.97 Purpose.

(a) This subpart establishes energy conservation voluntary performance standards for the design of new commercial and multi-family high rise residential buildings. The voluntary performance standards are designed to achieve the maximum practicable improvements in energy efficiency and increases in the use of non-depletable sources of energy.

(b) The voluntary performance standards will be used by Federal agencies for the design of new Federal commercial and multi-family high rise residential buildings.

(c) Except in the case of new commercial and multi-family high rise residential buildings, which are Federal buildings, voluntary performance standards prescribed under this subpart are developed solely as guidelines for the purpose of providing technical assistance for the design of energy efficient buildings.

§ 435.98 Scope.

(a) The voluntary performance standards for new commercial and multi-family high rise residential buildings apply to the design of a new commercial or multi-family high rise residential building, except for the following:

(1) A building constructed and developed for residential occupancy, unless the building is a multi-family high rise residential building with 3 or more stories;

(2) Heating, cooling, ventilating, or service hot water requirements for those spaces where processes occur for purposes other than occupant comfort and sanitation, and which impose thermal loads in excess of 5% of the loads that would otherwise be required for occupant comfort and sanitation without the process;

(3) Envelope requirements for those spaces where heating or cooling requirements are excepted in paragraph (a)(2) of this section;

(4) Lighting for tasks not listed or encompassed by areas or activities listed in Table 3.5–1; and

(5) Buildings that are composed entirely of spaces listed in paragraphs (a)(2), (3), and (4) of this section.

§ 435.99 General definitions and acronyms.

(a) For the purpose of this subpart:

Accessible (as applied to equipment) means admitting close approach; not guarded by locked doors, elevation, or other effective means. (See also *Readily Accessible*.)

Adjusted Lighting Power means lighting power, ascribed to a luminaire(s), that has been reduced by deducting a lighting power control credit based on use of an automatic control device.

Annual Fuel Utilization Efficiency means the ratio of annual output energy to annual input energy that includes any non-heating season pilot input loss.

Air Conditioning, Comfort means treating air to control its temperature, relative humidity, cleanliness, and distribution to meet the comfort requirements of the occupants of the conditioned space. Some air conditioners may not accomplish all of these controls.

Ambient Lighting means lighting that produces general illumination throughout an area.

Area Factor means a multiplying factor that adjusts the base unit power density (UPD) for spaces of various sizes to account for the impact of room configuration on lighting power utilization.

Automatic means a self-acting, operating by its own mechanism, when actuated by some impersonal influence, such as, a change in current strength,

pressure, temperature or mechanical configuration. (See also *Manual*.)

Ballast means a device used with an electric-discharge lamp to obtain the necessary circuit conditions (voltage, current, and wave form) for starting and operating.

Ballast Efficacy Factor—Fluorescent means the ratio of the relative light output to the power input in watts, at specified test conditions, expressed as a percent.

Ballast Factor means the ratio of a commercial ballast lamp lumens to a reference ballast lamp lumens, used to correct the lamp lumen output from rated to actual.

Boiler Capacity means the rated heat output in Btu/h of the boiler, at the design inlet and outlet conditions and rated fuel/energy input.

British Thermal Unit means approximately the amount of heat required to raise the temperature of one pound of water from 59 °F to 60 °F.

Building means any new structure to be constructed that includes provision for a heating or cooling system, or both, or for a hot water system.

Building Code means a legal instrument which is in effect in a state or unit of general purpose local government, the provisions of which must be adhered to if a building is to be considered to be in conformance with law and suitable for occupancy and use.

Building Design means the architectural and engineering drawings and specifications used for the construction of a new building.

Building Energy Cost means the computed annual energy cost of all purchased energy for the building, calculated using the methods of section 435.111 of these standards.

Building Envelope means the elements of a building that enclose conditioned spaces through which thermal energy may be transferred to or from the exterior or to or from unconditioned spaces.

Building Type means the classification of a building by usage. In this regulation the following classifications of buildings are defined by these uses:

(1) *Assembly* means a building or structure for the gathering together of persons, such as auditoriums, churches, dance halls, gymnasiums, theaters, museums, passenger depots, sports facilities, and public assembly halls.

(2) *Health and Institutional* means a building or structure for the purpose of providing medical treatment, confinement or care, and sleeping facilities such as hospitals, sanitariums, clinics, orphanages, nursing homes, mental institutions, reformatories, jails, and prisons.

(3) *Hotel/Motel* means a building or structure for transient occupancy, such as resorts, hotels, motels, barracks, and dormitories.

(4) *Multi-Family* means a building or structure containing three or more dwelling units. (See *Dwelling Units*, and *Multi-Family Dwelling*.)

(5) *Office (Business)* means a building or structure for office, professional, or service type transactions, such as medical offices, banks, libraries, and business offices, including governmental office buildings.

(6) *Restaurant* means a building or a structure for the consumption of food or drink, including fast food, coffee shops, cafeterias, bars, and restaurants.

(7) *Retail (Mercantile)* means a building or a structure for the display and sale (wholesale or retail) of merchandise, such as shopping malls, food markets, auto dealerships, department stores, and specialty shops. (See also *Retail Establishments*.)

(8) *School (Educational)* means a building or structure for the purpose of instruction, such as schools, colleges, universities, and academies.

(9) *Warehouse (Storage)* means a building or structure for storage, such as aircraft hangers, garages, warehouses, storage buildings, and freight depots.

Check Metering means measurement instrumentation for the supplementary monitoring of energy (electric, gas, oil, etc.) consumption, in addition to the revenue metering furnished by the utility, to isolate the various categories of energy use to permit conservation and control.

Coefficient of Performance—Cooling means the ratio of the rate of heat removal to the rate of energy input in consistent units, for a complete cooling

system or factory assembled equipment, as tested under a nationally recognized standard or designated operating conditions.

Coefficient of Performance, Heat Pump—Heating means the ratio of the rate of heat delivered to the rate of energy input, in consistent units, for a complete heat pump system under designated operating conditions. When checking compliance with the heat pump equipment COP's listed in the tables in section 435.108.

Combined Thermal Transmittance Values (See *Thermal Transmittance, Overall.*)

Commercial Building means a building other than a residential building, including any building developed for industrial or public purposes.

Conditioned Floor Area means the area of the conditioned space measured at floor level from the interior surfaces of the walls.

Conditioned Space means a volume within a building that is designed to be heated and/or cooled, directly or indirectly.

Connected Lighting Power means the power required to energize luminaires and lamps installed and connected to the building electrical service, in watts.

Control Loop, Local means a control system consisting of a sensor, a controller, and a controlled device.

Cooled Space means an enclosed area within a building that has a refrigeration system whose sensible capacity exceeds 5 Btu/h•ft^2 or is capable of maintaining space dry bulb temperatures of 90 °F or less at design cooling conditions.

Daylight Sensing Control means a device that automatically regulates the power input to electric lighting near the fenestration to maintain the desired workplace illumination, thus taking advantage of direct or indirect sunlight.

Dead Band (Dead Zone) means the range of values within which an input variable can be varied without initiating any noticeable change in the output variable.

Default Assumption means the value of an input used in a calculation procedure when a value is not entered by the designer.

Degree-Day means a unit, based upon temperature difference and time, used in estimating fuel consumption and specifying nominal heating load of building in winter. For any day, when the mean temperature is less than a reference temperature, typically 65 °F, there are as many Degree-Days as Fahrenheit degrees difference in temperature between the mean temperature for the day and the reference temperature.

Degree Day, Cooling means a unit, based upon temperature difference and time, used in estimating cooling energy consumption. For any one day, when the mean temperature is more than a reference temperature, typically 65 °F, there are as many Degree Days as degrees Fahrenheit temperature difference between the mean temperature for the day and the reference temperature. Annual Cooling Degree Days (CDD) are the sum of the degree days over a calendar year.

Degree Day, Heating means a unit, based upon temperature difference and time, used in estimating heating energy consumption. For any one day, when the mean temperature is less than a reference temperature, typically 65 °F, there are as many Degree Days as degrees Fahrenheit temperature difference between the mean temperature for the day and the reference temperature. Annual Heating Degree Days (HDD) are the sum of the degree days over a calendar year.

Demand (Electric) means the rate at which electric energy is delivered to or by a system, part of a system, or a piece of equipment; expressed in kilowatts, kilovoltamperes; or other suitable units at a given instant or averaged over any designated period.

Design Conditions means the exterior and interior environmental parameters specified for air conditioning and electrical design for a facility.

Design Energy Consumption means the computed annual energy usage of a proposed building design.

Design Energy Costs means the computed annual energy expenditures of a proposed building design.

Dwelling Unit means a single housekeeping unit comprised of one or more rooms providing complete, independent living facilities for one or more persons

including permanent provisions for living, sleeping, eating, cooking, and sanitation.

Economizer, Air means a ducting arrangement and automatic control system that allows a cooling supply fan system to supply outside air to reduce or eliminate the need for mechanical refrigeration during mild or cold weather.

Economizer, Water means a system by which the supply air of a cooling system is cooled directly and/or indirectly by evaporation of water, or by other appropriate fluid, in order to reduce or eliminate the need for mechanical refrigeration.

Efficiency, HVAC System means the ratio of the useful energy output (at the point of use) to the energy input in consistent units for a designated time period, expressed in percent.

Emergency System (Back Up System) means a system which exists for the purpose of operating in the event of failure of a primary system.

Energy means the capability for doing work; having several forms that may be transformed from one to another, such as thermal (heat), mechanical (work), electrical, and chemical.

Energy Cost means the annual cost of energy by unit and type of energy.

Energy Cost Budget means the maximum allowable computed annual energy expenditure for a proposed building.

Energy Efficiency Ratio means the ratio of net equipment cooling capacity in Btu/h to total rate of electric input in watts under designated operating conditions. When consistent units are used, this ratio becomes equal to COP. (See also *Coefficient of Performance*.)

Energy Management System means a control system designed to monitor the environment and the use of energy in a facility and to adjust the parameters of local control loops to conserve energy while maintaining a suitable environment.

Energy, Recovered (See *Recovered Energy*.)

Enthalpy means a thermodynamic property of a substance defined as the sum of its internal energy plus the quantity PV/J, where P=pressure of the substance, V=its volume, and J=the mechanical equivalent of heat; formerly called total heat and heat content.

Exterior Envelope (See *Building Envelope*.)

Fenestration means any light-transmitting section in a building wall or roof. The fenestration includes glazing material, which may be glass or plastic; framing, mullions, muntins, and dividers; external shading devices; internal shading devices, and integral (between-glass) shading devices.

Federal Agency means any department, agency, corporation, or other entity or instrumentality of the executive branch of the Federal Government, including the United States Postal Service, the Federal National Mortgage Association, and the Federal Home Loan Mortgage Corporation.

Federal Building means any building to be constructed by, or for the use of, any Federal Agency which is not legally subject to State or local building codes or similar requirements.

Footcandle means the unit of illuminance on a surface one square foot in area on which there is a uniformly distributed flux of one lumen, or the illuminance produced on a surface all points of which are at a distance of one foot from a directionally uniform point source of one candela.

General Lighting means lighting designed to provide illumination throughout an area, exclusive of any provision for special local requirements.

Gross Floor Area means the sum of the areas of the several floors of the building, including basements, mezzanine and intermediate-floored tiers and penthouses of headroom height, measured from the exterior faces of exterior walls or from the centerline of walls separating buildings, but excluding covered walkways, open roofed-over areas, porches and similar spaces, pipe trenches, exterior terraces or steps, chimneys, roof overhangs, and similar features.

Gross Lighted Area means the sum of the total lighted areas of a building measured from the inside of the perimeter walls, for each floor of the building.

Gross Roof Area means the total surface of the roof assembly exposed to

the outside air, including all roof/ceiling and skylight components through which heat may flow between indoor and outdoor environments, excluding service openings.

Gross Exterior Wall Area means the total surface of the wall assembly exposed to the outside air and enclosing a heated or cooled space consisting of opaque surfaces, including between floor spandrels, peripheral edges of flooring and window areas including sash and door areas but excluding vents, grilles, and pipes.

HVAC System means the equipment distribution network and terminals that provide either collectively or individually the processes of heating, ventilating, and/or air conditioning to a building.

HVAC System Efficiency (See *Efficiency, HVAC System*.)

Heat means the form of energy that is transferred by virtue of a temperature difference or a change in state of a material.

Heat Capacity means the amount of heat necessary to raise the temperature of a given mass one degree. Numerically the mass multiplied by the specific heat.

Heated Space means a volume within a building which is provided with a positive supply of thermal energy by a system whose output capacity either exceeds 10 $Btu/h \bullet ft^2$ or is capable of maintaining a space dry-bulb temperature of 50 °F or more at design building conditions.

Heating System Performance Factor means the total heating output of a heat pump during its normal annual usage period for heating, in Btu, divided by the total electric energy input during the same period, in watt-hours.

Heat Trap means a device coupled to the inlet and outlet of a water heater that effectively restricts the natural tendency of hot water to rise in the vertical pipe during periods of standby.

Humidistat means an automatic control device responsive to changes in humidity.

Illuminance means the density of the luminous flux incident on a surface. It is the quotient of the luminous flux multiplied by the area of the surface when the latter is uniformly illuminated. (See also *Footcandle*.)

Industrial Process means any manufacturing or other process whose energy requirements are not primarily intended to contribute to the heating, cooling, lighting, ventilation, or service hot water energy load requirements of the building.

Infiltration means the uncontrolled inward air leakage through cracks and crevices in any building element and around windows and doors of a building.

Insolation means the rate of solar energy incident on a unit area with a given orientation.

Integrated Part-Load Value means a single number figure of merit for airconditioning and heat pump equipment based on weighted operation at a set of less than full capacities for the equipment.

Lighting Power Budget means the lighting power, in watts, allowed for an interior or exterior area or activity.

Lighting Power Control Credit means the amount of interior connected lighting power which may be added to the Interior Lighting Power Allowance for lights in a space which is turned off or dimmed by automatic control devices.

Lumen means SI unit of luminous flux. Radiometrically, it is determined from the radiant power. Photometrically, it is the luminous flux emitted within a unit solid angle (one steradian) by a point source having a uniform luminous intensity of one candela.

Lumen Maintenance Control means a device that senses the illumination level and causes an increase/decrease of illuminance to maintain a preset illumination level.

Luminaire means a complete lighting unit consisting of a lamp or lamps together with the parts designed to distribute the light, to position and protect the lamps, and to connect the lamps to the power supply.

Luminaire Efficiency means the ratio of luminous flux (lumens) emitted by a luminaire to that emitted by the lamp or lamps used therein.

Manual (Non-Automatic) means action requiring personal intervention for its control. As applied to an electric controller, non-automatic control does not necessarily imply a manual controller,

but only that personal intervention is necessary. (See *Automatic*.)

Marked Rating means the design load operating conditions of a device as shown by the manufacturer on the nameplate or otherwise marked on the device.

Minimum Life Cycle Cost Methodology means the methodology specified in subpart A of 10 CFR part 436.

Motor Efficiency, Nominal means the median efficiency occurring in a population of motors of the same manufacturer and rating.

Multi-Family High Rise Residential Building means a residential building containing three or more dwelling units and is designed to be 3 or more stories above grade.

Multi-Family Low Rise Residential Building means a residential building containing three or more dwelling units and is designed not to exceed two stories above grade.

Non-Depletable Energy Sources means sources of energy, excluding minerals, derived from incoming solar radiation; thermal chemical or electrical energy derived directly from conversion of incident solar radiation; wind, waves and tides, lake, or pond thermal differences; and energy derived from the internal heat of the earth.

Occupancy Sensor means a device that detects the presence or absence of people within an area and causes lighting, equipment, and/or appliances to be adjusted accordingly.

Opaque Areas means all exposed areas of a building envelope which enclose conditioned space, except fenestration areas and building service openings, such as vents, grilles, and pipes.

Orientation means the directional placement of a building on a building site with reference to the building's longest horizontal axis, or, if none, with reference to the designated main entrance.

Outdoor (Outside) Air means air taken from the exterior of the building that has not been previously circulated through the building. (See also *Ventilating Air*.)

Ozone Depletion Factor means a relative measure of the potency of chemicals in depleting stratospheric ozone. The ozone depletion factor potential depends upon the chlorine and the bromine content and atmospheric lifetime of the chemical. The depletion factor potentials are normalized such that the factor for CFC–11 is set equal to unity and the factors for the other chemicals indicate their potential relative to CFC–11.

Packaged Terminal Air-Conditioner means a factory-selected wall sleeve and separate unencased combination of heating and cooling components, assemblies or sections, intended for mounting through the wall to serve a single room or zone. It includes heating capability by hot water, steam, or electricity.

Packaged Terminal Heat Pump means a PTAC capable of using the refrigeration system in a reverse cycle or heat pump mode to provide heat.

Piping means a system for conveying fluids, including pipes, valves, strainers, and fittings.

Plenum means an enclosure that is part of the air handling system and is distinguished by having a very low air velocity. A plenum often is formed in part or in total by portions of the building.

Power means, in connection with machines, the time rate of doing work; in connection with the transmission of energy of all types, the rate at which energy is transmitted; in inch-pound units, is measured in watts (W) or British thermal units per hour (Btu/h).

Power Adjustment Factor means a modifying factor that adjusts the effective connected lighting power of a space to account for the use of energy conserving lighting control devices.

Power Factor means the ratio of total watts to the root-mean-square (RMS) volt amperes.

Prescribed Assumption means a fixed value of an input to the standard calculation procedure.

Process Energy means energy consumed in support of a manufacturing, industrial, or commercial process, other than the maintenance of comfort and amenities for the occupants of a building.

Process Load means the calculated or measured time-integrated load on a building resulting from the consumption or release of process energy.

Proposed Design means a prospective design for a building that is to be evaluated for compliance.

Prototype Building means a generic building design of the same size and occupancy type as the proposed design, which complies with the prescriptive requirements of the standards and has prescribed assumptions used to generate the energy budget concerning shape, orientation, HVAC, and other system designs.

Public Facility Restroom means a restroom used by the transient public.

Radiant Comfort Heating means a system in which temperatures of room surfaces are adjusted to control the rate of heat loss by radiation from occupants.

Readily Accessible means capable of being reached quickly for operation, renewal, or inspections, without requiring those to whom ready access is requisite to climb over or remove obstacles or to resort to portable ladders, chairs, and so on. (See also *Accessible*.)

Recooling means lowering the temperature of air that has been previously heated by a heating system.

Recovered Energy means energy utilized which would otherwise be wasted (not contributing to a desired end use) from an energy utilization system.

Reference Building means a specific building design that has the same form, orientation and basic systems as the proposed design and meets all the criteria of the prescriptive compliance method.

Reflectance means the ratio of the light reflected by a surface to the light incident upon it.

Reheating means raising the temperature of air that has been previously cooled either by a refrigeration or an economizer system.

Reset means adjustment of the controller set point to a higher or lower value automatically or manually.

Residential means any structure which is constructed and developed for residential occupancy.

Retail Establishments means, for the purpose of determining lighting power limit, buildings, the primary functions of which are designed to be:

(1) Type A—Jewelry Merchandising, where the minute display and examination of merchandise is critical.

(2) Type B—Fine Merchandising: Fine apparel and accessories, china, crystal and silver, art galleries, etc., where the detailed display and examination of merchandise is important.

(3) Type C—Mass Merchandising, where focused display and detailed examination of merchandise is important.

(4) Type D—General Merchandising: General apparel, variety, stationery, books, sporting goods, hobby, cameras, gift, luggage, etc., where general display and examination of merchandise are adequate.

(5) Type E—Food & Miscellaneous: Bakeries, hardware and housewares, grocery, appliances and furniture, etc., where appetizing appearance is important.

(6) Type F—Service Establishments, where functional performance is important.

Roof means those portions of the building envelope including all opaque surfaces, fenestration, doors, and hatches which are above conditioned space and which are horizontal or tilted at less than 45° from horizontal. (See also *Walls*.)

Room Air Conditioner means an encased assembly designed as a unit to be mounted in a window or through a wall, or as a console. It is designed primarily to provide free delivery of conditioned air to an enclosed space, room, or zone. It includes a prime source of refrigeration for cooling and dehumidification and means for circulating and cleaning air, and may also include means for ventilating and heating.

Seasonal Energy Efficiency Ratio means the total cooling output of an air conditioner during its normal annual usage period for cooling, in Btu/h, divided by the total electric energy input during the same period, in watt-hours, as determined by 10 CFR, part 430.

Service Systems means all energy-using or distributing components in a building that are operated to support the occupant or process functions housed therein, including HVAC, service water heating, illumination, transportation, cooking or food preparation, laundering or similar functions.

Service Water Heating means the supply of hot water for purposes other than comfort heating and process requirements.

Service Water Heating Demand means the maximum design rate of water withdrawal from a service water heating system in a designated period of time (usually an hour or a day).

Shading Coefficient means the ratio of solar heat gain through fenestration, with or without integral shading devices, to that occurring through unshaded ⅛ inch thick clear, double strength glass.

Shell Building means a building for which the envelope is designed and/or constructed prior to knowing the occupancy type. (See also *Speculative Building*.)

Speculative Building means a building for which the envelope is designed and/or constructed prior to the design of the lighting and/or HVAC systems. A speculative building differs from a shell building in that the intended occupancy is known for the speculative building. (See also *Shell Building*.)

Standard Calculation Procedure means an energy simulation model, and a set of input assumptions, that produce estimates of annual energy consumption for heating, cooling, ventilation, lighting, and other uses and that account for the dynamic thermal performance of the building.

System means a combination of equipment and/or controls, accessories, interconnecting means, and terminal elements by which energy is transformed so as to perform a specific function, such as HVAC, service water heating, or illumination.

Tandem Wiring means pairs of luminaires operating with one lamp in each luminaire powered from a single two-lamp ballast contained in the other luminaire.

Task Lighting means lighting that provides illumination for specific visual functions and is directed to a specific surface or area.

Task Location means an area of the space where significant visual functions are performed and where lighting is required above and beyond that required for general ambient use.

Terminal Element means a device by which the transformed energy from a system is finally delivered; *i.e.*, registers, diffusers, lighting fixtures, faucets, etc.

Thermal Conductance means the constant time rate of heat flow through unit area of a body induced by a unit temperature difference between the surfaces, $Btu/ft^2 \bullet h \bullet °F$ or $Btu/h \bullet °F$. It is reciprocal of thermal resistance. (See *Thermal Resistance*.)

Thermal Mass means materials with mass heat capacity and surface area capable of affecting building loads by storing and releasing heat as the interior and/or exterior temperature and radiant conditions fluctuate. (See also *Wall Heat Capacity*.) Thermal Mass Wall Insulation Position:

(1) *Exterior Insulation Position* means a wall having all or nearly all of its mass exposed to the room air with the insulation on the exterior of that mass.

(2) *Integral Insulation Position* means a wall having mass exposed to both room and outside air, with substantially equal amounts of mass on the inside and outside of the insulation layer.

(3) *Interior Insulation Position* means a wall not meeting either of the above definitions, particularly a wall having most of its mass external to an insulation layer.

Thermal Resistance means the reciprocal thermal conductance; 1/C as well as 1/h, 1/U, $h \bullet ft^2 \bullet °F/Btu$.

Thermal Transmittance means the overall coefficient of heat transfer from air to air. It is the time rate of heat flow per unit area under steady conditions from the fluid on the warm side of the barrier to the fluid on the cold side, per unit temperature difference between the two fluids, $Btu/h \bullet ft^2 \bullet °F$.

Thermal Transmittance, Overall means the gross overall (area weighted average) coefficient of heat transfer from air to air for a gross area of the building envelope, $Btu/h \bullet ft^2 \bullet °F$. The thermal transmittance (U°) value applies to the combined effect of the time rate of heat flows through the various parallel paths, such as windows, doors, and opaque construction areas, comprising the gross area of one or more building envelope components, such as walls, floors, or roof/ceiling.

Thermostat means an automatic control device responsive to temperature.

Unconditioned Space means a volume within a building that is not designed to be directly or indirectly heated and/or cooled. (See *Conditioned Space*.)

Unit Power Density means the floor area designated for a specific occupancy, function, or activity expressed in W/ft^2.

Unitary Cooling Equipment means one or more factory-made assemblies which normally include an evaporator or cooling coil, a compressor and condenser combination, and may include a heating function as well.

Unitary Heat Pump means one or more factory-made assemblies which normally include an indoor conditioning coil, compressor(s) and outdoor coil or refrigerant-to-water heat exchanger, including means to provide both heating and cooling functions.

Unlisted Space means the difference in area between the gross lighted area and the sum of all listed spaces.

Variable Air Volume (VAV) HVAC System means HVAC systems that control the dry-bulb temperature within a space by varying the volume of supply air to the space.

Ventilation means the process of supplying or removing air by natural or mechanical means to or from any space. Such air may or may not have been conditioned.

Ventilation Air means that portion of supply air which comes from outside (outdoors) plus any recirculated air that has been treated to maintain the desired quality of air within a designated space. (See also *Outdoor Air*.)

Visual Task means those details and objects that must be seen for the performance of a given activity, and includes the immediate background of the details or objects.

Voluntary Performance Standards means an energy consumption goal or goals to be met without specification of the method, materials, and processes to be employed in achieving that goal or goals, but including statements of the requirements, criteria and evaluation methods to be used, and any necessary commentary.

Walls means those portions of the building envelope enclosing conditioned space including all opaque surfaces, fenestration and doors, which are vertical or tilted at an angle of 45° from horizontal or greater. (See also *Roof*.)

Wall Heat Capacity means the sum of the products of the mass of each individual material in the wall per unit area of wall surface times its individual specific heat, Btu/F. (See *Thermal Mass*.)

Watt means a unit of power. One watt is produced when one ampere, flows at an amp of one volt (unity power factor). (See also *Power*.)

Zone means a space or group of spaces within a building with heating, cooling, and/or lighting requirements sufficiently similar so that desired conditions can be maintained throughout by a single controlling device.

(b) For definitions not found in paragraph (a) of this section, the 1986 edition of ''Terminology of Heating and Ventilation, Air-Conditioning, and Refrigeration'' as published by the American Society of Heating, Refrigeration, and Air-Conditioning Engineers, Inc. (ASHRAE) shall apply to these standards.

(c) For purposes of this subpart, the acronyms and abbreviations shall have the following meanings:

A_o—Total Building Floor Area.

$A_{wall,roof,etc.}$—Area of a Specific Building component.

AAMA—American Aluminum Manufacturers Association.

ACP—Alternative Component Package.

AF—Area Factor.

AFUE—Annual Fuel Utilization Efficiency.

AHAM—Association of Home Appliance Manufacturers.

ALP—Adjusted Lighting Power.

ANSI—American National Standards Institute.

ARI—Air-Conditioning and Refrigeration Institute.

ASHRAE—American Society of Heating, Refrigeration and Air Conditioning Engineers, Inc.

ASME—American Society of Mechanical Engineers.

ASTM—American Society for Testing and Materials.

Btu—British Thermal Unit.

Btu/h—British Thermal Units Per Hour.

C—Thermal Conductance.

C_c—Cooling Criteria.
CDD—Cooling Degree-Days.
CDD50—Cooling Degree-Days Base 50 °F.
CDD65—Cooling Degree-Days Base 65 °F.
CDH—Cooling Degree-Hours.
CDH80—Cooling Degree-Hours Base 80 °F.
CEEU—Cost Equivalent Energy Units.
cfm—Cubic Feet Per Minute.
CFR—Code of Federal Regulations.
CLP—Connected Lighting Power.
COP—Coefficient of Performance.
CU—Coefficient of Utilization.
DOE—U.S. Department of Energy.
DR—Average Daily Temperature Range for Warmest Month.
EER—Energy Efficiency Ratio.
ELPA—Exterior Lighting Power Allowance.
EPD—Equipment Power Density.
° F—Degrees-Fahrenheit
GLA—Gross Lighted Building Area.
HC—Heat Capacity.
HDD—Heating Degree-Days.
HDD50—Heating Degree-Days Base 50 °F.
HDD65—Heating Degree-Days Base 65 °F.
HI—Hydronics Institute.
HID—High Intensity Discharge.
hp—Horsepower (force).
HPS—High Pressure Sodium.
HSPF—Heating System Performance Factor.
HVAC—Heating, Ventilating and Air Conditioning.
IEEE—Institute of Electrical and Electronics Engineers, Inc.
IES—Illuminating Engineering Society of North America.
ILPA—Interior Lighting Power Allowance.
IPLV—Integrated Part Load Value.
ILD—Internal Load Density.
IRF—Internal Reflecting Film.
ISSC—Internal Shading System Coefficient.
K_h—Daylighting Factor.
kVA—Kilo-Volts Amperes.
kW—Kilo-Watts.
LPB—Lighting Power Budget.
LPCC—Lighting Power Control Credits.
LS—Listed Space.
NWMA—National Woodwork Manufacturers Association.
o.c.—On Center.
OLA—Occupant Load Adjustment.
OMB—U.S. Office of Management and Budget.
P_b—Base Unit Lighting Power Allowance.
PAF—Power Adjustment Factor.
PF—Projection Factor.
PTAC—Packaged Terminal Air-Conditioner.
R—Thermal Resistance.
r—Thermal Resistivity.
S_{ea}—Shading Horizontal Adjustment Factor.
SC—Shading Coefficient.
SEER—Seasonal Energy Efficiency Ratio.
U_o—Average Thermal Transmittance.
UL—Underwriter's Laboratories, Inc.
ULPA—Unit Lighting Power Allowance.
UPD—Unit Power Density.
VAV—Variable Air Volume.
VCP—Visual Comfort Probability.
VDT—Visual Display Terminal.
VLT—Visible Light Transmittance.
VSEW—Vertical Surface of the Facade.
W.C.—Water Column.
W—Watts.
W/ft^2—Watts Per Square Foot.
W/lin. ft—Watts Per Linear Foot.
W_h—Window Height.
WWR—Window Wall Ratio.
WYEC—Weather Year for Energy Conservation Calculations.

§ 435.100 Explanation of numbering system for standards.

(a) For purposes of this subpart, a derivative of two different numbering systems will be used.

(1) For the purpose of designating a section, the system employed in the Code of Federal Regulations (CFR) will be employed. The number ''435,'' which signifies Part 435, Chapter II of Title 10, Code of Federal Regulations, is used as a prefix for all section headings. The suffix is a two or three digit number beginning with ''.97.'' For example, the lighting section of the standards is numbered § 435.103.

(2) Within each section, a numbering system common to many national voluntary consensus standards is used. This system was chosen because of its

commonality among the buildings industry. A decimal system is used to denote sections and subsections. For example, §9.4.2 refers to section 9, subsection 4, paragraph 2.

(b) The hybrid numbering system is used for two purposes:

(1) The use of the Code of Federal Regulation's numbering system allows the researcher using the CFR easy access to the standards.

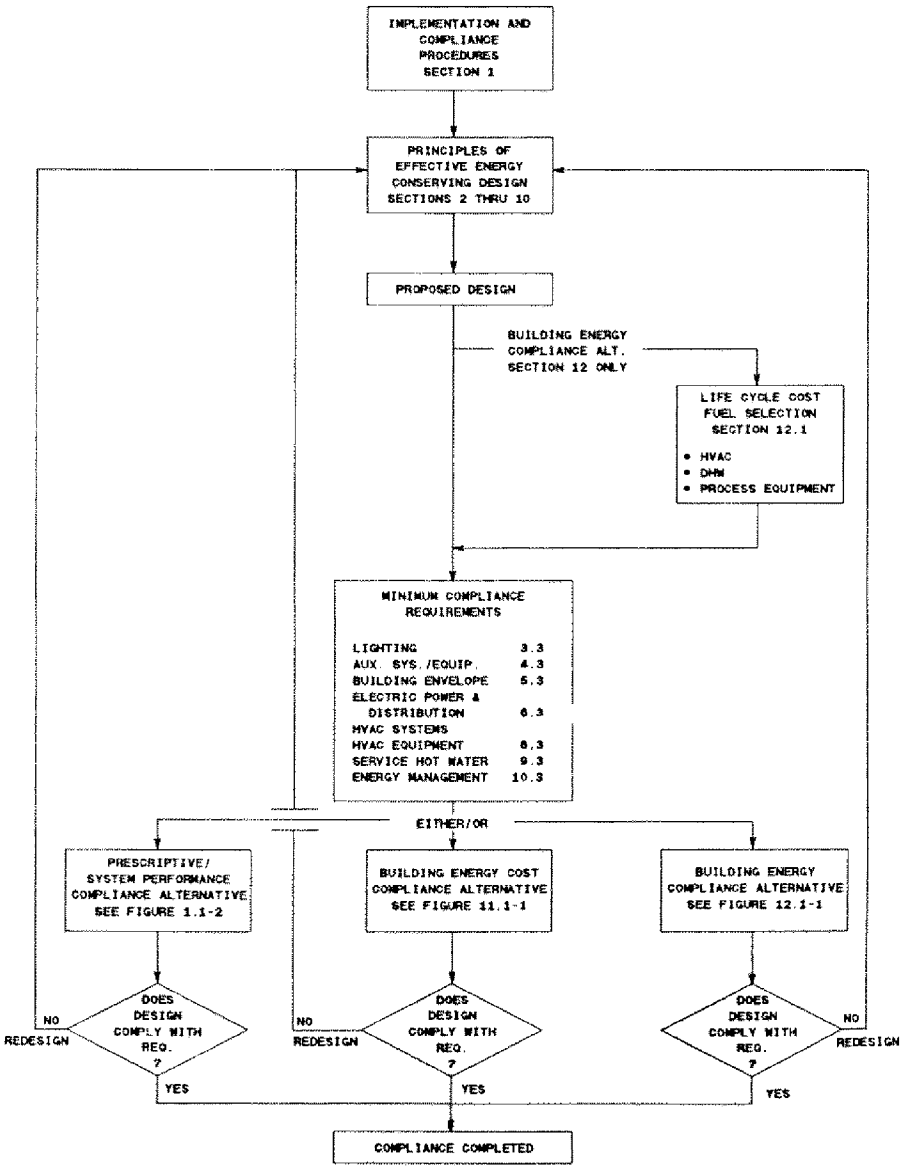
(2) The use of the second system allows the builder, designer, architect or engineer easy access because they are used to the system employed.

(c) To avoid confusion in the use of the two systems, §435.101 through §435.112, the substantive technical sections of the standards, have been numbered so that the last two digits in the suffix designate the section. For example, once the reader enters the body of §435.105: Building Envelope, the number ''5'' is used to designate the section. References throughout the standard do not employ the ''435'' prefix but rather refer to the section by the single or double digit numbers from 1–12.

§ 435.101 Implementation and compliance procedures for Federal agencies.

Alternative methods of achieving compliance are illustrated in Figure 1.1–1.

Figure 1.1-1 Alternative Methods of Achieving Compliance



1.1 Compliance

1.1.1 The head of each Federal agency responsible for the construction of Federal buildings shall adopt such procedures as may be necessary to assure that the design of the building shall:

1.1.1.1 be undertaken in a manner that provides for appropriate consideration of the Principles of Effective Energy Building Design prescribed in §§2.0, 3.2, 4.2, 5.2, 6.2, 7.2, 8.2, 9.2 and 10.2;

1.1.1.2 comply with the minimum requirements of §§3.3, 4.3, 5.3, 6.3, 7.3, 8.3, 9.3 and 10.3; and

1.1.1.3 meet or exceed, based upon the analysis of life-cycle cost-effectiveness required by §1.1.2 below, the following additional requirements:

1.1.1.3.1 the lighting design shall meet either the prescriptive requirements of §3.4 or the system performance requirements of §3.5,

1.1.1.3.2 the building envelope design shall meet either the prescriptive requirements of section 5.4 or the system performance requirements of section 5.5, and

1.1.1.3.3 the heating, ventilating and air conditioning systems design shall meet the prescriptive requirements of section 7.4, and

1.1.1.3.4 the service water heating systems design shall meet the prescriptive requirements of section 9.4.

1.1.2 In lieu of meeting the provisions of section 1.1.1 above, the building design shall meet the criteria of the building energy method of section 11.0 or 12.0, Building Energy Compliance Alternatives I and II.

1.1.3 The head of each Federal agency responsible for the construction of Federal buildings shall also assure that the decision-making process for the design of the building shall employ the methodology for estimating and comparing the life-cycle cost of Federal buildings and for determining life-cycle cost-effectiveness prescribed in subpart A of 10 C.F.R. part 436.

1.2 General Approach to Compliance

1.2.1 The standards, in addition to minimum requirements, establish three alternate methods to determine whether the design has achieved compliance.

1.2.2 There are several alternative methods of achieving compliance provided for in the standards:

1.2.2.1 Prescriptive (Sections 3.4, 5.4, 7.4 and 9.4),

1.2.2.2 System Performance (Sections 3.5 and 5.5), or

1.2.2.3 Building Energy (Section 11.0 or 12.0).

1.2.2.4 The criteria established for each of the methods allow for designs that are roughly equivalent in terms of energy conservation. The equivalency of the methods can be demonstrated by designing a building using the Prescriptive approach, then modeling the building using either the System Performance or Building Energy criteria calculation procedures and comparing results.

1.2.3 Compliance with these standards shall be demonstrated by meeting the set of minimum requirements defined in Sections 3.2, 3.3, 4.2, 4.3, 5.2, 5.3, 6.2, 6.3, 7.2, 7.3, 8.2, 8.3, 9.2, 9.3, 10.2, and 10.3 and one of the alternative methods.

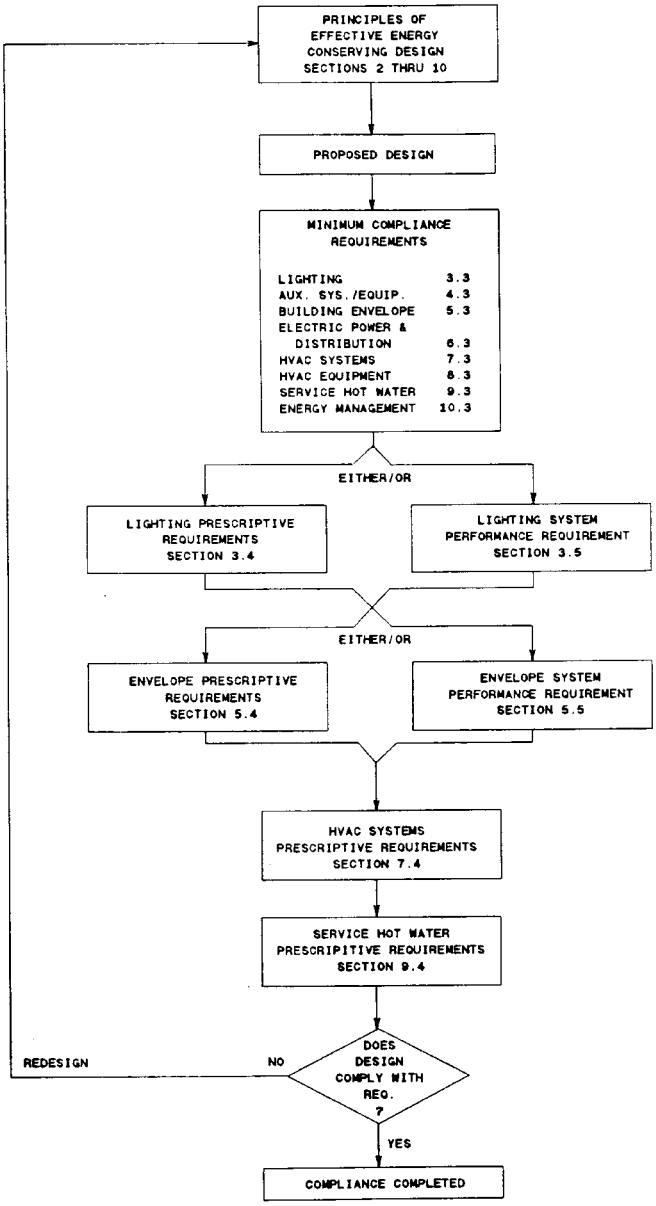
1.3 How To Select a Compliance Method

1.3.1 Use the Prescriptive method when the minimum amount of calculation and effort to achieve compliance is of primary concern. Its requirements can be readily specified in construction documents and are easily reviewed by building code enforcement authorities. The Prescriptive method permits few trade-offs or optimization procedures, but does permit several energy-effective and cost-effective alternate construction options to be used. See Figure 1.1–2.

1.3.2 Use the System Performance method when more innovative design is required, or when the Prescriptive method does not provide the necessary design flexibility. It requires more manual calculations than the Prescriptive method. See Figure 1.1–2

1.3.3 Use either of the Building Energy methods (Sections 11.0 or 12.0) when the most innovative design concepts are being considered. The Building Energy methods allow the trade-off of energy among the building systems as long as the total calculated design annual energy consumption does not exceed the limit prescribed. It will, in general, require the use of a computer program to simulate the operation of the various systems and to model building design energy use in accordance with the building loads and the proposed schedules of operation. See Figures 11–1 and 12–1.

Figure 1.1-2 Prescriptive/System Performance Compliance Alternatives



§435.102 Principles of effective energy building design.

2.1 General

2.1.1 This section complements the other sections of the standards by providing general principles of effective building design. The intention of this section is to provide ideas on how to improve the integration of the building's major energy using subsystems in a cost-effective manner without compromising the building's intended functional use or internal environmental conditions. In addition, more narrowly focused principles are included in sections 3.0 through 10.0.

2.1.2 To comply with the principles of effective design, designers shall use their professional judgment to identify the building's most significant energy requirements and select appropriate solutions from the general strategies found in this section and the more specific strategies found in sections 3.0 through 10.0.

2.2 Identification of Significant Energy Requirements

2.2.1 Before energy design strategies can be developed for a commercial or multi-family high rise residential building, a clear picture of its most significant energy requirements must be developed. The basic approach to achieving an energy conscious design is to improve the energy efficiency of the building by shifting or reducing loads, improving transport systems, and providing efficient environmental systems and controls. This is accomplished by first determining which aspects of the building's energy requirements are the most significant, those that would result in the largest annual energy costs to the building owner if energy conserving strategies were otherwise not applied. For example, for a given building, the largest annual energy cost component may be lighting, followed by cooling, heating, and ventilation, respectively. In this example electricity would be the major energy source. Therefore, peak time-rates of energy use (i.e., peak power demands), as well as direct energy use, would have to be included in any energy analysis. Consideration of peak demands will reduce the requirement for oversizing of energy systems in the building and will also have the added impact of helping to reduce the need for additional, low utilization peak capacity on utility grids.

2.2.2 Once the most significant cost components of the building's energy requirements have been determined, apply the strategies and design solutions listed below and those that appear in each of the following sections of the standards. ln the example noted above, lighting solutions would be addressed first, followed by cooling, heating, and then ventilation.

2.2.3 Research results indicate that the most significant energy uses for any given commercial or multi-family high rise residential building are generally not accurately identifiable by professional intuition. Therefore, use shall be made of one of the several available analysis tools, some of which are microcomputer-based.

2.3 General Solution Strategies

2.3.1 Consider energy efficiency from the initiation of the building design process, since design improvements are most easily and effectively made at that time. Seek the active participation of members of the design team early in the design process, including the owner, architect, engineer, and builder, if possible. Consider building attributes such as building function, form, orientation, window/wall ratio, and HVAC system types early in the design process. Each has major energy implications. These considerations most likely will result in solutions that minimize both construction and operation costs, including energy demand charges.

2.3.2 Address the building's energy requirements in the following sequence: minimize impact of the building functional requirements; minimize loads; improve the efficiency of distribution and conversion systems; and integrate building subsystems into an efficient whole. Each of these is discussed below.

2.3.2.1 Minimize impact of functional requirements by identifying major areas that offer energy efficiency opportunities based on the

building's functional use, human occupancy requirements, and site characteristics. These areas will vary considerably from building to building depending upon function and service requirements, and shall be considered when applying the criteria of these standards.

2.3.2.2 Minimize loads by analyzing the external and internal loads to be imposed on building energy-using subsystems, both for peak-load and part-load conditions. Include a determination of how the building relates to its external environment in the analysis, either adaptively or defensively. Consider changes in building form, aspect ratio, and other attributes that reduce, redistribute, or delay (shift) loads.

2.3.2.3 Improve subsystems by analyzing the diversified energy and demand (power) requirements of each energy-using subsystem serving the functional requirements of the building. Consider static and dynamic efficiency of energy conversion and energy transport subsystems and include consideration of opportunities to reclaim, redistribute and store energy for later use.

2.3.2.4 Alternative ways to integrate systems into the building will be accomplished by considering both power and time components of energy use. Identify, evaluate, and design each of these components to control the overall design energy consumption. The following shall be considered when integrating major building subsystems:

2.3.2.4.1 Address more than one problem when developing design solutions, and make maximum use of building components already present for non-energy reasons (e.g., windows, structural mass);

2.3.2.4.2 Examine design solutions that consider time since sufficient energy may already be present from the environment (e.g., solar heat, night cooling) or from internal equipment (e.g., lights, computers) but available at different times than needed. Thus, active (heat pumps with water tanks) and passive (building mass) storage techniques may be considered;

2.3.2.4.3 Examine design solutions that consider anticipated space utilization. For example, in large but relatively unoccupied spaces, task or zone heating may be considered. Transporting energy (light and heat) from locations of production and availability to locations of need shall be considered instead of the purchase of additional energy;

2.3.2.4.4 Never reject waste energy at temperatures usable for space conditioning or other practical purposes, without calculating the economic benefit of energy recovery;

2.3.2.4.5 Consider design solutions that provide more comfortable surface temperatures or increase availability of controlled daylight in buildings in which human occupancy is a primary function;

2.3.2.4.6 Use design solutions that are easily understood as they have a greater probability of use by building occupants; and

2.3.2.4.7 Where the functional requirements of the building may change, the installed environmental system should be designed to be adaptable to meet functional changes that can be anticipated as well as providing flexibility to meet indeterminate future changes in use, occupancy or other functions.

§ 435.103 Lighting.

3.1 General

3.1.1 This section contains principles of design, a set of minimum requirements, and two alternative compliance procedures, prescriptive and systems performance, for the design of building lighting and lighting control systems, and includes provisions for daylighting credit. The procedures in this section are solely for use in establishing lighting design budgets and are not intended for use as lighting design procedures.

3.1.2 *Scope.* The following are covered by this section:

3.1.2.1 Interior spaces of buildings;

3.1.2.2 Building exteriors and exterior areas, such as entrances, exits, and loading docks; and

3.1.2.3 Roads, grounds, parking, and other exterior areas where lighting is energized through the building electrical service.

3.1.3 *Exemptions.* The following are exempt from these standards:

3.1.3.1 Outdoor manufacturing, commercial greenhouses, and processing facilities;

3.1.3.2 Lighting power for theatrical production studios and stages, television broadcasting studios, audio-visual presentation, and entertainment facilities in spaces such as stages, hotel ballrooms, nightclubs, discos, and casinos, and where lighting is an essential technical element for the function performed;

3.1.3.3 Specialized luminaires for medical and dental purposes;

3.1.3.4 Outdoor athletic facilities;

3.1.3.5 Lighting power for display lighting required for art exhibits or displays in galleries, museums and monuments;

3.1.3.6 Exterior lighting for public monuments;

3.1.3.7 Special lighting needs for research;

3.1.3.8 Lighting power for lighting used solely for indoor plant growth during the hours of 10:00 p.m. to 6:00 a.m.;

3.1.3.9 Emergency lighting that is automatically ''off'' during normal operation;

3.1.3.10 High risk security areas or any area identified by local ordinances or regulations or by security or safety personnel as requiring additional lighting;

3.1.3.11 Lighting power densities for spaces with enhanced lighting specifically designed for primary use by the visually impaired, hard of hearing, or for senior citizens;

3.1.3.12 Lighting for signs;

3.1.3.13 Store-front exterior-enclosed display windows in retail facilities; and

3.1.3.14 Lighting for dwelling units.

3.1.4 *Building Lighting Power Allowance.* The lighting power allowance for a building consists of the Exterior Lighting Power Allowance (ELPA), in accordance with section 3.3, plus the Interior Lighting Power Allowance (ILPA) in accordance with section 3.4 or 3.5. This lighting power allowance is the upper limit to which the building can be designed, based on the criteria of the compliance alternative chosen.

3.1.4.1 The prescriptive criteria in section 3.4 provides a single compliance procedure based on calculating a lighting budget by building type or major area type within which a designer can flexibly design a lighting solution. To obtain credit for specific lighting energy conservation measures, use section 3.5, section 11.0, or section 12.0.

3.1.4.2 The systems performance criteria in section 3.5 provides a more complex compliance procedure based on calculating a lighting budget by activity or spaces within which the designer can flexibly design a lighting solution and receive credit for energy conserving controls and daylighting measures. To receive credit for more complex lighting conservation measures use section 11.0 or 12.0.

3.1.5 *Credit for Daylighting.* Daylighting credit, for reduced use of electric lighting energy resulting from the use of automatic lighting control devices in conjunction with fenestration (e.g., windows and skylights), may be taken if the systems performance alternative in section 3.5 is chosen. However, if such daylighting credit is to be applied to other building subsystems, such as use of additional fenestration area, section 11.0 or 12.0 must be used. Thermal credit provisions for daylighting are found in Section 5.0.

3.1.6 *Compliance.* A building shall be considered in compliance with this section if the following conditions are met:

3.1.6.1 The minimum requirements of section 3.3 are met;

3.1.6.2 The exterior lighting power to be installed is not greater than the Exterior Lighting Power Allowance (ELPA), calculated using Equation 3.3–1;

3.1.6.3 The interior lighting power to be installed is not greater than the Interior Lighting Power Allowance (ILPA), based on either the Prescriptive Criteria in section 3.4 or the Systems Performance Criteria in section 3.5.

3.1.6.4 Tradeoffs between ILPA and ELPA are not allowed. Tradeoffs of the interior Lighting Power Budgets (LPB) among interior spaces are allowed as long as the total Connected Lighting Power (CLP) within the building does not exceed the Interior Lighting Power Allowance (ILPA) and Lighting Power Control Credits (LPCC) are used only for connected lighting power in those spaces for which credit is claimed.

Tradeoffs of exterior lighting power budgets among exterior areas are allowed as long as the total Connected Lighting Power (CLP) of exterior lighting does not exceed the Exterior Lighting Power Allowance (ELPA) and the allowance for the building exterior surfaces is not exceeded.

3.1.7 *Multi-Building Facilities.* The total lighting power allowances for each building in a multi-building facility shall be calculated separately.

3.2 Principles of Design

3.2.1 The lighting system is designed to provide a productive, safe, and pleasing visual environment for the intended use of the space. However, lighting is both a major energy end use in commercial buildings (especially in office buildings) and a major contributor to internal loads by increasing cooling loads and decreasing heating loads. Therefore, it is important to produce a design that meets the lighting functional criteria of the space as well as one that minimizes energy use. Recommended maintained illuminance levels for visual tasks and surrounding lighted areas are included in the *IES Lighting Handbook, Applications (1983) or Reference (1985).* Principles of energy conserving design within that context are described below.

3.2.2 The following Design Concepts shall be considered in the design of lighting that is both energy efficient and visually effective.

3.2.2.1 Energy use is determined by the lighting load (demand power) and its duration of use (time). Minimize the actual demand load rather than just the apparent connected load, and control the load rather than just switching, if switching may adversely affect the quality of the luminous environment.

3.2.2.2 Consider daylighting along with the proper use of controls so that the savings from electric lighting can be realized. Design should be sensitive to window glare, sudden changes in luminances, and general use acceptance of controls. Window treatment (blinds, drapes and shades) and glazing should be carefully selected to control direct solar penetration and luminance extremes while still maintaining view and daylight penetration.

3.2.2.3 Design lighting systems so that illumination required for tasks is primarily limited to the location of the task and from a direction that will minimize direct glare and veiling reflections on the task. For example, the ideal positioning of work stations is between the rows of ceiling-mounted luminaires with the direction of view parallel to the primary task. In densely-occupied work spaces, uniform distribution of general lighting may be most appropriate. Where supplementary task illumination is necessary, general or ambient illumination should not be lower than a third of the luminance required for the task. This will help maintain luminance rates that are visually comfortable.

3.2.2.4 Use task lighting, whenever possible, to accommodate the need for higher lighting levels due to task visual difficulty, glare, intermittently changing requirements, or individual visual differences (poor and aging eyesight).

3.2.2.5 Group similar activities so high illuminance or special lighting for particular tasks are localized in certain rooms or areas, and so that less efficient fixtures required for critical glare control do not have to be installed uniformly when they are only required sparsely.

3.2.2.6 When indirect lighting is appropriate, use schemes that create reasonably uniform ceiling luminances. If this is achieved, work spaces may be located anywhere and occupants may face in any direction without being subject to excessive veiling reflection on the tasks. The indirect system may allow more effective use of the space than other types of lighting systems. However, indirect lighting systems generally have lower utilization factors, and may require increased ceiling height to provide uniform ceiling luminance.

3.2.2.7 Use lighting controls throughout that maintain proper lighting levels when and where it is needed but also allow reductions in lighting when tasks are less critical, or spaces are not fully occupied. The designer must consider user acceptance of control strategies to maximize energy efficiency.

3.2.2.8 Use lower levels of ambient lighting in situations such as merchandising, where the contrast between accent lighting and ambient lighting is critical. Accent lighting shall not exceed five (5) times the ambient level. Consider fewer, more effectively-accented displays, rather than more ineffectively-accented ones.

3.2.3 The following guidelines identify Fixture and Lamp selection strategies to be considered in the selection of luminaires and lamps for inclusion in an energy efficient, visually-effective design:

3.2.3.1 Consider the use of more efficient equipment with appropriate distribution, glare control and visual characteristics. Utilize fixture designs that will provide high lighting efficiency while meeting the other lighting objectives of the installation.

3.2.3.2 Review visual comfort probability (VCP) data, available from manufacturers, for specific luminaires when minimizing discomfort glare is a criterion.

3.2.3.3 Consider luminaire construction that minimizes light loss due to dirt collection.

3.2.3.4 Investigate the use of dimmers to reduce energy consumption when the system is new and capable of providing more light than the average depreciated design value.

3.2.3.5 Use more efficient lamps with appropriate luminous efficacy, life expectancy and spectrum distribution and color rendering characteristics.

3.2.3.6 Use more efficient ballasts for fluorescent and HID lamps with appropriate ballast factors, power factor, noise rating, starting and restarting characteristics.

3.2.3.7 Use luminaires with heat removal and heat recovery capabilities, thereby allowing the lighting equipment to operate more efficiently at a lower ambient temperature.

3.2.3.8 Limit the use of lower efficiency lamps, such as incandescent, to only those applications where their color, lumens or distribution characteristics cannot be duplicated by other sources. Due to their lower efficiency, the use of ''extended service'' incandescent lamps should be limited to those applications where fixtures are difficult to reach and/or maintenance costs for revamping will be excessive.

3.2.4 Space Design

3.2.4.1 It is important to carry through on the lighting design when completing the interior design. Reduce light absorption by encouraging the use of lighter finishes, particularly on ceilings, walls and partitions. Select colors and surface materials so that their reflectance values are within the ranges recommended by the IES. This will aid the efficient use of light and help to provide comfortable luminance ratios.

3.2.4.2 In offices with visual display terminals (VDT) that are susceptible to reflections, it may be necessary to use reflectances for some room surfaces at the low end of the recommended ranges to reduce unwanted reflections on the screens. Where practical, treat the screens of VDTs with anti-glare materials to avoid veiling reflection.

3.3 Minimum Requirements

3.3.1 Lighting Controls.

3.3.1.1 All lighting shall be provided with manual, automatic, or programmable controls.

3.3.1.1.1 *Exception to Section 3.3.1.1:*

(a) controls for emergency or exit lighting.

3.3.1.2 *Minimum Number of Lighting Controls.* Each space enclosed by walls or ceiling-height partitions shall be provided with control(s) that, together or alone are capable of controlling all lights within that space, excluding those requiring continuous operation for security purposes.

3.3.1.2.1 The minimum number of controls shall not be less than:

(a) One lighting control for each space; and

(b) One lighting control for each task or group of task locations within an area of 450 ft^2 or less.

3.3.1.2.2 *Equivalent Number of Controls.* The minimum number of controls may be reduced, by using an equivalent number of controls from Table 3.3–1, where control types listed in Table 3.3–1 are used. However, the minimum number of controls may not be reduced to less than one control for each 1500 W of connected lighting power.

Table 3.3-1
Equivalent Number of Controls

TYPE OF CONTROL	EQUIVALENT NUMBER OF CONTROLS
Manually operated on-off switch	1
Occupancy sensor	2
Timer-Programmable from the space being controlled	2
Three level, including off, step control or pre-set dimming	2
Four level, including off, step control or pre-set dimming	3
Automatic or continuous dimming	3

3.3.1.2.3 *Exceptions to Section 3.3.1.2:*

(a) Lighting control requirements for spaces that must be used as a whole, such as public lobbies of office buildings, hotels, and hospitals; retail and department stores and warehouses, storerooms, and service corridors under centralized supervision, shall be controlled by a lesser number of controls, but not less than one control for each 1500 W of connected lighting power, or a total of three (3) controls, whichever is greater. Lighting in such spaces shall be controlled in accordance with the work activities.

(b) Hotel and motel guest rooms shall have one or more master controls at the main entry door that turn off all permanently wired lighting fixtures and lighting and television receptacles. For multiple room suites, controls at the entry of each room, in lieu of a master switch, will meet these requirements.

3.3.1.3 Controls provided for task areas, if readily accessible, may be mounted as part of the task lighting luminaire.

3.3.1.4 Control of the same load from more than one location shall not be credited as additional control points.

3.3.1.5 All lighting controls shall be readily accessible to personnel occupying or using the space. Exceptions are automatic controls, programmable controls, lighting for safety hazards and security, controls requiring trained operators, and those controls for spaces that must be used as a whole.

3.3.1.6 Exterior lighting shall be automatically controlled by timer, photocell, or combination of timer and photocell. Timers shall be of the automatic type or otherwise capable of adjustment for seven days and for seasonal daylight schedule variations. All time-controllers shall be equipped with back-up mechanisms to keep time during a four hour power outage.

3.3.1.7 When the building is served by an energy management system, programmable controls, shared tenant services that affect interior environments, or ''intelligent building'' systems, provisions shall be made to incorporate lighting controls into the system if a separate automatically-controlled lighting system is not provided.

3.3.2 Fluorescent Lamp Ballasts.

3.3.2.1 Fluorescent lamp ballasts shall have a ballast efficacy factor not less than that shown in Table 3.3–2.

3.3.2.1.1 *Exception to 3.3.2.1:* Ballasts not included in Table 3.3–2 and ballasts designed for use with dimming controls are excluded from these criteria.

Table 3.3-2
Fluorescent Ballast For Efficacy Factors*

NUMBER OF LAMPS	LAMP TYPE	NOMINAL OPERATIONAL INPUT VOLTAGE	DESIGN STARTING TEMPERATURE	INPUT FREQUENCY	MAX. LAMP OPERATING TEMPERATURE	MIN. BALLAST EFFICIENCY FACTOR
1	4 ft rapid start	120 or 277	>40 °F	60Hz	<1000 m amp	1.805
2	4 ft rapid start	120	>40 oF	60Hz	<1000 m amp	1.060
2	4 ft rapid start	277	>40 °F	60Hz	<1000 m amp	1.050
2	8 ft slimline	120 - 277	>40 °F	60Hz	<1000 m amp	0.570
2	8 ft high output, rapid start	120 - 277	<40 °F	60Hz	<1000 m amp	0.390

* For ballasts not specifically designed for use with dimming controls.

3.3.2.2 The Ballast Efficacy Factor shall be calculated in accordance with Equation 3.3–1:

$$BEF = \frac{BF}{\text{Power Input}}$$

Equation 3.3–1

Where:

BEF=Ballast Efficacy Factor.
BF=Ballast Factor, expressed as a percent.
Power Input=Total Wattage of combined lamps and ballasts

3.3.2.2.1 Tests for ballast factor and power input shall be in accordance with *ANSI Standard C–82.2–1984* ''Method of Measurement for Fluorescent Lamp Ballasts'', using ''Standard'' F40T1240A, F96T12 75 watt, or F96T12H0 110 watt lamps.

3.3.2.3 One-lamp or three-lamp fluorescent luminaires shall be tandem-wired to eliminate unnecessary use of single lamp ballasts if they are: used for general lighting; recess mounted within ten feet center-to-center of each other; or pendant or surface mounted within 1 ft of each other, and within the same room. Tandem wiring consists of pairs of luminaires operating with one lamp in a luminaire powered from a single two-lamp ballast contained in a second luminaire.

3.3.2.3.1 *Exception to Section 3.3.2.3:*
(a) Three-lamp ballasts may be used.

3.3.2.4 Fluorescent lamp ballasts shall have a power factor equal to or greater than 80%.

3.3.2.4.1 *Exception to 3.3.2.4:* Ballasts for circline and compact fluorescent lamps and low wattage, high intensity discharge lamps of less than 100 watts.

3.4 Lighting—Prescriptive Compliance Alternative

3.4.1 Purpose

3.4.1.1 This subsection provides a prescriptive procedure for determining an exterior lighting power allowance and the Interior Lighting Power Allowances for illumination systems installed in six types of new buildings. It is intended for use with buildings having simple lighting requirements and where the minimum amount of calculation and effort to achieve compliance is of primary concern. For other building types, to receive credit for switching, daylighting, or other trade-offs, or to receive credit for lighting optimization, use section 3.5, section 11.0, or section 12.0.

3.4.1.2 This section also serves as the basis for calculating the skylight area in section 5.3.9.6, and may be used for estimating the lighting heat gain for calculating the internal load density in Equation 5.4–1 and section 5.5.6.2.

3.4.2 General

3.4.2.1 This method for compliance prescribes a total allowable Unit Lighting Power Allowance (ULPA) for interior lighting for the building type/area as listed in Table 3.4–1. There is no recognition of specific makeup of spaces and activities within the building.

Table 3.4-1
Prescriptive Unit Lighting Power Allowance (ULPA), W/ft^2

BUILDING TYPE/AREA FUNCTION	Gross Lighted Area Ranges						Effective Date
	0 to 2,000 ft^2	2,001 to 10,000 ft^2	10,001 to 25,000 ft^2	25,001 to 50,000 ft^2	50,001 to 250,000 ft^2	> 250,000 ft^2	
Food Service							
Fast Food/Cafeteria	1.50	1.38	1.34	1.32	1.31	1.30	1988
	0.92	0.85	0.82	0.81	0.81	0.80	1993
Leisure Dining/Bar	2.20	1.91	1.71	1.56	1.46	1.40	1988
	1.60	1.56	1.52	1.48	1.44	1.40	1993
Offices	1.90	1.81	1.72	1.65	1.57	1.50	1988
	1.40	1.34	1.27	1.22	1.16	1.11	1993
Retail[1]							
Retail General	3.30	3.08	2.83	2.50	2.28	2.10	1988
	2.70	2.52	2.32	2.05	1.87	1.72	1993
Mall Concourse							
Multi-Store Service	1.60	1.58	1.52	1.46	1.43	1.40	1988
	0.69	0.68	0.65	0.63	0.61	0.60	1993
Service Establishment	2.70	2.37	2.08	1.92	1.80	1.70	1988
	2.81	2.03	1.78	1.65	1.54	1.46	1993
Garages	0.30	0.28	0.24	0.22	0.21	0.20	1988
	0.25	0.24	0.23	0.22	0.21	0.20	1993
Schools							
Pre-elementary	1.80	1.80	1.72	1.65	1.57	1.50	1988
	1.33	1.33	1.27	1.22	1.16	1.11	1993
Jr. High/High School	1.90	1.90	1.88	1.83	1.76	1.70	1988
	1.40	1.40	1.39	1.35	1.30	1.26	1993
Technical/Vocational	2.40	2.33	2.17	2.01	1.84	1.70	1988
	1.77	1.72	1.60	1.49	1.36	1.26	1993
Warehouse/Storage	0.80	0.66	0.56	0.48	0.43	0.40	1988
	0.60	0.50	0.42	0.36	0.32	0.30	1993

Notes:
1. Includes general, merchandising and display lighting.

3.4.3 Exterior Lighting Power Allowance

3.4.3.1 Building exteriors and exterior areas, as defined in section 3.1.2.2, and roads, grounds, parking, and other exterior areas, defined in section 3.1.2.3, shall have a lighting power density not to exceed the Exterior Lighting Power Allowance (ELPA), which is the sum of the allowances for each of the areas listed above, as calculated by Equation 3.4–1 using unit power densities from Table 3.4–2.

Table 3.4-2
Exterior Lighting Unit Power Density

AREA DESCRIPTION	UNIT POWER DENSITY (UPD)
Exit (with or without canopy) . . .	25 W/lin. ft of door opening
Entrance (without canopy)	30 W/lin. ft of door opening
Entrance (with canopy)	
High Traffic (retail, hotel, airport, theater, etc.)	10 W/ft^2 of canopied area
Light Traffic (hospital, office, school, etc.)	4 W/ft^2 canopied area
Loading area	0.40 W/ft^2
Loading door	20 W/lin. ft of door opening
Building Exterior Surfaces/Facades	0.25 W/ft^2 of surface area to be illuminated
Storage and non-manufacturing work areas	0.20 W/ft^2
Other activity areas for casual use such as picnic grounds, gardens, parks, and other landscaped areas	0.10 W/ft^2
Private driveways/walkways	0.10 W/ft^2
Public driveways/walkways	0.15 W/ft^2
Private parking lots	0.12 W/ft^2
Public parking lots	0.18 W/ft^2

$$ELPA=\Sigma\ DO_i\ UPD_{Di}+\Sigma\ A_i\ UPD_{Ai}=\Sigma\ [(DO_1\times UPD_{D1}\ .\ .\ .+DO_n\times UPD_{Dn})+(A\times UPD_{A1}\ .\ .\ .\ A_n\times UPD_{An})]$$

Equation 3.4–1

Where:

ELPA=Exterior lighting power allowance, in Watts.

i=numerical subscript (1,2, ... n) for each occurrence of exterior openings or exterior areas of the building.
n=total number of occurrences of exterior openings or areas of the building.
DO=Door opening, linear feet.
UPD_D=Unit power density for the door, W/lin. ft, from Table 3.4–2.
UPD_A=Unit power density for the area in W/ft^2, from Table 3.4–2.
A=Exterior area in ft^2.

3.4.4 Interior Lighting Power Allowance

3.4.4.1 The Interior Lighting Power Allowance (ILPA) shall be calculated using the prescriptive Unit Lighting Power Allowances (ULPA) in Table 3.4–1. First, determine if the predominant function of the proposed building is one of the six building types listed in Table 3.4–1. If not, section 3.5, 11.0, or 12.0 must be used. Next, determine whether the proposed design has secondary functions that are 10% or more of the gross lighted area of the building and are listed in Table 3.4–1. If so, the designer has the option of using the predominant building function to calculate the ILPA or using the calculation method for multiple-use buildings in section 3.4.4.1.2 below.

3.4.4.1.1 If the proposed building has only one function, has no secondary functions with 10% or more of the gross lighted area, or the designer chooses to determine the ILPA based on only one function, Equation 3.4–2 shall be used to determine the building ILPA. First, select the appropriate building type in Table 3.4–1, and the appropriate column for the Gross Lighted Area (GLA) of the proposed building. This value is the Unit Lighting Power Allowance (ULPA). Determine the ILPA by multiplying the ULPA by the GLA as shown in Equation 3.4–2.

$$ILPA=ULPA\times GLA$$

Equation 3.4–2

Where:
ILPA=Interior Lighting Power Allowance, in Watts.
ULPA=Unit Lighting Power Allowance, in W/ft^2,from Table 3.4–1.
GLA=Gross Lighted Area of the Proposed Building, in ft^2.

3.4.4.1.2 If a building design has more than one function listed in Table 3.4–1, such as an office building with parking and retail stores, with more than 10% of the gross lighted area, Equation 3.4–3 may be used to calculate the building Interior Lighting Power Allowance (ILPA). First, determine the gross lighted area of the building (GLA) and the gross lighted area for each qualifying secondary function (GLA_f) in the building. Select the ULPA from Table 3.4–1 under the column corresponding to the gross lighted area of the entire proposed building and multiply it by the gross lighted area of that function. Sum the products to determine the building ILPA, as shown in Equation 3.4–3 below.

$$ILPA=ULPA_p\ GLA_p+\Sigma(ULPA_i\ GLA_i)=[ULPA_p\ GLA_p+(ULPA_{f1}\ GLA_{f1}+ULPA_{f2}\ GLA_{f2}\ .\ .\ .\ ULPA_{fn}\ GLA_f)]$$

Equation 3.4–3

Where:
i=numerical subscript (1,2, . . . n) for each secondary function with 10% or more of the gross lighted area of the building.
n=number of secondary functions.
ILPA=Interior Lighting Power Allowance, in Watts.
$ULPA_p$=Unit Lighting Power Allowance of the predominant function based on the gross lighted area of the entire building, from Table 3.4–1, in W/ft^2.
$ULPA_f$=Unit Lighting Power Allowance of qualifying secondary functions based on the gross lighted area of the entire building, from Table 3.4–1, in W/ft^2.
GLA_p=Gross lighted area of the predominant function of the proposed building.
GLA_f=Gross lighted area of each qualifying secondary function.

3.4.4.3 *Lighting compliance in partially defined speculative buildings.* For defined functions in partially defined speculative buildings, the total connected lighting power shall not exceed the interior lighting power allowance for that portion of the building. When determining the ILPA for those cases, the gross lighted area of the entire building must be used.

3.5 Lighting—System Performance Compliance Alternative

3.5.1 Purpose

3.5.1.1 This subsection provides a procedure for determining the maximum lighting power allowance for buildings, roads and grounds. It allows the designer to take credit for the use

of daylighting and other lighting controls. It also serves as a basis for estimating the lighting heat gain and lighting energy use for Section 5.0.

3.5.2 General

3.5.2.1 The total Connected Lighting Power (CLP) in a building, including permanently installed lighting plus supplemental or task related lighting provided by movable fixtures or plug-in luminaires, shall not exceed the Interior Lighting Power Allowance (ILPA). A Lighting Power Control Credit (LPCC), taken for individual spaces, may only be utilized for credit to connected lighting power in those spaces for which credit is claimed.

3.5.2.2 *Compliance for lighting in partially defined speculative buildings.* The total connected lighting power of lighting designs of defined areas of partially defined speculative buildings shall not exceed the interior lighting power allowance for those areas of the building for which lighting has been designed.

3.5.3 The Lighting Power Budget (LPB) of each interior space shall be determined in accordance with Equation 3.5–1.

$$LPB=(A\times UPD_b\times AF)+LPCC$$

Equation 3.5–1

Where:

LPB=Lighting power budget of the space, in watts

A_r=Area of the room at the horizontal lighted working place, ft^2

UPD_b=Base Unit Power Density, W/ft^2, (Table 3.5–1)

AF=Area factor of the room, (Figure 3.5–1)

LPCC=Lighting Power Control Credit, as determined by §3.5.6

3.5.3.1 The room area (A) shall be calculated from the inside dimensions of the room.

3.5.3.2 The Base Unit Power Density (UPD) shall be selected from Table 3.5–1. For applications to areas or activities other than those given, select values for similar areas or activities.

TABLE 3.5-1
BASE UPD (P_b) FOR AREA/ACTIVITY

AREA/ACTIVITY COMMON ACTIVITY AREAS	1989 UPD	1989 NOTE	1993 UPD	1993 NOTE
Auditorium	1.6	(d)	1.4	(d)
Corridor	0.8	(a)	0.8	(a)
Classroom/Lecture Hall	2.0		1.0	
Elec/Mech Equipment Room				
General	0.7	(a)	0.7	(a)
Control Rooms	1.5	(a)	1.5	(a)
Food Service				
Fast Food/Cafeteria	1.3		0.8	
Leisure Dining	2.5	(c)	1.4	(c)
Bar/Lounge	2.5	(c)	1.3	(c)
Kitchen	1.4		1.4	
Recreation/Lounge	0.7		0.5	
Stairs				
Active Traffic	0.6		0.6	
Emergency Exit	0.4		0.4	
Toilet & Washroom	0.8		0.5	
Garage				
Auto/Pedestrian Circulation	0.3		0.25	
Parking Area	0.2		0.2	
Laboratory	2.3		2.2	
Library				
Audio Visual	1.1		1.1	
Stack Area	1.5		1.5	
Card File & Cataloging	1.6		0.8	
Reading Area	1.9		1.0	
Lobby (General)				
Reception & Waiting	1.0		0.55	
Elevator Lobbies	0.8		0.4	
Atrium (Multi-Story)				
First 3 Floors	0.7		0.4	
Each Additional Floor	0.2		0.15	
Locker Room & Shower	0.8		0.6	

AREA/ACTIVITY COMMON ACTIVITY AREAS	1989 UPD	1989 NOTE	1993 UPD	1993 NOTE
Offices				
Enclosed offices of less than 900 ft^2 and all open plan offices w/out partitions or w/partitions lower than 4.5 ft below ceiling.		(h)		(h)
Reading, Typing and Filing	1.8	(g)	1.3	(g)
Drafting	2.6	(g)	2.2	(g)
Accounting	2.1	(g)	1.8	(g)
Open plan offices, 900 ft^2 or larger, w/medium height partitions 3.5 to 4.5 ft below ceiling.		(h)		(h)
Reading, Typing and Filing	1.9	(a)	1.5	(a)
Drafting	2.9	(a)	2.6	(a)
Accounting	2.4	(a)	2.1	(a)
Open plan offices, 900 ft^2 or larger, w/partitions higher higher than 3.5 ft below ceiling.		(h)		(h)
Reading, Typing and Filing	2.2	(a)	1.7	(a)
Drafting	3.4	(a)	3.0	(a)
Accounting	2.7	(a)	2.4	(a)
Common Activity Areas				
Conference/Meeting Room	1.8	(d)	1.3	(d)
Computer/Office Equipment	2.1		2.1	
Filing, Inactive	1.0		1.0	
Mail Room	1.8		1.8	
Shop (Non-Industrial)				
Machinery	2.5		2.5	
Electrical/Electronic	2.5		2.5	
Painting	1.6		1.6	
Carpentry	2.3		2.3	
Welding	1.2		1.2	
Storage & Warehouse				
Inactive Storage	0.3		0.2	
Active Storage, Bulky	0.3		0.3	
Active Storage, Fine	1.0		0.9	
Material Handling	1.0		1.0	
Unlisted Space	0.2		0.2	

TABLE 3.5-1 (Continued)
BASE UPD (P_b) FOR AREA/ACTIVITY

AREA/ACTIVITY SPECIFIC BUILDINGS	1989 UPD	NOTE	1993 UPD	NOTE
Airport, Bus and Rail Station				
Baggage Area	0.8		0.75	
Concourse/Main Thruway	0.9		0.45	
Ticket Counter	2.5		1.3	
Waiting & Lounge Area	1.2		0.6	
Bank				
Customer Area	1.0		0.8	
Banking Activity Area	2.8		2.2	
Barber & Beauty Parlor	2.0		1.6	
Church, Synagogue, Chapel				
Worship/Congregational	2.3		1.3	
Preaching & Sermon/Choir	2.7		1.8	
Dormitory				
Bedroom	1.0		0.6	
Bedroom with Study	1.3		1.3	
Study Hall	1.8		0.9	
Fire & Police Department				
Fire Engine Room	0.7		0.7	
Jail Cell	0.8		0.4	
Hospital/Nursing Home				
Corridor	1.3	(a)	0.9	(a)
Dental Suite/Exam/Treat	1.6		1.4	
Emergency	2.3		2.0	
Laboratory	1.9		1.7	
Lounge/Waiting Room	0.9		0.6	
Medical Supplies	2.4		2.4	
Nursery	2.0		1.6	
Nurse Station	2.1		1.8	
Occu./Physical Therapy	1.6		1.4	
Patient Room	1.4		0.9	
Pharmacy	1.7		1.5	
Radiology	2.1		1.8	
Surgical & O.B. Suites				
General Area	2.1		1.8	
Operating Room	7.0		6.0	
Recovery	3.0		2.0	
Hotel/Conference Center				
Banquet Room/Multipurpose	2.4	(d)	1.4	(d)
Bathroom/Powder Room	1.2		0.6	
Guest Room	1.4		0.7	
Public Area	1.1		0.8	
Exhibition Hall	2.6		1.3	
Conference/Meeting	1.8	(d)	1.5	(d)
Lobby	1.9		1.3	
Reception Desk	2.4		2.4	
Laundry				
Washing	0.9		0.6	
Ironing & Sorting	1.3		1.3	
Museum & Gallery				
General Exhibition	1.9		1.2	
Inspection/Restoration	3.9		3.0	
Storage (Artifacts)				
Inactive	0.6		0.25	
Active	0.7		0.5	
Post Office				
Lobby	1.1		0.8	
Sorting & Mailing	2.1		2.1	
Service Station/Auto Repair	1.0		0.8	
Theater				
Performance Arts	1.5		1.1	
Motion Picture	1.0		0.75	
Lobby	1.5		1.0	
Retail Establishments				
(Merchandising & Circulation Area)				
Applicable to all lighting, including				
accent and display lighting, installed				
in merchandising and circulation areas				
Type A	5.6	(e)	6.0	(e)
Type B	3.2	(e)	2.9	(e)
Type C	3.3	(e)	2.7	(e)
Type D	3.0	(e)	2.5	(e)
Type E	2.8	(e)	2.4	(e)
Type F	2.7	(e)	2.6	(e)
Mall Concourse	1.4		0.6	
Retail Support Area				
Tailoring	2.1		2.1	
Dressing/Fitting Rooms	1.4		1.1	

TABLE 3.5-1 (Continued)
BASE UPD (P_b) FOR AREA/ACTIVITY

AREA/ACTIVITY INDOOR ATHLETIC AREAS	1989 UPD	1989 NOTE (b)	1993 UPD	1993 NOTE (b)
Seating Area, All Sports	0.4		0.4	
Badminton				
Club	0.5		0.5	
Tournament	0.8		0.8	
Basketball/Volleyball				
Intramural	0.8		0.8	
College	1.3		1.3	
Professional	1.9		1.9	
Bowling				
Approach Area	0.5		0.5	
Lanes	1.1		1.1	
Boxing or Wrestling (platform)				
Amateur	2.4		2.4	
Professional	4.8		4.8	
Gymnasium				
General Exercising & Recreation Only	1.0		1.0	
Handball/Racquetball/Squash				
Club	1.3		1.3	
Tournament	2.6		2.6	
Hockey, Ice				
Amateur	1.3		1.3	
College or Professional	2.6		2.6	
Skating Rink				
Recreational	0.6		0.6	
Exhibition/Professional	2.6		2.6	
Swimming				
Recreational	0.9		0.9	
Exhibition	1.5		1.5	
Underwater	1.0		1.0	
Tennis				
Recreational (Class III)	1.3		1.3	
Club/College (Class II)	1.9		1.9	
Professional (Class I)	2.6		2.6	
Tennis, Table				
Club	1.0		1.0	
Tournament	1.6		1.6	

NOTES:
(a) Area Factor of 1.0 shall be used for these spaces.
(b) Area Factor of 1.0 shall be used for all indoor athletic spaces.
(c) Base UPD includes lighting power required for clean-up purpose.
(d) A 1.5 adjustment factor is applicable for multi-functional spaces
(e) See Section 11.0 - Definitions for Classification of Retail Facilities
(f) These Standards do not prescribe UPD for dwelling units.
(g) Area factor shall not exceed 1.55.
(h) Minimum of 90% of all work stations shall be enclosed with partitions of the height prescribed.

3.5.3.3 The Area Factor (AF) shall be determined from Figure 3.5–1 based on the floor area and ceiling height of the room. Rooms with identical ceiling height and activities, and with similar size may be treated as a group. The AF

of such a group of rooms shall be determined from the average area of the rooms.

Equation 3.5–2 gives the formula used in developing Figure 3.5–1.

$$AF = 0.2 + 0.8 \exp. - \left[\left[\frac{10.21 \times (CH - 2.5)}{\sqrt{A_r}} - 1\right] \times Ln\ (0.9)\right]$$

Equation 3.5–2

Where:

AF=Area Factor

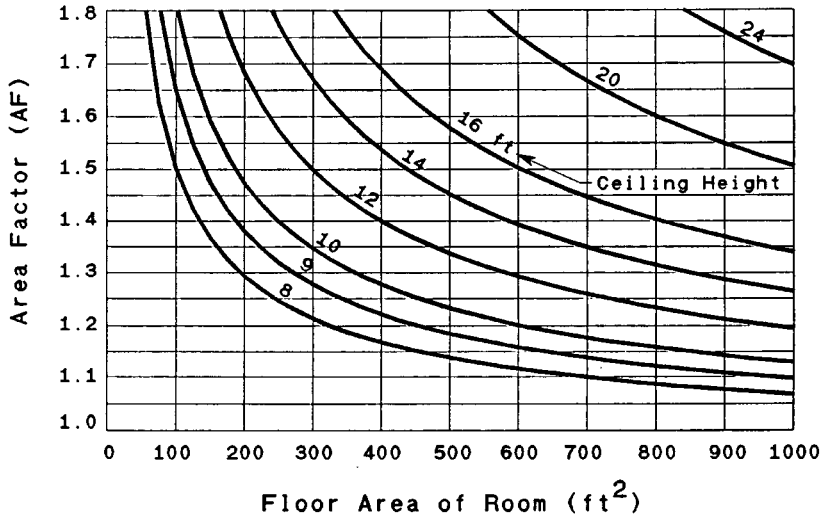
CH=Ceiling Height

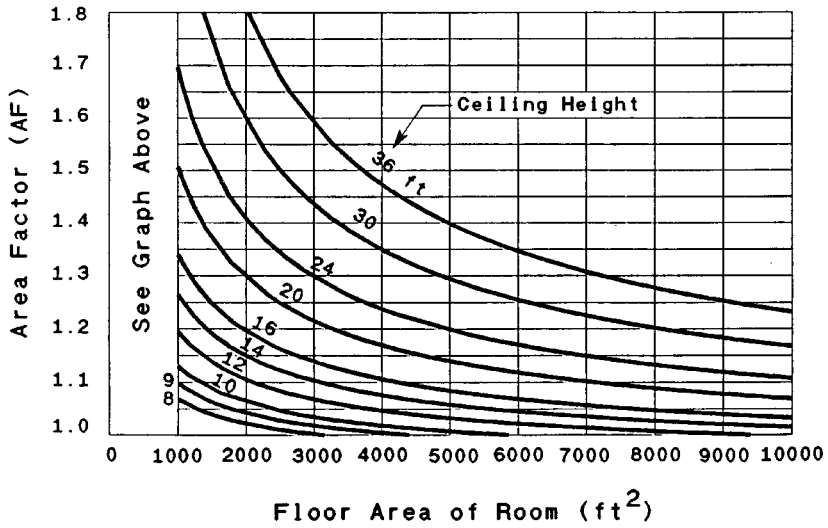
A_r=Floor Area of Room, ft^2

If AF<1.0 then AF=1.0

If AF>1.8 then AF=1.8

Figure 3.5-1 Base Unit Power Density Area Factor





3.5.4 Special Spaces and Activities.

3.5.4.1 Multi-Function Rooms.

3.5.4.1.1 For rooms serving multi-functions, such as hotel banquet/meeting rooms and office conference/presentation rooms, an adjustment factor of 1.5 times the base UPD may be used if

a supplementary lighting system is actually installed to serve the secondary function of the room and the design meets the following conditions:

(a) The installed power for the supplementary system shall not be greater than 33% of the adjusted LPB calculated for that room; and

(b) Independent controls shall be installed for the supplementary lighting system.

3.5.4.2 Simultaneous Activities.

3.5.4.2.1 In rooms containing multiple simultaneous activities, such as a large general office having separate accounting and drafting areas within the same room, the LPB for the rooms shall be the weighted average of the activities in proportion to the areas being served.

3.5.4.3 Indoor Sports.

3.5.4.3.1 The floor area of indoor sports activities areas shall be considered as the area within the playing boundaries of the sport, plus the floor area 10 ft beyond the playing boundaries, not to exceed the total floor area of the indoor room less the spectator seating area.

3.5.5 *Calculation of Interior Lighting Power Allowance.* The system performance Interior Lighting Power Allowance (ILPA) shall be calculated in accordance with Equation 3.5–3. The ILPA shall include a 0.20 W/ft² allowance for unlisted spaces.

$$ILPA=(LPB_1\times LS_1+LPB_2\times LS_2\text{——}LPB_n\times LS_n)+0.2\ W/ft^2\times(\text{Unlisted Space})$$

Equation 3.5–3

Where:

ILPA=Interior Lighting Power Allowance, W/ft²

$$\text{Unlisted space}=\frac{i-1}{\left(GLA-n\sum LS_{i-n}\right),ft^2}$$

GLA=Gross Lighted Area, ft²
LPB=Lighting Power Budget, Watts
LS=Listed Space Area, ft²

3.5.6 Lighting Power Controls Credit and Power Adjustment Factor

3.5.6.1 When calculating the ULPA in this section, the connected power for lights automatically controlled by daylighting sensors, occupancy sensor, programmable timing controls, or lumen maintenance controls may be reduced by factoring control credits on a specific area by area basis. This credit is termed the Lighting Power Controls Credit (LPCC) and shall be determined in accordance with Equation 3.5–4:

$$LPCC=CLP\times PAF$$

Equation 3.5–4

Where:

LPCC=Lighting Power Controls Credit, Watts
CLP=Connected Lighting Power for the luminaires controlled by the automatic control device, Watts
PAF=Power Adjustment Factor, from Table 3.5–2

The adjusted lighting power (ALP) is then equal to CLP minus the LPCC.

3.5.6.2 The Lighting Power Controls Credit is limited to the specific luminaires controlled by the automatic control device.

3.5.6.2.1 Only one adjustment factor may be used for each building space or luminaire, and 50% or more of the controlled luminaire shall be within the applicable space to qualify for the power adjustment factor.

3.5.6.2.2 Controls shall be installed in series with the lights and in series with all manual switching devices in order to qualify for an adjustment factor.

3.5.6.2.3 When sufficient daylight is available, daylight sensing controls shall be capable of reducing electrical power consumption for lighting, continuously or in steps, to 50% or less of maximum power consumption.

3.5.6.2.4 Daylight sensing controls shall control all luminaires to which the power adjustment factor is applied and that direct a minimum of 50% of their light output into the daylight zone.

3.5.6.2.5 Occupancy sensors located in daylighted spaces should be installed in conjunction with a manual ON switch, or photocell override for ON.

3.5.6.2.6 Programmable timing controls used for credit in conjunction with Table 3.5–2 shall be:

Table 3.5-2
Power Adjustment Factor (PAF)

AUTOMATIC CONTROL DEVICE(S)	STANDARD PAF*
(1) Occupancy sensor	0.30
(2) Daylight Sensing continuous dimming	0.30
(3) Daylight Sensing multiple step dimming	0.20
(4) Daylight Sensing ON/OFF	0.10
(5) Lumen maintenance	0.10

* - Power Adjustment Factor cannot be used for incandescent fixtures.

(a) Programmable for different schedules for occupied and unoccupied days;

(b) Accessible for temporary override by occupants of individual zones, spaces or tasks, with automatic return to the original schedules; and

(c) Capable of keeping time during power outages for a minimum of four hours.

§ 435.104 Auxiliary systems and equipment.

4.1 General

This section contains a few minimum requirements for auxiliary systems and equipment. Because auxiliary systems and equipment vary greatly among buildings, the section is not more comprehensive.

4.2 Principles of Design

4.2.1 Energy recovery should be used when coincident thermal and refrigeration loads of similar magnitude are expected.

4.2.2 Consideration shall be given to the use of waste heat, energy recovery or heat tape systems to conserve energy.

4.3 Minimum Requirements

4.3.1 Transportation Systems.

4.3.1.1 Automatic elevator and/or conveyor systems shall incorporate schedule controls and efficient motor controls, such as solid state control devices.

4.3.2 Freeze Protection System.

4.3.2.1 Boilers or water heaters used for purposes such as freeze protection in fire protection storage vessels and defrosting sidewalks and driveways shall meet the efficiency requirements of sections 8.3 or 9.3 when they operate in excess of 750 hours per year.

4.3.3 Retail Food and Food Service Refrigeration.

4.3.3.1 Refrigeration systems containing multiple compressors shall have compressors sized to optimally match capacity with loads.

4.3.3.2 Variable speed shall be considered.

§ 435.105 Building Envelope.

5.1 General

5.1.1 This section contains requirements for the energy conscious design of building envelopes. It sets principles of good envelope design, and provides a set of minimum requirements and two alternative compliance paths—prescriptive and system performance.

5.1.2 *Compliance.* A building shall be considered in Compliance with this section if the following conditions are met:

5.1.2.1 The minimum requirements of Section 5.3 are met;

5.1.2.2 The design of the building envelope complies with either the prescriptive criteria of section 5.4 or the system performance criteria of section 5.5. For the design of buildings with high internal heat gains, unusual operating schedules, or that incorporate innovative design strategies, consideration shall be given to using the compliance paths set forth in sections 11.0 or 12.0.

5.1.3 The prescriptive compliance alternative of section 5.4 provides requirements for buildings designed to take advantage of perimeter daylighting, thermal mass, high performance glazings, and fenestration shading. The designer is allowed to make trade-offs between thermal mass, wall insulation, amount of fenestration, shading coefficients, shading projections, thermal transmittance of the glazing, daylighting for several different climate locations.

5.1.4 The systems performance compliance alternative of section 3.5 provides calculation procedures that give credit for the benefits of more complex energy conserving envelope designs.

5.1.5 Information on thermal properties, performance of building envelope sections and components, and heat transfer shall be obtained from the *ASHRAE Handbook, 1985 Fundamentals Volume*. When information is not available from this source, the data shall be obtained from laboratory or field test measurements conducted in accordance with *ASTM Standard C–177–85*, ''Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Guarded Hot Plate,'' *ASTM Standard C–518–85*, ''Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter,'' *ASTM Standard C–236–80*, ''Standard Test Method for Steady-State Thermal Performance of Building Assemblies by Means of a Guarded Hot Box,'' and *ASTM Standard C–976–82*, ''Thermal Performance of Building Assemblies By Means of a Calibrated Hot Box.''

5.1.6 *Daylighting Credit*. In this section, daylighting credit for reduced energy use resulting from the use of automatic lighting control devices in conjunction with fenestration, is given only for space heating and cooling loads. Credit for the reduced use of electric lighting energy is calculated in section 3.5.6. If daylighting credit for reduced electric lighting energy use is desired to be applied to other building systems, such as more fenestration area, section 11.0 or 12.0 should be used.

5.1.7 The requirements of this section are not intended to replace building loads calculation procedures.

5.2 Principles of Design

5.2.1 Building Loads

5.2.1.1 Building loads result from sources external and internal to the building. (1) External loads, from outdoor temperature, humidity, wind, and insolation, fluctuate daily and seasonally. (2) Internal loads from the activities conducted within the building, including heating and moisture produced by the occupants, lights, and process equipment (e.g., appliances, computers) vary with internal activities. Improving energy efficiency in a building depends on achieving a balance between and among the internal and external loads. The building design should, therefore, offset gains and losses of heat, light, and moisture between the interior and exterior of the building, among interior spaces, and over-time, (daily, seasonally, and annually).

5.2.1.2 This balance of loads can be most efficiently achieved if the building envelope is viewed as, and designed to be, a controlled membrane rather than an immutable barrier. The typical design of a modern building has considered the building envelope to be a fixed barrier that restricts heat and air flow to the maximum extent possible. This will not usually yield the most energy efficient building.

5.2.1.3 The desired goal of the energy design of the building envelope shall be to produce a controlled membrane that allows or prevents heat, light, and moisture flow to achieve a balance between internal and external loads. Thus the envelope becomes an integral part of the building's environmental conditioning systems.

5.2.1.4 To achieve control of the building envelope as a membrane, and to simultaneously achieve occupant comfort in the perimeter zones, many of the traditional building skin components must be used (insulation, mass, caulking and weather stripping). However, other concepts shall also be considered to temper supply air or utilize waste heat in exhaust air to temper envelope conditions, such as operable solar shading devices, and the integration of glazing systems with the HVAC distribution system.

5.2.1.5 Control of External Loads

5.2.1.5.1 Control of Conduction

(a) Controlled conductivity may be considered through the careful use of insulation, sensible (mass) or phase-change storage and movable insulation at levels which minimizes net heating and cooling loads on a time integrated (annual) basis.

(b) Unintentional or uncontrolled thermal bridges shall be minimized and considered in energy related calculations since they can radically alter the conductivity of a building envelope. Examples include wall studs, balconies, ledges, and extensions of building slabs.

5.2.1.5.2 Control of Infiltration (Heat Loss or Gain)

(a) Infiltration shall be minimized and all efforts to achieve a zero level shall be taken. This will minimize fan energy consumption in pressurized buildings during occupied periods and heat loss (or unwanted heat gain in warm climates) during unoccupied periods. Infiltration reduction shall be accomplished through design details that enhance the fit and integrity of building envelope joints in a way that may be readily achieved during building construction. This includes infiltration control by caulking, weather stripping, vestibule doors and/or revolving doors with construction meeting or exceeding accepted specifications.

(b) The quantity of mechanical ventilation must vary with the need, with recommended values at any given time equal to that required by ASHRAE Standard 62–1981. Higher levels of ventilation (e.g., economizers) shall be considered to substitute for mechanical cooling.

(c) Operable windows may be considered to allow for occupant controlled ventilation. When using operable windows, the design of the building's mechanical system must be carefully executed to minimize unnecessary HVAC energy consumption, and building operators must be cautioned about the improper use of the operable windows.

(d) Non-mechanical ventilation can be enhanced in the shape of the building as well as the physical elements of the building envelope, such as cupolas.

(e) For hotels and high rise dwelling units and other systems having exhaust totalling 3000 cfm or more, with annual operation in excess of 3000 hours and within 200 linear ft of simultaneous make-up air equipment, they shall incorporate energy recovery or treatment to ASHRAE 62–1981 quality levels and reuse exhaust air when allowed by code.

5.2.1.5.3 Control of Radiated Heat Losses and Gains

(a) Capability for occupant radiant comfort shall be maintained regardless of whether the building envelope is designed to be a static or dynamic membrane. Opaque surfaces shall be designed so that the *average* inside surface temperatures will remain within 5 °F of room temperature in the coldest anticipated weather (i.e., winter design conditions), and the coldest inside surface will remain within 25 °F of the room temperature.

(b) In a building with time-varying internal heat generation, thermal mass may be considered for controlling radiant comfort. In the perimeter zone, thermal mass is more effective when it is positioned internal to the envelope insulation.

(c) The effective control of solar radiation is critical to the design of energy-efficient buildings due to the high level of internal heat production already present in most commercial building types. In some climates, the lighting energy consumption savings due to daylighting techniques can be greater than the heating and cooling energy penalties from additional glazed surface area, provided that the building envelope is properly designed for daylighting and lighting controls are installed and used. In other climates they may not. Daylighting designs are most effective if direct solar beam radiation is not allowed to cause glare in building spaces.

(d) The transparent portions of the building envelope shall be designed to prevent solar radiant gain above that necessary for effective daylighting and solar heating. On south-facing facades, the use of low shading coefficients is generally not as effective as external physical shading devices in achieving this balance. Light shelves offer a very effective means of admitting daylight while shading the view glazing and simultaneously allowing occupants to manipulate interior shading devices (draperies, blinds) without eliminating day light.

(e) The solar spectrum contains a range of wavelengths including visible and infrared (heat). Designers shall consider which portion of the spectrum to admit into the building. For example, low emissivity, high-visible-transmittance glazings may be considered for the effective control of radiant heat gains and losses. For shading control designers may consider the careful use of vegetation that can block excess

gain, year-around or seasonally depending on the plant species chosen.

5.3 Minimum Requirements

5.3.1 Overall Thermal Transmittance (U_o)

5.3.1.1 The overall thermal transmittance of the building envelope above grade assembly shall be calculated as follows:

$$U_o = \sum U_i A_i / A_o = \left(U_1 A_1 \times U_2 A_2 + \cdots + U_n A_n\right) / A_o$$

Equation 5.3–1

Where:

U_o = the area weighted average thermal transmittance of the gross area of the building envelope assembly, e.g., the exterior wall assembly including fenestration and doors; roofs and ceiling assembly; or the floor assembly, Btu/h•ft^2•°F.

A_o = the gross area of the envelope assembly, ft^2.

U_i = the thermal transmittance of each individual path of the envelope assembly (see Section 5.3.2), $U_i = 1/R_i$ (where R_1 is the total resistance to heat flow of an individual path through an envelope assembly).

A_i = the area of each individual element of the envelope assembly, ft^2.

5. 3. 2 *Thermal Resistance of Below Grade Components (R)*

5.3.2.1 In calculating the thermal resistance of all below grade components, the thermal performance of the adjacent ground shall be excluded.

5.3.2.2 *Slabs*

5.3.2.2.1 The R-value required for slabs refers only to the insulation materials. Insulative continuity shall be maintained in the design of slab edge insulation systems. Continuity shall be maintained from the wall insulation through the slab/wall/footing intersection to the body of the slab edge insulation.

5.3.2.2.2 Slab-on-grade floors shall have insulation around the perimeter of the floor with the thermal resistance (R_u) of the insulation specified in accordance with Figure 5.5–2. The slab insulation specified shall extend either in a vertical plane downward from the top of the slab for the minimum distance shown or downward to the bottom of the slab then in a horizontal plane beneath the slab or outward from the building for the minimum distance shown. The horizontal length, or vertical depth, of insulation required varies from 24 in. to 48 in. depending upon the R-value selected. For heated slabs, an R of 2 shall be added to the thermal resistance required.

5.3.2.2.3 Vertical insulation shall not be required to extend below the foundation footing. There are no insulation requirements for slabs in locations having less than 3,000 HDD65 or for footings extending less than 18 in. below grade.

5.3.2.2.4 The dimensional requirements for horizontal insulation refers to the insulation materials only. Horizontal applications shall have a thermal break in the slab edge that provides continuity between the wall insulation on the slab and the horizontal insulation.

Below Grade Walls

5.3.2.3.1 The R-value required for Below Grade Walls refers to the overall R-value of the wall assembly excluding air film coefficients and the thermal performance of the adjacent ground.

5.3.3 Thermal Transmittance (U_i) of an Envelope Assembly

5.3.3.1 The thermal transmittance of each envelope assembly shall be determined with due consideration of all major series and parallel heat flow paths through the elements of the assembly. Compression of insulation shall be considered in determining the thermal resistance.

5.3.3.2 The thermal transmittance of opaque assemblies U_i shall be determined using a series path procedure that corrects parallel paths, such as insulation and studs in a wall cavity or the roof assembly shown in Figure 5.3–1. Table 5.3–1 prescribes the procedure to be used for Subsections 5.3.3.2.1 and 5.3.3.2.2.

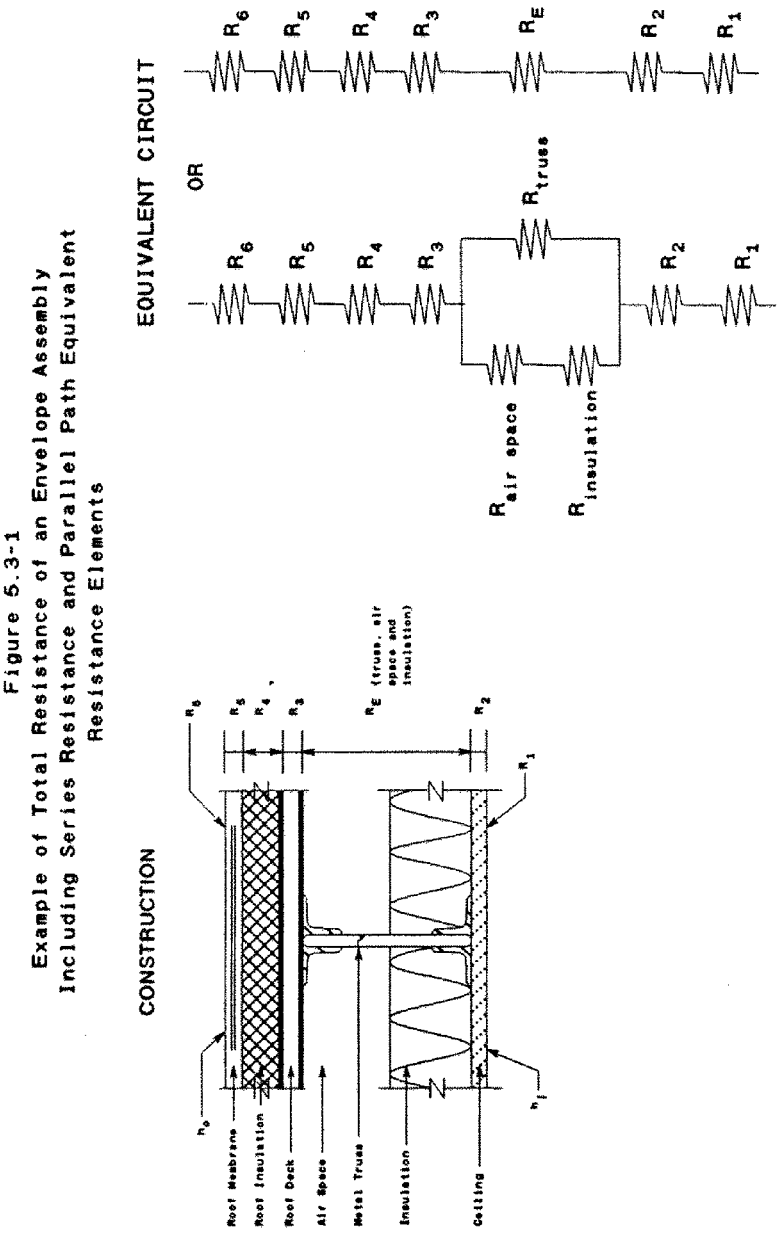


Figure 5.3-1
Example of Total Resistance of an Envelope Assembly
Including Series Resistance and Parallel Path Equivalent
Resistance Elements

Table 5.3-1
Calculation Procedures for Thermal Transmittance
Through Opaque Envelope Assemblies

Material Attached To Thermal Bridge Material	Thermal Bridge Material	Calculation Procedure(s)
Metal	Metal	Thermal Bridges Sheet Metal Construction, 5.3.3.2.1 (d)
Metal	Non-Metal	Parallel/Series 5.3.3.2.2
Non-Metal	Metal	Case Specific Correction 5.3.3.2.1 (b), or 5.3.3.2.1 (c)
Non-Metal	Non-Metal	Parallel/Series 5.3.3.2.2

5.3.3.2.1 For envelope assemblies containing metal framing, the U_i shall be determined by using one of the following methods:

(a) Results from laboratory or field test measurements, using one of the procedures specified in section 5.1.5.

(b) For non-metal surfaces attached to metal framing, where data from tests conducted using procedures specified in section 5.1.5, such as those provided in Tables 5.3–2 and 5.3–3, is available, the total resistance of the series path may be calculated using Equations 5.3–2a and 5.3–2b, and illustrated in Figure 5.3–1:

Table 5.3-2

Parallel Path Correction Factors[1]

Bridged R-Value	0	5	10	15	20	25	30	35	40	45	50	55
Correction Factor	1.0	0.96	0.92	0.88	0.85	0.81	0.79	0.76	0.73	0.71	0.69	0.67

1. Table 5.3-2 values are based upon metal trusses with 4 ft spacing that penetrate the insulation, and 0.66 in. diameter crossmembers every 1 ft.

Table 5.3-3
Wall Sections With Metal Stops
Parallel Path Correction Factors

Size of Members	Gauge of Stud	Spacing of Framing, In.	Cavity Insulation R-Value	Correction Factor
2 X 4	18-16	16 o.c.	R-11	0.50
2 X 4	18-16	24 o.c.	R-11	0.60
2 X 6	18-16	16 o.c.	R-19	0.40
2 X 6	18-16	24 o.c.	R-19	0.45

$$U_i = 1/R_t$$

Equation 5.3–2a

$$R_t = R_i + R_e$$

Equation 5.3–2b

Where:

R_t=the total resistance of the envelope assembly

R_i=the resistance of the series elements (for i=1 to n), excluding the parallel path element(s)

R_e=the equivalent resistance of the element containing the parallel path, the value of R_e is:

R_e=(R-value of insulation)×F_c

Equation 5.3–2c

Where:

F_c=the correction factor from Table 5.3–2 or Table 5.3–3.

(c) For elements other than those covered in item (b) above, the zone method described in Chapter 23 of the *ASHRAE Handbook, 1985 Fundamentals Volume* shall be used. The equations on pages 23.13 and 23.14 shall be used.

(d) For sheet metal construction, internally insulated with an internal metal structure bonded on one or both sides to a metal skin or covering (see Figure 5.3–2), the following steps shall be used to calculate the U-value of the envelope construction.

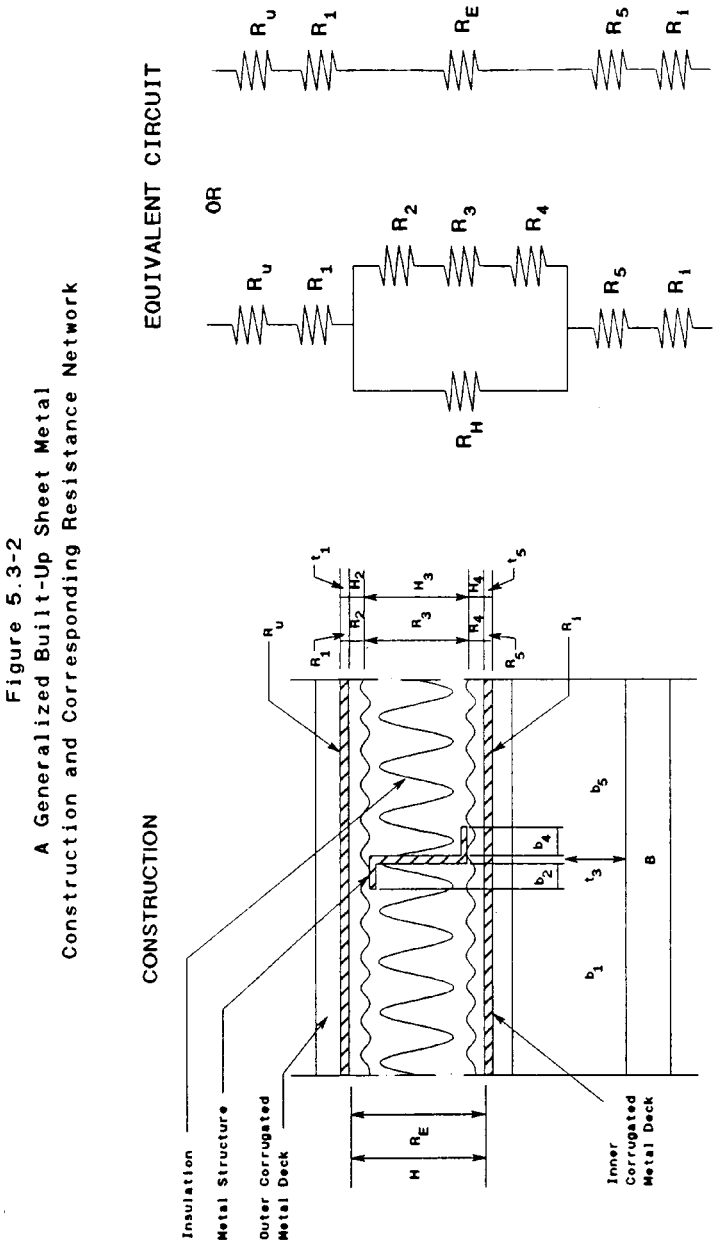


Figure 5.3-2
A Generalized Built-Up Sheet Metal Construction and Corresponding Resistance Network

(1) First, calculate the resistance of the thermal bridge R_{TB} as follows:

$$R_{TB} = R_1 + R_2 + R_3 + R_4 + R_5$$

(i) Where R_1, the effective mean flow path along the outer metal surface, is calculated by:

$$R_1 = \frac{1}{2 \times L\sqrt{h_1 k_1 T_1}} - \frac{1}{B \times L \times h_1}$$

(ii) And if it occurs, the resistance of insulation (R_2) between the outer metal surface and the metal structural member is calculated by:

$$R_2 = \frac{1}{k \times L\left[\frac{b_2}{H_2} + \frac{2}{\pi}\right]}$$

(iii) And, the resistance of the structural member (R_3) is calculated by:

$$R_3 = \frac{h_3}{L \times t_3 \times k_3}$$

Equation 5.3–6

(iv) And if it occurs, the resistance of insulation (R_4) between the inner metal surface and the purlin flange is calculated by:

$$R_4 = \frac{1}{k \times L\left[\frac{b_4}{H_4} + \frac{2}{\pi}\right]}$$

(v) And finally, the effective mean flow path along the inner metal surface (R_5) is calculated by:

$$R_5 = \frac{1}{2 \times L\sqrt{h_5 k_5 T_5}} - \frac{1}{B \times L \times h_5}$$

Where:
L=total length
h=coefficient of heat transfer
k=thermal conductivity
T=temperature
B=total width
H=partial height
t=thickness of sheet metal

(2) Then calculate the parallel path resistance of the homogeneous insulation R_H as follows:

$$R_H = \frac{\Sigma\left[\frac{H}{K}\right]}{B \times L}$$

(3) Then obtain the overall construction resistance R_C by combining R_H and R_{TB} as two parallel resistances:

$$R_C = \frac{R_{TB} \times R_H}{R_{TB} + R_H}$$

Equation 5.3–10

(4) Then add the inside and outside surface resistances R_i and R_u to get the total resistance R_{TOT}≦

$$R_{TOT} = R_C + R_i + R_u$$

Equation 5.3–11

(5) The total area resistance m_{TOT} is then calculated by:

$$m_{TOT} = R_{TOT} \times B \times L$$

Equation 5.3–12

(6) And finally, obtain the U-value by:

$$U = \frac{1}{m_{TOT}}$$

Equation 5.3–13

(7) Where additional resistances are introduced in the construction, introduce them in lieu of the above (R_2 and R_4) resistances. An example of this would be the calculation of both a metallic fastener and a block of higher thermal conductivity material between the outer sheet metal and the internal structural member as shown in Figure 5.3–3. In this case the original R_2 is recalculated by first calculating the thermal bridge R_{2TB} as follows:

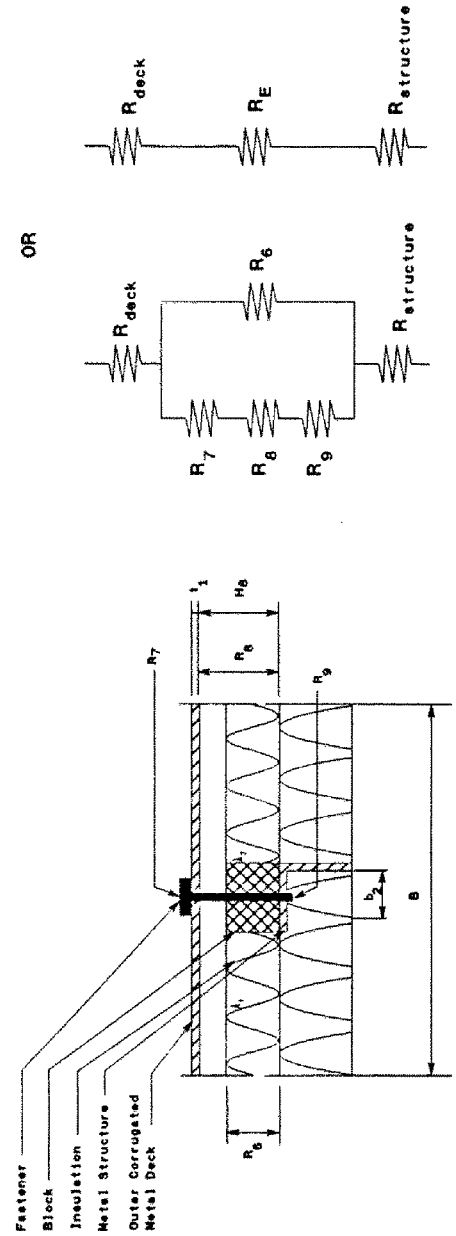


Figure 5.3-3
Detail of Heat Transfer From a Metal Surface to a Structure Through a Metal Fastener and Insulating Block With Corresponding Resistance Network

$$R_{2TB} = R_7 + R_8 + R_9$$

Equation 5.3–14

(i) Where the resistance of the heads of number (N) of fasteners per length

(L), adjusting for surface resistance in common with the sheet metal surface, is calculated by:

$$R_7 = \frac{1}{N \times 2 \times \pi \times \lambda_1 \times t_1 \times f\left(\beta r_1, \infty\right)} - \frac{1}{a_1 \times B \times L}$$

Equation 5.3–15

Where:

N=the number of fasteners in Length L

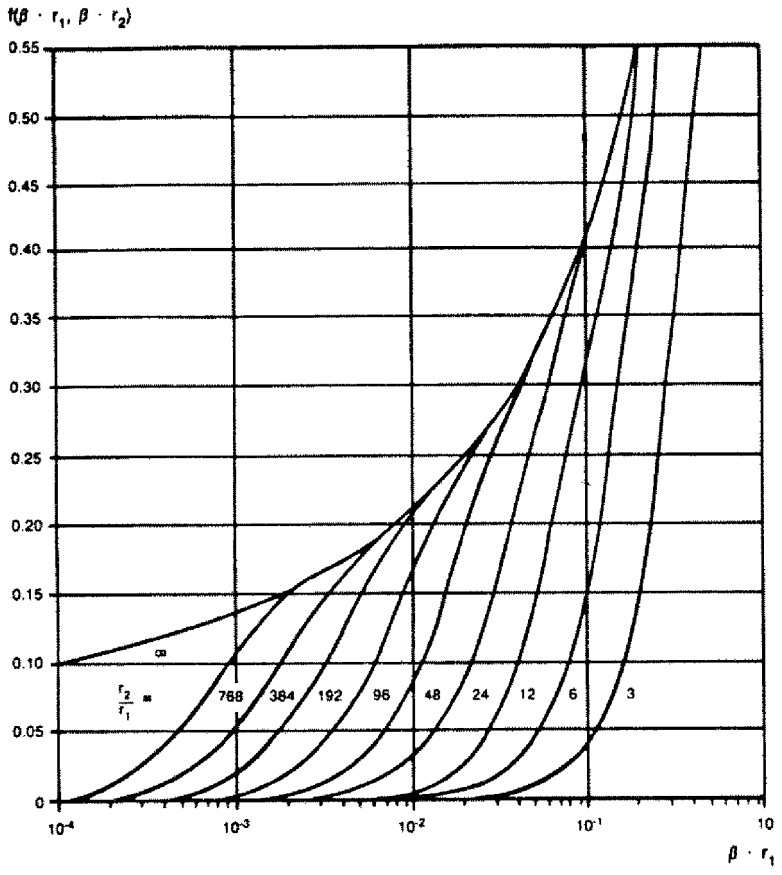
f=the function of B&divide= r for different values of the ratio r_2/r_1 given in Figure 5.3–4.

$$\# = \sqrt{\ } = \frac{\sqrt{h}}{\lambda x t}$$

r_1=the radius of the fastener shank.

r_2=the outer radius of the fastener head.

Figure 5.3–4 – The Function (f) Given as a Function of βr and for Different Values of the Ratio, r_1/r_2



(ii) And, the resistance of the shank of the fastener is calculated by:

$$R_8 = \frac{H_8}{N \times \lambda \times \pi \times r^2_1}$$

Equation 5.3–16

(iii) And, finally, the resistance of the connection to the internal structural member is calculated by:

$$R_9 = \frac{1_n \times \frac{b_2}{r_1}}{N \times 2\pi\lambda \times t}$$

(iv) Then calculate the resistance of the block of higher thermal conductivity material as follows:

$$R_6 = \frac{1}{L_1\left[\lambda_1 \frac{b}{H_8} + \lambda_2 \frac{2}{\pi}\right]}$$

Where:

λ1λ2

(v) Then obtain the resistance to be used in lieu of the original R_2 by:

$$R_2 = \frac{R_{TB} \times R_6}{R_{TB} + R_6}$$

Equation 5.3–19

5.3.3.2.2 For envelope assemblies containing Non-Metal Framing, the U_i shall be determined from one of the laboratory or field test measurements specified in Section 5.1.5 or from the ASHRAE series-parallel method. Formulas in Chapter 23, page 23.2 of the *ASHRAE Handbook, 1985 Fundamentals Volume*, shall be used for these calculations.

5.3.3.3 The thermal transmittance of fenestration assemblies shall be corrected to account for the presence of sash, frames, edge effects and spacers in multiple-glazed units.

If thermal transmittances of sash and frames are known, Equation 5.3–1 shall be used, otherwise the thermal transmittance offenestration assemblies shall be calculated as follows:

$U_{of} = \Sigma\ U_{gi} \times F_{f,i} \times A_i / A_{of} =$
$(U_{g,1} \times F_{e,1} \times A_1 + U_{g,2 \times Ff,2} \times A_2 + \ldots$
$+ U_{g,n} \times F_{f,n} \times A_n) / A_{of}$

Equation 5.3–20

Where:

A_i=area of ith fenestration assembly

i=numerical subscript (1,2,...n) refers to each of the various fenestration assemblies present in the wall

n=the number of fenestration assemblies in the wall assembly.

U_{of}=the overall thermal transmittance of the fenestration assembly, including sash and frames, Btu/h•ft²°F.

U_g=the thermal transmittance of the central area of the fenestration excluding edge effects, spacers in multiple-glazed units, and the sash and frame, Btu/h•ft²°F.

$F_{f,i}$=framing adjustment factor for sash, frames, etc.

A_{of}=the area of all fenestration including glazed portions, sash, frames, etc.

5.3.3.3.1 Values for U_g shall be the winter value obtained from the glazing manufacturer's test data or from Table 13 or Figure 14 of Chapter 27 of the *ASHRAE Handbook, 1985 Fundamentals Volume.* Values for F_f shall be obtained from the frame manufacturer's test data or from the average adjustment factor for a particular product in Table 13, Part C, in Chapter 27 of the *ASHRAE Handbook, 1985 Fundamentals Volume.* For glass products with a U value of 0.45 or less, use the F_f for triple insulated glazing. Alternatively, values of the U_g°F product may be used from manufacturer's test data for open window and frame assemblies tested as a unit provided that the tests referenced edge-effects and windspeed are accounted for winter tested U-values are used.

5.3.4 Gross Area of Envelope Components

5.3.4.1 The gross area of a roof assembly consists of the total surface of the roof assembly exposed to outside air or unconditioned spaces. The roof assembly shall include all roof/ceiling components through which heat may flow between indoor and outdoor environments including skylight surfaces, but excluding service openings.

5.3.4.1.1 For thermal transmittance purposes, when return air ceiling plenums are employed, the roof/ceiling assembly shall not include the thermal resistance of the ceiling, or the plenum space, as part of the total thermal resistance of the assembly.

5.3.4.2 The gross area of a floor assembly over outside or unconditioned space consists of the total surface of the floor assembly exposed to the outside air or an unconditioned space. The floor assembly shall include all floor components through which heat may flow between indoor and outdoor or unconditioned space environments.

5.3.4.3 The gross area of exterior walls enclosing a heated or cooled space is measured on the exterior and consists of the opaque wall including between floor spandrels, peripheral edges of flooring, window areas including sash and door areas, but excluding vents, grilles and pipes.

5.3.5 Shading Coefficients

5.3.5.1 The Shading Coefficient (SC) for fenestration shall be obtained from Chapter 27 of the *ASHRAE Handbook,*

1985 Fundamentals Volume or from manufacturers' test data. For the prescriptive or system performance envelope compliance calculations in sections 5.4 and 5.5, a factor, SC_x, is used. SC_x is the Shading Coefficient of the fenestration, including internal and external shading devices, but excluding the effect of external shading projections, which is calculated separately. The shading coefficient used for louvered shade screens shall be determined using a profile angle of 30°, as found in Table 41, Chapter 27 of the *ASHRAE Handbook, 1985 Fundamentals Volume.*

5.3.6 Wall Heat Capacity

5.3.6.1 Heat capacity in Btu/°F•ft², shall be determined as the product of the average wall weight in lb/ft² and the weighted average specific heat of the wall component in Btu/lb•°F.

5.3.6.2 If the wall system is defined as having exterior insulation only the properties of the wall elements inside of the insulation layer shall be used in determining the wall heat capacity.

5.3.6.3 For walls with integral insulation, all of the elements of the entire wall system may be used in the calculation of the wall heat capacity.

5.3.7 Air Leakage and Moisture Migration

5.3.7.1 The requirements of this subsection apply only to those locations separating the outdoors from interior building conditioned space. Compliance with the criteria for air leakage through building components shall be determined by *ASTM E 283–1984*, ''Standard Method of Test Rate of Air Leakage Through Exterior Windows, Curtain Walls and Doors.''

5.3.7.2 Air Leakage Requirements for Fenestration and Doors

5.3.7.2.1 Fenestration meeting the following standards for air leakage is acceptable:

(a) *ANSI/AAMA 101–85*, ''Aluminum Prime Windows.''

(b) *ASTM D–4099–83*, ''Specifications for Poly(VinylChloride) (PVC) Prime Windows.''

(c) *ANSI/NWMA I.S. 2–80*, ''Wood Window Units (Improved Performance Rating Only).''

5.3.7.2.2 Sliding Doors shall meet one of the following standards for air leakage:

(a) *ANSI/AAMA 101–85*, ''Aluminum Sliding Glass Doors.''

(b) *NWMA I.S. 3–83*, ''Wood Sliding Patio Doors.''

5.3.7.2.3 Commercial entrance swinging or revolving doors shall limit air leakage to a rate not to exceed 1.25 cfm/ft² of door area, at standard test conditions.

5.3.7.2.4 Residential swinging doors shall limit air leakage to a rate not to exceed 0.5 cfm/ft² of door area, at standard test conditions.

5.3.7.2.5 Where spaces have regular high volume traffic through the building envelope, such as retail store entrances and loading bays, estimates of air leakage for HVAC system design shall be based on air exchange by traffic flow.

5.3.7.2.6 To reduce infiltration due to stack-effect draft in multi-story buildings, the use of vestibules or revolving doors on all primary entries and exits shall be considered.

5.3.7.3 Air Leakage Requirements for Exterior Envelope Joints and Penetrations.

5.3.7.3.1 Exterior joints, cracks, and holes in the building envelope, such as those around window or door frames, between wall and foundation, between wall and roof, through wall panels at penetrations of utility services or other service entry through walls, floors, and roofs, between wall panels, particularly at corners and changes in orientation, between wall and floor, where floor penetrates wall, around penetrations of chimney, flue vents, or attic hatches, shall be caulked, gasketed, weather stripped, or otherwise sealed.

5.3.7.4 Moisture Migration Requirements for Exterior Envelopes

5.3.7.4.1 The building envelope shall be designed to prevent moisture migration that leads to deterioration in insulation performance of the building.

5.3.7.4.2 Vapor retarders shall be considered to prevent moisture from collecting within the envelope. Designs should incorporate the principles of *ASHRAE Handbook, 1985 Fundamentals Volume*, Chapter 21, ''Moisture in Building Construction.''

5.3.8 Shell Buildings

5.3.8.1 The following conditions shall be assumed if determination of

building envelope compliance occurs prior to the determination of lighting power density, equipment power density, or fenestration shading device characteristics:

5.3.8.1.1 *Lighting Power Density and Equipment Power Density.* For section 5.4, the total power density shall be assumed to be those listed in Table 5.3–4. For section 5.5, the values in Table 5.3–4 shall be assumed to be apportioned as ⅔ lighting and ⅓ for other equipment. Note that these are not recommended design values, but are for compliance purposes only.

Table 5.3-4
Assumed Internal Loads For Shell And Speculative Buildings

	HDD65<3000	3000<HDD65<6000	HDD65>6000
Shell Buildings	3.0 w/Ft^2	2.25 W/ft^2	1.50 W/ft^2
Speculative Buildings	Use the ULPA from Table 3.4-1 and the average equipment power density from Table 5.4-32.		

5.3.8.1.2 *Fenestration shading devices.* Only those shading devices that are part of the design when it is being evaluated for compliance shall be considered when determining compliance.

5.3.8.1.3 *Daylighting controls for electric lighting.* Only those controls that are part of the design when it is being evaluated for compliance shall be considered when determining compliance.

5.3.9 Buildings Located in Climates With Greater Than 15,000 HDD Base 65 °F.

5.3.9.1 For locations with a heating degree-day base (HDD) 65 ° F greater than 15,000, the envelope criteria listed in Table 5.3–5 shall apply, and the window wall ratio (WWR) shall be less than or equal to 0.20.

Table 5.3-5
Requirements For Locations With
Heating Degree-Days Base 65 °F Greater Than 15,000

Envelope Statement	Maximum U Value	Minimum R Value	Notes
U_o opaque wall for buildings with ≥ 12,000 ft^2 of gross floor area [1,3]	0.053		See 5.3.3.2
U_o opaque wall for buildings with < 12,000 ft^2 of gross floor area [2,3]	0.040		
U fenestration	0.450		Use Eq 5.3-20
U roof	0.024		
Floor over unconditioned spaces[4]	0.023		See 5.3.3.2
Wall below grade[5]		18	
Slab-on-grade:			

Position	Minimum Insulation Distance, in.	Minimum R Value Unheated Slab	Minimum R Value Heated Slab
Horizontal	48	15	17
Vertical	48	6	8

Skylights: Not allowed for locations with HDD65 greater than 15,000.

Footnotes for Table 5.3-5:

1. For window to wall ration, WWR ≤ 0.20. Shall include corrections for parallel paths within the envelope assembly. For WWR > 0.20, see Footnote (3).
2. For window to wall ratio, WWR ≤ 0.15. Shall include corrections for parallel paths within the envelope assembly. For WWR > 0.15, see Footnote (3).
3. The window to wall ratio and the stated U-values for opaque wall and fenestration may be increased or decreased provided that the combined thermal wall transmittance shall not exceed 0.125 for buildings ≥ 12,000 ft^2, and 0.091 for buildings < 12,000 ft^2.
4. Including pile-supported floors and elevated floors.
5. Installed on the exterior of perimeter foundation walls for heated foundations.

5.3.10 Daylight Credits for Skylights.

5.3.10.1 Skylights used in conjunction with automatic lighting controls for daylighting can significantly reduce the lighting energy consumption, thereby more than offsetting the increase in envelope heat transfer.

5.3.10.2 When determining building roof compliance, daylight credits for skylights may be used if the criteria of this subsection are met.

5.3.10.3 Skylights for which daylight credit is taken may be excluded from the calculation of the overall thermal transmittance value (U_{or}) of the roof assembly, if all of the following conditions are met:

5.3.10.3.1 The opaque roof thermal transmittance U_{or} value does not exceed the value determined within the selected Alternate Component Package (ACP) table for the prescriptive method or by Equation 5.5–1 for the systems performance method.

5.3.10.3.2 Skylight areas, including framing, as a percentage of the roof area do not exceed the values specified in Tables 5.3–6A and 5.3–6B for building sites located within the climate ranges listed in the two Tables, where Visible Light Transmittance (VLT) is the transmittance of a particular glazing material over the visible portion of the solar spectrum. Skylight areas shall be interpolated between visible light transmittance values of 0.75 and 0.50, only.

Table 5.3-6a
(VLT = 0.75)
Maximum Percent Skylight Area for Given Conditions of Lighting Power Density, Light Level (fc), HDD65 and CDH80

BUILDING LOCATION		LIGHT LEVEL IN (fc)	Range of Lighting Power Density (W/ft^2)				
HDD65	CDH80		<1.00	1.01-1.50	1.51-2.00	2.01-2.50	>2.50
0-3000	0-10000	30	2.3	3.1	3.9	4.7	4.7
		50	3.1	4.3	5.5	6.7	6.7
		70	4.3	5.5	6.7	7.9	7.9
0-3000	>10000	30	2.2	2.8	3.4	4.0	4.0
		50	2.3	3.1	3.9	4.7	4.7
		70	2.9	4.1	5.3	6.5	6.5
>3000	ALL	30	2.3	3.4	4.5	5.6	5.6
		50	2.5	4.0	5.5	7.0	7.0
		70	2.8	4.6	6.4	8.2	8.2

Table 5.3-6b
(VLT = 0.50)
Maximum Percent Skylight Area for Given Conditions of Lighting Power Density, Light Level (fc), HDD65 and CDH80

BUILDING LOCATION		LIGHT LEVEL IN FC	Range of Lighting Power Density (W/ft^2)				
HDD65	CDH80		<1.00	1.0-1-1.50	1.51-2.00	2.01-2.50	>2.50
0-3000	0-10000	30	3.6	4.8	6.0	7.2	7.2
		50	4.8	6.6	8.4	10.2	10.2
		70	6.6	8.4	10.2	12.0	12.0
0-3000	>10000	30	3.3	4.2	5.1	6.0	6.0
		50	3.6	4.8	6.0	7.2	7.2
		70	4.2	6.0	7.8	9.6	9.6
>3000	ALL	30	3.6	5.1	6.6	8.1	8.1
		50	3.9	6.0	8.1	10.2	10.2
		70	4.2	6.9	9.6	12.3	12.3

5.3.10.3.3 The skylight area associated with daylight credit can be taken is the area under each skylight whose dimension in each direction (centered on the skylight) is equal to the skylight dimension in that direction plus a distance equal to the floor to ceiling height.

5.3.10.3.4 Skylight areas that overlap areas that have already taken daylight credit (perimeter window areas or other skylight areas) do not again take daylight credit.

5.3.10.3.5 All electric lighting fixtures within skylight areas are controlled by daylight-activated automatic lighting controls.

5.3.10.3.6 For buildings located in climates that have less than 8000 HDD65, the overall thermal transmittance of the skylight assembly, including framing, is less than or equal to 0.7 $Btu/h \bullet ft^2 \bullet °F$. For locations greater

than 8000 HDD65, the overall thermal transmittance of the skylight assembly, including framing, is less than or equal to 0.45 Btu/h•ft²•°F.

5.3.10.3.7 Skylight curbs have thermal transmittance (U) values no greater than 0.21 Btu/h•ft²•°F.

5.3.10.3.8 The infiltration coefficient of the skylights does not exceed 0.05 cfm/ft².

5.3.10.4 Skylight areas in Tables 5.3–6A and 5.3–6B may be increased by 50% if a shading device is used that blocks over 50% of the solar gain during the peak cooling design condition.

5.3.10.5 Areas for vertical glazing in clerestories and roof monitors shall be included in the wall fenestration calculation.

5.3.10.6 For shell buildings, the permitted skylight area from Tables 5.3–6A and 5.3–6B shall be based on a light level of 30 fc and a lighting power density (LPD) of less than 1 W/ft².

5.3.10.7 For speculative buildings, the permitted skylight area from Tables 5.3–6A and 5.3–6B shall be based on the unit lighting power allowance from Table 3.4–1 and an illuminance level as follows:

5.3.10.7.1 For LPD less than or equal to 1.0 W/ft², use 30 fc;

5.3.10.7.2 For LPD greater than 1.0 W/ft² and less than 2.5 W/ft², use 50 fc; and

5.3.10.7.3 For LPD greater than 2.5 W/ft², use 70 fc.

5.3.10.8 Buildings with roof assembly devices that cannot be evaluated under this subsection shall be evaluated using the Building Energy Compliance Methods of Section 11.0 or 12.0.

5.4 Building Envelope—Prescriptive Compliance Alternative

5.4.1 General.

5.4.1.1 This section provides a simple compliance path using precalculated prescriptive requirements for selected exterior envelope configurations of new buildings.

5.4.1.2 The Alternate Component Packages (ACP), found in this subsection, provide design criteria for use with the following options:

5.4.1.2.1 ''Base Case''—buildings with envelopes designed without perimeter daylighting.

5.4.1.2.2 ''Perimeter Daylighting''—buildings with envelopes that use additional fenestration area by incorporating automatic lighting controls in the perimeter zone to permit the use of daylighting in lieu of electric lighting. This ACP is not available for those climates that do not usually require space cooling by means of mechanical refrigeration.

(a) This daylighting credit is in addition to the increased lighting power allowance provided in section 3.5. Some perimeter daylighting options allow a greater proportion of fenestration area due to the increased visible and decreased thermal transmittances of high performance glazings in combination with automatic lighting controls.

5.4.1.3 Each ACP provides a limited number of complying combinations of building variables for a set of climate ranges. The criteria, such as maximum percent fenestration, were calculated using the system performance criteria of section 5.5. Values were chosen from within climate and other variable ranges for the most restrictive results, to ensure compliance of any combination of values within those ranges. Thus, for most climate locations and envelope parameters, the prescriptive criteria may be slightly more stringent than the system performance criteria of section 5.5.

5.4.1.4 Both the base and perimeter daylight cases have two or three fenestration U-value ranges depending on the climate.

5.4.2 Compliance.

5.4.2.1 The envelope design of the building being evaluated is in compliance with the prescriptive criteria of this section provided that:

5.4.2.1.1 The minimum requirements of section 5.3 are met.

5.4.2.1.2 All envelope thermal transmittance (U) values are less than or equal to those chosen from the ACP Table selected for roofs, opaque walls, walls next to unconditioned spaces, and floors over unconditioned spaces.

5.4.2.1.3 The percentage of fenestration of the combined gross wall area is less than or equal to the value permitted for internal load range and glazing in the selected ACP Table.

5.4.2.1.4 Slab-on-grade floors have insulation around the perimeter of the

floor with the thermal resistance (R_u) of the insulation as listed in the ACP table. The slab insulation specified shall extend either in a vertical plane downward from the top of the slab for the minimum distance shown or downward to the bottom of the slab then in a horizontal plane beneath the slab or outward from the building for the minimum distance shown. The horizontal length, or vertical depth, of insulation required varies from 24 in. to 48 in. depending upon the R-value selected. For heated slabs, an R of 2 shall be added to the thermal resistance required.

(a) Vertical insulation shall not be required to extend below the foundation footing.

(b) There are no insulation requirements for slabs in locations having less than 3,000 HDD65 or for footings extending less than 18 in. below grade.

5.4.2.1.5 The thermal resistance of the below-grade wall assembly must be greater than or equal to that listed in the ACP table, or the heat loss calculated in accordance with Chapter 25 of the *ASHRAE Handbook, 1985 Fundamentals* shall be less than or equal to that of a wall below grade having a thermal resistance equal to that specified in Figure 5.5–3. No insulation is required for climates with less than 3,000 HDD65 or for those portions of walls more than one story below grade.

5.4.3 Procedure for Using the Alternate Component Packages (ACP).

5.4.3.1 The prescriptive envelope criteria for each of 30 climate ranges are contained in Tables 5.4–2 through 5.4–31.

5.4.3.2 The following steps shall be used to determine compliance with these prescriptive envelope criteria.

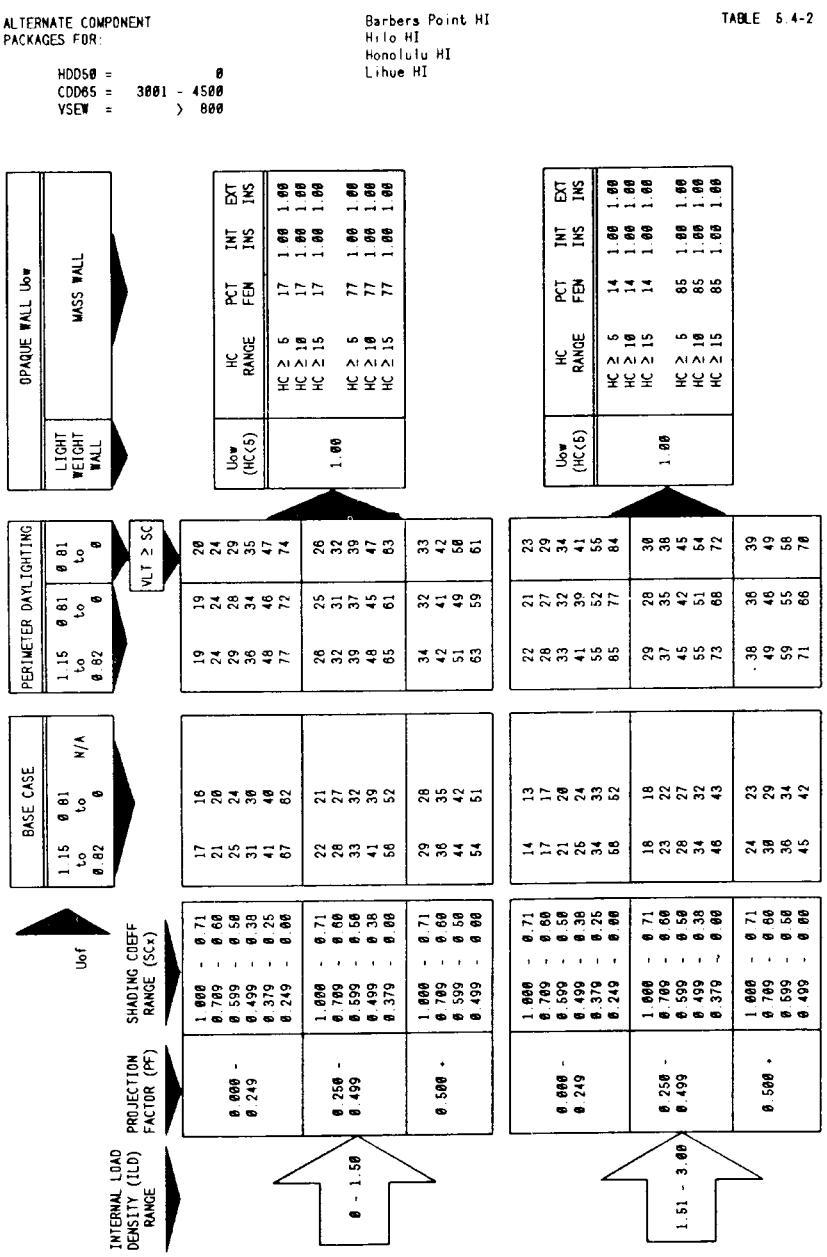
5.4.3.2.1 Determine appropriate climate range using either (a) or (b) below.

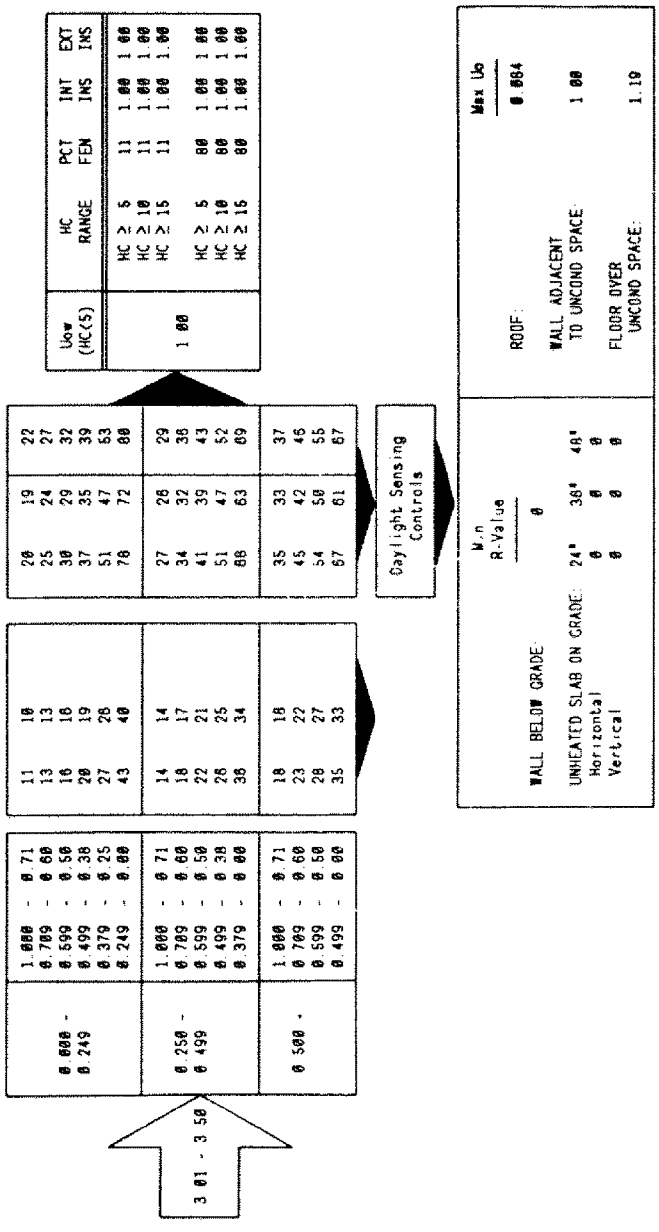
(a) From Table 5.4–1, select the appropriate ACP Table based on the climate for the building site. The main climate variables that are needed for the proper selection of an ACP Table are cooling degree-days base 65 °F (CDD65), heating degree-days base 50 °F (HDD50), and annual average daily incident of solar radiation on the east or west vertical surface of the facade, Btu/ft²/day (VSEW). For certain climate ranges this must be augmented by cooling degree-hours base 80 °F (CDH80).

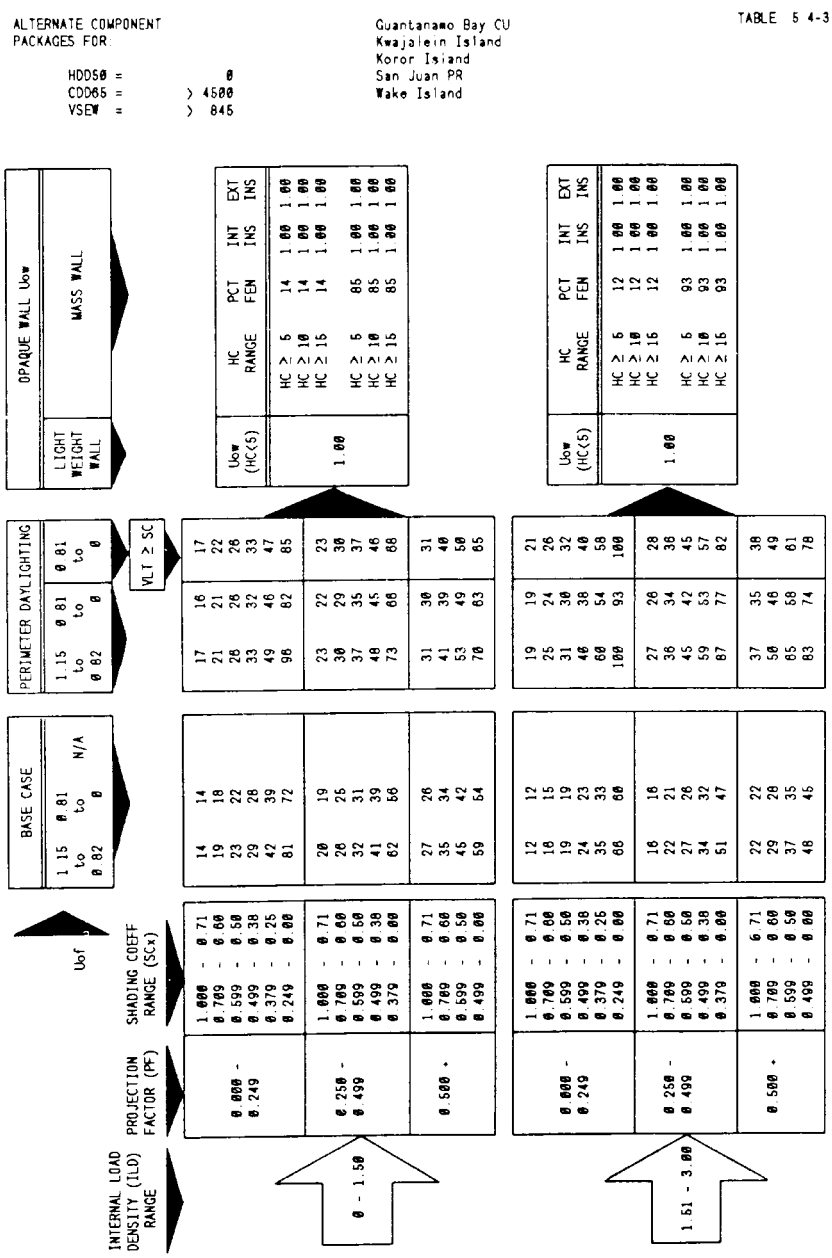
(1) This data, for a specific building location, may be acquired from the U.S. Weather Service of the National Oceanic and Atmospheric Administration or the local weather bureau. The column designated ''ACP Table No.'' in Table 5.4–1 contains the table number of the appropriate ACP Table.

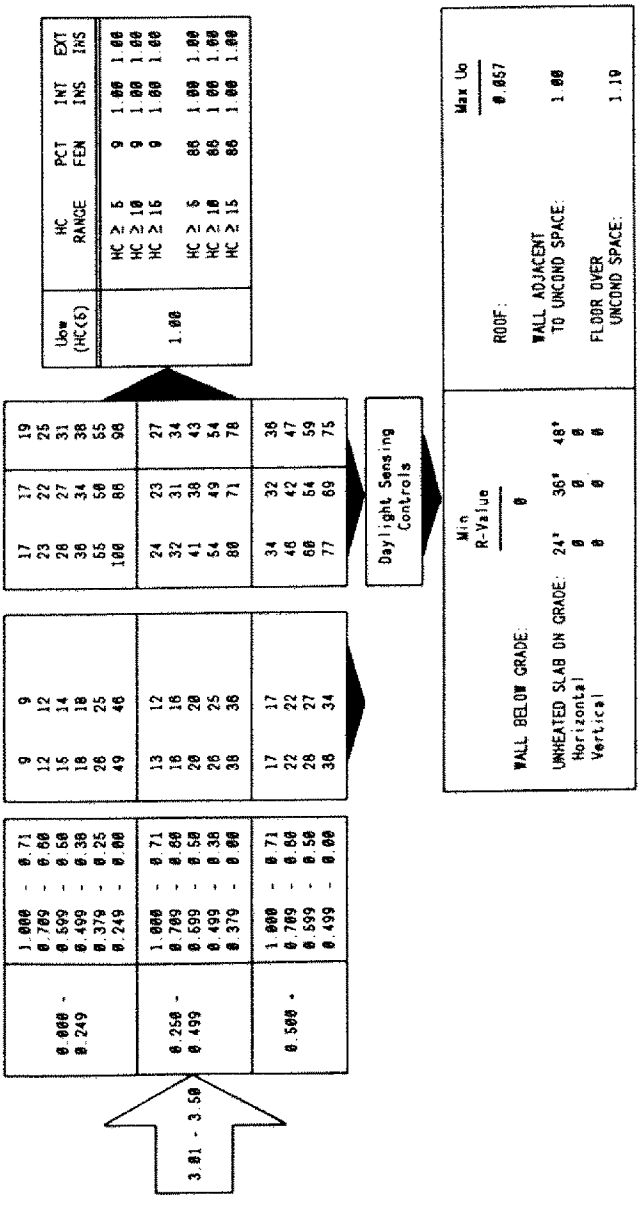
Table 5.4-1
Climate Data Grouped by ACP Tables

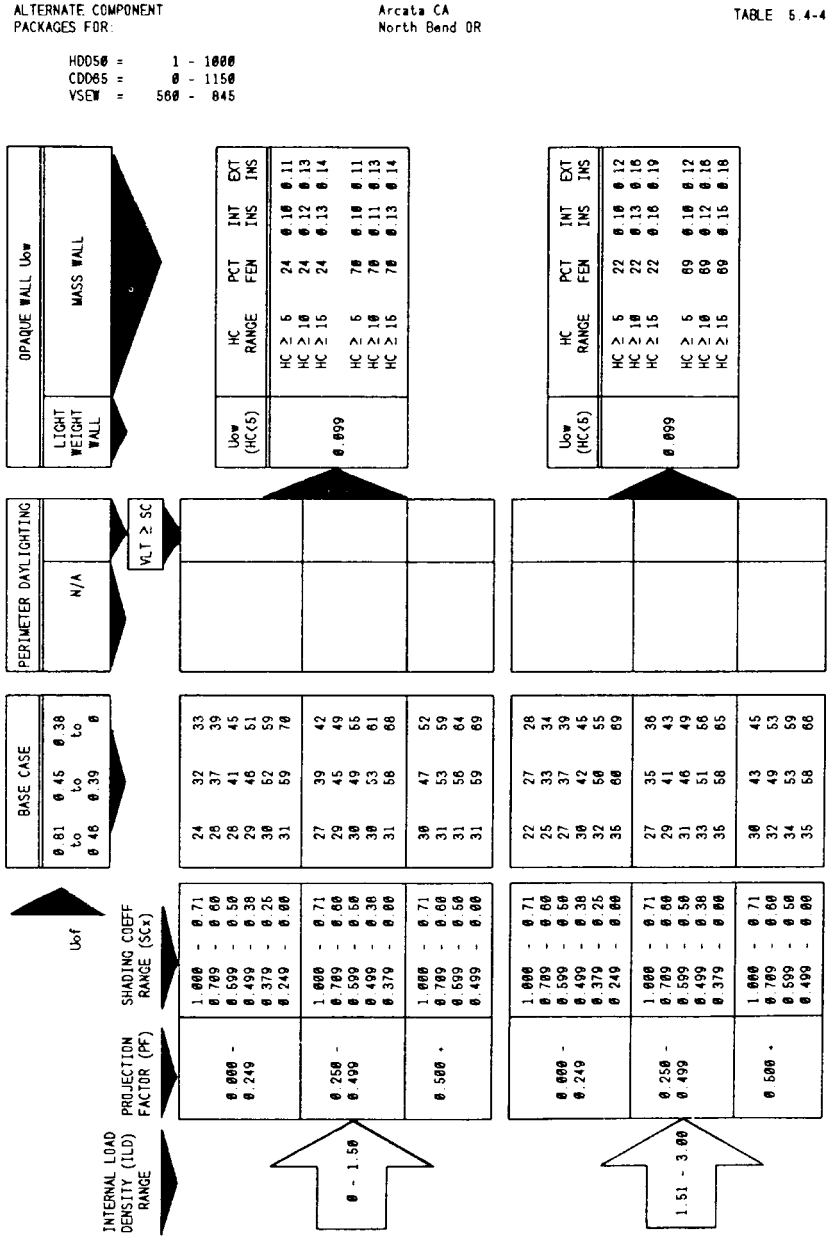
ACP Table Number	HDD50 Range	CDD65 Range	VSEW Range	CDH80 Range	Example Cities
5.4-2	0	3001-4500	>800		Barbers Point, Hilo, Honolulu, Lihue
5.4-3	0	>4500	>845		Guantanamo Bay, Kwajalein, San Juan, Wake Island
5.4-4	1-1000	0-1150	560-845		Arcata, North Bend
5.4-5	1-1000	0- 300	>845		Oakland, San Francisco, Santa Maria, Sunnyvile
5.4-6	1-1000	301-1150	>845		El Toro, Long Beach, Los Angeles, San Diego
5.4-7	1-1000	1151-2000	560-845		Atlanta, Augusta, Birmingham, Cherry Point, Greenville
5.4-8	1-1000	1151-2000	>845		Fresno, Red Bluff, Sacramento
5.4-9	1-1000	2001-3250	560-845		Charleston, Houston, Jackson, Montgomery, New Orleans
5.4-10	1-1000	2001-3250	>845	0-18000	Austin, Bakersfield, El Paso, Fort Worth, Tallahassee, Tampa
5.4-11	1-1000	2001-3250	>845	>18000	China Lake, Las Vegas, Tucson
5.4-12	1-1000	3251-4500	>845	0-18000	Brownsville, Corpus Christi, Miami, Orlando, West Palm Beach
5.4-13	1-1000	3251-4500	>845	>18000	Laredo, Phoenix, Yuma
5.4-14	1001-1750	0- 500	560-845		Olympia, Portland, Salem, Seattle/Tacoma, Whidbey Island
5.4-15	1001-1750	501-1150	560-845		Asheville, Medford
5.4-16	1001-1750	1-1150	>845		Prescott, Winslow, Yucca
5.4-17	1001-1750	1151-2000	560-845		Charlotte, Chattanooga, Knoxville, Norfolk, Raleigh, Richmond
5.4-18	1001-1750	1151-2000	>845		Albuquerque, Lubbock, Oklahoma City, Roswell, Tucumcari
5.4-19	1001-1750	2001-3250	560-845		Fort Smith, Memphis, Tulsa
5.4-20	1751-2600	0-1150	560-845		Baltimore, Boston, Columbus, Harrisburg, New York, Washington
5.4-21	2601-3200	0-1150	560-845		Akron, Chicago, Detroit, Hartford, Indianapolis, Pittsburgh
5.4-22	1751-3200	0-1150	>845		Boise, Colorado Springs, Denver, Reno, Salt Lake City
5.4-23	1751-3200	1151-2000	560-845		Evensville, Lexington, Louisville, Saint Louis, Springfield
5.4-24	1751-3200	1151-2000	>845		Dodge City, Grand Junction
5.4-25	3201-4000	0-1150	560-845		Albany, Buffalo, Concord, Des Moines, Milwaukee, Rapid City
5.4-26	4001-5000	0-1150	560-845		Bangor, Cutbank, Huron, Minneapolis, Rochester, Sioux Falls
5.4-27	3201-4000	0-1150	>845		Casper, Cheyenne, Ely, North Platte, Scottsbluff
5.4-28	4001-5000	0-1150	>845		Bryce, Eagle, Rock Springs
5.4-29	5001-6500	0-1150	560-845		Bismarck, Duluth, Fargo, Glasgow, International Falls
5.4-30	1-6500	< 100	<560		Adak, Anchorage, Juneau, Kodiak, Yakutat
5.4-31	>6500	< 100	<560		Bethel, Fairbanks, King Salmon, Nome, Summit

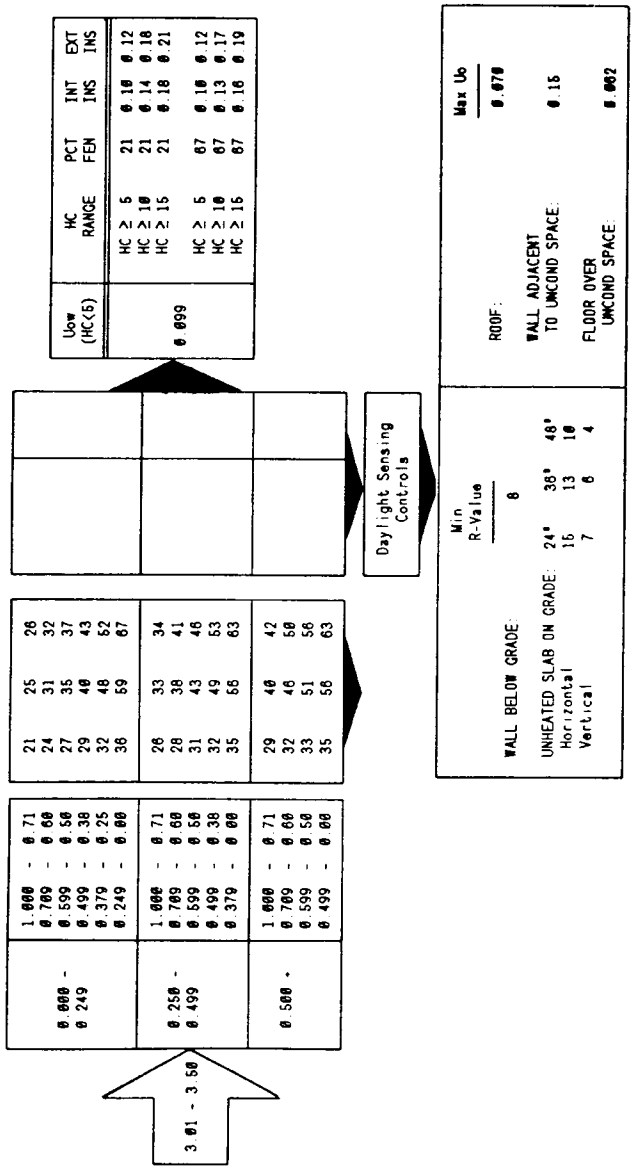

ALTERNATE COMPONENT PACKAGES FOR:
HDD50 = 0
CDD65 = 3001 - 4500
VSEW = > 800
Barbers Point HI
Hilo HI
Honolulu HI
Lihue HI
TABLE 5.4-2
OPAQUE WALL Uow
LIGHT WEIGHT WALL
MASS WALL
PERIMETER DAYLIGHTING
1.15 to 0.82
0.81 to 0
0.81 to 0
BASE CASE
1.15 to 0.82
0.81 to 0
N/A
VLT ≥ SC
Uow (HC≤5)
HC RANGE
PCT FEN
INT INS
EXT INS
HC ≥ 5
HC ≥ 10
HC ≥ 15
1.00
Uow (HC≥6)
Uof
SHADING COEFF RANGE (SCx)
PROJECTION FACTOR (PF)
INTERNAL LOAD DENSITY (ILD) RANGE
1.000 - 0.710
0.709 - 0.600
0.599 - 0.500
0.499 - 0.380
0.379 - 0.250
0.249 - 0.000
0.000 - 0.249
0.250 - 0.499
0.500 +
0 - 1.50
1.51 - 3.00

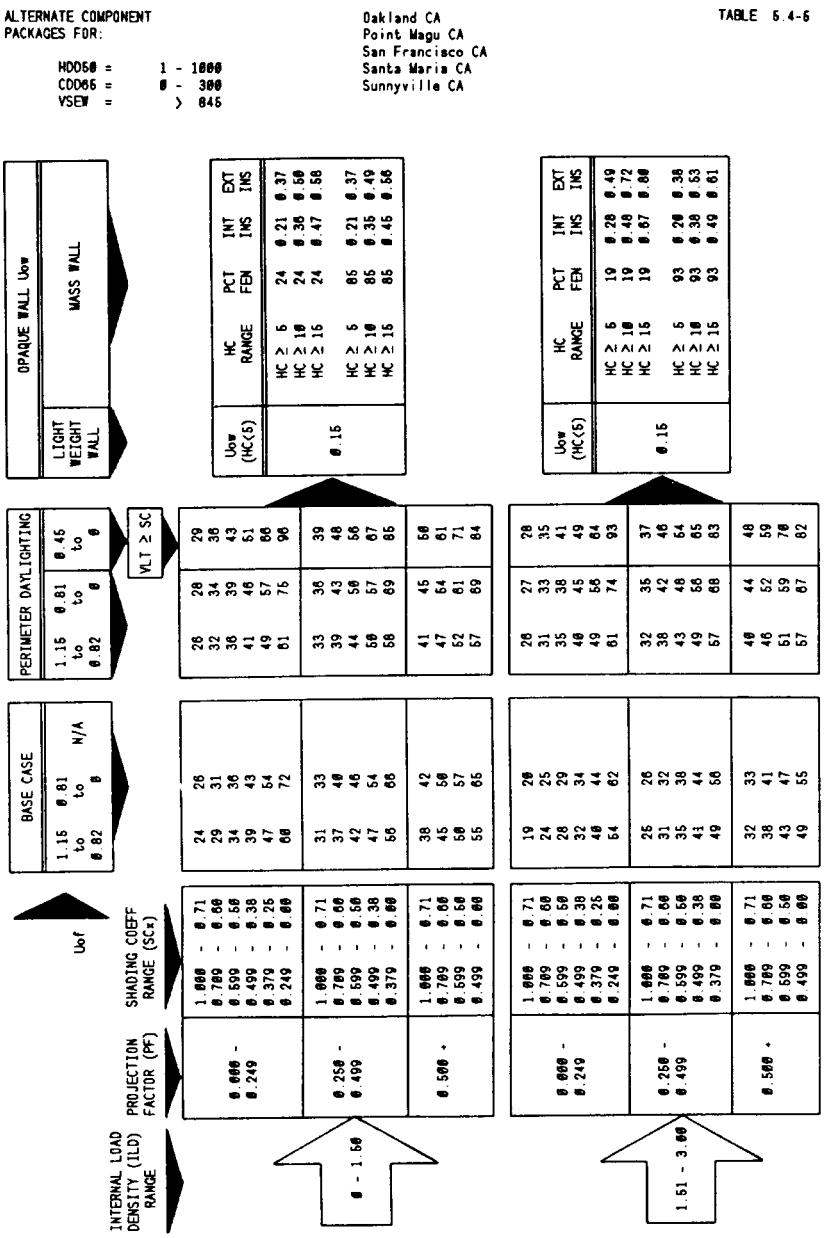

3.01 - 3.50
0.000 - 0.249
0.250 - 0.499
0.500 -
1.000 - 0.71
0.709 - 0.60
0.599 - 0.50
0.499 - 0.38
0.379 - 0.25
0.249 - 0.00
11 10
13 13
16 16
20 19
27 28
43 40
14 14
18 17
22 21
28 25
38 34
18 18
23 22
28 27
35 33
20 19 22
25 24 27
30 29 32
37 35 39
51 47 53
78 72 80
27 26 29
34 32 36
41 39 43
51 47 52
68 63 69
35 33 37
45 42 46
54 58 55
67 61 67
Daylight Sensing Controls
W.n R-Value
0
WALL BELOW GRADE:
UNHEATED SLAB ON GRADE: 24" 36" 48"
Horizontal 0 0 0
Vertical 0 0 0
Uow (HC(5)
1.00
HC RANGE
PCT FEN
INT INS
EXT INS
HC ≥ 5 11 1.00 1.00
HC ≥ 10 11 1.00 1.00
HC ≥ 15 11 1.00 1.00
HC ≥ 5 00 1.00 1.00
HC ≥ 10 00 1.00 1.00
HC ≥ 15 00 1.00 1.00
Max Uo
ROOF: 0.064
WALL ADJACENT TO UNCOND SPACE: 1.00
FLOOR OVER UNCOND SPACE: 1.19

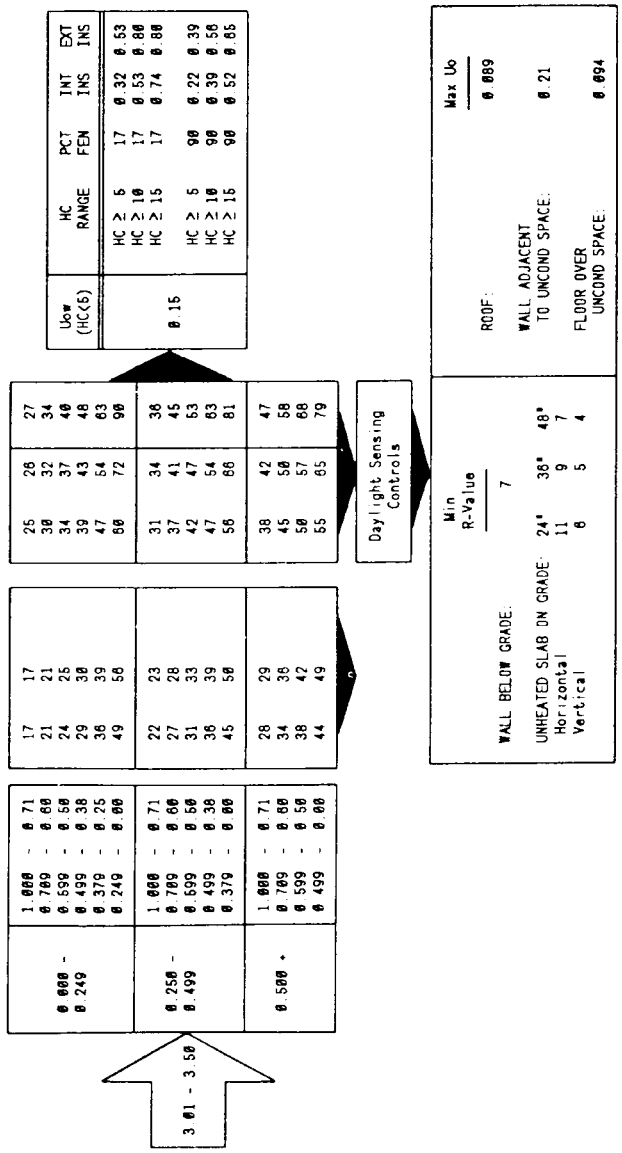

ALTERNATE COMPONENT PACKAGES FOR:
HDD50 = 0
CDD65 = > 4500
VSEW = > 845
Guantanamo Bay CU
Kwajalein Island
Koror Island
San Juan PR
Wake Island
TABLE 5 4-3
OPAQUE WALL Uow
LIGHT WEIGHT WALL
MASS WALL
PERIMETER DAYLIGHTING
VLT ≥ SC
BASE CASE
Uof
INTERNAL LOAD DENSITY (ILD) RANGE
PROJECTION FACTOR (PF)
SHADING COEFF RANGE (SCx)
Uow (HC(5)
HC RANGE
PCT FEN
INT INS
EXT INS
0 - 1.50
1.51 - 3.00

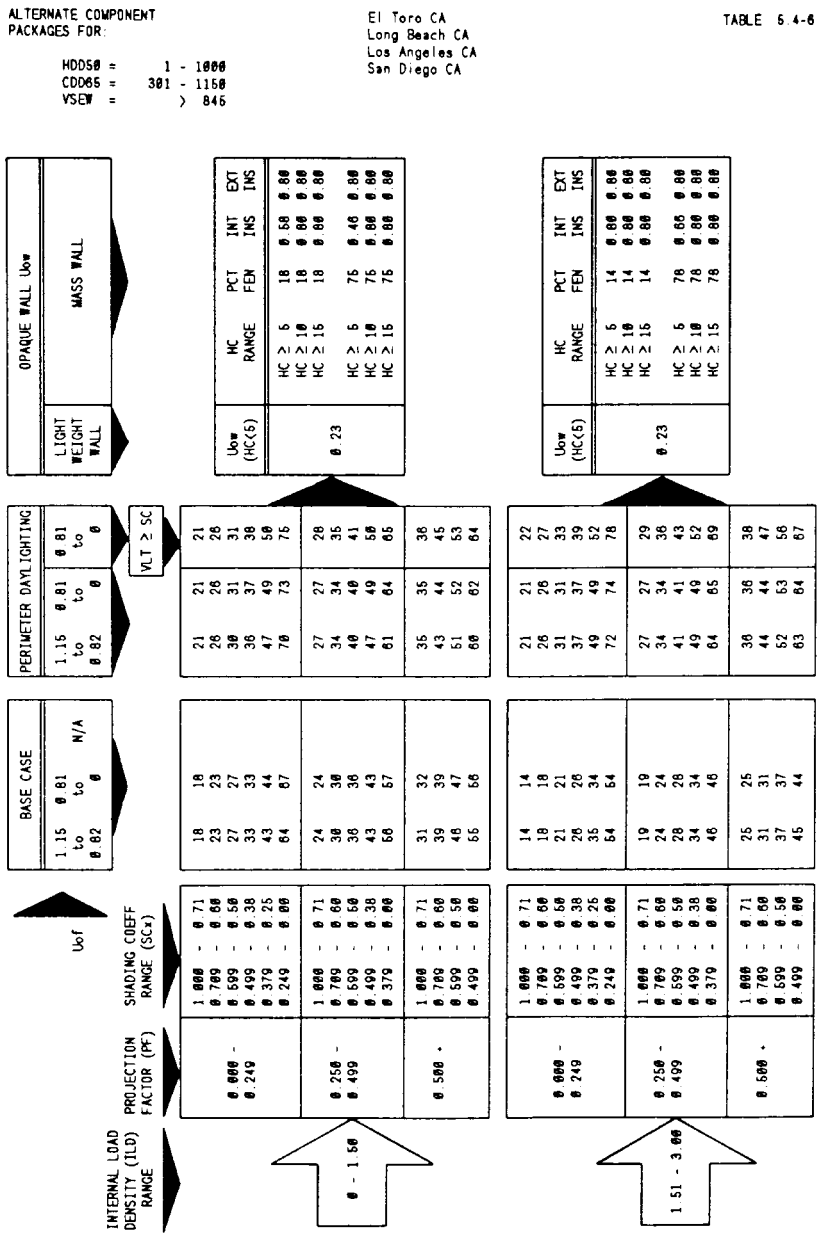

3.01 - 3.50
0.000 - 0.249
0.250 - 0.499
0.500 +
1.000 - 0.710
0.709 - 0.600
0.599 - 0.500
0.499 - 0.380
0.379 - 0.250
0.249 - 0.000
9 9
12 12
15 14
18 18
26 25
49 46
13 12
18 16
20 20
26 25
38 36
17 17
22 22
28 27
36 34
17 17 19
23 22 25
28 27 31
36 34 38
55 50 55
100 80 90
24 23 27
32 31 34
41 38 43
54 49 54
80 71 78
34 32 36
46 42 47
60 54 59
77 69 75
Daylight Sensing Controls
Min R-Value
WALL BELOW GRADE: 0
UNHEATED SLAB ON GRADE: 24' 36' 48'
Horizontal 0 0 0
Vertical 0 0 0
Max Uo
ROOF: 0.057
WALL ADJACENT TO UNCOND SPACE: 1.00
FLOOR OVER UNCOND SPACE: 1.19
Uow (HC(6))
1.00
HC RANGE
PCT FEN
INT INS
EXT INS
HC ≥ 5 9 1.00 1.00
HC ≥ 10 9 1.00 1.00
HC ≥ 16 9 1.00 1.00
HC ≥ 5 80 1.00 1.00
HC ≥ 10 80 1.00 1.00
HC ≥ 15 80 1.00 1.00

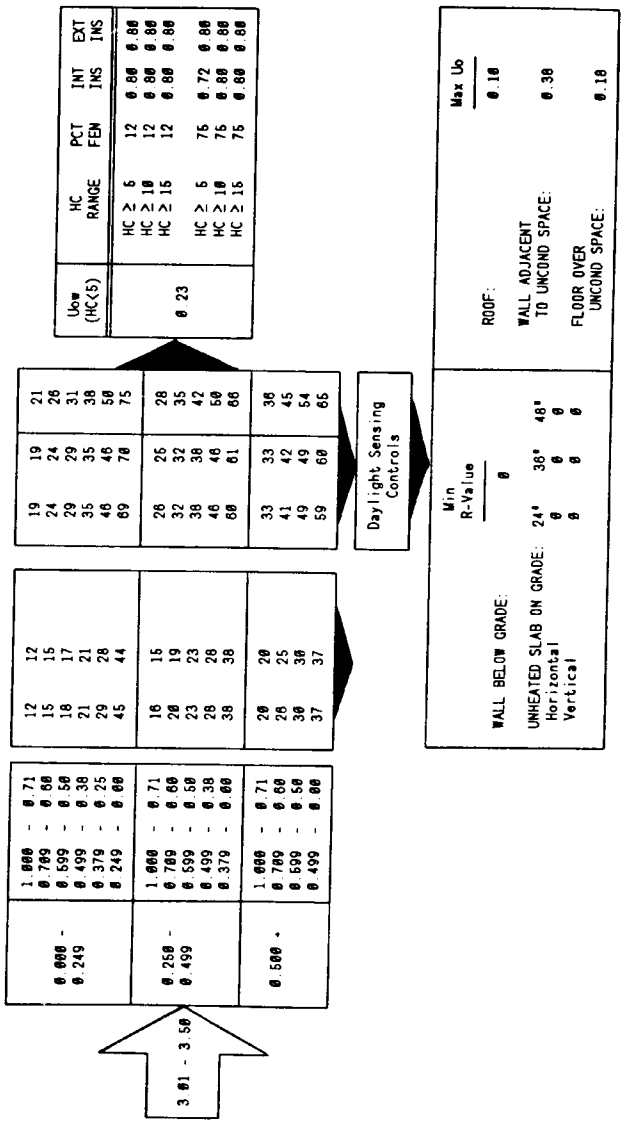

ALTERNATE COMPONENT PACKAGES FOR:
Arcata CA
North Bend OR
TABLE 5.4-4
HDD50 = 1 - 1000
CDD65 = 0 - 1150
VSEW = 500 - 845
OPAQUE WALL Uow
LIGHT WEIGHT WALL
MASS WALL
PERIMETER DAYLIGHTING
N/A
VLT ≥ SC
BASE CASE
0.81 to 0.46
0.45 to 0.39
0.38 to 0
Uof
SHADING COEFF RANGE (SCs)
PROJECTION FACTOR (PF)
INTERNAL LOAD DENSITY (ILD) RANGE
0 - 1.50
1.51 - 3.00
Uow (HC(5)
HC RANGE
PCT FEN
INT INS
EXT INS
0.099
HC ≥ 5
HC ≥ 10
HC ≥ 15
0.000 - 0.249
0.250 - 0.499
0.500 +
1.000 - 0.709
0.709 - 0.599
0.599 - 0.499
0.499 - 0.379
0.379 - 0.249
0.249 - 0.000

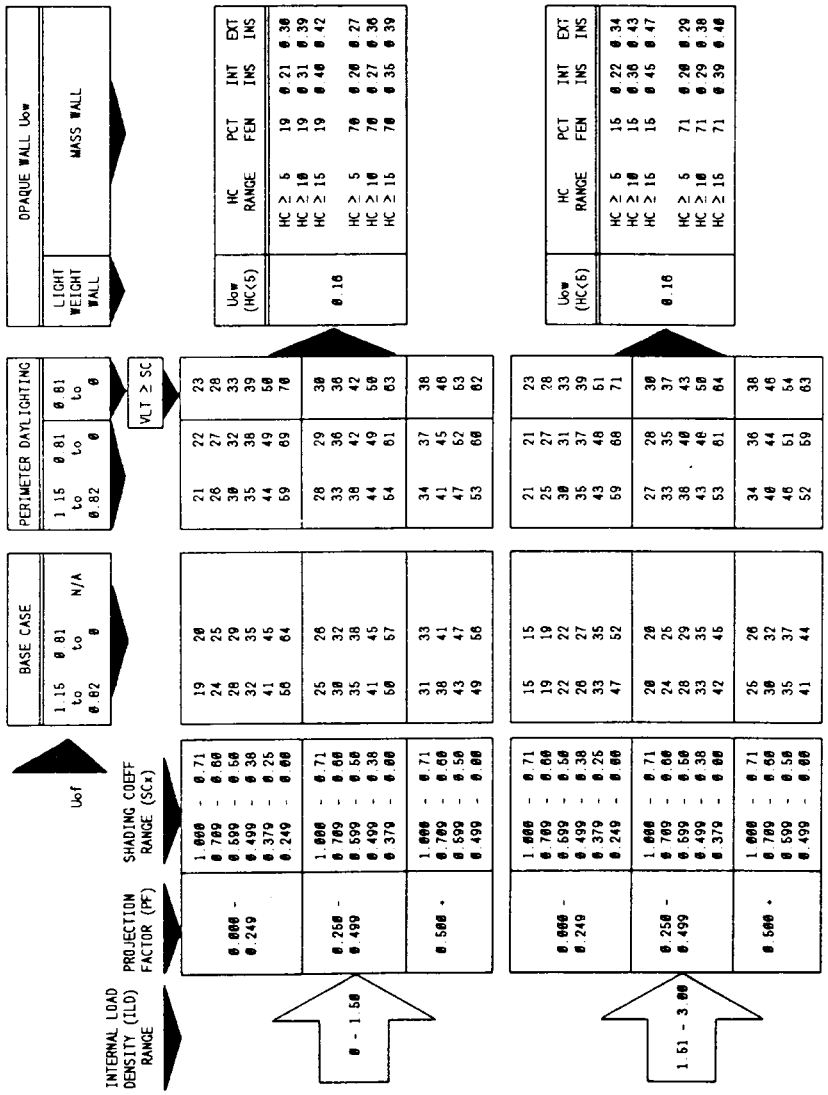

3.01 - 3.50
0.000 - 0.249
1.000 - 0.710
0.709 - 0.600
0.599 - 0.500
0.499 - 0.380
0.379 - 0.250
0.249 - 0.000
0.250 - 0.499
1.000 - 0.710
0.709 - 0.600
0.599 - 0.500
0.499 - 0.380
0.379 - 0.000
0.500 +
1.000 - 0.710
0.709 - 0.600
0.599 - 0.500
0.499 - 0.000
21 25 26
24 31 32
27 35 37
29 40 43
32 48 52
38 59 67
26 33 34
28 38 41
31 43 46
32 49 53
35 56 63
29 40 42
32 46 50
33 51 56
35 56 63
Daylight Sensing Controls
Uow (HC≤5)
HC RANGE
PCT FEN
INT INS
EXT INS
0.099
HC ≥ 5 21 0.10 0.12
HC ≥ 10 21 0.14 0.18
HC ≥ 15 21 0.18 0.21
HC ≥ 5 67 0.10 0.12
HC ≥ 10 67 0.13 0.17
HC ≥ 15 67 0.16 0.19
Min R-Value
Max Uo
WALL BELOW GRADE: 0
ROOF: 0.070
UNHEATED SLAB ON GRADE: 24" 36" 48"
Horizontal 15 13 10
Vertical 7 6 4
WALL ADJACENT TO UNCOND SPACE: 0.15
FLOOR OVER UNCOND SPACE: 0.062

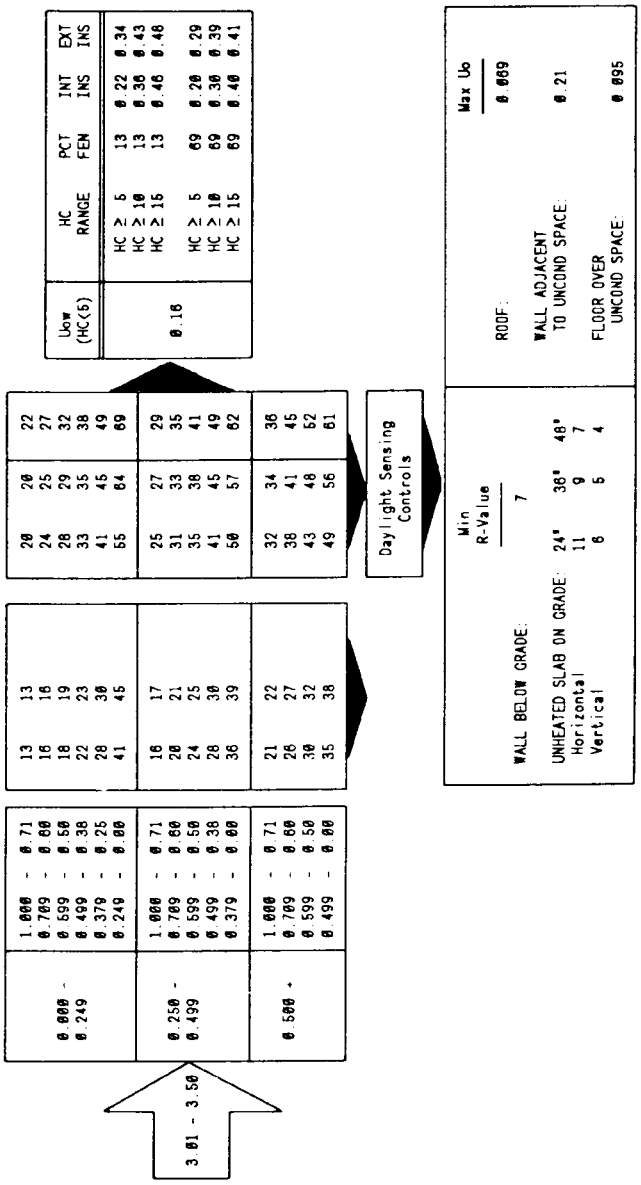

ALTERNATE COMPONENT PACKAGES FOR:
HDD65 = 1 - 1000
CDD65 = 0 - 300
VSEW = > 845
Oakland CA
Point Magu CA
San Francisco CA
Santa Maria CA
Sunnyville CA
TABLE 5.4-6
OPAQUE WALL Uow
LIGHT WEIGHT WALL
MASS WALL
PERIMETER DAYLIGHTING
BASE CASE
VLT ≥ SC
Uof
SHADING COEFF RANGE (SCx)
PROJECTION FACTOR (PF)
INTERNAL LOAD DENSITY (ILD) RANGE
0 - 1.60
1.61 - 3.00
Uow (HC≤5)
HC RANGE
PCT FEN
INT INS
EXT INS
0.15
HC ≥ 5
HC ≥ 10
HC ≥ 15

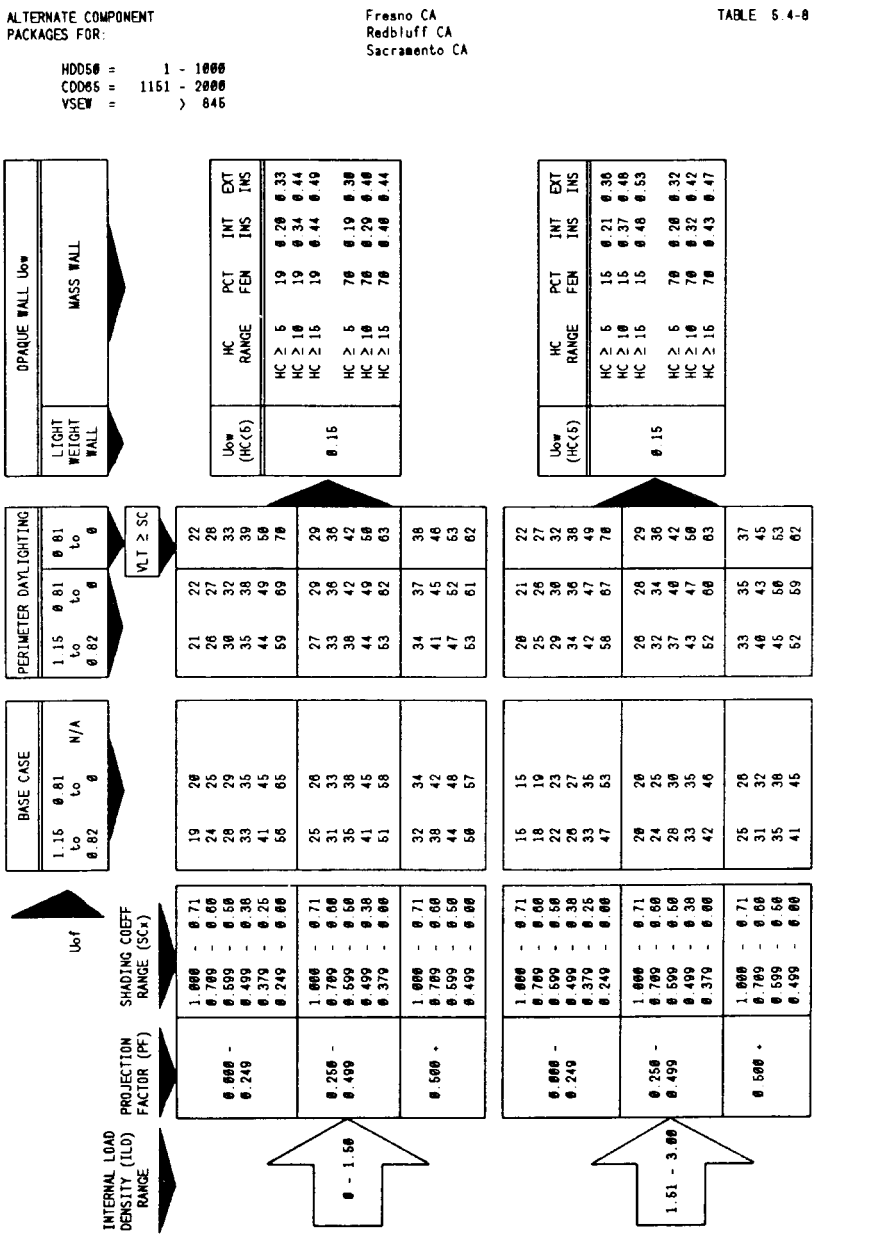

3.01 - 3.50
0.000 - 0.249
0.250 - 0.499
0.500 +
1.000 - 0.71
0.709 - 0.60
0.599 - 0.50
0.499 - 0.38
0.379 - 0.25
0.249 - 0.00
17 17
21 21
24 25
29 30
36 39
49 50
22 23
27 28
31 33
36 39
45 50
28 29
34 36
38 42
44 49
25 28 27
30 32 34
34 37 40
39 43 48
47 54 63
60 72 90
31 34 38
37 41 45
42 47 53
47 54 63
56 66 81
38 42 47
45 50 58
50 57 66
55 65 79
Daylight Sensing Controls
Min R-Value
7
WALL BELOW GRADE:
UNHEATED SLAB ON GRADE: 24" 36" 48"
Horizontal 11 9 7
Vertical 8 5 4
ROOF:
WALL ADJACENT TO UNCOND SPACE:
FLOOR OVER UNCOND SPACE:
Max Uo
0.089
0.21
0.094
Uow (HC≤5)
0.15
HC RANGE
PCT FEN
INT INS
EXT INS
HC ≥ 5 17 0.32 0.53
HC ≥ 10 17 0.53 0.80
HC ≥ 15 17 0.74 0.80
HC ≥ 5 90 0.22 0.39
HC ≥ 10 90 0.39 0.58
HC ≥ 15 90 0.52 0.65

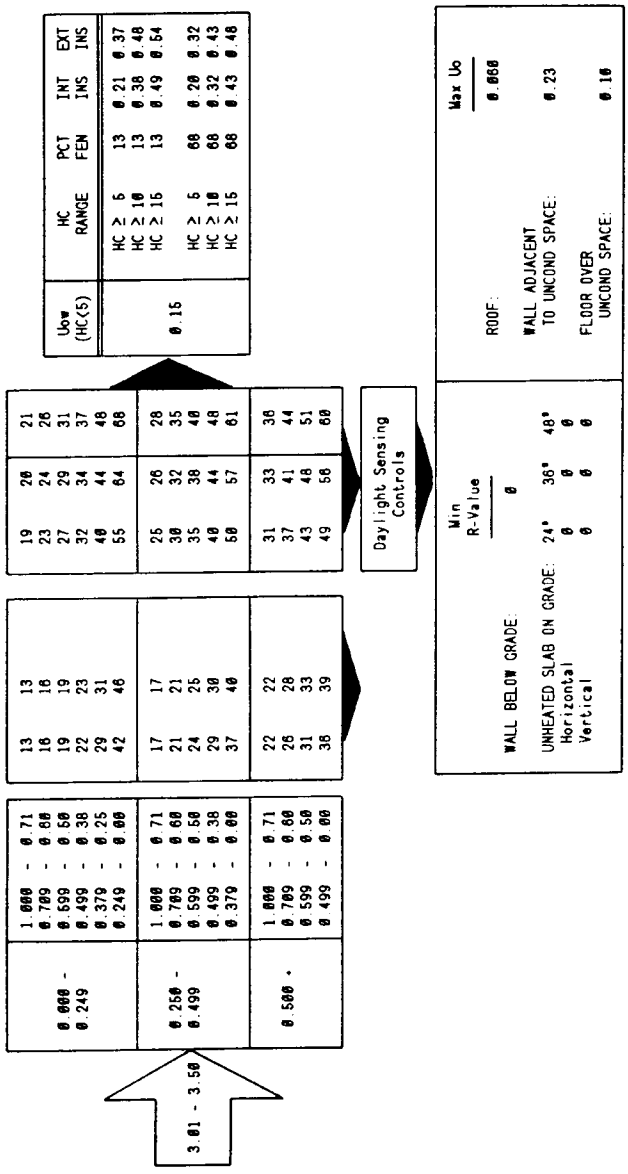

ALTERNATE COMPONENT PACKAGES FOR:
HDD65 = 1 - 1000
CDD65 = 301 - 1150
VSEW = > 846
El Toro CA
Long Beach CA
Los Angeles CA
San Diego CA
TABLE 5.4-6
OPAQUE WALL Uow
LIGHT WEIGHT WALL
MASS WALL
PERIMETER DAYLIGHTING
BASE CASE
VLT ≥ SC
Uof
INTERNAL LOAD DENSITY (ILD) RANGE
PROJECTION FACTOR (PF)
SHADING COEFF RANGE (SCx)
0 - 1.50
1.51 - 3.00

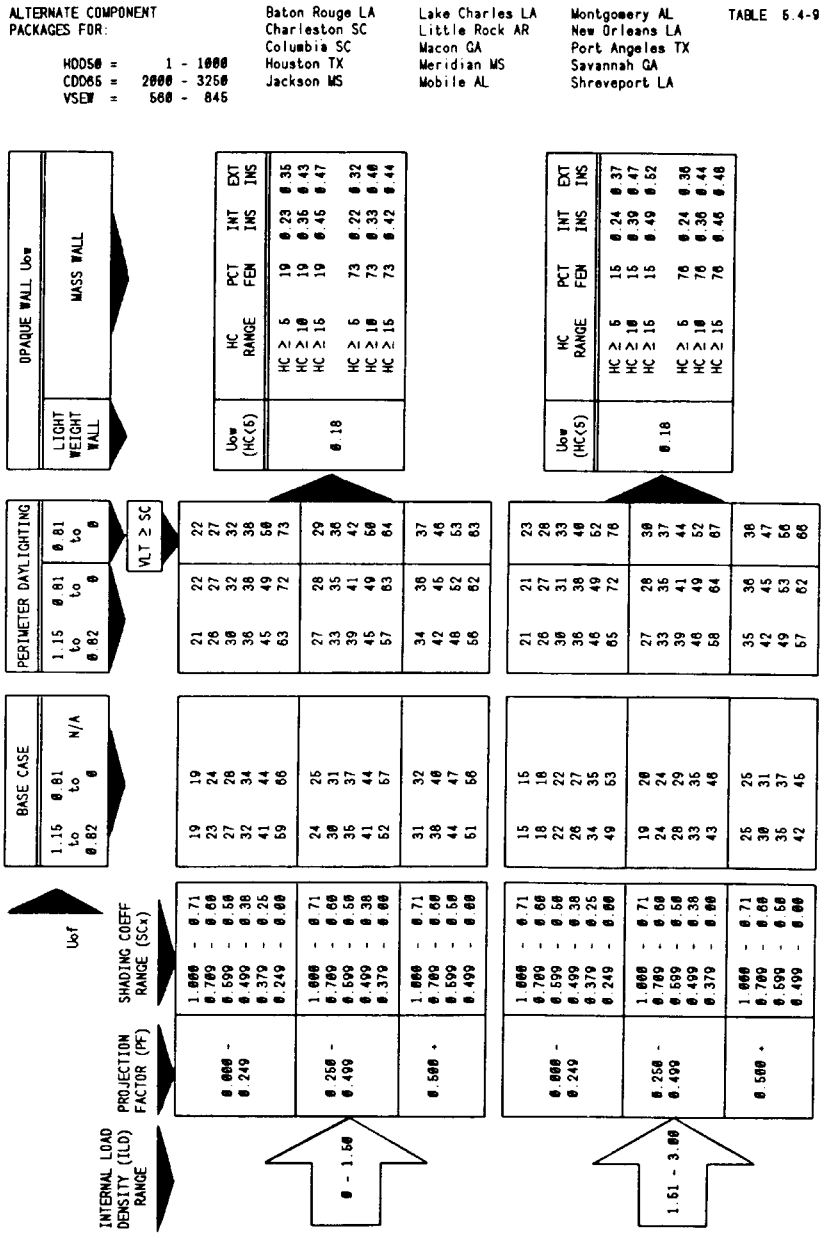

3.01 - 3.50
0.000 - 0.249
0.250 - 0.499
0.500 +
1.000 - 0.71
0.709 - 0.60
0.599 - 0.50
0.499 - 0.38
0.379 - 0.25
0.249 - 0.00
12 12
15 15
18 17
21 21
29 28
45 44
16 15
20 19
23 23
28 28
38 38
20 20
28 25
30 30
37 37
19 19 21
24 24 26
29 29 31
35 35 38
46 46 50
69 70 75
28 26 28
32 32 35
38 38 42
46 46 50
60 61 66
33 33 38
41 42 45
49 49 54
59 60 65
Daylight Sensing Controls
Uow (HC(5)
0.23
HC RANGE
PCT FEN
INT INS
EXT INS
HC ≥ 5 12 0.00 0.00
HC ≥ 10 12 0.00 0.00
HC ≥ 15 12 0.00 0.00
HC ≥ 5 75 0.72 0.00
HC ≥ 10 75 0.00 0.00
HC ≥ 15 75 0.00 0.00
Min R-Value
WALL BELOW GRADE: 0
UNHEATED SLAB ON GRADE: 24' 36' 48'
Horizontal 0 0 0
Vertical 0 0 0
Max Uo
ROOF: 0.10
WALL ADJACENT TO UNCOND SPACE: 0.30
FLOOR OVER UNCOND SPACE: 0.10

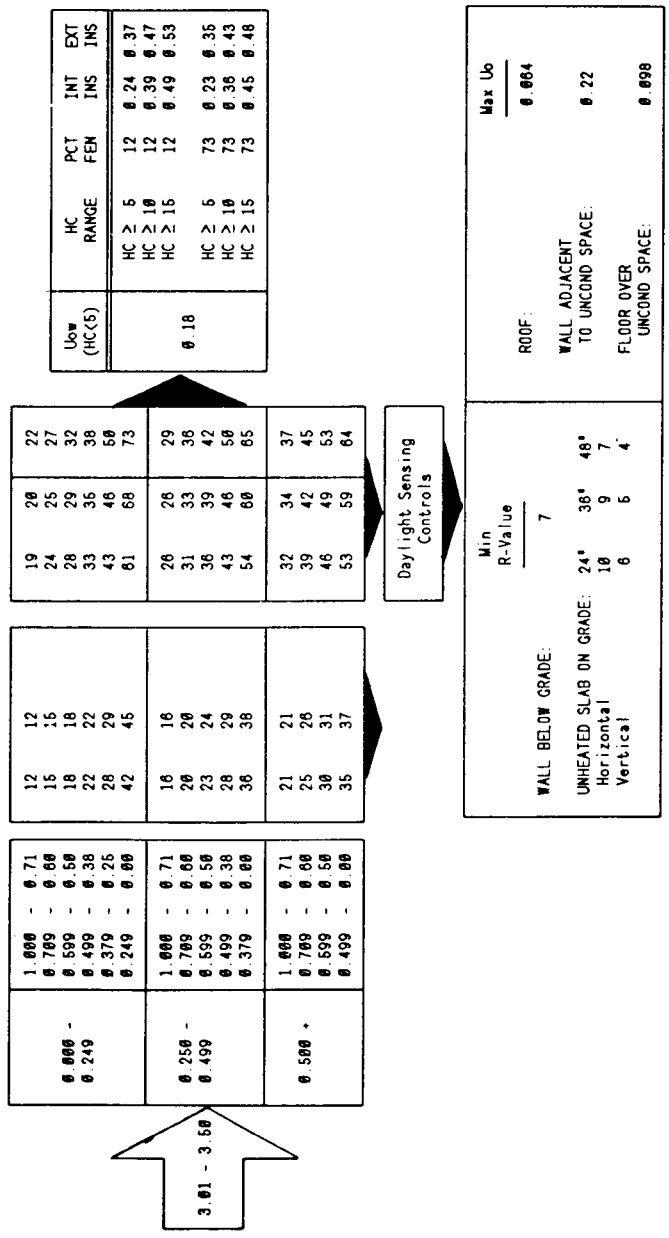

ALTERNATE COMPONENT PACKAGES FOR:
HDD65 = 1 - 1000
CDD65 = 1151 - 2000
VSEW = 560 - 845
Atlanta GA
Birmingham AL
Cape Hatteras NC
Cherry Point NC
Greenville SC
TABLE 5.4-7
OPAQUE WALL Uow
LIGHT WEIGHT WALL
MASS WALL
Uow (HC≤5)
HC RANGE
PCT FEN
INT INS
EXT INS
HC ≥ 5
HC ≥ 10
HC ≥ 15
0.10
Uow (HC≤6)
PERIMETER DAYLIGHTING
1.15 to 0.82
0.81 to 0
0.81 to 0
VLT ≥ SC
BASE CASE
1.15 to 0.82
0.81 to 0
N/A
Uof
SHADING COEFF RANGE (SCx)
PROJECTION FACTOR (PF)
INTERNAL LOAD DENSITY (ILD) RANGE
0 - 1.50
1.51 - 3.00
0.000 - 0.249
0.250 - 0.499
0.500 +

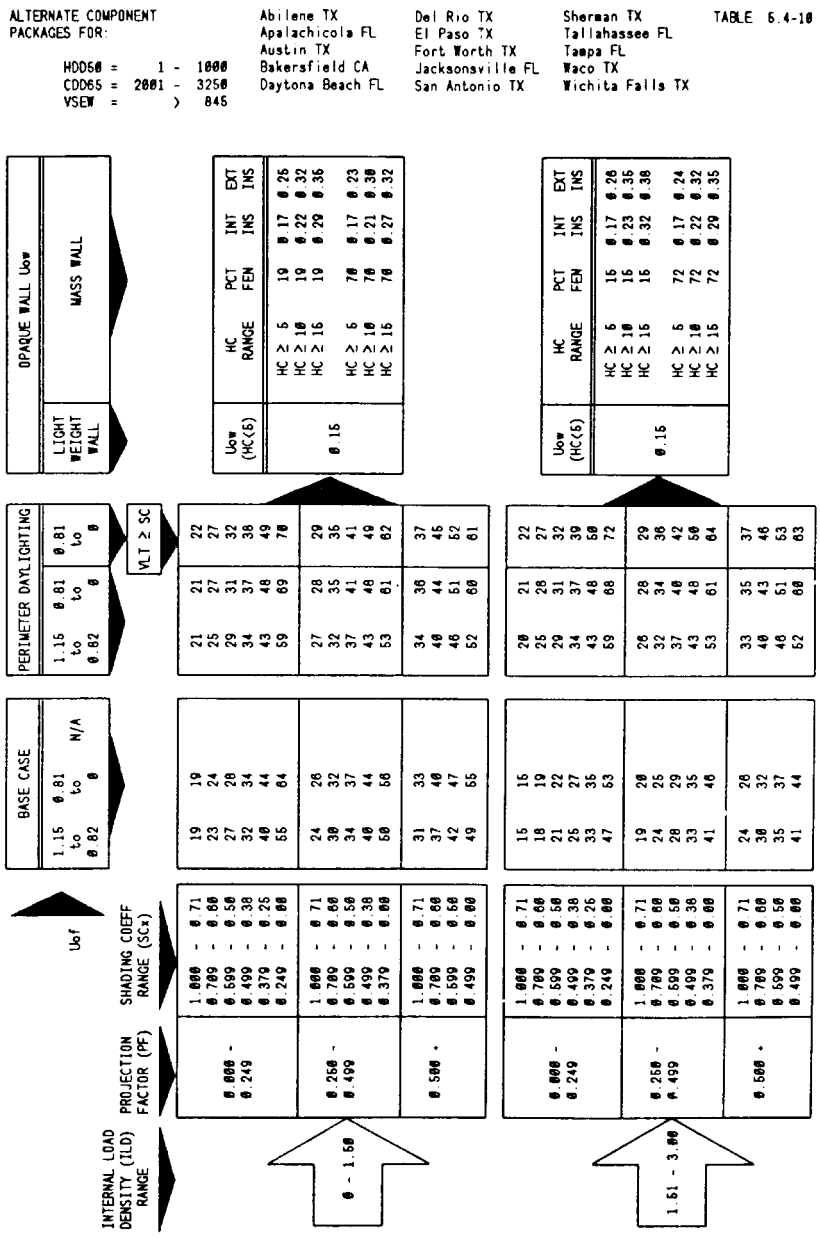

3.01 - 3.50
0.000 - 0.249
0.250 - 0.499
0.500 +
1.000 - 0.710
0.709 - 0.600
0.599 - 0.500
0.499 - 0.380
0.379 - 0.250
0.249 - 0.000
13 13
16 16
18 19
22 23
28 30
41 45
16 17
20 21
24 25
28 30
36 39
21 22
26 27
30 32
35 38
20 20 22
24 25 27
28 29 32
33 35 38
41 45 49
55 64 69
25 27 29
31 33 35
35 38 41
41 45 49
50 57 62
32 34 36
38 41 45
43 48 52
49 56 61
Daylight Sensing Controls
Low (HC<6)
0.18
HC RANGE
PCT FEN
INT INS
EXT INS
HC ≥ 5 13 0.22 0.34
HC ≥ 10 13 0.36 0.43
HC ≥ 15 13 0.46 0.48
HC ≥ 5 69 0.20 0.29
HC ≥ 10 69 0.30 0.39
HC ≥ 15 69 0.40 0.41
Min R-Value
7
WALL BELOW GRADE:
UNHEATED SLAB ON GRADE: 24" 36" 48"
Horizontal 11 9 7
Vertical 6 5 4
Max Uo
ROOF: 0.069
WALL ADJACENT TO UNCOND SPACE: 0.21
FLOOR OVER UNCOND SPACE: 0.095

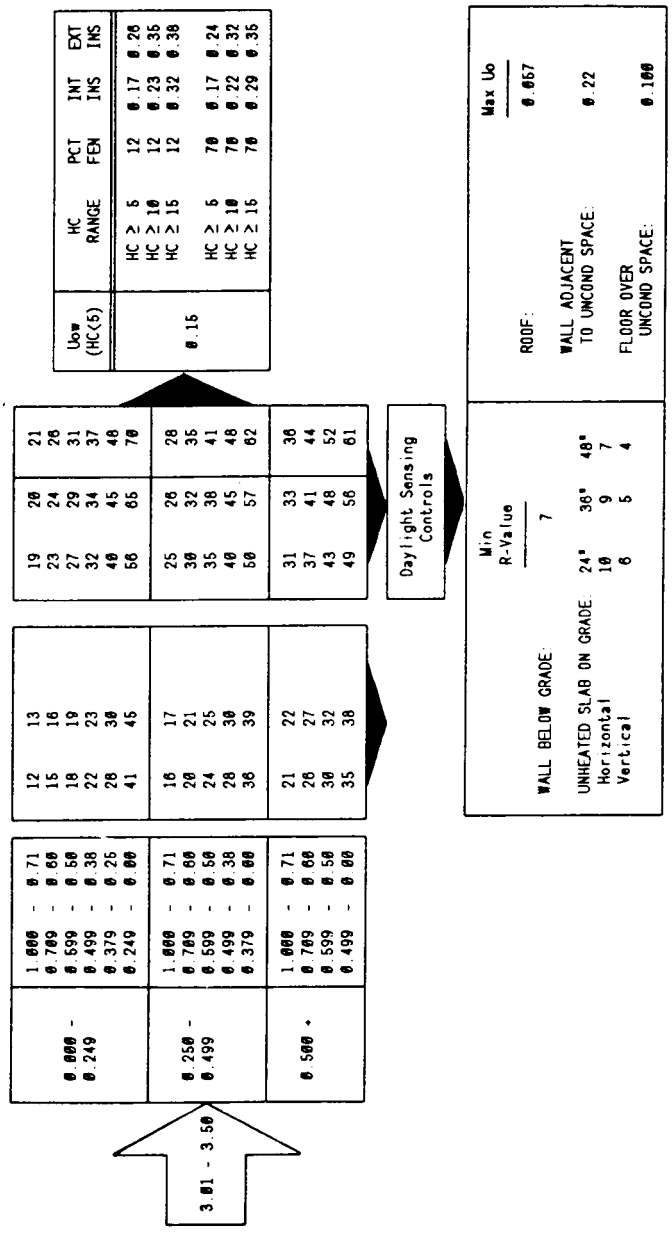

ALTERNATE COMPONENT PACKAGES FOR:
HDD50 = 1 - 1000
CDD65 = 1151 - 2000
VSEW = > 845
Fresno CA
Redbluff CA
Sacramento CA
TABLE 5.4-8
OPAQUE WALL Uow
LIGHT WEIGHT WALL
MASS WALL
PERIMETER DAYLIGHTING
BASE CASE
Uof
SHADING COEFF RANGE (SCx)
PROJECTION FACTOR (PF)
INTERNAL LOAD DENSITY (ILD) RANGE
VLT ≥ SC
Uow (HC<6)
HC RANGE
PCT FEN
INT INS
EXT INS
0 - 1.50
1.51 - 3.00

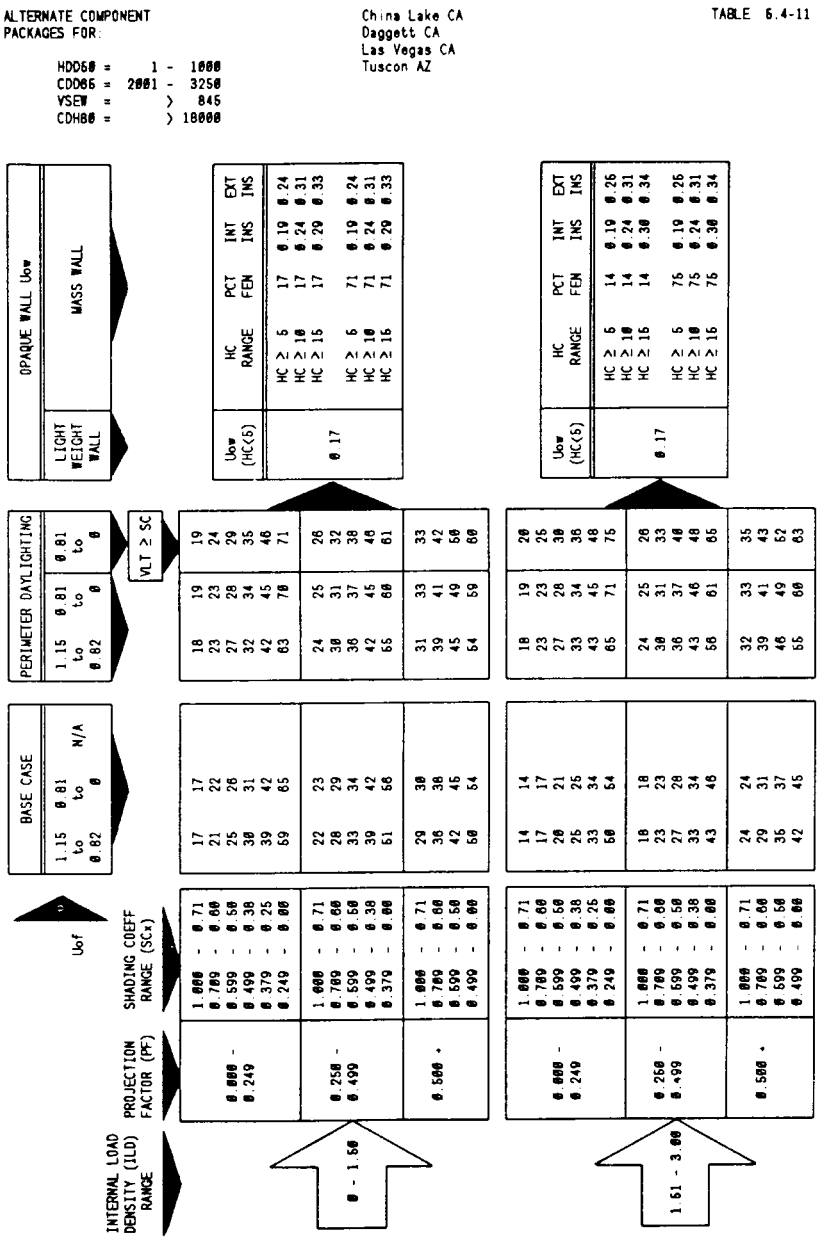

3.01 - 3.50
0.000 - 0.249
1.000 - 0.71
0.709 - 0.60
0.599 - 0.50
0.499 - 0.38
0.379 - 0.25
0.249 - 0.00
0.250 - 0.499
1.000 - 0.71
0.709 - 0.60
0.599 - 0.50
0.499 - 0.38
0.379 - 0.00
0.500 +
1.000 - 0.71
0.709 - 0.60
0.599 - 0.50
0.499 - 0.00
13 13
16 16
19 19
22 23
29 31
42 46
17 17
21 21
24 25
29 30
37 40
22 22
28 28
31 33
38 39
19 20 21
23 24 26
27 29 31
32 34 37
40 44 48
55 64 68
25 26 28
30 32 35
35 38 40
40 44 48
50 57 61
31 33 38
37 41 44
43 48 51
49 58 60
Daylight Sensing Controls
Uow (HC≤5)
0.15
HC RANGE
PCT FEN
INT INS
EXT INS
HC ≥ 5 13 0.21 0.37
HC ≥ 10 13 0.38 0.48
HC ≥ 15 13 0.49 0.64
HC ≥ 5 60 0.20 0.32
HC ≥ 10 60 0.32 0.43
HC ≥ 15 60 0.43 0.48
Min R-Value
0
WALL BELOW GRADE:
UNHEATED SLAB ON GRADE: 24' 36' 48'
Horizontal 0 0 0
Vertical 0 0 0
Max Uo
0.060
ROOF:
WALL ADJACENT TO UNCOND SPACE: 0.23
FLOOR OVER UNCOND SPACE: 0.16

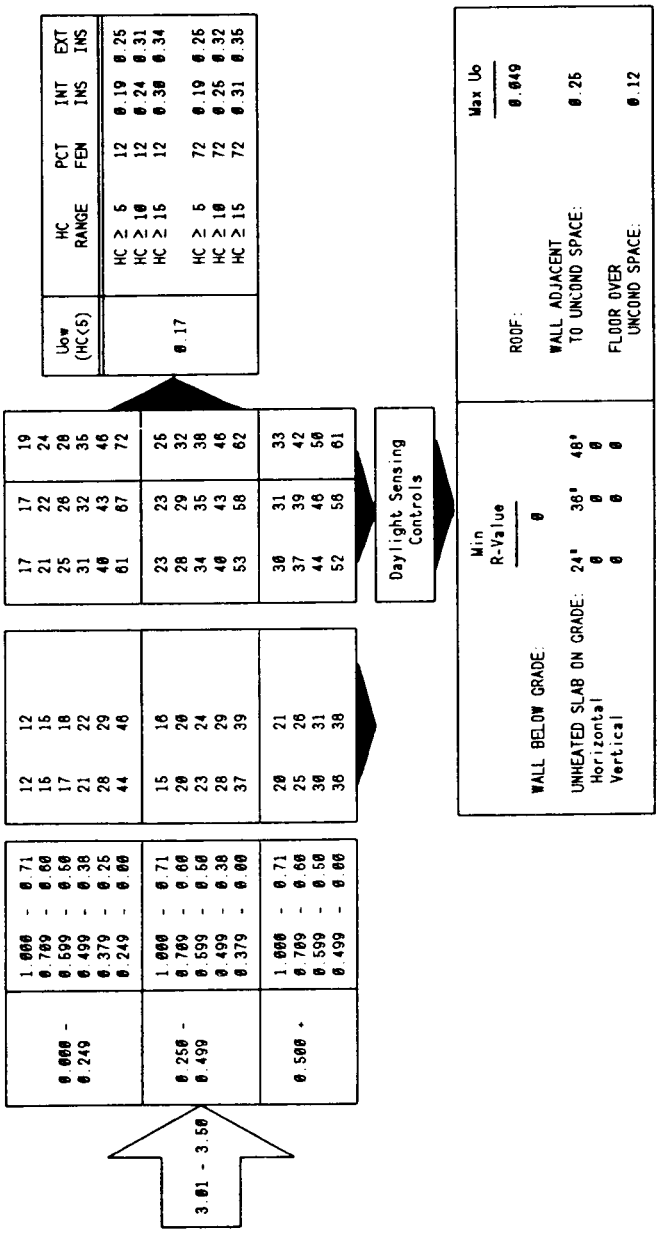

ALTERNATE COMPONENT PACKAGES FOR:
HDD65 = 1 - 1000
CDD65 = 2000 - 3250
VSEW = 560 - 845
Baton Rouge LA
Charleston SC
Columbia SC
Houston TX
Jackson MS
Lake Charles LA
Little Rock AR
Macon GA
Meridian MS
Mobile AL
Montgomery AL
New Orleans LA
Port Angeles TX
Savannah GA
Shreveport LA
TABLE 5.4-9
OPAQUE WALL Uow
LIGHT WEIGHT WALL
MASS WALL
PERIMETER DAYLIGHTING
BASE CASE
VLT ≥ SC
Uof
SHADING COEFF RANGE (SCx)
PROJECTION FACTOR (PF)
INTERNAL LOAD DENSITY (ILD) RANGE
0 - 1.60
1.61 - 3.00

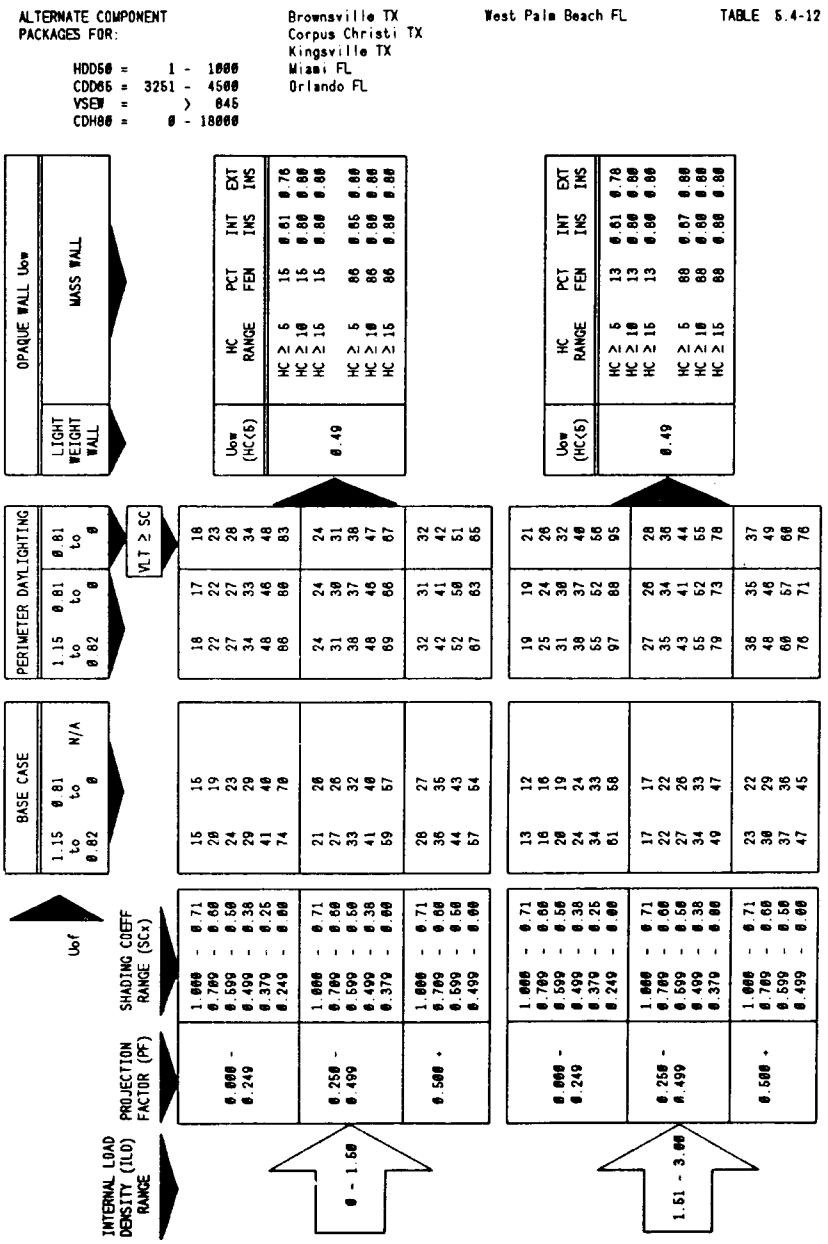

3.01 - 3.50
0.000 - 0.249
0.250 - 0.499
0.500 +
1.000 - 0.710
0.709 - 0.600
0.599 - 0.500
0.499 - 0.380
0.379 - 0.250
0.249 - 0.000
12 12
15 15
18 18
22 22
28 29
42 45
16 16
20 20
23 24
28 29
36 38
21 21
25 28
30 31
35 37
19 20 22
24 25 27
28 29 32
33 36 38
43 46 50
61 68 73
26 28 29
31 33 36
36 39 42
43 46 50
54 60 65
32 34 37
39 42 45
46 49 53
53 59 64
Daylight Sensing Controls
Min R-Value
WALL BELOW GRADE: 7
UNHEATED SLAB ON GRADE: 24" 36" 48"
Horizontal 10 9 7
Vertical 6 6 4
Max Uo
ROOF: 0.064
WALL ADJACENT TO UNCOND SPACE: 0.22
FLOOR OVER UNCOND SPACE: 0.098
Uow (HC(5)
0.18
HC RANGE
PCT FEN
INT INS
EXT INS
HC ≥ 5 12 0.24 0.37
HC ≥ 10 12 0.39 0.47
HC ≥ 15 12 0.49 0.53
HC ≥ 5 73 0.23 0.35
HC ≥ 10 73 0.36 0.43
HC ≥ 15 73 0.45 0.48

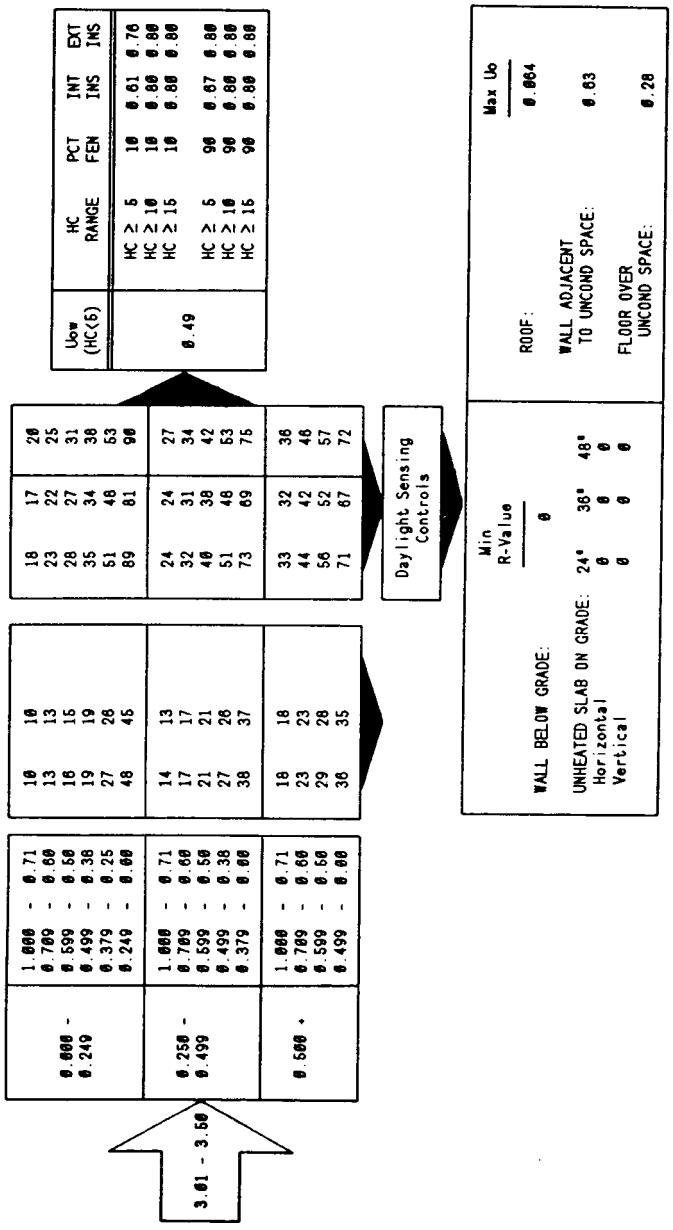

ALTERNATE COMPONENT PACKAGES FOR:
HDD65 = 1 - 1000
CDD65 = 2001 - 3250
VSEW = > 845
Abilene TX
Apalachicola FL
Austin TX
Bakersfield CA
Daytona Beach FL
Del Rio TX
El Paso TX
Fort Worth TX
Jacksonsville FL
San Antonio TX
Sherman TX
Tallahassee FL
Tampa FL
Waco TX
Wichita Falls TX
TABLE 6.4-10
OPAQUE WALL Uow
LIGHT WEIGHT WALL
MASS WALL
Uow (HC<6)
HC RANGE
PCT FEN
INT INS
EXT INS
HC ≥ 6
HC ≥ 10
HC ≥ 16
0.15
0.17 0.25
0.22 0.32
0.29 0.36
0.17 0.23
0.21 0.30
0.27 0.32
0.16
0.17 0.26
0.23 0.35
0.32 0.38
0.17 0.24
0.22 0.32
0.29 0.35
PERIMETER DAYLIGHTING
1.15 to 0.82
0.81 to 0
0.81 to 0
VLT ≥ SC
BASE CASE
1.15 to 0.82
0.81 to 0
N/A
Uof
SHADING COEFF RANGE (SCx)
1.000 - 0.71
0.709 - 0.60
0.599 - 0.50
0.499 - 0.38
0.379 - 0.25
0.249 - 0.00
PROJECTION FACTOR (PF)
0.000 - 0.249
0.250 - 0.499
0.500 +
INTERNAL LOAD DENSITY (ILD) RANGE
0 - 1.50
1.51 - 3.00

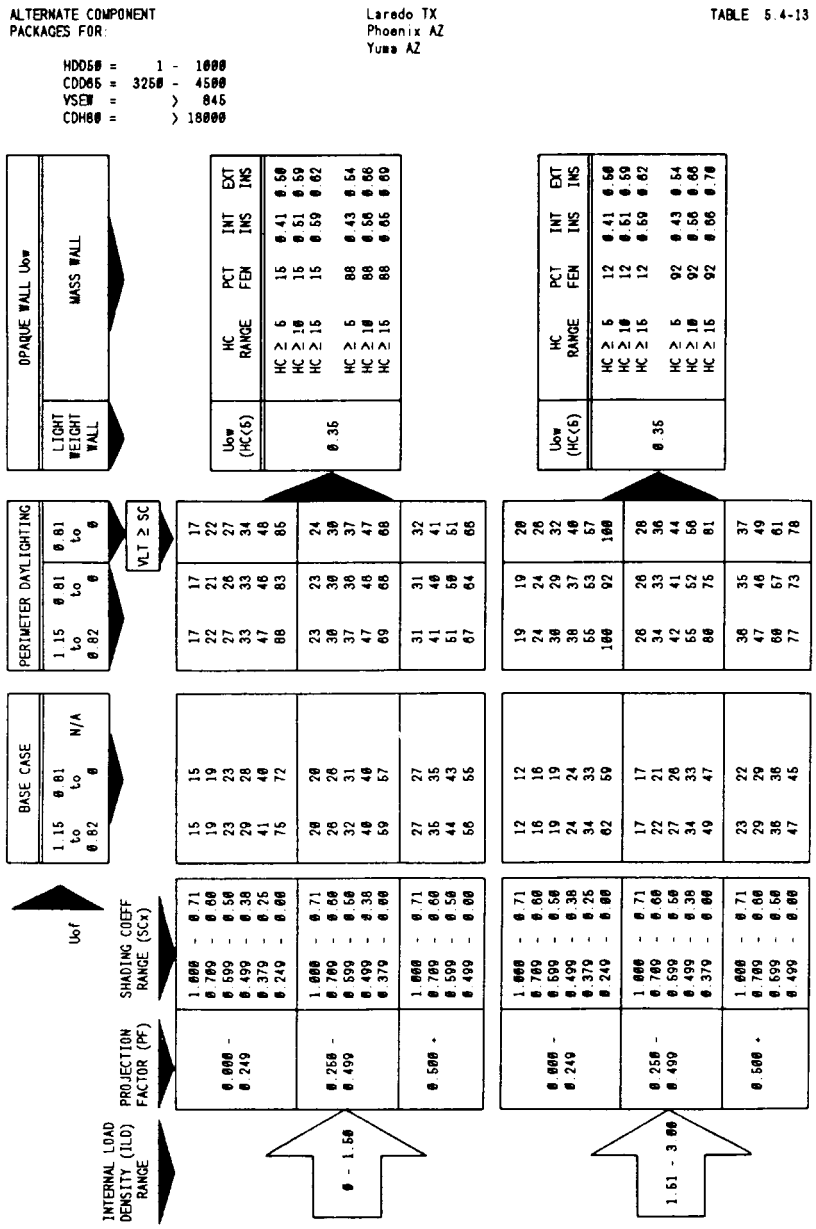

3.01 - 3.50
0.000 - 0.249
0.250 - 0.499
0.500 +
1.000 - 0.71
0.709 - 0.60
0.599 - 0.50
0.499 - 0.38
0.379 - 0.25
0.249 - 0.00
12 13
15 16
18 19
22 23
28 30
41 45
16 17
20 21
24 25
28 30
38 39
21 22
26 27
30 32
35 38
19 20 21
23 24 26
27 29 31
32 34 37
40 45 48
56 65 70
25 28 28
30 32 35
35 38 41
40 45 48
50 57 62
31 33 36
37 41 44
43 48 52
49 56 61
Daylight Sensing Controls
Min R-Value
WALL BELOW GRADE: 7
UNHEATED SLAB ON GRADE: 24" 36" 48"
Horizontal 10 9 7
Vertical 6 5 4
Uow (HC(5))
0.16
HC RANGE
PCT FEN
INT INS
EXT INS
HC ≥ 5 12 0.17 0.20
HC ≥ 10 12 0.23 0.35
HC ≥ 15 12 0.32 0.38
HC ≥ 5 70 0.17 0.24
HC ≥ 10 70 0.22 0.32
HC ≥ 15 70 0.29 0.36
Max Uo
ROOF: 0.057
WALL ADJACENT TO UNCOND SPACE: 0.22
FLOOR OVER UNCOND SPACE: 0.100

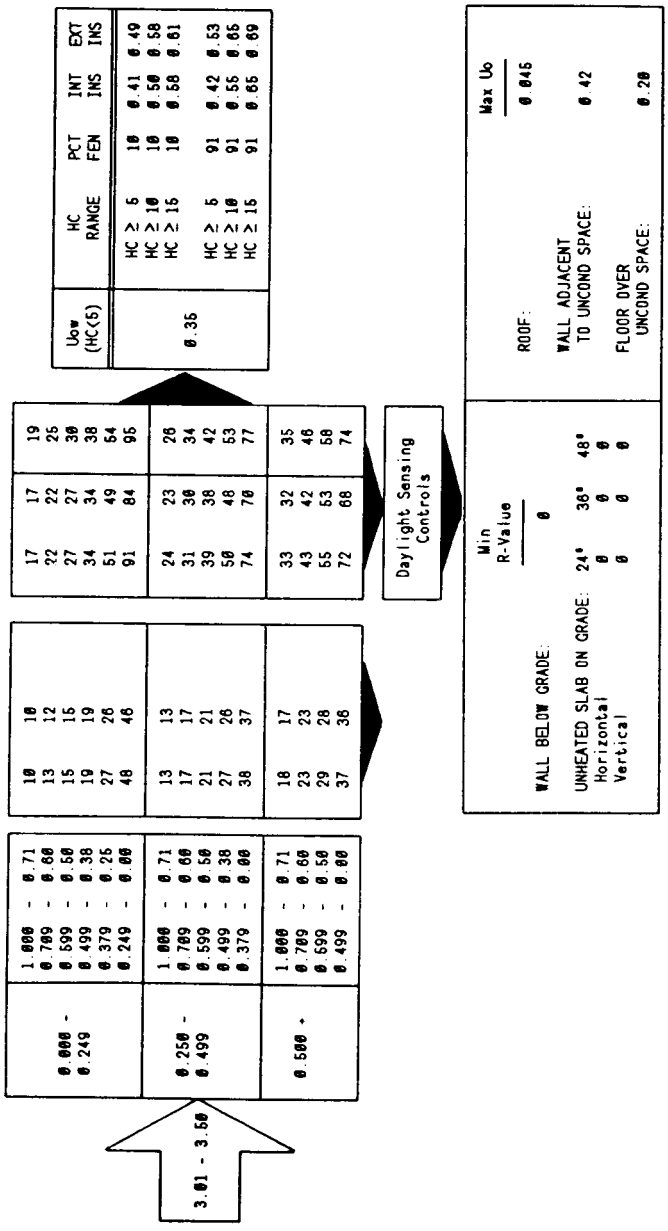

ALTERNATE COMPONENT PACKAGES FOR:
HDD65 = 1 - 1000
CDD65 = 2001 - 3250
VSEW = > 845
CDH80 = > 10000
China Lake CA
Daggett CA
Las Vegas CA
Tuscon AZ
TABLE 5.4-11
OPAQUE WALL Uow
LIGHT WEIGHT WALL
MASS WALL
PERIMETER DAYLIGHTING
1.15 to 0.82
0.81 to 0
0.81 to 0
VLT ≥ SC
BASE CASE
1.15 to 0.82
0.81 to 0
N/A
Uof
INTERNAL LOAD DENSITY (ILD) RANGE
PROJECTION FACTOR (PF)
SHADING COEFF RANGE (SCx)
0 - 1.50
1.61 - 3.00
0.000 - 0.249
0.250 - 0.499
0.500 +
1.000 - 0.700
0.700 - 0.599
0.599 - 0.499
0.499 - 0.379
0.379 - 0.249
Uow (HC(5))
0.17
HC RANGE
HC ≥ 5
HC ≥ 10
HC ≥ 15
PCT FEN
INT INS
EXT INS

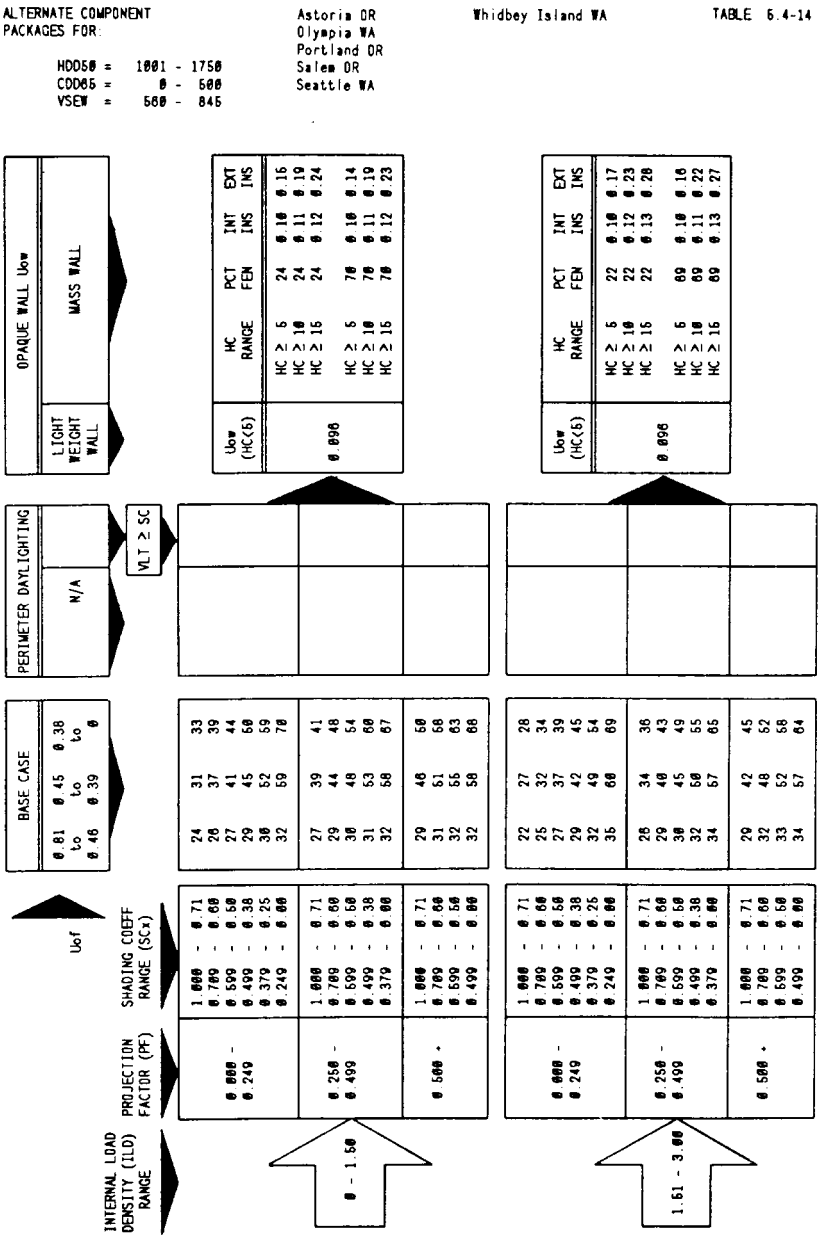

3.01 - 3.50
0.000 - 0.249
1.000 - 0.71
0.709 - 0.60
0.599 - 0.50
0.499 - 0.38
0.379 - 0.25
0.249 - 0.00
12 12
16 16
17 18
21 22
28 29
44 46
0.250 - 0.499
1.000 - 0.71
0.709 - 0.60
0.599 - 0.50
0.499 - 0.38
0.379 - 0.00
15 16
20 20
23 24
28 29
37 39
0.500 +
1.000 - 0.71
0.709 - 0.60
0.599 - 0.50
0.499 - 0.00
20 21
25 26
30 31
38 38
17 17 19
21 22 24
25 28 28
31 32 36
40 43 46
61 67 72
23 23 25
28 29 32
34 35 38
40 43 46
53 58 62
30 31 33
37 39 42
44 46 50
52 58 61
Daylight Sensing Controls
Uow (HC(5)
HC RANGE
PCT FEN
INT INS
EXT INS
0.17
HC ≥ 5 12 0.19 0.25
HC ≥ 10 12 0.24 0.31
HC ≥ 15 12 0.30 0.34
HC ≥ 5 72 0.19 0.25
HC ≥ 10 72 0.25 0.32
HC ≥ 15 72 0.31 0.35
Min R-Value
Max Uo
ROOF: 0.049
WALL BELOW GRADE: 0
WALL ADJACENT TO UNCOND SPACE: 0.26
UNHEATED SLAB ON GRADE: 24' 36' 48'
Horizontal 0 0 0
Vertical 0 0 0
FLOOR OVER UNCOND SPACE: 0.12

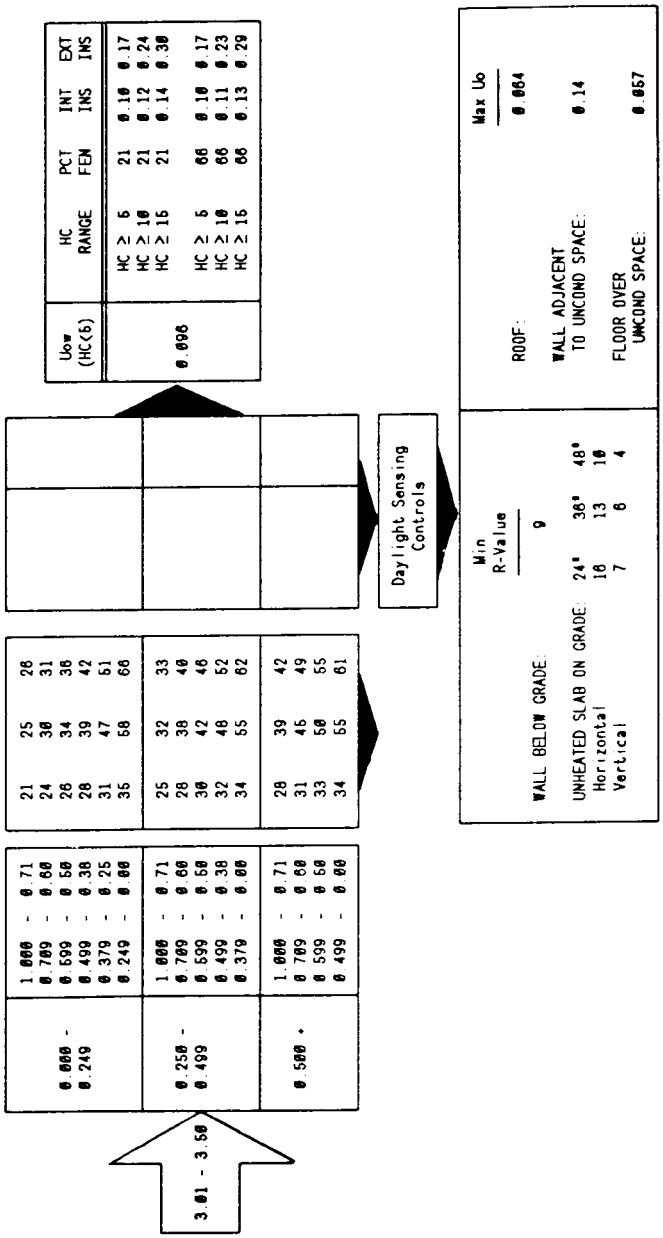

ALTERNATE COMPONENT PACKAGES FOR:
HDD50 = 1 - 1000
CDD65 = 3251 - 4500
VSEW = > 845
CDH80 = 0 - 18000
Brownsville TX
Corpus Christi TX
Kingsville TX
Miami FL
Orlando FL
West Palm Beach FL
TABLE 5.4-12
OPAQUE WALL Uow
LIGHT WEIGHT WALL
MASS WALL
Uow (HC≤6)
HC RANGE
PCT FEN
INT INS
EXT INS
0.49
HC ≥ 5 15 0.61 0.70
HC ≥ 10 15 0.80 0.00
HC ≥ 15 15 0.80 0.00
HC ≥ 5 80 0.66 0.00
HC ≥ 10 80 0.80 0.00
HC ≥ 15 80 0.80 0.00
HC ≥ 5 13 0.61 0.70
HC ≥ 10 13 0.80 0.00
HC ≥ 15 13 0.80 0.00
HC ≥ 5 80 0.67 0.00
HC ≥ 10 80 0.80 0.00
HC ≥ 15 80 0.80 0.00
PERIMETER DAYLIGHTING
1.15 to 0.82
0.81 to 0
VLT ≥ SC
BASE CASE
1.15 to 0.82
0.81 to 0
N/A
Uof
SHADING COEFF RANGE (SCx)
PROJECTION FACTOR (PF)
INTERNAL LOAD DENSITY (ILD) RANGE
1.000 - 0.71
0.709 - 0.60
0.599 - 0.50
0.499 - 0.38
0.379 - 0.25
0.249 - 0.00
0.000 - 0.249
0.250 - 0.499
0.500 +
0 - 1.50
1.51 - 3.00
15 15
20 19
24 23
29 29
41 40
74 70
21 20
27 26
33 32
41 40
59 57
28 27
36 35
44 43
57 54
13 12
16 16
20 19
24 24
34 33
61 58
17 17
22 22
27 26
34 33
49 47
23 22
30 29
37 36
47 45
18 17 18
22 22 23
27 27 28
34 33 34
48 46 48
86 80 83
24 24 24
31 30 31
38 37 38
48 46 47
69 66 67
32 31 32
42 41 42
52 50 51
67 63 65
19 19 21
25 24 26
31 30 32
38 37 40
55 52 56
97 88 95
27 26 28
35 34 36
43 41 44
55 52 55
79 73 78
38 35 37
48 46 49
60 57 60
76 71 78

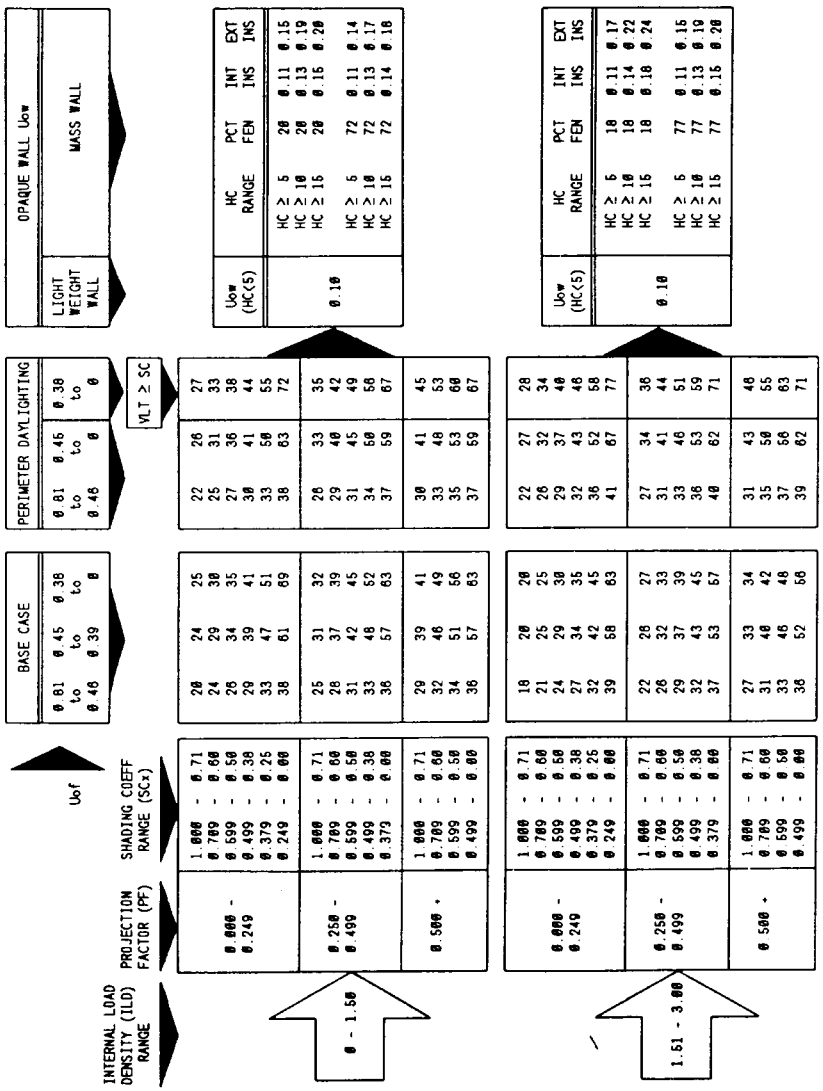

3.61 - 3.80
0.000 - 0.249
0.250 - 0.499
0.500 +
1.000 - 0.710
0.709 - 0.600
0.599 - 0.500
0.499 - 0.380
0.379 - 0.250
0.249 - 0.000
10 10
13 13
16 16
19 19
27 28
48 45
14 13
17 17
21 21
27 28
38 37
18 18
23 23
29 28
36 35
18 17 20
23 22 25
28 27 31
35 34 38
51 48 53
89 81 90
24 24 27
32 31 34
40 38 42
51 48 53
73 69 75
33 32 36
44 42 46
56 52 57
71 67 72
Daylight Sensing Controls
Min R-Value
WALL BELOW GRADE: 0
UNHEATED SLAB ON GRADE: 24" 36" 48"
Horizontal 0 0 0
Vertical 0 0 0
Uow (HC(6))
0.49
HC RANGE
PCT FEN
INT INS
EXT INS
HC ≥ 5 10 0.61 0.76
HC ≥ 10 10 0.80 0.80
HC ≥ 15 10 0.80 0.80
HC ≥ 5 90 0.67 0.80
HC ≥ 10 90 0.80 0.80
HC ≥ 15 90 0.80 0.80
Max Uo
ROOF: 0.064
WALL ADJACENT TO UNCOND SPACE: 0.83
FLOOR OVER UNCOND SPACE: 0.28

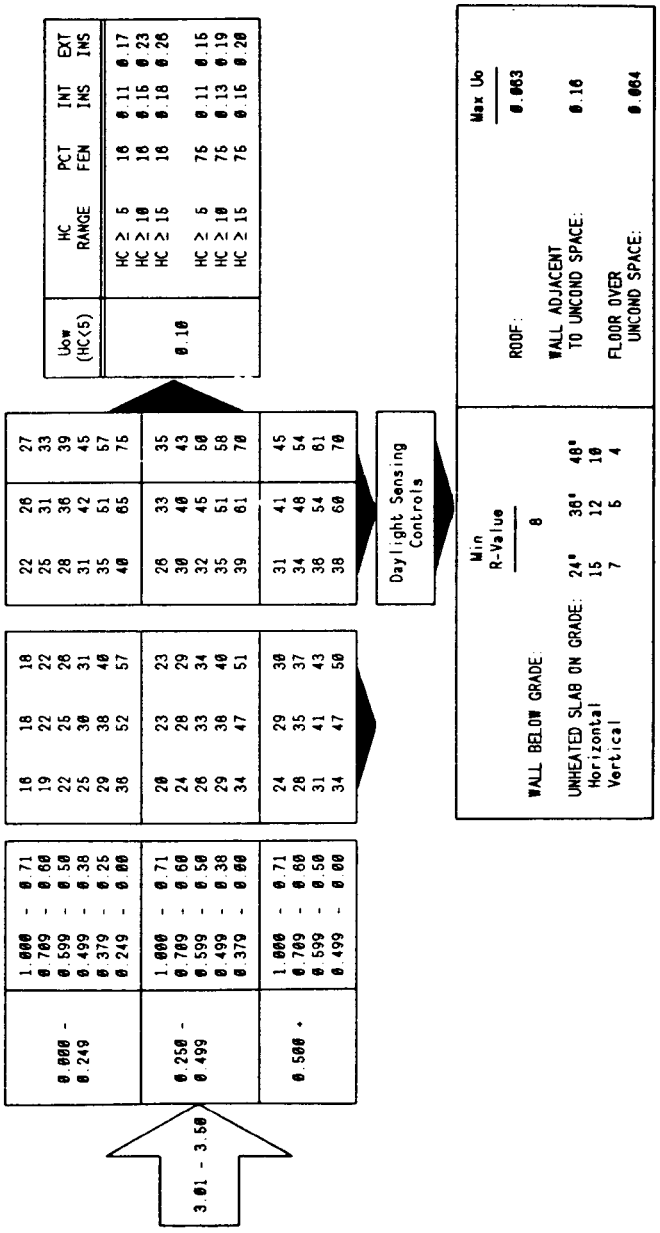

ALTERNATE COMPONENT PACKAGES FOR:
HDD65 = 1 - 1000
CDD65 = 3250 - 4500
VSEW = > 845
CDH80 = > 18000
Laredo TX
Phoenix AZ
Yuma AZ
TABLE 5.4-13
OPAQUE WALL Uow
LIGHT WEIGHT WALL
MASS WALL
PERIMETER DAYLIGHTING
VLT ≥ SC
BASE CASE
Uof
SHADING COEFF RANGE (SCx)
PROJECTION FACTOR (PF)
INTERNAL LOAD DENSITY (ILD) RANGE
0 - 1.50
1.51 - 3.00
Uow (HC(6))
HC RANGE
PCT FEN
INT INS
EXT INS
0.35

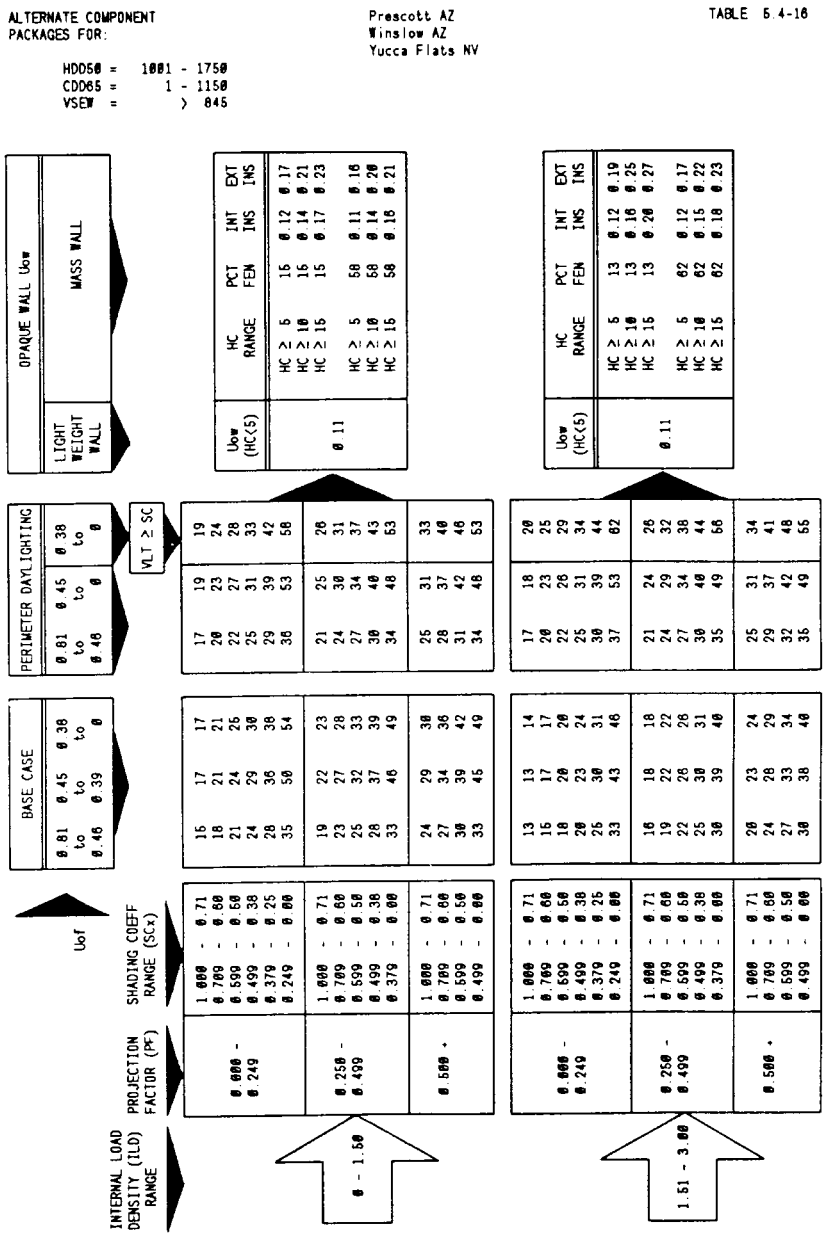

3.01 - 3.50
0.000 - 0.249
0.250 - 0.499
0.500 +
1.000 - 0.710
0.709 - 0.600
0.599 - 0.500
0.499 - 0.380
0.379 - 0.250
0.249 - 0.000
10 10
13 12
15 15
19 19
27 26
48 46
13 13
17 17
21 21
27 26
38 37
18 17
23 23
29 28
37 36
17 17
22 22
27 27
34 34
51 49
91 84
24 23
31 30
39 38
50 48
74 70
33 32
43 42
55 53
72 68
19
25
30
38
54
95
28
34
42
53
77
35
46
58
74
Daylight Sensing Controls
Uow (HC<6)
HC RANGE
PCT FEN
INT INS
EXT INS
0.36
HC ≥ 5 10 0.41 0.49
HC ≥ 10 10 0.50 0.58
HC ≥ 15 10 0.58 0.81
HC ≥ 5 90 0.42 0.53
HC ≥ 10 90 0.55 0.65
HC ≥ 15 90 0.65 0.69
Min R-Value
WALL BELOW GRADE: 0
UNHEATED SLAB ON GRADE: 24" 36" 48"
Horizontal 0 0 0
Vertical 0 0 0
Max Uo
ROOF: 0.045
WALL ADJACENT TO UNCOND SPACE: 0.42
FLOOR OVER UNCOND SPACE: 0.28

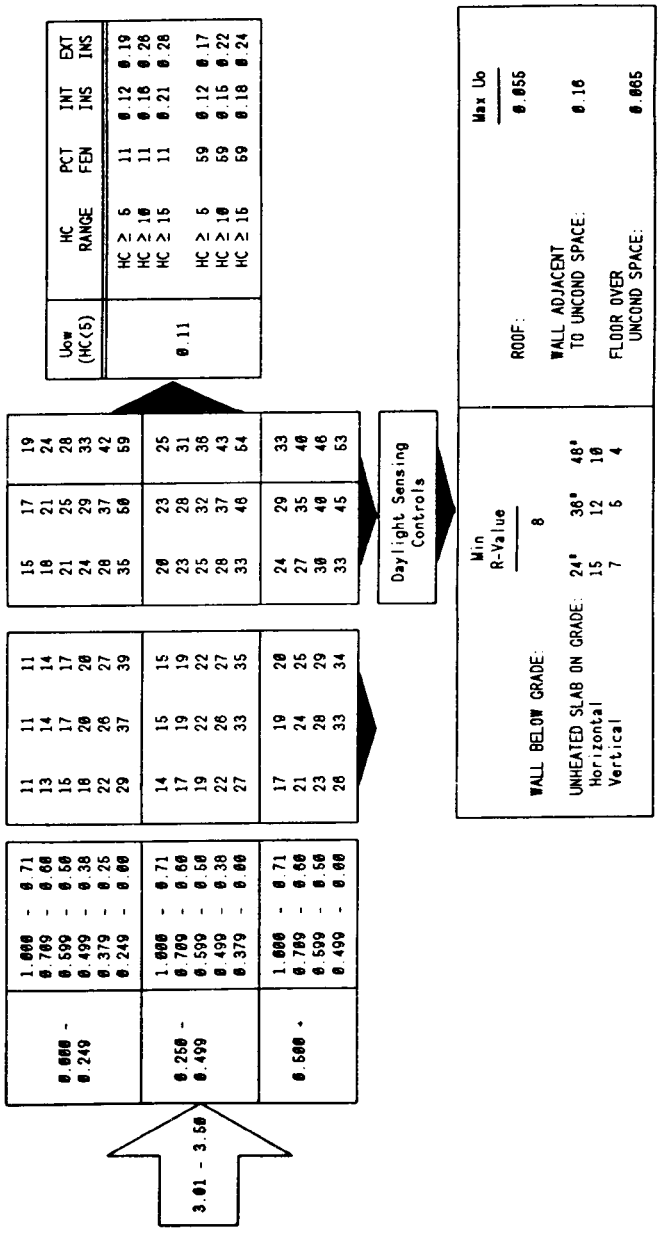

ALTERNATE COMPONENT PACKAGES FOR:
HDD65 = 1001 - 1750
CDD65 = 0 - 500
VSEW = 500 - 845
Astoria OR
Olympia WA
Portland OR
Salem OR
Seattle WA
Whidbey Island WA
TABLE 5.4-14
OPAQUE WALL Uow
LIGHT WEIGHT WALL
MASS WALL
PERIMETER DAYLIGHTING
N/A
VLT ≥ SC
BASE CASE
Uof
SHADING COEFF RANGE (SCx)
PROJECTION FACTOR (PF)
INTERNAL LOAD DENSITY (ILD) RANGE
0 - 1.50
1.61 - 3.00
Uow (HC(6))
HC RANGE
PCT FEN
INT INS
EXT INS
0.898
HC ≥ 5
HC ≥ 10
HC ≥ 15

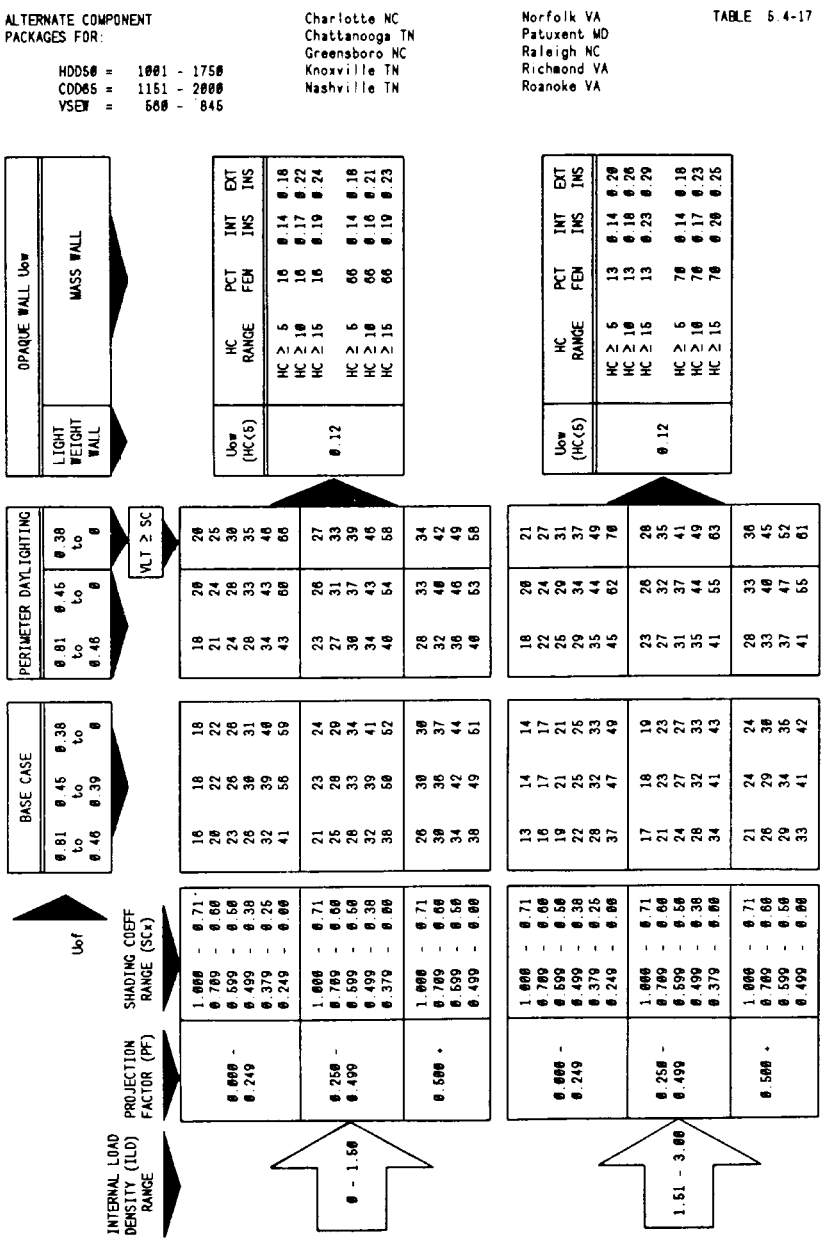

3.01 - 3.50
0.000 - 0.249
1.000 - 0.710
0.709 - 0.600
0.599 - 0.500
0.499 - 0.380
0.379 - 0.250
0.249 - 0.000
0.250 - 0.499
1.000 - 0.710
0.709 - 0.600
0.599 - 0.500
0.499 - 0.380
0.379 - 0.000
0.500 +
1.000 - 0.710
0.709 - 0.600
0.599 - 0.500
0.499 - 0.000
21 25 26
24 30 31
26 34 36
28 39 42
31 47 51
35 50 60
25 32 33
28 38 40
30 42 46
32 48 52
34 55 62
28 39 42
31 46 49
33 50 55
34 55 61
Daylight Sensing Controls
Uow (HC(6))
HC RANGE
PCT FEN
INT INS
EXT INS
0.006
HC ≥ 6 21 0.10 0.17
HC ≥ 10 21 0.12 0.24
HC ≥ 15 21 0.14 0.30
HC ≥ 6 60 0.10 0.17
HC ≥ 10 60 0.11 0.23
HC ≥ 15 60 0.13 0.29
Min R-Value
Max Uo
ROOF: 0.054
WALL BELOW GRADE: 9
WALL ADJACENT TO UNCOND SPACE: 0.14
UNHEATED SLAB ON GRADE: 24" 36" 48"
Horizontal 10 13 10
Vertical 7 8 4
FLOOR OVER UNCOND SPACE: 0.057

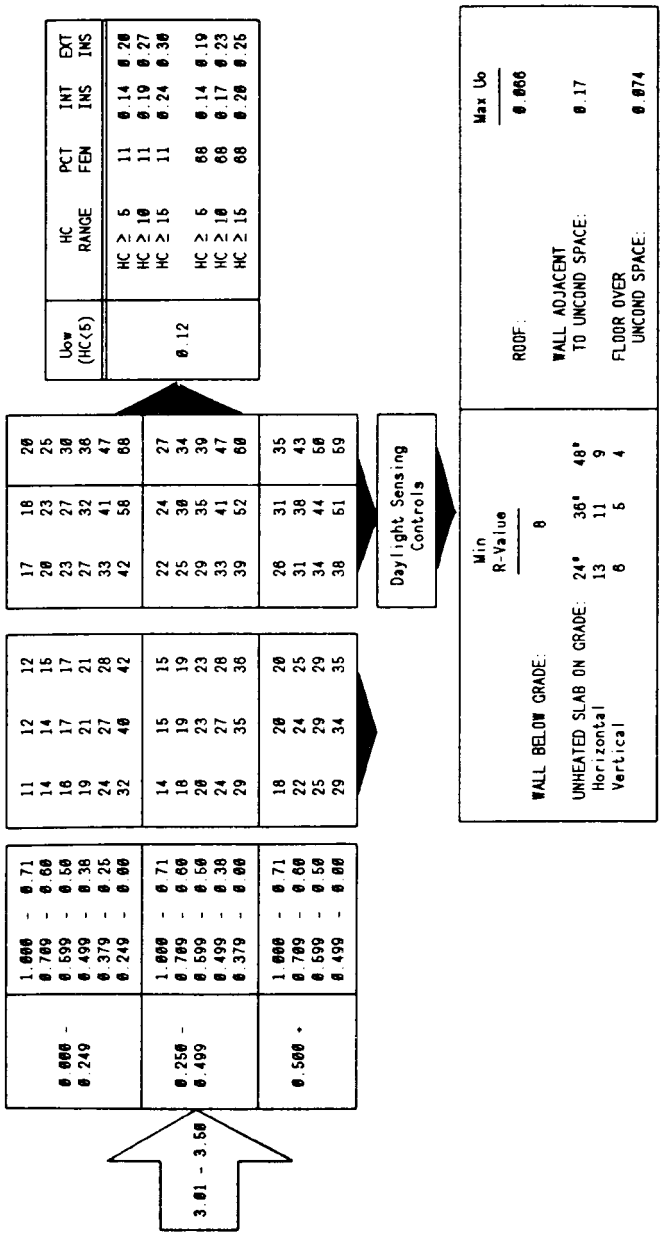

ALTERNATE COMPONENT PACKAGES FOR:
Asheville NC
Medford OR
TABLE 5.4-15
HDD65 = 1001 - 1750
CDD65 = 501 - 1150
VSEW = 560 - 845
OPAQUE WALL Uow
LIGHT WEIGHT WALL
MASS WALL
PERIMETER DAYLIGHTING
BASE CASE
VLT ≥ SC
Uof
INTERNAL LOAD DENSITY (ILD) RANGE
PROJECTION FACTOR (PF)
SHADING COEFF RANGE (SCx)
Uow (HC<5)
HC RANGE
PCT FEN
INT INS
EXT INS
0 - 1.50
1.51 - 3.00

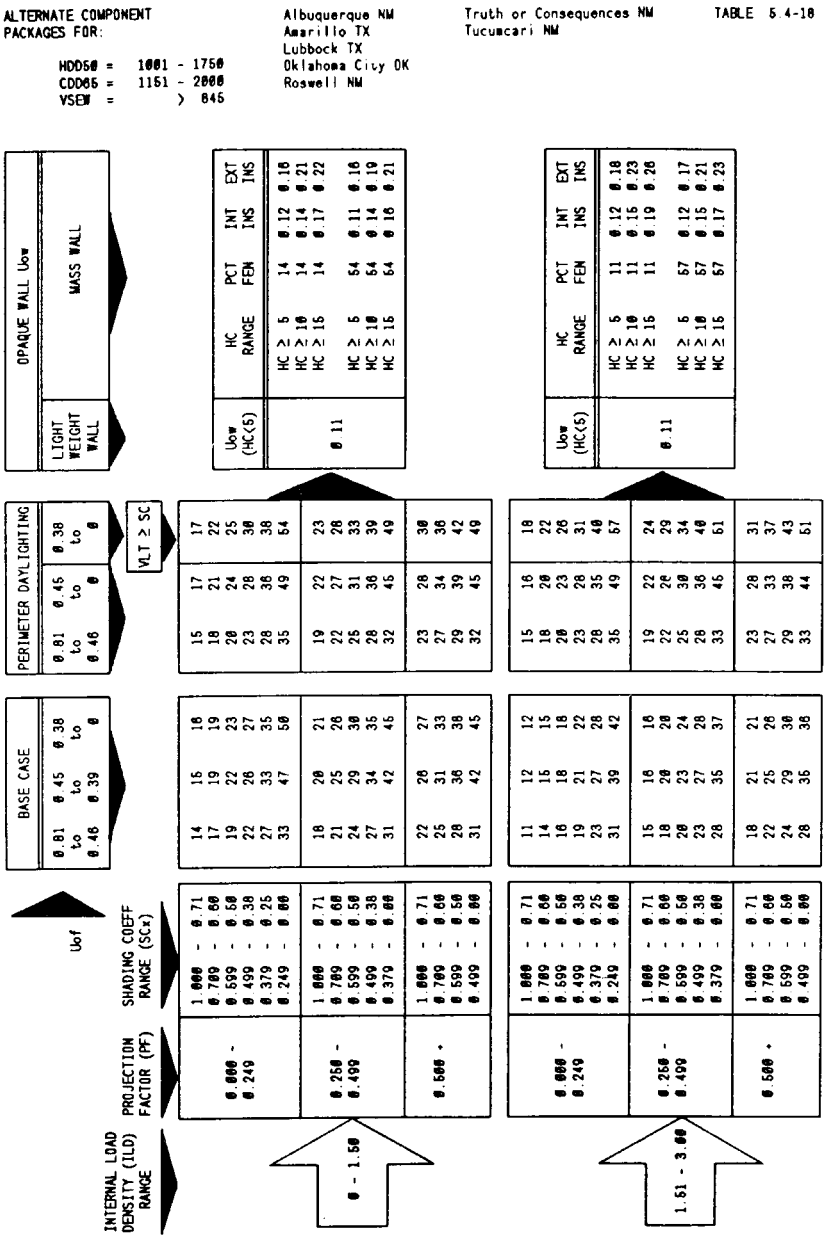

3.01 - 3.50
0.000 - 0.249
1.000 - 0.710
0.709 - 0.600
0.599 - 0.500
0.499 - 0.380
0.379 - 0.250
0.249 - 0.000
0.250 - 0.499
1.000 - 0.710
0.709 - 0.600
0.599 - 0.500
0.499 - 0.380
0.379 - 0.000
0.500 +
1.000 - 0.710
0.709 - 0.600
0.599 - 0.500
0.499 - 0.000
16 18 18
19 22 22
22 25 26
25 30 31
29 38 40
36 52 57
20 23 23
24 28 29
26 33 34
29 38 40
34 47 51
24 29 30
28 35 37
31 41 43
34 47 50
22 26 27
25 31 33
28 36 39
31 42 45
35 51 57
40 65 75
26 33 35
30 40 43
32 45 50
35 51 58
39 61 70
31 41 45
34 48 54
36 54 61
38 60 70
Daylight Sensing Controls
Uow (HC≤5)
HC RANGE
PCT FEN
INT INS
EXT INS
0.10
HC ≥ 5 10 0.11 0.17
HC ≥ 10 10 0.15 0.23
HC ≥ 15 10 0.18 0.26
HC ≥ 5 75 0.11 0.15
HC ≥ 10 75 0.13 0.19
HC ≥ 15 75 0.16 0.20
Min R-Value
WALL BELOW GRADE: 8
UNHEATED SLAB ON GRADE: 24' 36' 48'
Horizontal 15 12 10
Vertical 7 5 4
Max Uo
ROOF: 0.063
WALL ADJACENT TO UNCOND SPACE: 0.10
FLOOR OVER UNCOND SPACE: 0.064

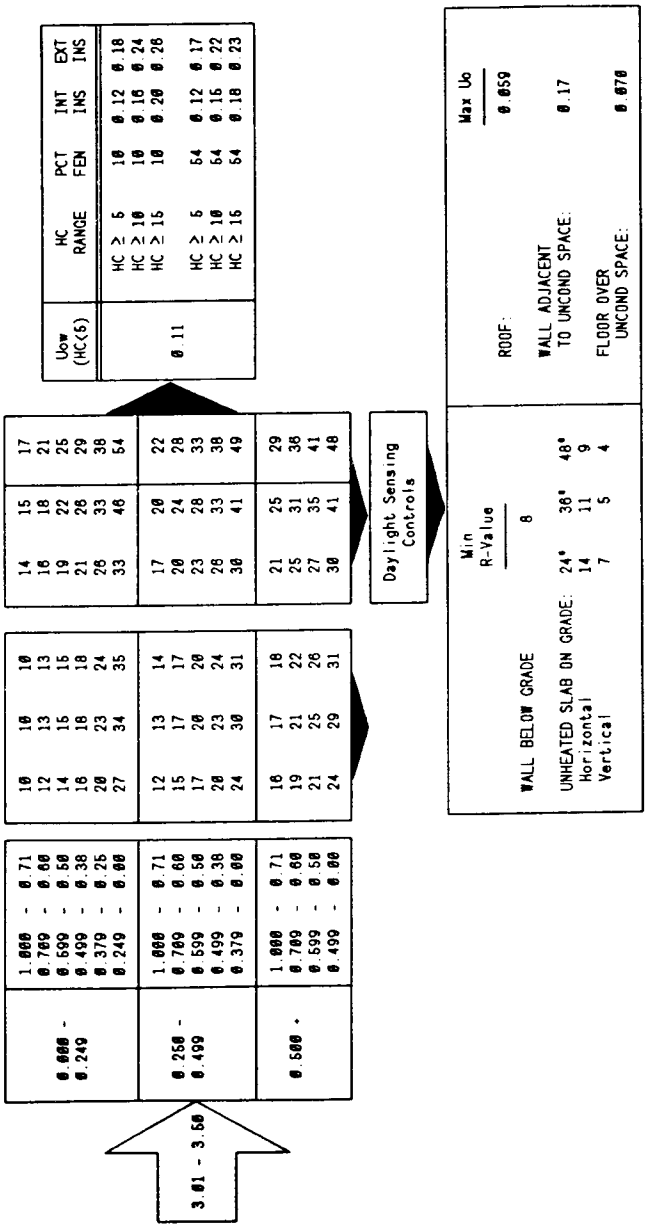

ALTERNATE COMPONENT PACKAGES FOR:
HDD65 = 1001 - 1750
CDD65 = 1 - 1150
VSEW = > 845
Prescott AZ
Winslow AZ
Yucca Flats NV
TABLE 5.4-16
OPAQUE WALL Uow
LIGHT WEIGHT WALL
MASS WALL
PERIMETER DAYLIGHTING
BASE CASE
VLT ≥ SC
Uof
SHADING COEFF RANGE (SCx)
PROJECTION FACTOR (PF)
INTERNAL LOAD DENSITY (ILD) RANGE
0 - 1.50
1.51 - 3.00
Uow (HC(5))
HC RANGE
PCT FEN
INT INS
EXT INS

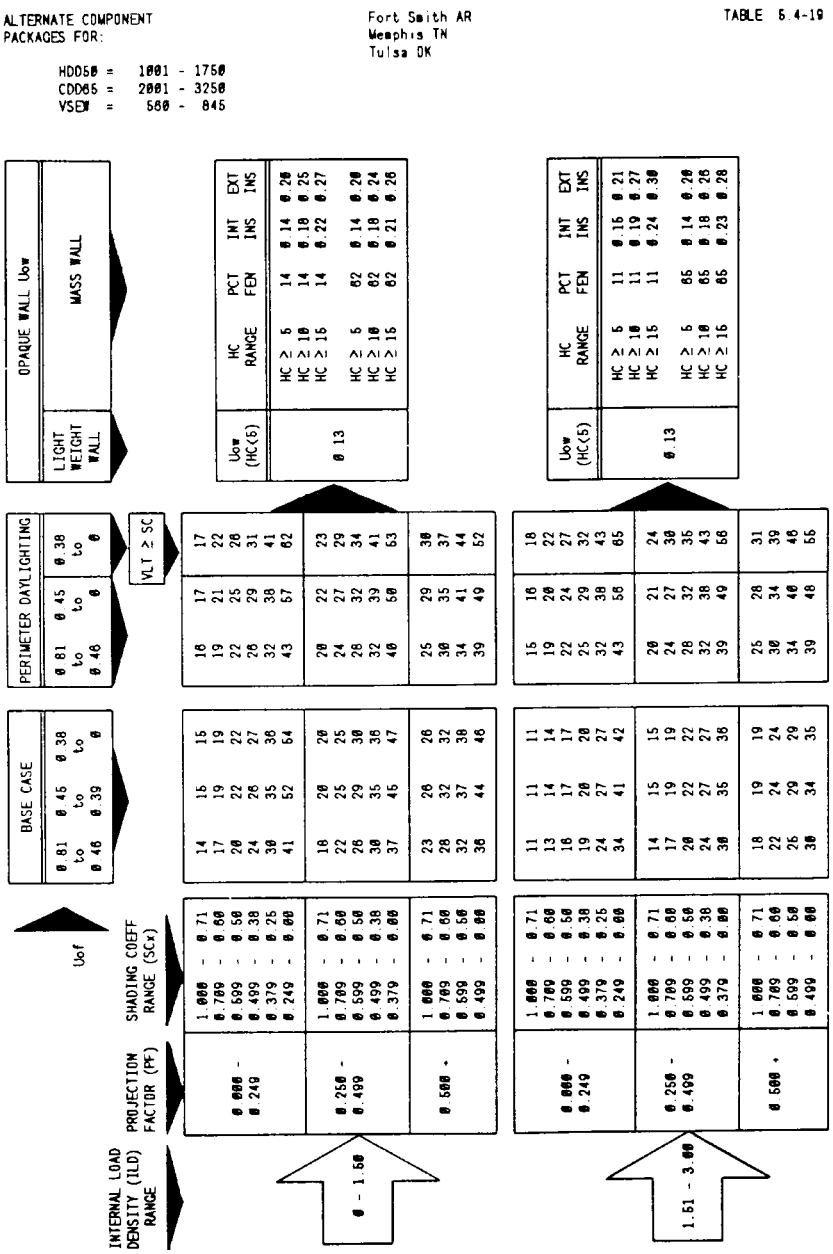

3.01 - 3.50
0.666 - 0.249
1.000 - 0.71
0.709 - 0.60
0.599 - 0.50
0.499 - 0.38
0.379 - 0.25
0.249 - 0.00
0.250 - 0.499
1.000 - 0.71
0.709 - 0.60
0.599 - 0.50
0.499 - 0.38
0.379 - 0.00
0.500 -
1.000 - 0.71
0.709 - 0.60
0.599 - 0.50
0.499 - 0.00
11 11 11
13 14 14
15 17 17
18 20 20
22 26 27
29 37 39
14 15 15
17 19 19
19 22 22
22 26 27
27 33 35
17 19 20
21 24 25
23 28 29
26 33 34
15 17 19
18 21 24
21 25 28
24 29 33
28 37 42
35 50 59
20 23 25
23 28 31
25 32 38
28 37 43
33 46 54
24 29 33
27 35 40
30 40 46
33 45 53
Daylight Sensing Controls
Uow (HC(5)
0.11
HC RANGE
PCT FEN
INT INS
EXT INS
HC ≥ 5 11 0.12 0.19
HC ≥ 10 11 0.16 0.20
HC ≥ 15 11 0.21 0.28
HC ≥ 5 59 0.12 0.17
HC ≥ 10 59 0.15 0.22
HC ≥ 15 59 0.18 0.24
Min R-Value
8
WALL BELOW GRADE:
UNHEATED SLAB ON GRADE: 24" 36" 48"
Horizontal 15 12 10
Vertical 7 5 4
Max Uo
ROOF: 0.055
WALL ADJACENT TO UNCOND SPACE: 0.16
FLOOR OVER UNCOND SPACE: 0.065

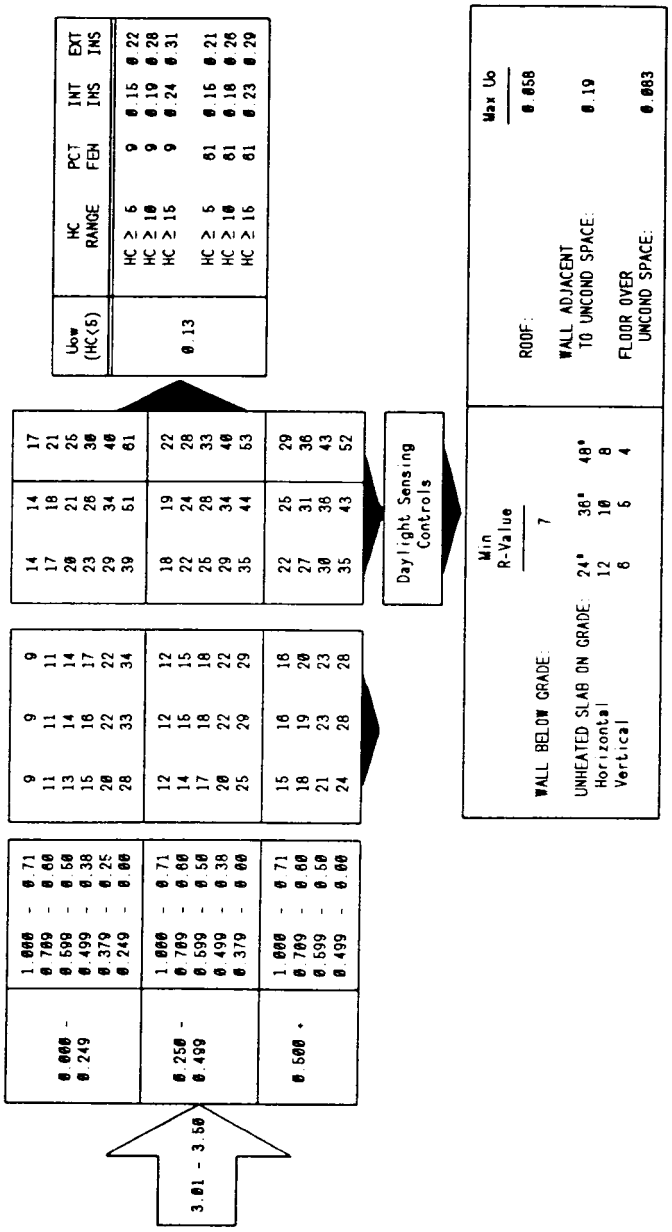

ALTERNATE COMPONENT PACKAGES FOR:
HDD56 = 1001 - 1750
CDD65 = 1151 - 2000
VSEW = 500 - 845
Charlotte NC
Chattanooga TN
Greensboro NC
Knoxville TN
Nashville TN
Norfolk VA
Patuxent MD
Raleigh NC
Richmond VA
Roanoke VA
TABLE 5.4-17
OPAQUE WALL Uow
LIGHT WEIGHT WALL
MASS WALL
Uow (HC(S))
HC RANGE
PCT FEN
INT INS
EXT INS
0.12
HC ≥ 5
HC ≥ 10
HC ≥ 15
10
16
66
0.14
0.17
0.19
0.18
0.22
0.24
0.14
0.16
0.19
0.18
0.21
0.23
PERIMETER DAYLIGHTING
0.81 to 0.46
0.45 to 0
0.38 to 0
VLT ≥ SC
BASE CASE
Uof
SHADING COEFF RANGE (SCx)
PROJECTION FACTOR (PF)
INTERNAL LOAD DENSITY (ILD) RANGE
0 - 1.50
1.51 - 3.00
0.000 - 0.249
0.250 - 0.499
0.500 +
1.000 - 0.71
0.709 - 0.60
0.599 - 0.50
0.499 - 0.38
0.379 - 0.25
0.249 - 0.00

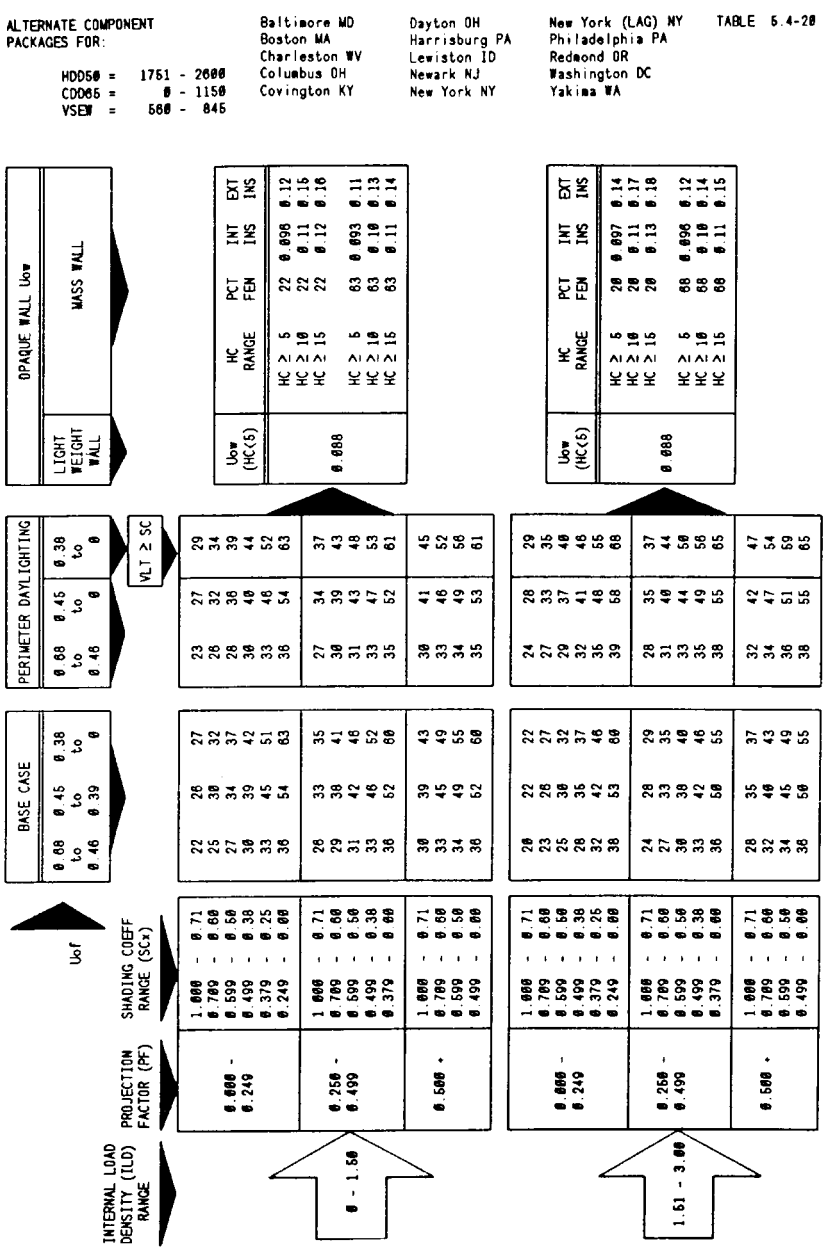

3.01 - 3.50
0.000 - 0.249
1.000 - 0.710
0.709 - 0.600
0.599 - 0.500
0.499 - 0.380
0.379 - 0.250
0.249 - 0.000
0.250 - 0.499
1.000 - 0.710
0.709 - 0.600
0.599 - 0.500
0.499 - 0.380
0.379 - 0.000
0.500 +
1.000 - 0.710
0.709 - 0.600
0.599 - 0.500
0.499 - 0.000
11 12 12
14 14 15
16 17 17
19 21 21
24 27 28
32 40 42
14 15 15
18 19 19
20 23 23
24 27 28
29 35 36
18 20 20
22 24 25
25 29 29
29 34 35
17 18 20
20 23 25
23 27 30
27 32 38
33 41 47
42 58 60
22 24 27
25 30 34
29 35 39
33 41 47
39 52 60
26 31 35
31 38 43
34 44 50
38 51 59
Daylight Sensing Controls
Uow (HC(5)
0.12
HC RANGE
HC ≥ 5
HC ≥ 10
HC ≥ 15
HC ≥ 5
HC ≥ 10
HC ≥ 15
PCT FEN
11
11
11
60
60
60
INT INS
0.14
0.19
0.24
0.14
0.17
0.20
EXT INS
0.20
0.27
0.30
0.19
0.23
0.25
Min R-Value
WALL BELOW GRADE: 0
UNHEATED SLAB ON GRADE: 24" 36" 48"
Horizontal 13 11 9
Vertical 6 5 4
Max Uo
ROOF: 0.060
WALL ADJACENT TO UNCOND SPACE: 0.17
FLOOR OVER UNCOND SPACE: 0.074


ALTERNATE COMPONENT PACKAGES FOR:
HDD65 = 1001 - 1750
CDD65 = 1151 - 2000
VSEW = > 845
Albuquerque NM
Amarillo TX
Lubbock TX
Oklahoma City OK
Roswell NM
Truth or Consequences NM
Tucumcari NM
TABLE 5.4-18
OPAQUE WALL Uow
LIGHT WEIGHT WALL
MASS WALL
PERIMETER DAYLIGHTING
BASE CASE
VLT ≥ SC
Uof
SHADING COEFF RANGE (SCr)
PROJECTION FACTOR (PF)
INTERNAL LOAD DENSITY (ILD) RANGE
0 - 1.50
1.51 - 3.00
HC RANGE
PCT FEN
INT INS
EXT INS
Uow (HC(5)
HC ≥ 5
HC ≥ 10
HC ≥ 15
0.11


3.01 - 3.50
0.000 - 0.249
1.000 - 0.71
0.709 - 0.60
0.599 - 0.50
0.499 - 0.38
0.379 - 0.25
0.249 - 0.00
0.250 - 0.499
1.000 - 0.71
0.709 - 0.60
0.599 - 0.50
0.499 - 0.38
0.379 - 0.00
0.500 +
1.000 - 0.71
0.709 - 0.60
0.599 - 0.50
0.499 - 0.00
10 10 10
12 13 13
14 15 15
16 18 18
20 23 24
27 34 35
12 13 14
15 17 17
17 20 20
20 23 24
24 30 31
16 17 18
19 21 22
21 25 26
24 29 31
14 15 17
16 18 21
19 22 25
21 28 29
28 33 38
33 46 54
17 20 22
20 24 28
23 28 33
28 33 38
30 41 49
21 25 29
25 31 38
27 35 41
30 41 48
Daylight Sensing Controls
Uow (HC(S))
HC RANGE
PCT FEN
INT INS
EXT INS
0.11
HC ≥ 5 10 0.12 0.18
HC ≥ 10 10 0.16 0.24
HC ≥ 15 10 0.20 0.26
HC ≥ 5 54 0.12 0.17
HC ≥ 10 54 0.16 0.22
HC ≥ 15 54 0.18 0.23
Min R-Value
8
WALL BELOW GRADE
UNHEATED SLAB ON GRADE: 24" 36" 48"
Horizontal 14 11 9
Vertical 7 5 4
Max Uo
ROOF: 0.059
WALL ADJACENT TO UNCOND SPACE: 0.17
FLOOR OVER UNCOND SPACE: 0.070


ALTERNATE COMPONENT PACKAGES FOR:
HDD65 = 1001 - 1750
CDD65 = 2001 - 3250
VSEW = 500 - 845
Fort Smith AR
Memphis TN
Tulsa OK
TABLE 5.4-19
OPAQUE WALL Uow
LIGHT WEIGHT WALL
MASS WALL
PERIMETER DAYLIGHTING
BASE CASE
VLT ≥ SC
Uow (HC(6))
HC RANGE
PCT FEN
INT INS
EXT INS
Uof
INTERNAL LOAD DENSITY (ILD) RANGE
PROJECTION FACTOR (PF)
SHADING COEFF RANGE (SCx)
0 - 1.50
1.51 - 3.00


3.01 - 3.50
0.000 - 0.249
1.000 - 0.71
0.799 - 0.60
0.599 - 0.50
0.499 - 0.38
0.379 - 0.25
0.249 - 0.00
9 9 9
11 11 11
13 14 14
15 16 17
20 22 22
28 33 34
14 14 17
17 18 21
20 21 25
23 28 30
29 34 40
39 51 61
0.250 - 0.499
1.000 - 0.71
0.799 - 0.60
0.599 - 0.50
0.499 - 0.38
0.379 - 0.00
12 12 12
14 15 15
17 18 18
20 22 22
25 29 29
18 19 22
22 24 28
25 28 33
29 34 40
35 44 53
0.500 +
1.000 - 0.71
0.799 - 0.60
0.599 - 0.50
0.499 - 0.00
15 16 16
18 19 20
21 23 23
24 28 28
22 25 29
27 31 36
30 38 43
35 43 52
Daylight Sensing Controls
Uow (HC(6)
HC RANGE
PCT FEN
INT INS
EXT INS
0.13
HC ≥ 6 9 0.15 0.22
HC ≥ 10 9 0.19 0.28
HC ≥ 15 9 0.24 0.31
HC ≥ 6 61 0.15 0.21
HC ≥ 10 61 0.18 0.26
HC ≥ 15 61 0.23 0.29
Min R-Value
7
WALL BELOW GRADE:
UNHEATED SLAB ON GRADE: 24" 36" 48"
Horizontal 12 10 8
Vertical 6 6 4
Max Uo
ROOF: 0.058
WALL ADJACENT TO UNCOND SPACE: 0.19
FLOOR OVER UNCOND SPACE: 0.083



ALTERNATE COMPONENT PACKAGES FOR:

HDD50 = 1751 - 2600
CDD65 = 0 - 1150
VSEW = 560 - 845

Baltimore MD
Boston MA
Charleston WV
Columbus OH
Covington KY

Dayton OH
Harrisburg PA
Lewiston ID
Newark NJ
New York NY

New York (LAG) NY
Philadelphia PA
Redmond OR
Washington DC
Yakima WA

TABLE 5.4-20

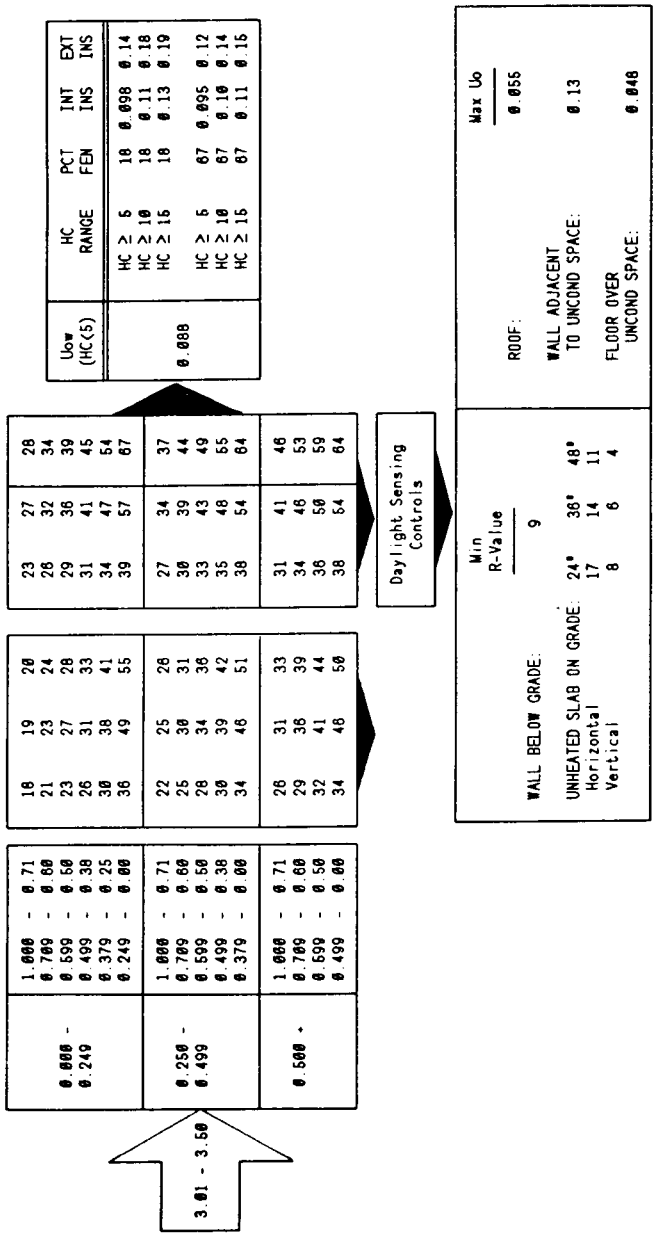
INTERNAL LOAD DENSITY (ILD) RANGE	PROJECTION FACTOR (PF)	SHADING COEFF RANGE (SCx)	BASE CASE 0.68 to 0.46	BASE CASE 0.45 to 0.39	BASE CASE 0.38 to 0	PERIMETER DAYLIGHTING 0.68 to 0.46	PERIMETER DAYLIGHTING 0.45 to 0	PERIMETER DAYLIGHTING 0.38 to 0 (VLT ≥ SC)
0 - 1.50	0.000 - 0.249	1.000 - 0.71	22	26	27	23	27	29
		0.709 - 0.60	25	30	32	26	32	34
		0.599 - 0.50	27	34	37	28	36	39
		0.499 - 0.38	30	39	42	30	40	44
		0.379 - 0.25	33	45	51	33	46	52
		0.249 - 0.00	36	54	63	36	54	63
	0.250 - 0.499	1.000 - 0.71	26	33	35	27	34	37
		0.709 - 0.60	29	38	41	30	39	43
		0.599 - 0.50	31	42	46	31	43	48
		0.499 - 0.38	33	46	52	33	47	53
		0.379 - 0.00	36	52	60	35	52	61
	0.500 +	1.000 - 0.71	30	39	43	30	41	45
		0.709 - 0.60	33	45	49	33	46	52
		0.599 - 0.50	34	49	55	34	49	56
		0.499 - 0.00	36	52	60	35	53	61
1.51 - 3.00	0.000 - 0.249	1.000 - 0.71	20	22	22	24	28	29
		0.709 - 0.60	23	26	27	27	33	35
		0.599 - 0.50	25	30	32	29	37	40
		0.499 - 0.38	28	35	37	32	41	46
		0.379 - 0.25	32	42	46	36	48	55
		0.249 - 0.00	38	53	60	39	58	68
	0.250 - 0.499	1.000 - 0.71	24	28	29	28	35	37
		0.709 - 0.60	27	33	35	31	40	44
		0.599 - 0.50	30	38	40	33	44	50
		0.499 - 0.38	33	42	46	35	49	56
		0.379 - 0.00	36	50	55	38	55	65
	0.500 +	1.000 - 0.71	28	35	37	32	42	47
		0.709 - 0.60	32	40	43	34	47	54
		0.599 - 0.50	34	45	49	36	51	59
		0.499 - 0.00	36	50	55	38	55	65

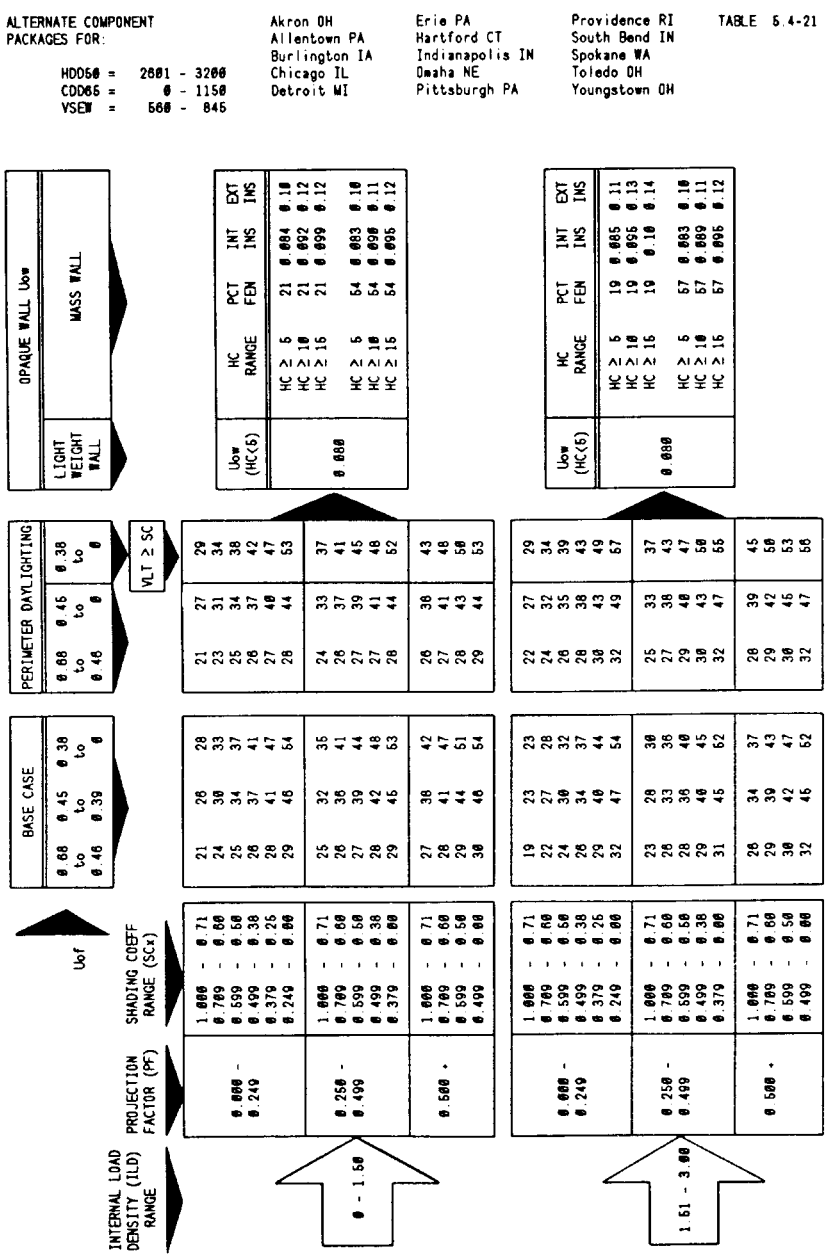
OPAQUE WALL Uow

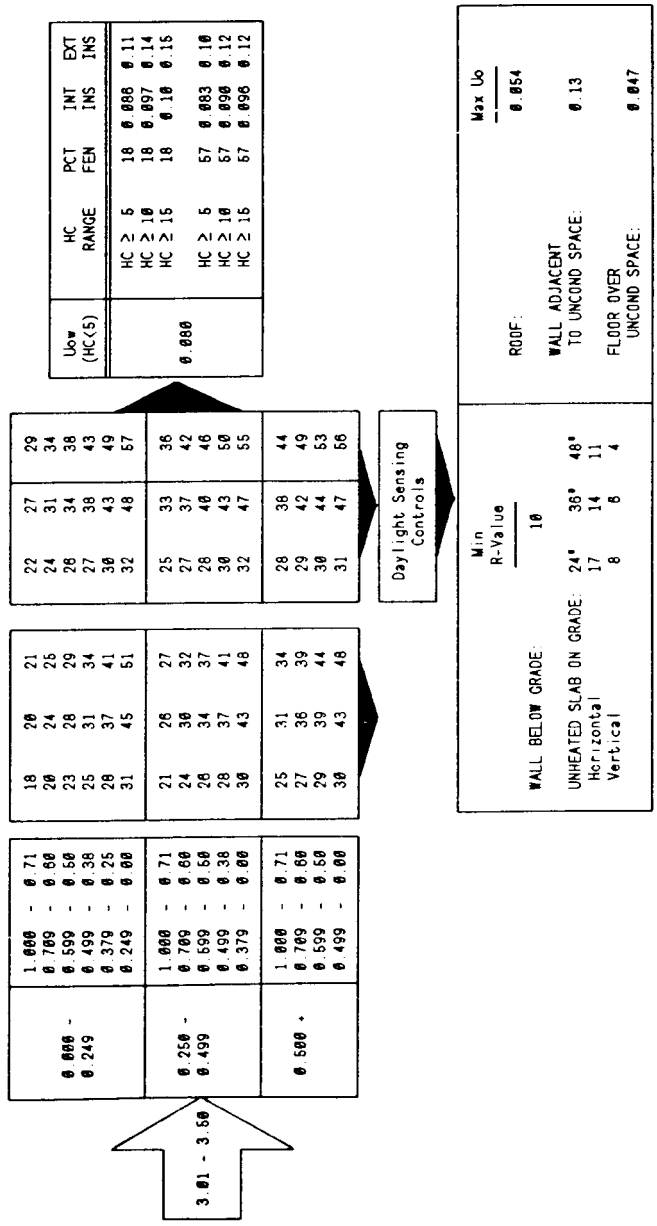
LIGHT WEIGHT WALL	MASS WALL

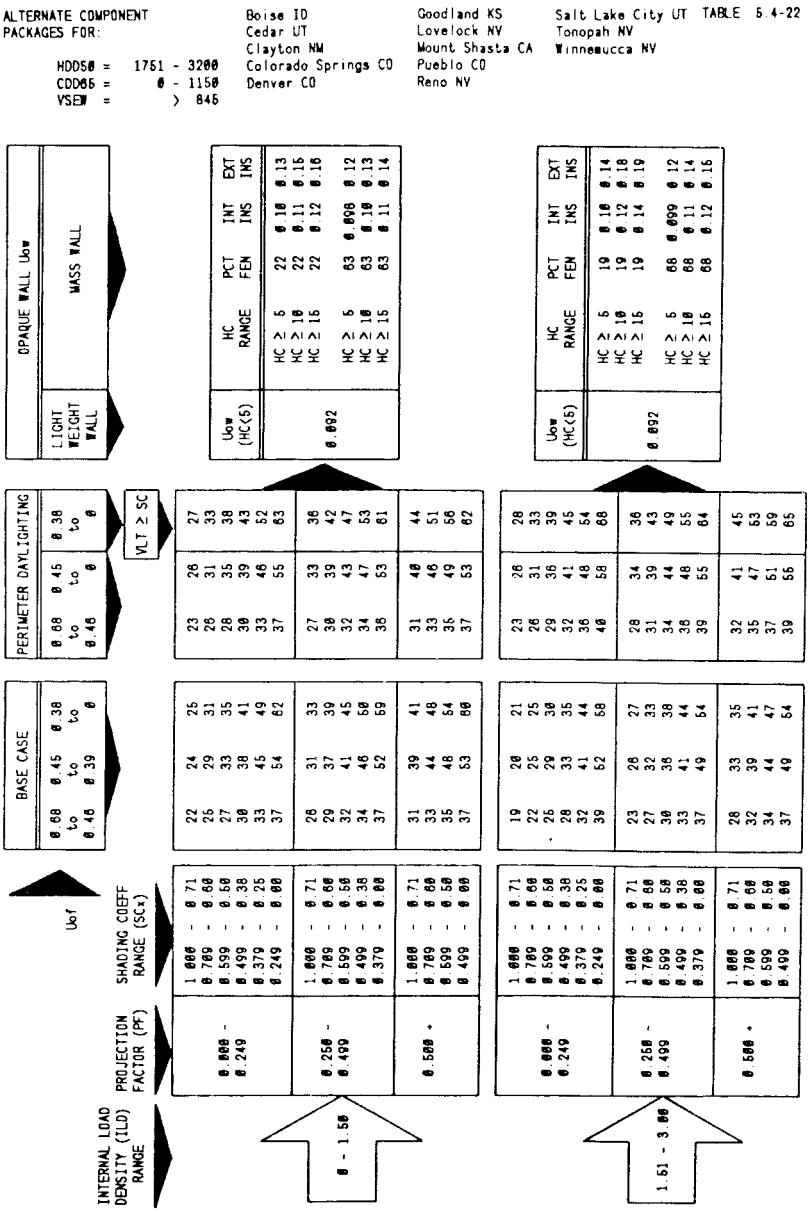
Uow (HC<5)	HC RANGE	PCT FEN	INT INS	EXT INS
0.088	HC ≥ 5	22	0.096	0.12
	HC ≥ 10	22	0.11	0.15
	HC ≥ 15	22	0.12	0.16
	HC ≥ 5	63	0.093	0.11
	HC ≥ 10	63	0.10	0.13
	HC ≥ 15	63	0.11	0.14

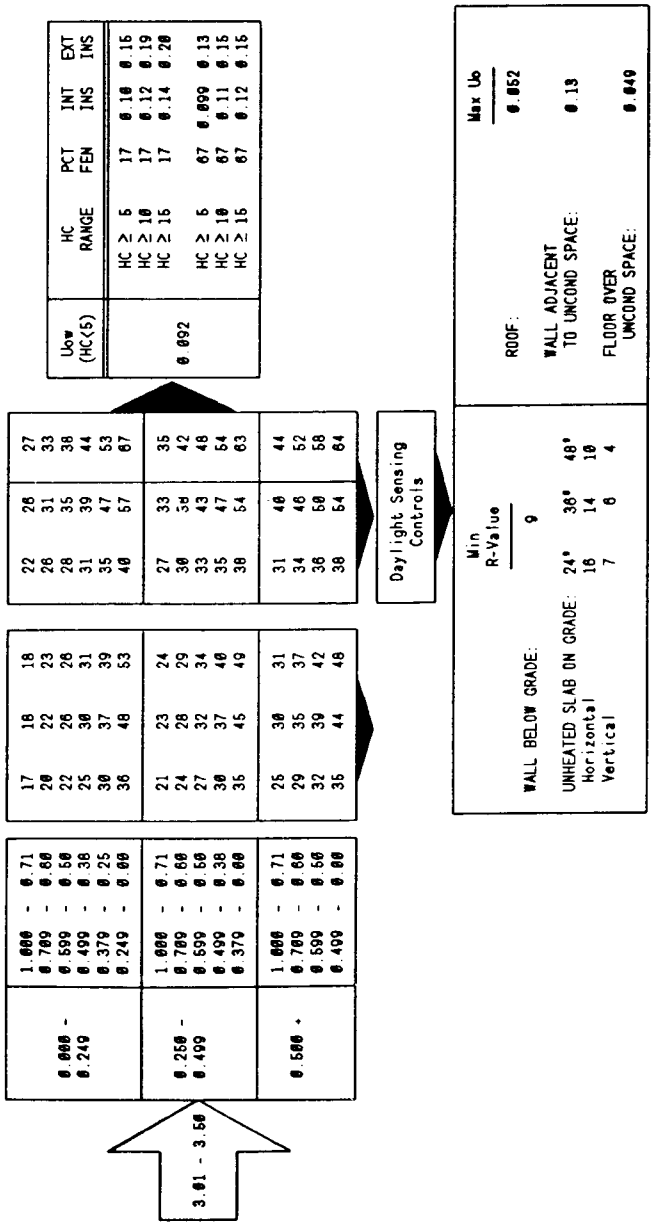
Uow (HC<5)	HC RANGE	PCT FEN	INT INS	EXT INS
0.088	HC ≥ 5	20	0.097	0.14
	HC ≥ 10	20	0.11	0.17
	HC ≥ 15	20	0.13	0.18
	HC ≥ 5	68	0.096	0.12
	HC ≥ 10	68	0.10	0.14
	HC ≥ 15	68	0.11	0.15

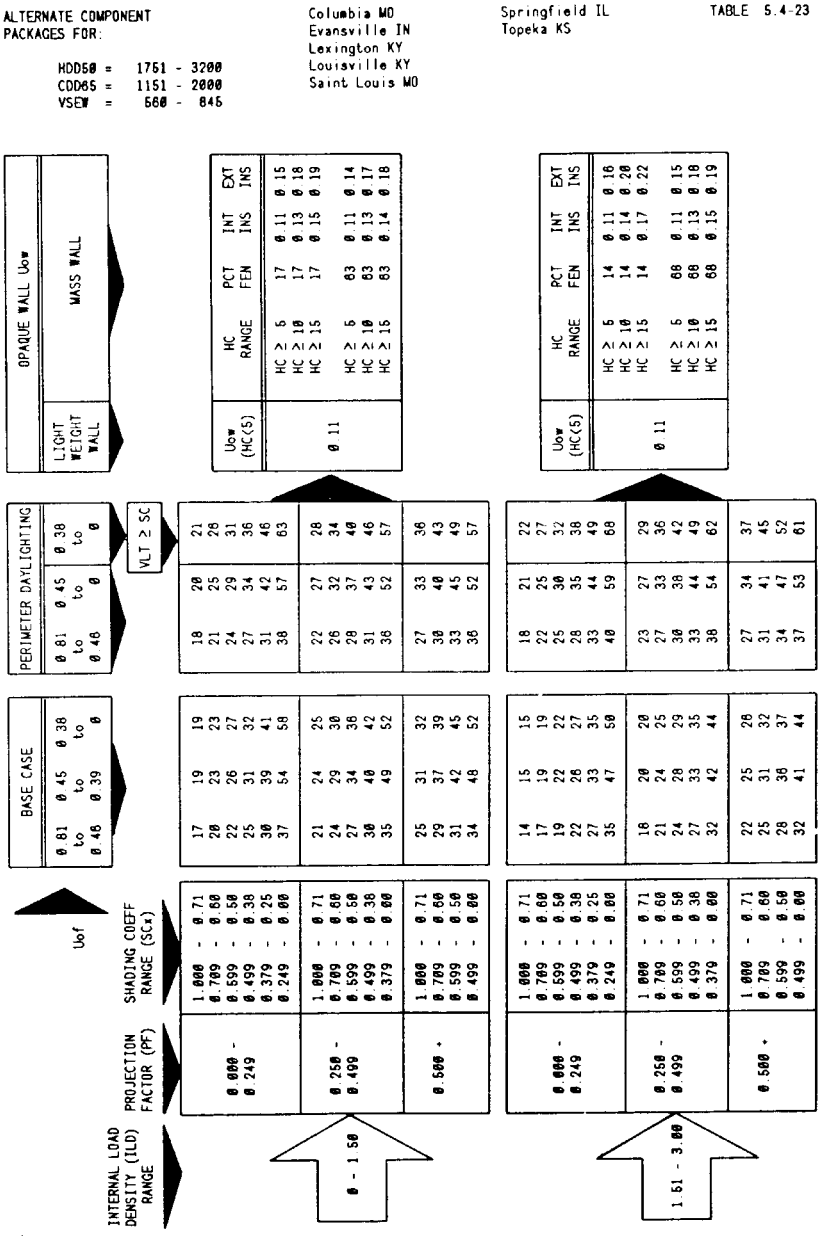

3.01 - 3.50
0.000 - 0.249
1.000 - 0.71
0.709 - 0.60
0.599 - 0.50
0.499 - 0.38
0.379 - 0.25
0.249 - 0.00
18 19 20
21 23 24
23 27 28
26 31 33
30 38 41
36 49 55
0.250 - 0.499
1.000 - 0.71
0.709 - 0.60
0.599 - 0.50
0.499 - 0.38
0.379 - 0.00
22 25 28
25 30 31
28 34 36
30 39 42
34 46 51
0.500 +
1.000 - 0.71
0.709 - 0.60
0.599 - 0.50
0.499 - 0.00
26 31 33
29 38 39
32 41 44
34 46 50
23 27 28
28 32 34
29 36 39
31 41 45
34 47 54
39 57 67
27 34 37
30 39 44
33 43 49
35 48 55
38 54 64
31 41 46
34 46 53
36 50 59
38 54 64
Daylight Sensing Controls
Uow (HC(5))
0.088
HC RANGE
PCT FEN
INT INS
EXT INS
HC ≥ 5 10 0.098 0.14
HC ≥ 10 10 0.11 0.18
HC ≥ 15 10 0.13 0.19
HC ≥ 5 67 0.095 0.12
HC ≥ 10 67 0.10 0.14
HC ≥ 15 67 0.11 0.15
Min R-Value
9
WALL BELOW GRADE:
UNHEATED SLAB ON GRADE: 24" 36" 48"
Horizontal 17 14 11
Vertical 8 6 4
Max Uo
ROOF: 0.055
WALL ADJACENT TO UNCOND SPACE: 0.13
FLOOR OVER UNCOND SPACE: 0.040

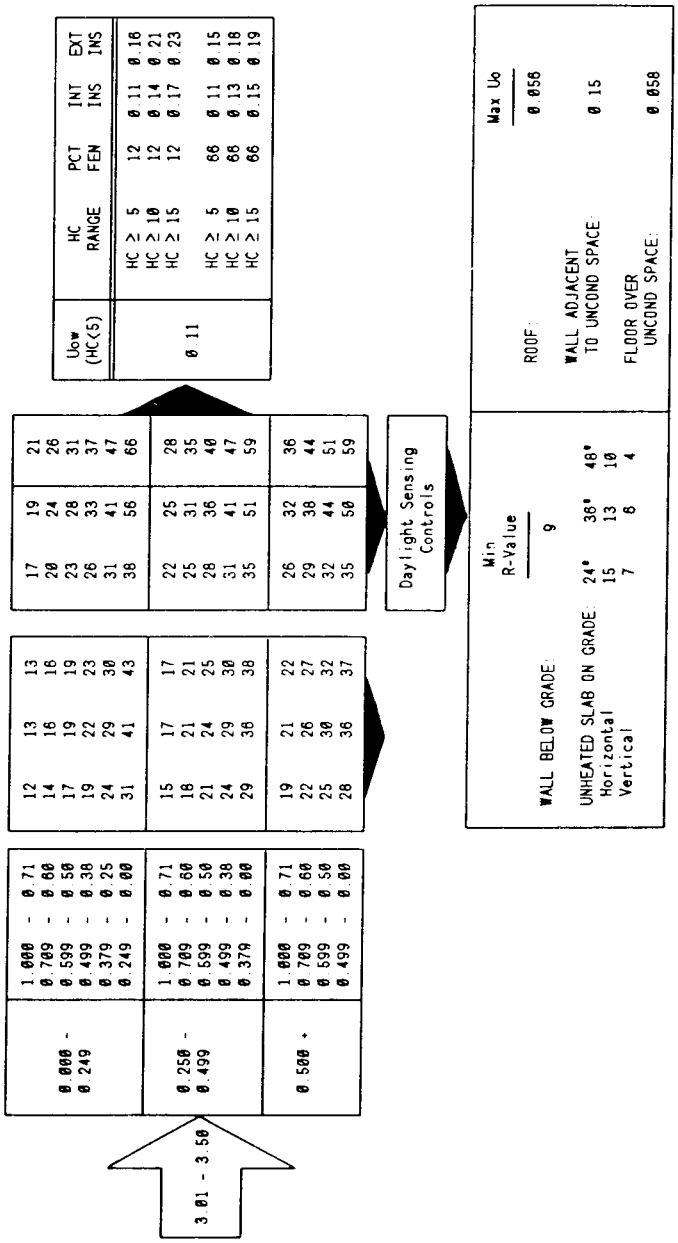

ALTERNATE COMPONENT PACKAGES FOR:
HDD65 = 2801 - 3200
CDD65 = 0 - 1150
VSEW = 560 - 845
Akron OH
Allentown PA
Burlington IA
Chicago IL
Detroit MI
Erie PA
Hartford CT
Indianapolis IN
Omaha NE
Pittsburgh PA
Providence RI
South Bend IN
Spokane WA
Toledo OH
Youngstown OH
TABLE 5.4-21
OPAQUE WALL Uow
LIGHT WEIGHT WALL
MASS WALL
PERIMETER DAYLIGHTING
BASE CASE
VLT ≥ SC
Uof
INTERNAL LOAD DENSITY (ILD) RANGE
PROJECTION FACTOR (PF)
SHADING COEFF RANGE (SCx)
0 - 1.50
1.51 - 3.00

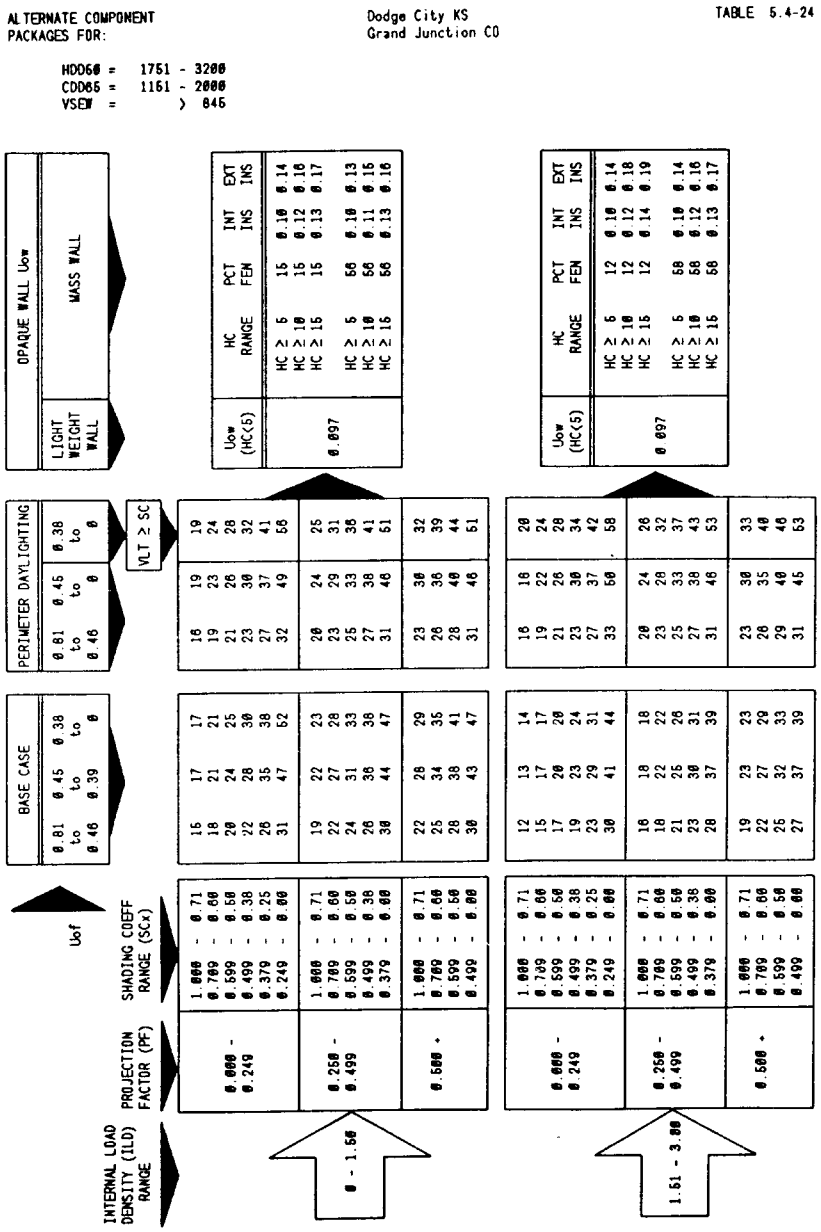

3.01 - 3.50
0.000 - 0.249
1.000 - 0.710
0.709 - 0.600
0.599 - 0.500
0.499 - 0.380
0.379 - 0.250
0.249 - 0.000
18 20 21
20 24 25
23 28 29
25 31 34
28 37 41
31 45 51
0.250 - 0.499
1.000 - 0.710
0.709 - 0.600
0.599 - 0.500
0.499 - 0.380
0.379 - 0.000
21 26 27
24 30 32
26 34 37
28 37 41
30 43 48
0.500 +
1.000 - 0.710
0.709 - 0.600
0.599 - 0.500
0.499 - 0.000
25 31 34
27 36 39
29 39 44
30 43 48
22 27 29
24 31 34
26 34 38
27 38 43
30 43 49
32 48 57
25 33 36
27 37 42
28 40 46
30 43 50
32 47 55
28 38 44
29 42 49
30 44 53
31 47 56
Daylight Sensing Controls
Uow (HC(S))
HC RANGE
PCT FEN
INT INS
EXT INS
0.000
HC ≥ 5 10 0.088 0.11
HC ≥ 10 10 0.097 0.14
HC ≥ 15 10 0.10 0.15
HC ≥ 5 57 0.083 0.10
HC ≥ 10 57 0.090 0.12
HC ≥ 15 57 0.096 0.12
Min R-Value
10
WALL BELOW GRADE:
UNHEATED SLAB ON GRADE: 24' 36' 48'
Horizontal 17 14 11
Vertical 8 8 4
Max Uo
ROOF: 0.054
WALL ADJACENT TO UNCOND SPACE: 0.13
FLOOR OVER UNCOND SPACE: 0.047

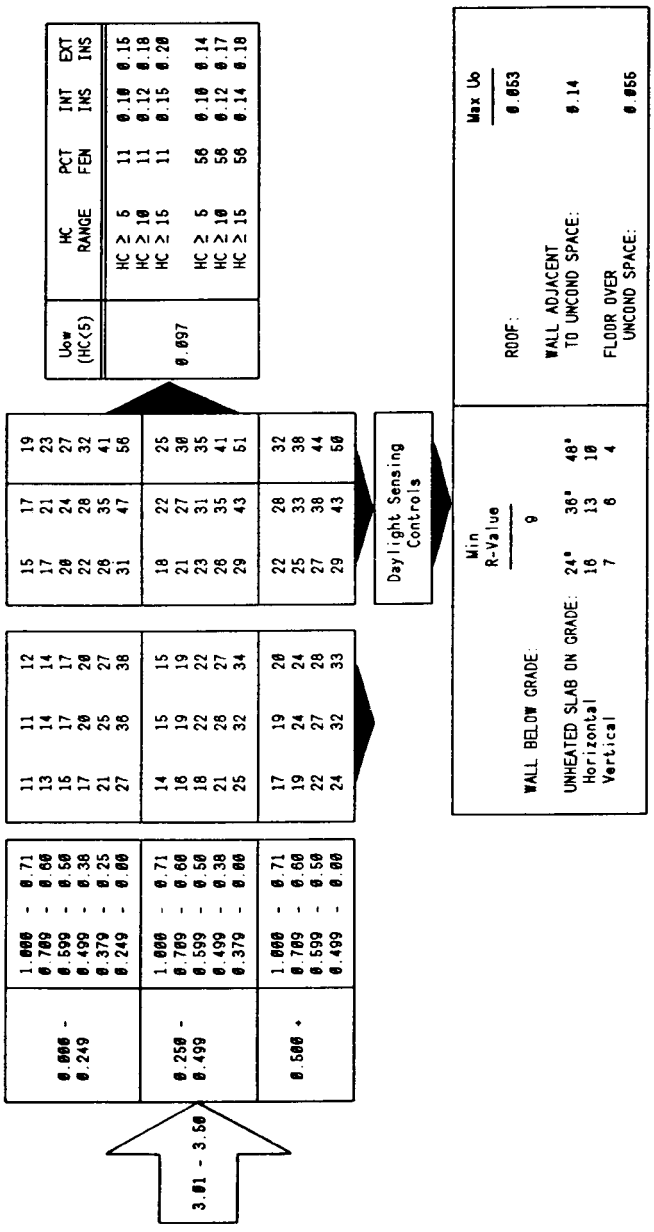

ALTERNATE COMPONENT PACKAGES FOR:
HDD65 = 1751 - 3200
CDD65 = 0 - 1150
VSEW = > 845
Boise ID
Cedar UT
Clayton NM
Colorado Springs CO
Denver CO
Goodland KS
Lovelock NV
Mount Shasta CA
Pueblo CO
Reno NV
Salt Lake City UT
Tonopah NV
Winnemucca NV
TABLE 5.4-22
OPAQUE WALL Uow
LIGHT WEIGHT WALL
MASS WALL
PERIMETER DAYLIGHTING
VLT ≥ SC
BASE CASE
Uof
INTERNAL LOAD DENSITY (ILD) RANGE
PROJECTION FACTOR (PF)
SHADING COEFF RANGE (SCx)
0 - 1.50
1.51 - 3.00
Uow (HC≤6)
HC RANGE
PCT FEN
INT INS
EXT INS
0.092
HC ≥ 6
HC ≥ 10
HC ≥ 15
HC ≥ 16

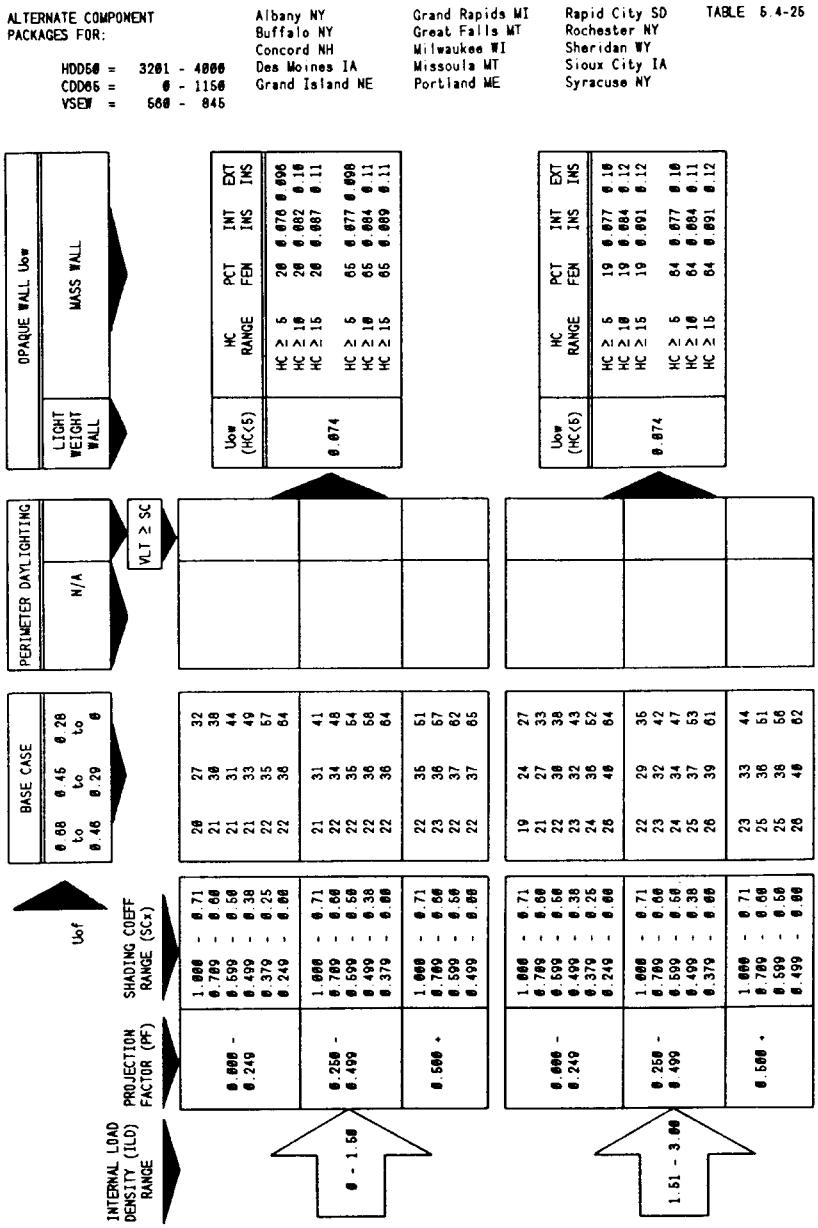

3.01 - 3.50
0.000 - 0.249
1.000 - 0.710
0.709 - 0.600
0.599 - 0.500
0.499 - 0.380
0.379 - 0.250
0.249 - 0.000
0.250 - 0.499
1.000 - 0.710
0.709 - 0.600
0.599 - 0.500
0.499 - 0.380
0.379 - 0.000
0.500 +
1.000 - 0.710
0.709 - 0.600
0.599 - 0.500
0.499 - 0.000
Daylight Sensing Controls
Uow (HC≤5)
0.092
HC RANGE
PCT FEN
INT INS
EXT INS
HC ≥ 5
HC ≥ 10
HC ≥ 15
17 0.10 0.15
17 0.12 0.19
17 0.14 0.20
67 0.099 0.13
67 0.11 0.15
67 0.12 0.15
Min R-Value
9
WALL BELOW GRADE:
UNHEATED SLAB ON GRADE:
Horizontal
Vertical
24° 30° 48°
18 14 10
7 6 4
Max Uo
ROOF: 0.052
WALL ADJACENT TO UNCOND SPACE: 0.13
FLOOR OVER UNCOND SPACE: 0.040

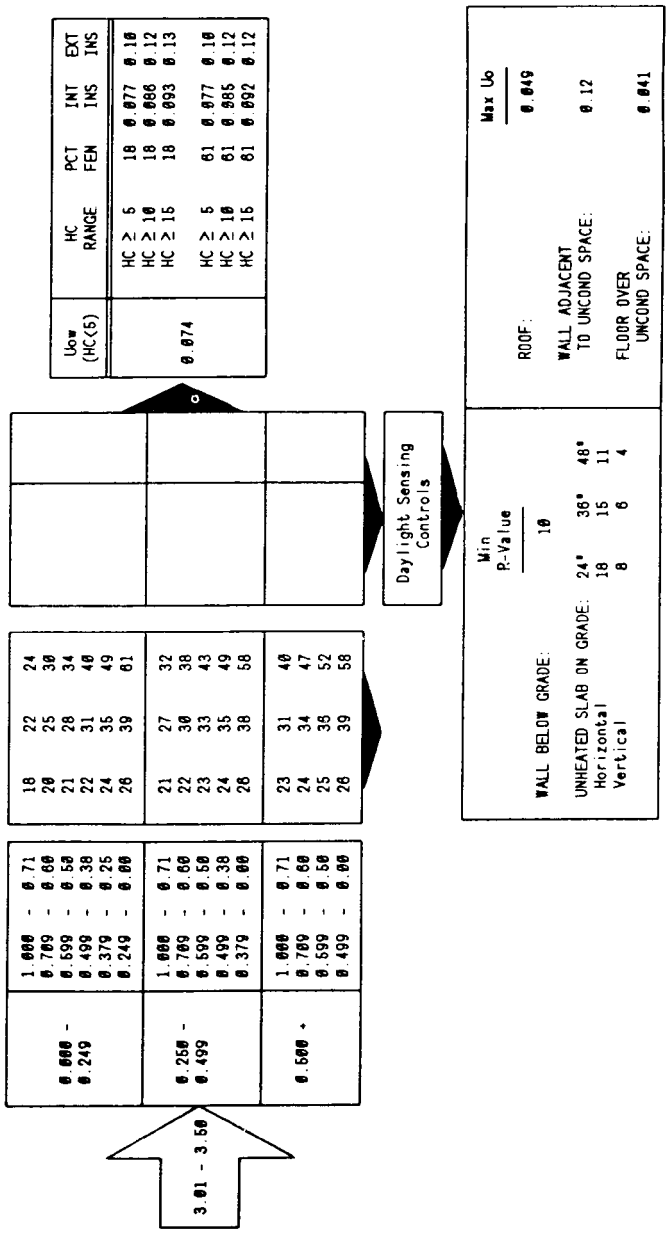

ALTERNATE COMPONENT PACKAGES FOR:
HDD65 = 1751 - 3200
CDD65 = 1151 - 2000
VSEW = 560 - 845
Columbia MO
Evansville IN
Lexington KY
Louisville KY
Saint Louis MO
Springfield IL
Topeka KS
TABLE 5.4-23
OPAQUE WALL Uow
LIGHT WEIGHT WALL
MASS WALL
PERIMETER DAYLIGHTING
BASE CASE
VLT ≥ SC
Uof
SHADING COEFF RANGE (SCx)
PROJECTION FACTOR (PF)
INTERNAL LOAD DENSITY (ILD) RANGE
0 - 1.50
1.51 - 3.00
Uow (HC(5))
HC RANGE
PCT FEN
INT INS
EXT INS

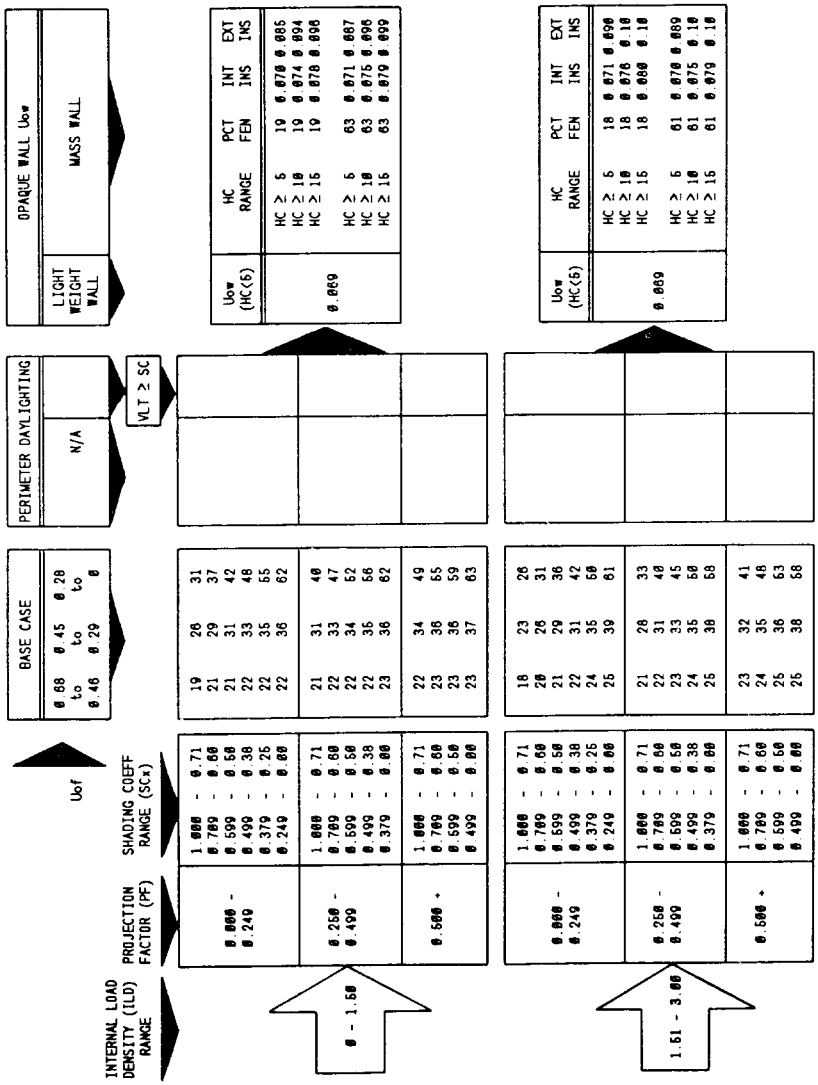

3.01 - 3.50
0.000 - 0.249
1.000 - 0.71
0.709 - 0.60
0.599 - 0.50
0.499 - 0.38
0.379 - 0.25
0.249 - 0.00
12 13 13
14 16 16
17 19 19
19 22 23
24 29 30
31 41 43
17 19 21
20 24 26
23 28 31
26 33 37
31 41 47
38 56 66
0.250 - 0.499
1.000 - 0.71
0.709 - 0.60
0.599 - 0.50
0.499 - 0.38
0.379 - 0.00
15 17 17
18 21 21
21 24 25
24 29 30
29 36 38
22 25 28
25 31 35
28 36 40
31 41 47
35 51 59
0.500 +
1.000 - 0.71
0.709 - 0.60
0.599 - 0.50
0.499 - 0.00
19 21 22
22 26 27
25 30 32
28 36 37
26 32 36
29 38 44
32 44 51
35 50 59
Daylight Sensing Controls
Uow (HC(5)
HC RANGE
PCT FEN
INT INS
EXT INS
0.11
HC ≥ 5 12 0.11 0.16
HC ≥ 10 12 0.14 0.21
HC ≥ 15 12 0.17 0.23
HC ≥ 5 66 0.11 0.15
HC ≥ 10 66 0.13 0.18
HC ≥ 15 66 0.15 0.19
Min R-Value
9
WALL BELOW GRADE:
UNHEATED SLAB ON GRADE: 24' 36' 48'
Horizontal 15 13 10
Vertical 7 8 4
Max Uo
ROOF: 0.056
WALL ADJACENT TO UNCOND SPACE: 0.15
FLOOR OVER UNCOND SPACE: 0.050

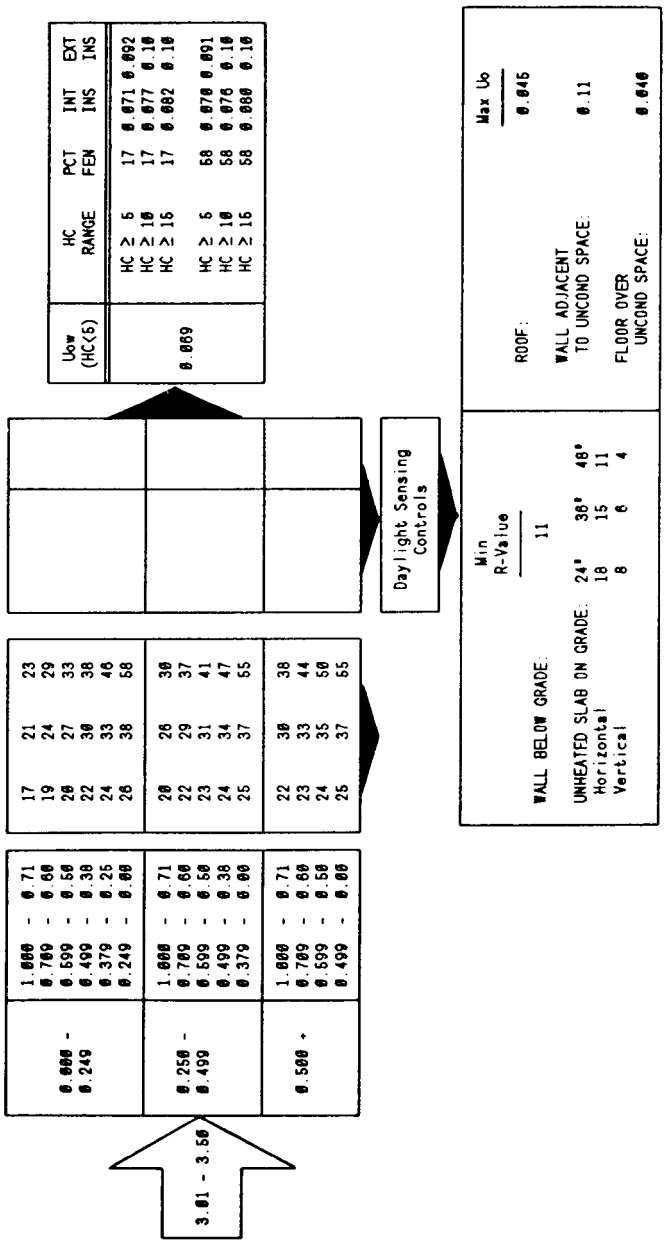

ALTERNATE COMPONENT PACKAGES FOR:
HDD65 = 1751 - 3200
CDD65 = 1161 - 2000
VSEW =) 845
Dodge City KS
Grand Junction CO
TABLE 5.4-24
OPAQUE WALL Uow
LIGHT WEIGHT WALL
MASS WALL
PERIMETER DAYLIGHTING
BASE CASE
VLT ≥ SC
Uof
INTERNAL LOAD DENSITY (ILD) RANGE
PROJECTION FACTOR (PF)
SHADING COEFF RANGE (SCx)
0 - 1.50
1.51 - 3.00

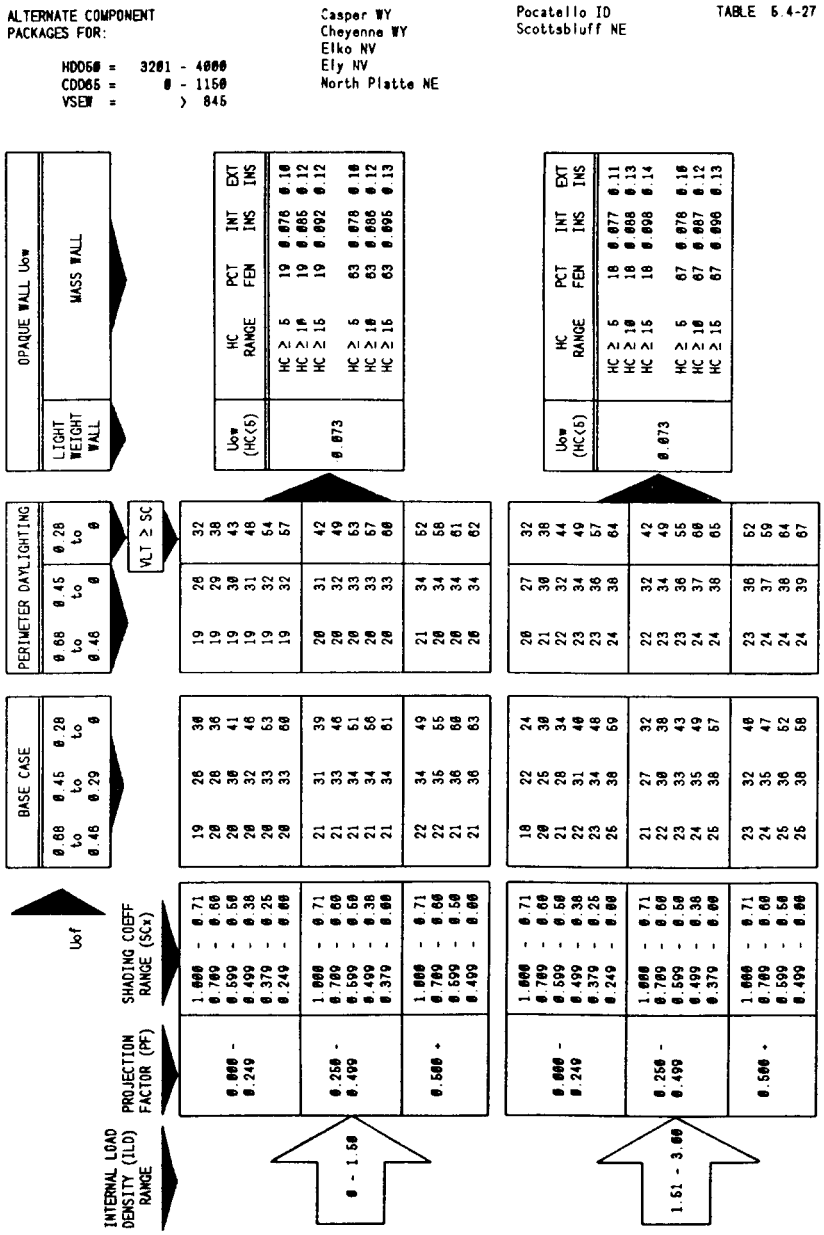

3.01 - 3.50
0.000 - 0.249
0.250 - 0.499
0.500 +
1.000 - 0.710
0.709 - 0.600
0.599 - 0.500
0.499 - 0.380
0.379 - 0.250
0.249 - 0.000
11 11 12
13 14 14
16 17 17
17 20 20
21 25 27
27 36 38
14 15 15
16 19 19
18 22 22
21 28 27
25 32 34
17 19 20
19 24 24
22 27 28
24 32 33
15 17 19
17 21 23
20 24 27
22 28 32
26 35 41
31 47 56
18 22 25
21 27 30
23 31 35
26 35 41
29 43 51
22 28 32
25 33 38
27 38 44
29 43 50
Daylight Sensing Controls
Win R-Value
WALL BELOW GRADE: 9
UNHEATED SLAB ON GRADE: 24' 36' 48'
Horizontal 16 13 10
Vertical 7 6 4
Max Uo
ROOF: 0.053
WALL ADJACENT TO UNCOND SPACE: 0.14
FLOOR OVER UNCOND SPACE: 0.056
Uow (HC(5)) 0.097
HC RANGE PCT FEN INT INS EXT INS
HC ≥ 5 11 0.10 0.15
HC ≥ 10 11 0.12 0.18
HC ≥ 15 11 0.15 0.20
HC ≥ 5 56 0.10 0.14
HC ≥ 10 56 0.12 0.17
HC ≥ 15 56 0.14 0.18

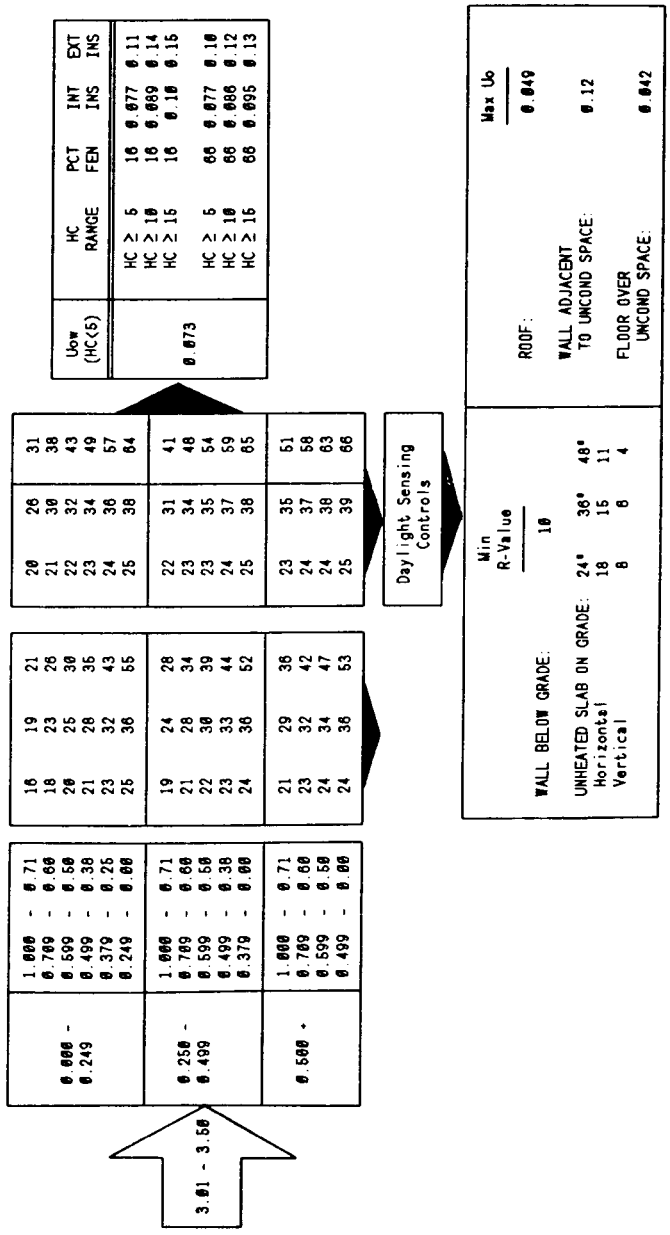

ALTERNATE COMPONENT PACKAGES FOR:
HDD65 = 3201 - 4000
CDD65 = 0 - 1150
VSEW = 560 - 845
Albany NY
Buffalo NY
Concord NH
Des Moines IA
Grand Island NE
Grand Rapids MI
Great Falls MT
Milwaukee WI
Missoula MT
Portland ME
Rapid City SD
Rochester NY
Sheridan WY
Sioux City IA
Syracuse NY
TABLE 5.4-25
OPAQUE WALL Uow
LIGHT WEIGHT WALL
MASS WALL
PERIMETER DAYLIGHTING
N/A
VLT ≥ SC
BASE CASE
0.60 to 0.46
0.46 to 0.29
0.28 to 0
Uof
SHADING COEFF RANGE (SCx)
PROJECTION FACTOR (PF)
INTERNAL LOAD DENSITY (ILD) RANGE
0 - 1.50
1.51 - 3.00
Uow (HC≤5)
0.074
HC RANGE
PCT FEN
INT INS
EXT INS

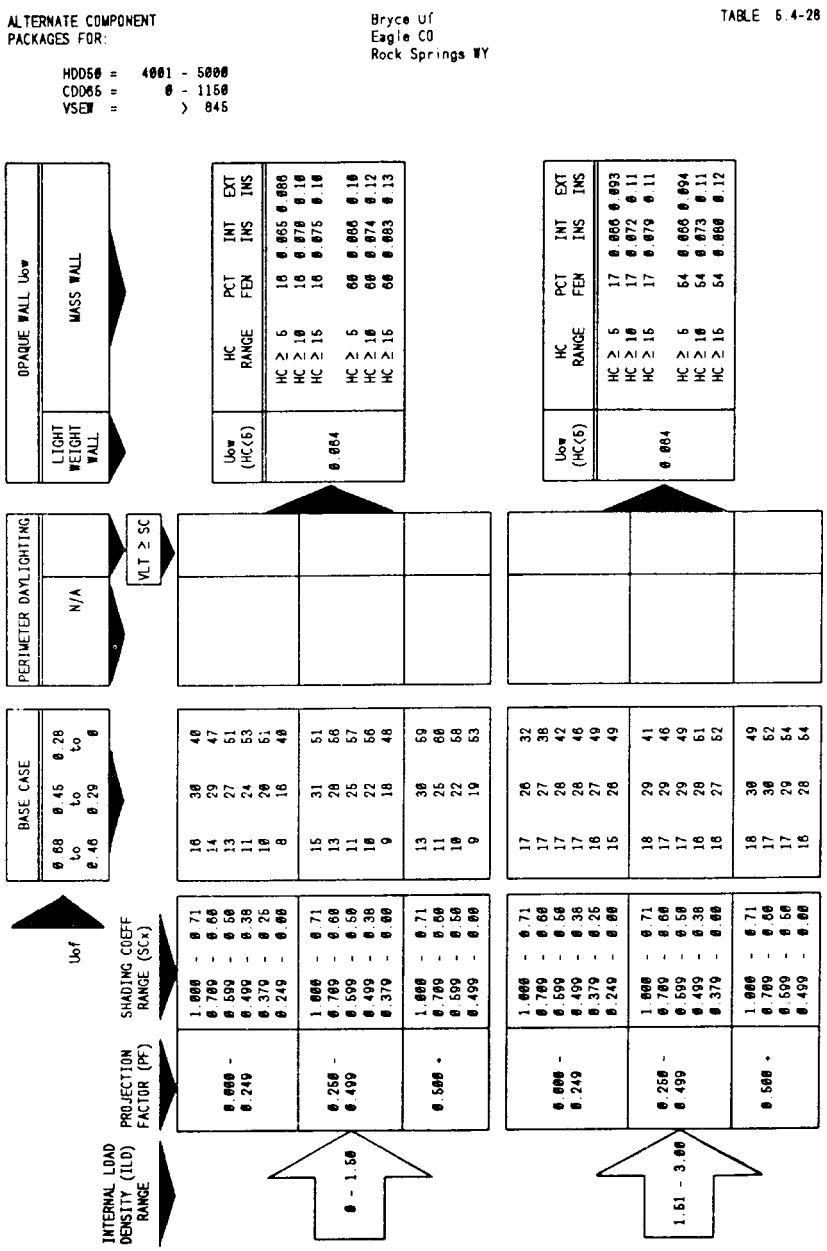

3.01 - 3.50
0.000 - 0.249
1.000 - 0.71
0.709 - 0.60
0.599 - 0.50
0.499 - 0.38
0.379 - 0.25
0.249 - 0.00
18 22 24
20 25 30
21 28 34
22 31 40
24 35 49
26 39 61
0.250 - 0.499
1.000 - 0.71
0.709 - 0.60
0.599 - 0.50
0.499 - 0.38
0.379 - 0.00
21 27 32
22 30 38
23 33 43
24 35 49
26 38 58
0.500 +
1.000 - 0.71
0.709 - 0.60
0.599 - 0.50
0.499 - 0.00
23 31 40
24 34 47
25 36 52
26 39 58
Daylight Sensing Controls
Uow (HC<5)
HC RANGE
PCT FEN
INT INS
EXT INS
0.074
HC ≥ 5 18 0.077 0.10
HC ≥ 10 18 0.086 0.12
HC ≥ 15 18 0.093 0.13
HC ≥ 5 61 0.077 0.10
HC ≥ 10 61 0.085 0.12
HC ≥ 15 61 0.092 0.12
WALL BELOW GRADE:
Min R-Value
10
UNHEATED SLAB ON GRADE: 24" 36" 48"
Horizontal 18 15 11
Vertical 8 6 4
ROOF:
Max Uo
0.049
WALL ADJACENT TO UNCOND SPACE: 0.12
FLOOR OVER UNCOND SPACE: 0.041

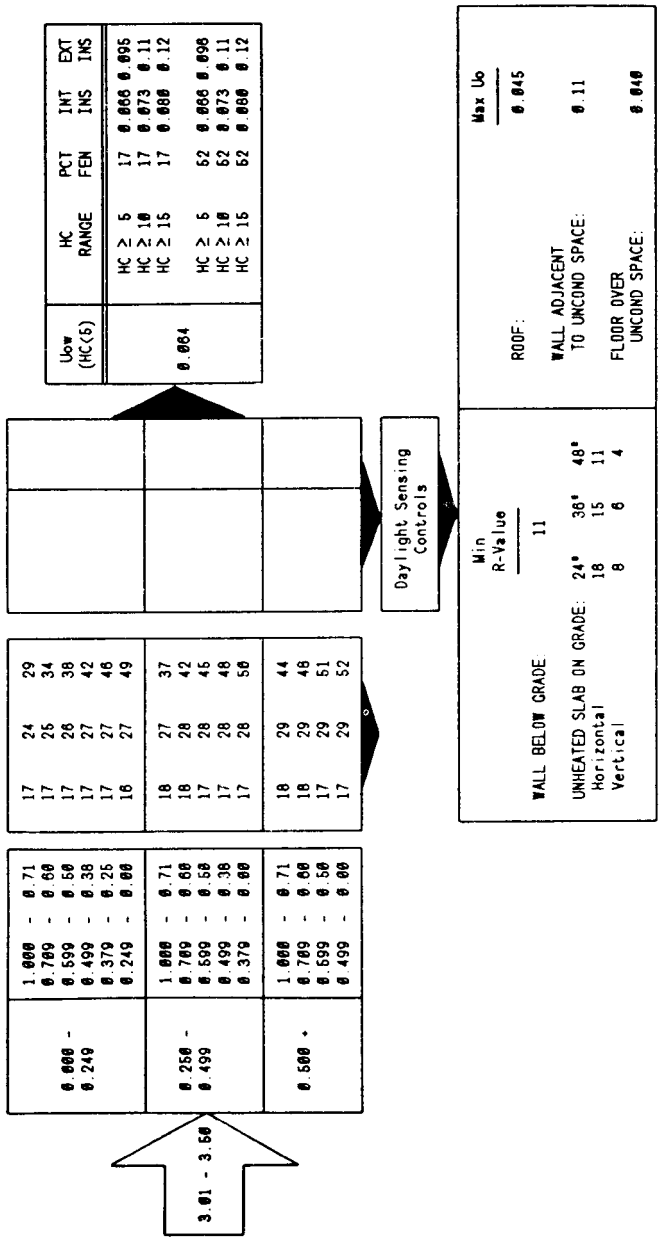

ALTERNATE COMPONENT PACKAGES FOR:
HDD65 = 4001 - 5000
CDD65 = 0 - 1150
VSEW = 560 - 845
Alpena MI
Bangor ME
Burlington VT
Cutbank MT
Eau Claire WI
Greenbay WI
Huron SD
Madison WI
Mason City IA
Massena NY
Miles City MT
Minneapolis MN
Pierre SD
Rochester NY
Sioux Falls SD
TABLE 5.4-26
OPAQUE WALL Uow
LIGHT WEIGHT WALL
MASS WALL
Uow (HC≤6)
HC RANGE
PCT FEN
INT INS
EXT INS
HC ≥ 6
HC ≥ 10
HC ≥ 15
0.069
0.070 0.085
0.074 0.094
0.078 0.096
0.071 0.090
0.076 0.10
0.080 0.10
PERIMETER DAYLIGHTING
N/A
VLT ≥ SC
BASE CASE
0.60 to 0.46
0.45 to 0.29
0.20 to 0
Uof
SHADING COEFF RANGE (SCx)
PROJECTION FACTOR (PF)
INTERNAL LOAD DENSITY (ILD) RANGE
1.000 - 0.71
0.700 - 0.60
0.599 - 0.50
0.499 - 0.38
0.379 - 0.25
0.249 - 0.00
0.000 - 0.249
0.250 - 0.499
0.500 +
0 - 1.50
1.51 - 3.00
19 26 31
21 29 37
21 31 42
22 33 48
22 35 55
22 36 62
21 31 40
22 33 47
22 34 52
22 35 58
22 36 62
23 36 62
22 34 49
23 36 55
23 36 59
23 37 63
18 23 28
20 26 31
21 29 36
22 31 42
24 35 50
25 39 61
21 28 33
22 31 40
23 33 45
24 35 50
25 38 58
23 32 41
24 35 48
25 36 53
25 38 58

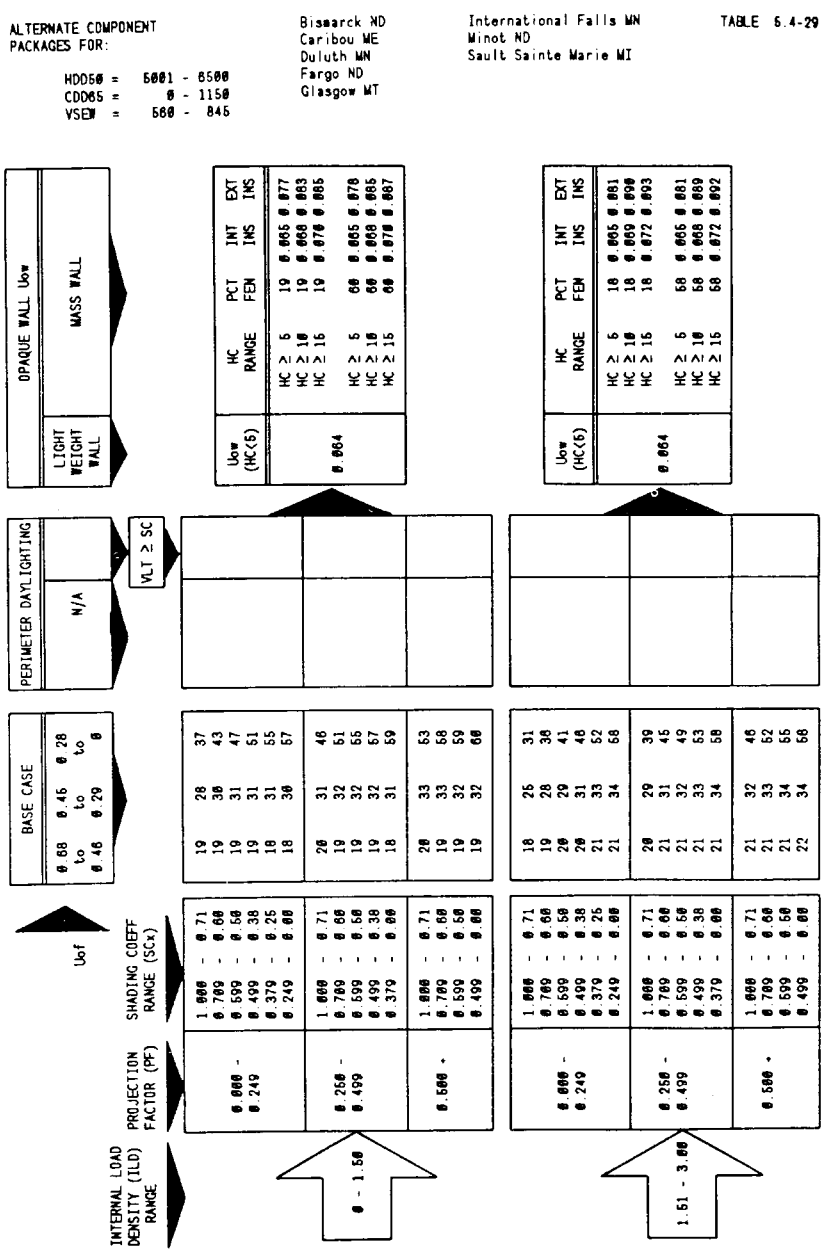

3.01 - 3.50
0.000 - 0.249
0.250 - 0.499
0.500 +
1.000 - 0.71
0.700 - 0.60
0.699 - 0.50
0.499 - 0.38
0.379 - 0.25
0.249 - 0.00
17 21 23
19 24 29
20 27 33
22 30 38
24 33 46
26 38 58
20 26 30
22 29 37
23 31 41
24 34 47
25 37 55
22 30 38
23 33 44
24 35 50
25 37 55
Daylight Sensing Controls
Uow (HC(S))
HC RANGE
PCT FEN
INT INS
EXT INS
0.069
HC ≥ 5 17 0.071 0.092
HC ≥ 10 17 0.077 0.10
HC ≥ 15 17 0.082 0.10
HC ≥ 5 58 0.070 0.091
HC ≥ 10 58 0.076 0.10
HC ≥ 15 58 0.080 0.10
Min R-Value
WALL BELOW GRADE: 11
UNHEATED SLAB ON GRADE: 24' 30' 48'
Horizontal 18 15 11
Vertical 8 6 4
Max Uo
ROOF: 0.045
WALL ADJACENT TO UNCOND SPACE: 0.11
FLOOR OVER UNCOND SPACE: 0.040

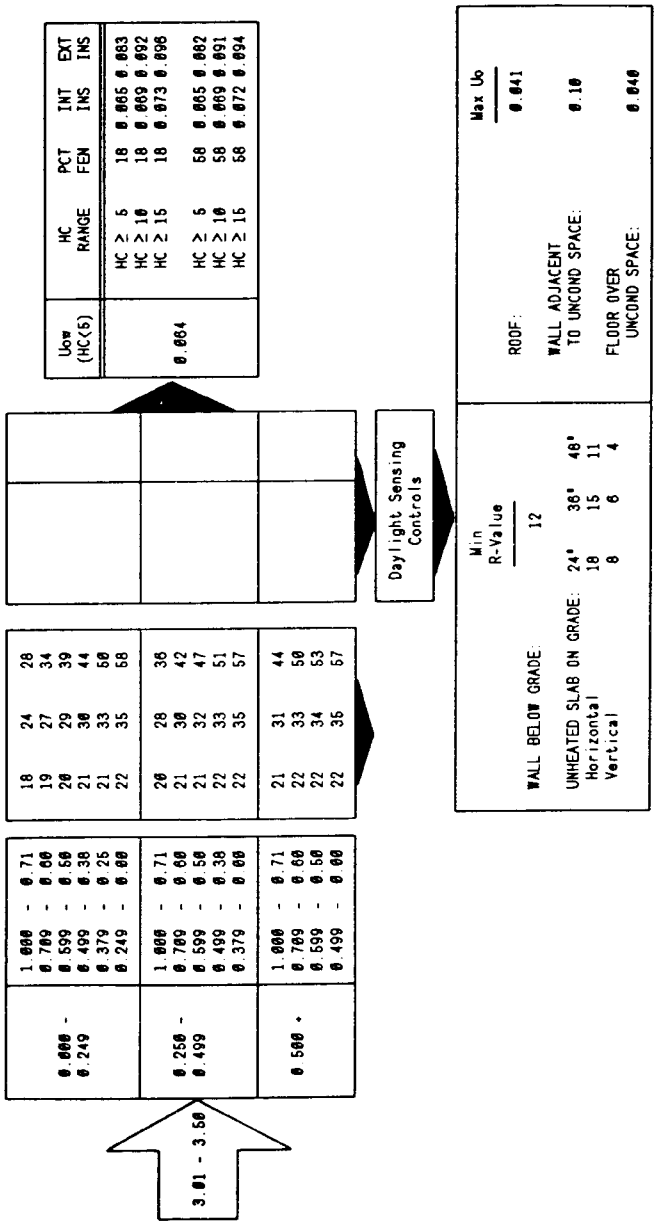

ALTERNATE COMPONENT PACKAGES FOR:
HDD65 = 3201 - 4000
CDD65 = 0 - 1150
VSEW = > 845
Casper WY
Cheyenne WY
Elko NV
Ely NV
North Platte NE
Pocatello ID
Scottsbluff NE
TABLE 5.4-27
OPAQUE WALL Uow
LIGHT WEIGHT WALL
MASS WALL
PERIMETER DAYLIGHTING
BASE CASE
VLT ≥ SC
Uof
INTERNAL LOAD DENSITY (ILD) RANGE
PROJECTION FACTOR (PF)
SHADING COEFF RANGE (SCx)
0 - 1.60
1.61 - 3.00
Uow (HC≤6)
HC RANGE
PCT FEN
INT INS
EXT INS
0.073
HC ≥ 6
HC ≥ 10
HC ≥ 15

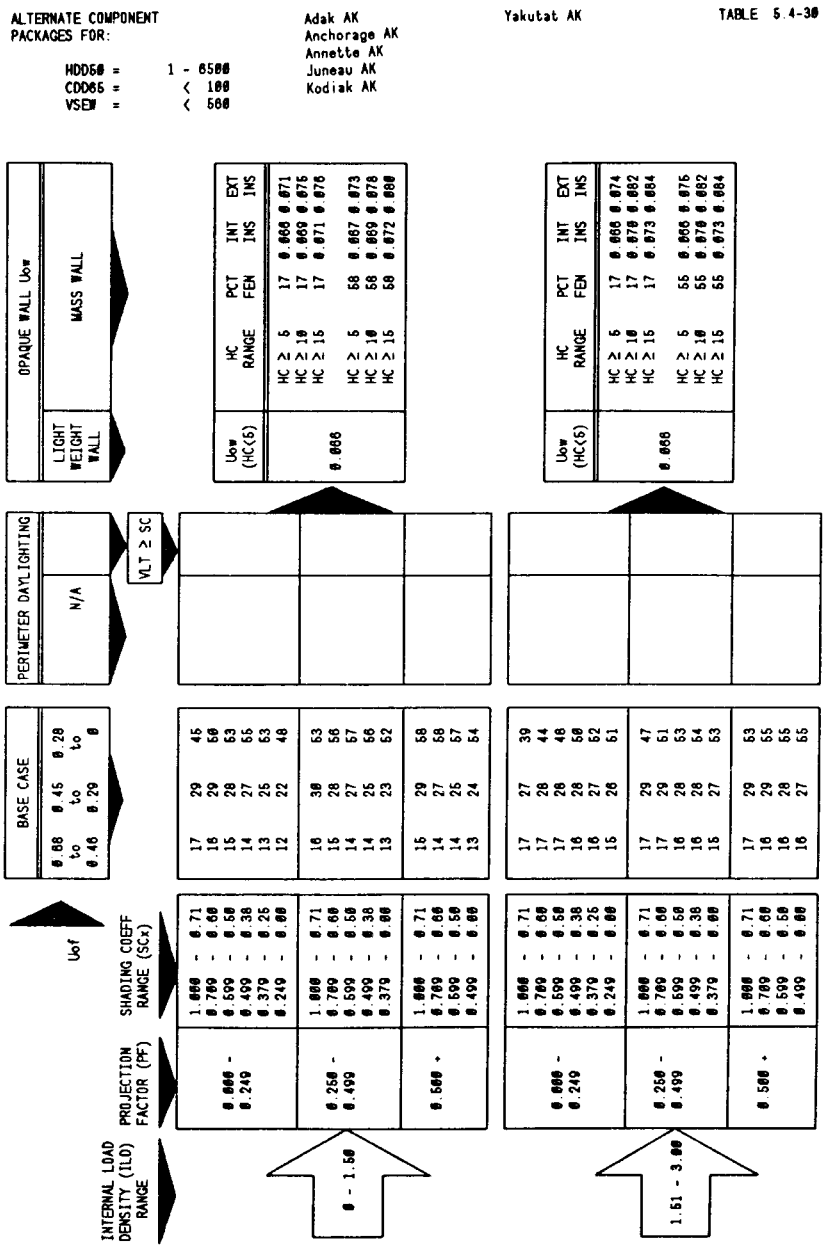

3.01 - 3.50
0.000 - 0.249
1.000 - 0.71
0.709 - 0.60
0.599 - 0.50
0.499 - 0.38
0.379 - 0.25
0.249 - 0.00
0.250 - 0.499
1.000 - 0.71
0.709 - 0.60
0.599 - 0.50
0.499 - 0.38
0.379 - 0.00
0.500 +
1.000 - 0.71
0.709 - 0.60
0.599 - 0.50
0.499 - 0.00
16 19 21
18 23 26
20 25 30
21 28 36
23 32 43
26 36 55
19 24 28
21 28 34
22 30 39
23 33 44
24 36 52
21 29 36
23 32 42
24 34 47
24 36 53
20 26 31
21 30 38
22 32 43
23 34 49
24 36 57
25 38 64
22 31 41
23 34 48
23 35 54
24 37 59
25 38 65
23 35 51
24 37 58
24 38 63
25 39 66
Daylight Sensing Controls
Min R-Value
16
WALL BELOW GRADE:
UNHEATED SLAB ON GRADE: 24" 36" 48"
Horizontal 18 15 11
Vertical 8 8 4
ROOF:
WALL ADJACENT TO UNCOND SPACE:
FLOOR OVER UNCOND SPACE:
Max Uo
0.040
0.12
0.042
Uow (HC<5)
0.073
HC RANGE
PCT FEN
INT INS
EXT INS
HC ≥ 5 16 0.077 0.11
HC ≥ 10 16 0.089 0.14
HC ≥ 15 16 0.10 0.15
HC ≥ 5 66 0.077 0.10
HC ≥ 10 66 0.086 0.12
HC ≥ 15 66 0.095 0.13

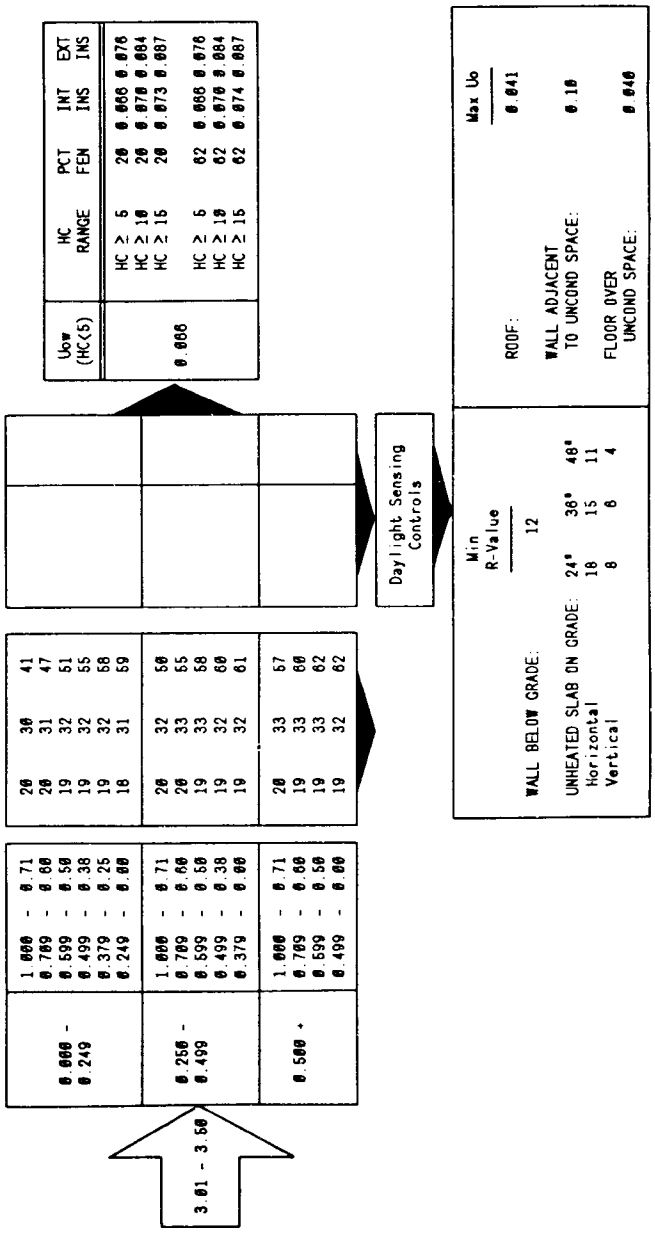

ALTERNATE COMPONENT PACKAGES FOR:
HDD65 = 4001 - 5000
CDD65 = 0 - 1150
VSEW = > 845
Bryce Ut
Eagle CO
Rock Springs WY
TABLE 5.4-28
OPAQUE WALL Uow
LIGHT WEIGHT WALL
MASS WALL
PERIMETER DAYLIGHTING
N/A
VLT ≥ SC
BASE CASE
Uof
INTERNAL LOAD DENSITY (ILD) RANGE
PROJECTION FACTOR (PF)
SHADING COEFF RANGE (SCx)
0 - 1.50
1.51 - 3.00

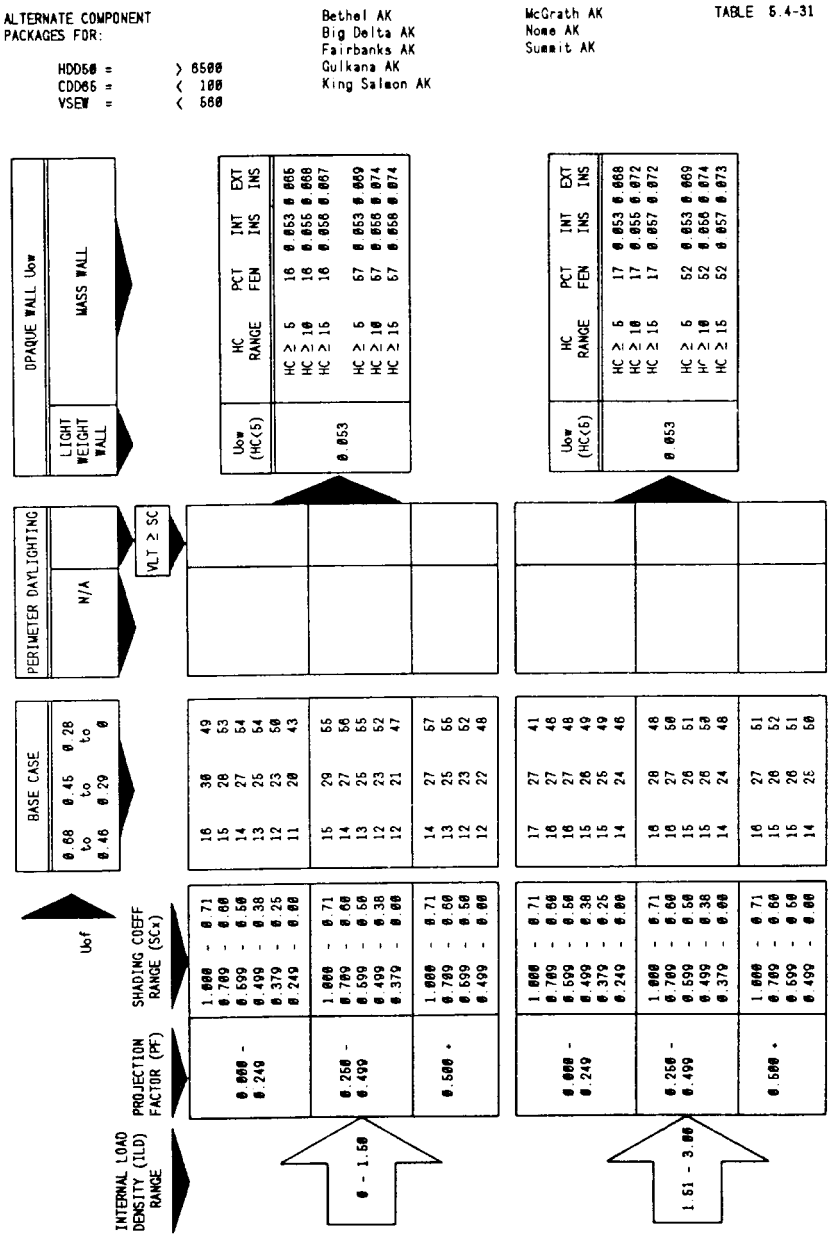

3.01 - 3.50
0.000 - 0.249
0.250 - 0.499
0.500 +
1.000 - 0.71
0.700 - 0.60
0.599 - 0.50
0.499 - 0.38
0.379 - 0.25
0.249 - 0.00
17 24 29
17 25 34
17 26 38
17 27 42
17 27 46
16 27 49
18 27 37
18 28 42
17 28 45
17 28 48
17 28 50
18 29 44
18 29 48
17 29 51
17 29 52
Uow (HC≤5)
0.064
HC RANGE
PCT FEN
INT INS
EXT INS
HC ≥ 5 17 0.066 0.095
HC ≥ 10 17 0.073 0.11
HC ≥ 15 17 0.080 0.12
HC ≥ 5 52 0.066 0.095
HC ≥ 10 52 0.073 0.11
HC ≥ 15 52 0.080 0.12
Daylight Sensing Controls
Min R-Value
WALL BELOW GRADE: 11
UNHEATED SLAB ON GRADE: 24" 36" 48"
Horizontal 18 15 11
Vertical 8 6 4
Max Uo
ROOF: 0.045
WALL ADJACENT TO UNCOND SPACE: 0.11
FLOOR OVER UNCOND SPACE: 0.040


ALTERNATE COMPONENT PACKAGES FOR:
HDD65 = 5001 - 8500
CDD65 = 0 - 1150
VSEW = 500 - 845
Bismarck ND
Caribou ME
Duluth MN
Fargo ND
Glasgow MT
International Falls MN
Minot ND
Sault Sainte Marie MI
TABLE 6.4-29
OPAQUE WALL Uow
LIGHT WEIGHT WALL
MASS WALL
PERIMETER DAYLIGHTING
N/A
VLT ≥ SC
BASE CASE
0.68 to 0.46
0.46 to 0.29
0.28 to 0
Uof
INTERNAL LOAD DENSITY (ILD) RANGE
PROJECTION FACTOR (PF)
SHADING COEFF RANGE (SCx)
0 - 1.50
1.51 - 3.00
0.000 - 0.249
0.250 - 0.499
0.500 +
1.000 - 0.71
0.709 - 0.60
0.599 - 0.50
0.499 - 0.38
0.379 - 0.25
0.249 - 0.00
Uow (HC<6)
0.064
HC RANGE
PCT FEN
INT IMS
EXT IMS
HC ≥ 6
HC ≥ 10
HC ≥ 15
19 0.065 0.077
19 0.068 0.083
19 0.070 0.085
60 0.065 0.078
60 0.068 0.085
60 0.070 0.087
18 0.065 0.081
18 0.069 0.090
18 0.072 0.093
60 0.066 0.081
60 0.068 0.089
60 0.072 0.092


3.01 - 3.50
0.000 - 0.249
1.000 - 0.71
0.709 - 0.60
0.599 - 0.50
0.499 - 0.38
0.379 - 0.25
0.249 - 0.00
18 24 28
19 27 34
20 29 39
21 30 44
21 33 50
22 35 58
0.250 - 0.499
1.000 - 0.71
0.709 - 0.60
0.599 - 0.50
0.499 - 0.38
0.379 - 0.00
20 28 36
21 30 42
21 32 47
22 33 51
22 35 57
0.500 +
1.000 - 0.71
0.709 - 0.60
0.599 - 0.50
0.499 - 0.00
21 31 44
22 33 50
22 34 53
22 35 57
Daylight Sensing Controls
Min R-Value
ROOF: 12
WALL BELOW GRADE:
UNHEATED SLAB ON GRADE: 24" 36" 48"
Horizontal 10 15 11
Vertical 0 0 4
Max Uo
ROOF: 0.041
WALL ADJACENT TO UNCOND SPACE: 0.10
FLOOR OVER UNCOND SPACE: 0.040
Uow (HC(5)) 0.064
HC RANGE PCT FEN INT INS EXT INS
HC ≥ 5 18 0.065 0.083
HC ≥ 10 18 0.069 0.092
HC ≥ 15 18 0.073 0.096
HC ≥ 5 50 0.065 0.082
HC ≥ 10 50 0.069 0.091
HC ≥ 15 50 0.072 0.094


ALTERNATE COMPONENT PACKAGES FOR:
HDD65 = 1 - 6500
CDD65 = < 100
VSEW = < 500
Adak AK
Anchorage AK
Annette AK
Juneau AK
Kodiak AK
Yakutat AK
TABLE 5.4-30
OPAQUE WALL Uow
LIGHT WEIGHT WALL
MASS WALL
PERIMETER DAYLIGHTING
N/A
VLT ≥ SC
BASE CASE
Uof
SHADING COEFF RANGE (SCx)
PROJECTION FACTOR (PF)
INTERNAL LOAD DENSITY (ILD) RANGE
0 - 1.50
1.51 - 3.00
Uow (HC(5)
HC RANGE
PCT FEN
INT INS
EXT INS
0.066
HC ≥ 5
HC ≥ 10
HC ≥ 15


3.01 - 3.60
0.000 - 0.249
1.000 - 0.710
0.709 - 0.600
0.599 - 0.500
0.499 - 0.380
0.379 - 0.250
0.249 - 0.000
20 30 41
20 31 47
19 32 51
19 32 55
19 32 58
18 31 59
0.250 - 0.499
1.000 - 0.710
0.709 - 0.600
0.599 - 0.500
0.499 - 0.380
0.379 - 0.000
20 32 50
20 33 55
19 33 58
19 32 60
19 32 61
0.500 +
1.000 - 0.710
0.709 - 0.600
0.599 - 0.500
0.499 - 0.000
20 33 57
19 33 60
19 33 62
19 32 62
Daylight Sensing Controls
Uow (HC(S))
HC RANGE
PCT FEN
INT INS
EXT INS
0.066
HC ≥ 5 20 0.066 0.076
HC ≥ 10 20 0.070 0.084
HC ≥ 15 20 0.073 0.087
HC ≥ 5 02 0.066 0.076
HC ≥ 10 02 0.070 0.084
HC ≥ 15 02 0.074 0.087
Min R-Value
12
WALL BELOW GRADE:
UNHEATED SLAB ON GRADE: 24" 36" 48"
Horizontal 18 15 11
Vertical 8 6 4
Max Uo
ROOF: 0.041
WALL ADJACENT TO UNCOND SPACE: 0.10
FLOOR OVER UNCOND SPACE: 0.040


ALTERNATE COMPONENT PACKAGES FOR:
HDD65 = > 6500
CDD65 = < 100
VSEW = < 500
Bethel AK
Big Delta AK
Fairbanks AK
Gulkana AK
King Salmon AK
McGrath AK
Nome AK
Summit AK
TABLE 5.4-31
OPAQUE WALL Uow
LIGHT WEIGHT WALL
MASS WALL
Uow (HC(5))
0.053
HC RANGE
PCT FEN
INT INS
EXT INS
HC ≥ 5 16 0.053 0.066
HC ≥ 10 16 0.055 0.068
HC ≥ 15 16 0.058 0.067
HC ≥ 5 67 0.053 0.069
HC ≥ 10 67 0.058 0.074
HC ≥ 15 67 0.058 0.074
Uow (HC(6))
0.053
HC ≥ 5 17 0.053 0.068
HC ≥ 10 17 0.055 0.072
HC ≥ 15 17 0.057 0.072
HC ≥ 5 52 0.053 0.069
HC ≥ 10 52 0.056 0.074
HC ≥ 15 52 0.057 0.073
PERIMETER DAYLIGHTING
N/A
VLT ≥ SC
BASE CASE
0.68 to 0.46
0.45 to 0.29
0.28 to 0
Uof
SHADING COEFF RANGE (SCx)
1.000 - 0.71
0.709 - 0.60
0.599 - 0.50
0.499 - 0.38
0.379 - 0.25
0.249 - 0.00
PROJECTION FACTOR (PF)
0.000 - 0.249
0.250 - 0.499
0.500 +
INTERNAL LOAD DENSITY (ILD) RANGE
0 - 1.50
1.51 - 3.00

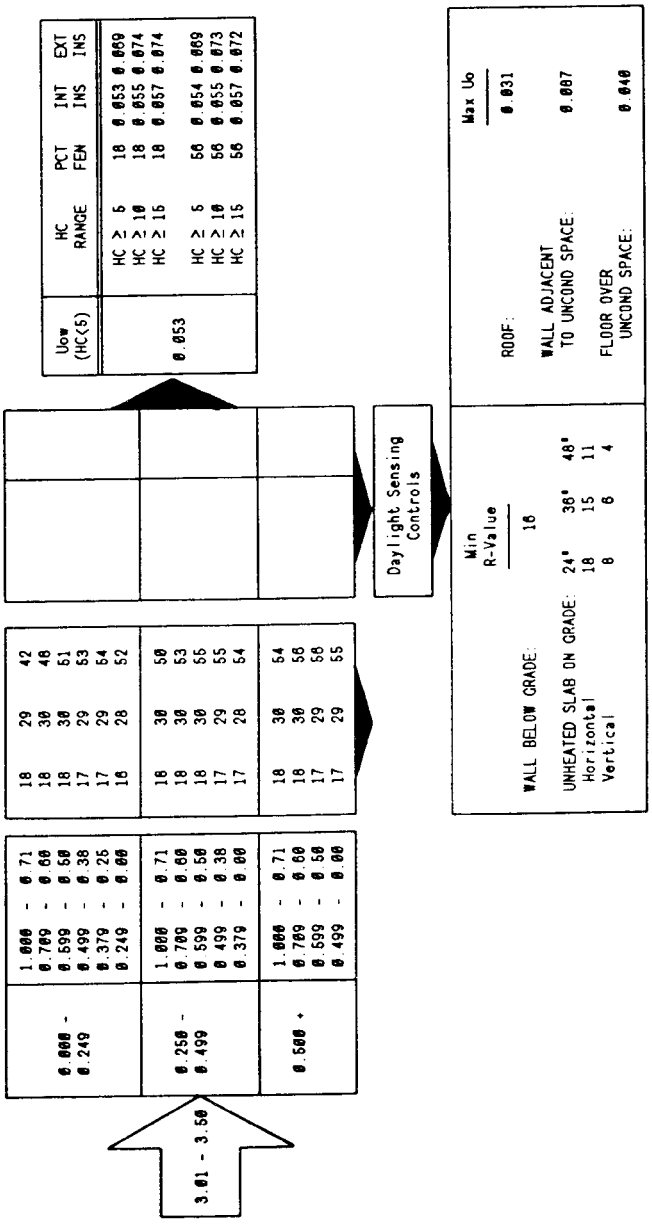

3.01 - 3.50
0.000 - 0.249
1.000 - 0.71
0.709 - 0.60
0.599 - 0.50
0.499 - 0.38
0.379 - 0.25
0.249 - 0.00
18 29 42
18 30 48
18 30 51
17 29 53
17 29 54
16 28 52
0.250 - 0.499
1.000 - 0.71
0.709 - 0.60
0.599 - 0.50
0.499 - 0.38
0.379 - 0.00
16 30 50
18 30 53
18 30 55
17 29 55
17 28 54
0.500 +
1.000 - 0.71
0.709 - 0.60
0.599 - 0.50
0.499 - 0.00
18 30 54
18 30 56
17 29 56
17 29 55
Daylight Sensing Controls
Uow (HC(5))
0.053
HC RANGE
PCT FEN
INT INS
EXT INS
HC ≥ 5 18 0.053 0.069
HC ≥ 10 18 0.055 0.074
HC ≥ 15 18 0.057 0.074
HC ≥ 5 50 0.054 0.069
HC ≥ 10 50 0.055 0.073
HC ≥ 15 50 0.057 0.072
Min R-Value
16
WALL BELOW GRADE:
UNHEATED SLAB ON GRADE: 24' 30' 48'
Horizontal 18 15 11
Vertical 8 8 4
Max Uo
ROOF: 0.031
WALL ADJACENT TO UNCOND SPACE: 0.087
FLOOR OVER UNCOND SPACE: 0.040

Table 5.4-1
Climate Data Grouped by ACP Tables

ACP Table Number	HDD50 Range	CDD65 Range	VSEW Range	CDH80 Range	Example Cities
5.4-2	0	3001-4500	>800		Barbers Point, Hilo, Honolulu, Lihue
5.4-3	0	>4500	>845		Guantanamo Bay, Kwajalein, San Juan, Wake Island
5.4-4	1-1000	0-1150	560-845		Arcata, North Bend
5.4-5	1-1000	0- 300	>845		Oakland, San Francisco, Santa Maria, Sunnyville
5.4-6	1-1000	301-1150	>845		El Toro, Long Beach, Los Angeles, San Diego
5.4-7	1-1000	1151-2000	560-845		Atlanta, Augusta, Birmingham, Cherry Point, Greenville
5.4-8	1-1000	1151-2000	>845		Fresno, Red Bluff, Sacramento
5.4-9	1-1000	2001-3250	560-845	0-18000	Charleston, Houston, Jackson, Montgomery, New Orleans
5.4-10	1-1000	2001-3250	>845	>18000	Austin, Bakersfield, El Paso, Fort Worth, Tallahassee, Tampa
5.4-11	1-1000	2001-3250	>845	>18000	China Lake, Las Vegas, Tucson
5.4-12	1-1000	3251-4500	>845	0-18000	Brownsville, Corpus Christi, Miami, Orlando, West Palm Beach
5.4-13	1-1000	3251-4500	>845	>18000	Laredo, Phoenix, Yuma
5.4-14	1001-1750	0- 500	560-845		Olympia, Portland, Salem, Seattle/Tacoma, Whidbey Island
5.4-15	1001-1750	501-1150	560-845		Asheville, Medford
5.4-16	1001-1750	1-1150	>845		Prescott, Winslow, Yucca
5.4-17	1001-1750	1151-2000	560-845		Charlotte, Chattanooga, Knoxville, Norfolk, Raleigh, Richmond
5.4-18	1001-1750	1151-2000	>845		Albuquerque, Lubbock, Oklahoma City, Roswell, Tucumcari
5.4-19	1001-1750	2001-3250	560-845		Fort Smith, Memphis, Tulsa
5.4-20	1751-2600	0-1150	560-845		Baltimore, Boston, Columbus, Harrisburg, New York, Washington
5.4-21	2601-3200	0-1150	560-845		Akron, Chicago, Detroit, Hartford, Indianapolis, Pittsburgh
5.4-22	1751-3200	0-1150	>845		Boise, Colorado Springs, Denver, Reno, Salt Lake City
5.4-23	1751-3200	1151-2000	560-845		Evansville, Lexington, Louisville, Saint Louis, Springfield
5.4-24	1751-3200	1151-2000	>845		Dodge City, Grand Junction
5.4-25	3201-4000	0-1150	560-845		Albany, Buffalo, Concord, Des Moines, Milwaukee, Rapid City
5.4-26	4001-5000	0-1150	560-845		Bangor, Cutbank, Huron, Minneapolis, Rochester, Sioux Falls
5.4-27	3201-4000	0-1150	>845		Casper, Cheyenne, Ely, North Platte, Scottsbluff
5.4-28	4001-5000	0-1150	>845		Bryce, Eagle, Rock Springs
5.4-29	5001-6500	0-1150	560-845		Bismarck, Duluth, Fargo, Glasgow, International Falls
5.4-30	1-6500	< 100	<560		Adak, Anchorage, Juneau, Kodiak, Yakutat
5.4-31	>6500	< 100	<560		Bethel, Fairbanks, King Salmon, Nome, Summit

(b) From the list of cities in Appendix 5A, ''List of Cities and Climate Data'', which contains data for 234 cities, select the closest city climatologically to the building site. If the site is not one of the cities listed or if the climate at the site differs significantly from a listed adjacent city, obtain the information from the weather bureau or other reliable source and use (a) above. The column designated ''ACP Table No.'' contains the table number of the appropriate ACP Table.

(c) For information purposes only, the climate data used to develop the ACP tables for the above-grade wall section are shown in Table 5.4–32. The criteria for all other envelope sections was based on the most stringent level for the cities listed in the ACP Table.

5.4.3.2.2 Determination of Maximum Allowable Percent Fenestration.

(a) Using the appropriate ACP Table, determine the maximum allowable percent fenestration. The maximum allowable percent fenestration is the

total area of fenestration assemblies divided by the total gross exterior wall area, considering all elevations of the building. Determining the maximum allowable percent fenestration requires the following five steps:

(1) Based on the Internal Load Density (ILD) for the proposed design, select one of the three Internal Load Ranges as the point of entry to the tables. Note for ILD's greater than 3.5 W/ft^2 use the 3.5 W/ft^2 range. For shell buildings, see procedures in Section 5.3.8. Determine the ILD of the proposed design, based on the sum of the Internal Lighting Power Allowance (ILPA), the Equipment Power Density (EPD) and Occupant Load Adjustment (OLA), as shown in Equation 5.4–1.

ILD=ILPA+EPD+OLA

Equation 5.4–1

Where:

The Internal Lighting Power Allowance (ILPA) shall be:

1. The building average Internal Lighting Power Allowance (ILPA) of the design building in W/ft^2 as determined in Section 3.4 or 3.5;

2. The average of the Lighting Power Budgets (LPB) for all activity areas within 15 ft of each exterior wall based on the procedures specified by the Systems Performance Criteria of Section 3.5.3, or

3. The actual lighting power density of the proposed design in W/ft^2, either the building average or the average of the lighting power within 15 ft of each exterior wall.

NOTE.— The lighting prescriptive path, Section 3.4, does not provide lighting values for health, assembly, multi-family high rise, and hotel/motel buildings type occupancies. Use the 1.51 to 3.0 range of Internal Load Density for health and assembly buildings; and the 0 to 1.5 range for multi-family high rise and hotel/motel buildings.

The Equipment Power Density (EPD) shall be either:

1. The building average receptacle power density selected from Table 5.4–33 in W/ft^2; or

Table 5.4-33
Average Receptacle Power Densities

BUILDING TYPE	W/ft^2
1. Assembly	.0.25
2. Office	.0.75
3. Retail	.0.25
4. Warehouse	.0.10
5. School	.0.50
6. Hotel/Motel	.0.25
7. Restaurant	.0.10
8. Health	.1.00
9. Multi-Family	.0.75

2. The actual average receptacle power density for all activity areas within 15 ft of each exterior wall in W/ft^2, considering diversity. For determining compliance in Tables 5.4–2 through 5.4–31, the actual average receptacle power densities calculated by this method that exceed 1.0 W/ft^2 shall be limited to 1.0 W/ft^2 in Equation 5.4–1.

The Occupant Load Adjustment (OLA) shall be either:

1. 0.0 W/ft^2. This recognizes the assumed occupant sensible load of 0.6 W/ft^2 that is built into the ACP tables; or

2. A positive or negative difference between the actual occupant load and 0.6 W/ft^2 if the design building has a larger or smaller occupant load.

(2) *Select external shading projection factor (PF).* If no external shading projections are used in the proposed design, select the column designated Projection Factor=0.000−0.249. If external shading projections are used, determine the average area weighted projection factor on the window in accordance with Equation 5.4–2. Then select the appropriate column in the ACP Table.

$$PF = P_d/H$$

Equation 5.4–2

Where:

PF=Average area weighted projection factor

P_d=External horizontal shading projection depth, in. or ft

H=Sum of height of the fenestration and the distance from the top of the fenestration to the bottom of external shading projection in units consistent with P_d.

(3) Select the Shading Coefficient of the fenestration (SC_x) including internal, integral, and external shading devices, but excluding the effect of external shading projections (PF). This includes curtains, shades, or blinds. Reference *ASHRAE Handbook, 1985 Fundamentals Volume*, Chapter 27.

(4) Select one of the daylighting options, either:

1. Base Case, no daylighting; or

2. Perimeter Daylighting (automatic daylight controls for lighting system must be used). This option is not available in some locations.

(5) Select appropriate fenestration type. For most options, this is determined by the thermal transmittance value (U_{of}) of the fenestration assembly. For some fenestration options, the visible light transmittance (VLT) of the fenestration should not be less than the shading coefficient of the glazed portion of the fenestration assembly, not considering any shading devices. The ranges generally correspond to single glazing, double glazing, triple glazing and high performance glazing incorporating low emissivity coatings/films or more than two glazing layers. Each ACP table includes at most, three ranges of glazing U-value.

5.4.4.2.3 *Determine the Maximum U_{ow} for the Opaque Wall Assembly*. In the appropriate ACP Table the Maximum U_{ow} for the opaque wall assembly is determined using the following steps:

(a) For a lightweight wall assembly, heat capacity (HC) less than 5 Btu/ft²•°F, use the value indicated. This U_{ow} is constant over all internal load ranges.

(b) To use the mass wall adjustment, the following additional steps are necessary:

(1) Select the same internal load range as that used in determining the maximum allowable percent fenestration.

(2) Select the mass wall heat capacity (HC) and insulation position. If the wall insulation is positioned internal to or integral with the wall mass, use the column headed Interior/Integral Insulation. If the wall insulation is positioned external to the wall mass use the column headed Exterior Insulation. For HC less than 5 Btu/ft²•°F this adjustment table cannot be used. At this step you will have two choices of U_{ow} that are keyed to a small or large percent fenestration. This represents the full range of U_{ow} values allowed.

(3) Select or interpolate the appropriate maximum U_{ow} for the opaque wall based on the maximum allowable percent fenestration determined in Section 5.4.4.2.2 or the actual building percent fenestration whichever value is lower. The U_{ow} shall be determined by straight line interpolation for fenestration percentages between the smallest and largest values listed. If the design building percentage fenestration is less than the smallest value listed, select the U_{ow} for the largest percentage fenestration listed.

5.4.4.2.4 *Determine Other Envelope Criteria*. In each ACP table, the criteria for roof, wall adjacent to unconditioned space, wall below grade (first story only), floor over unconditioned space, and slab-on-grade floors, shall be met. For heated slabs on grade, the R-value shall be the R-value for the unheated slab-on-grade plus 2.0. For skylights, the daylight credit procedure presented in Section 5.3.10 shall be used.

5.5 Building Envelope—System Performance Compliance Alternative

5.5.1 Roof Thermal Transmittance Criteria

5.5.1.1 Any building that is heated and/or mechanically cooled shall have an overall thermal transmittance value (U_{or}) for the gross area of the roof assembly not greater than the value determined by Equation 5.5–1. The provisions of Section 5.3 shall be followed in determining acceptable combinations of materials that will meet the required U_{or} values of Equation 5.5–1.

$$U_o=1/(5.3+1.8\times10^{-3}\times HDD65+1.3\times10^{-3}\times CDD65+2.6\times10^{-4}\times CDH80)$$

Equation 5.5–1

5.5.1.2 Equation 5.5–1 applies only for climate locations with HDD65 less than or equal to 15,000. For climate locations with HDD65 greater than 15,000, see subsection 5.3.9, Table 5.3–5.

5.5.1.2.1 *Exceptions to Section 5.5.1.2:*

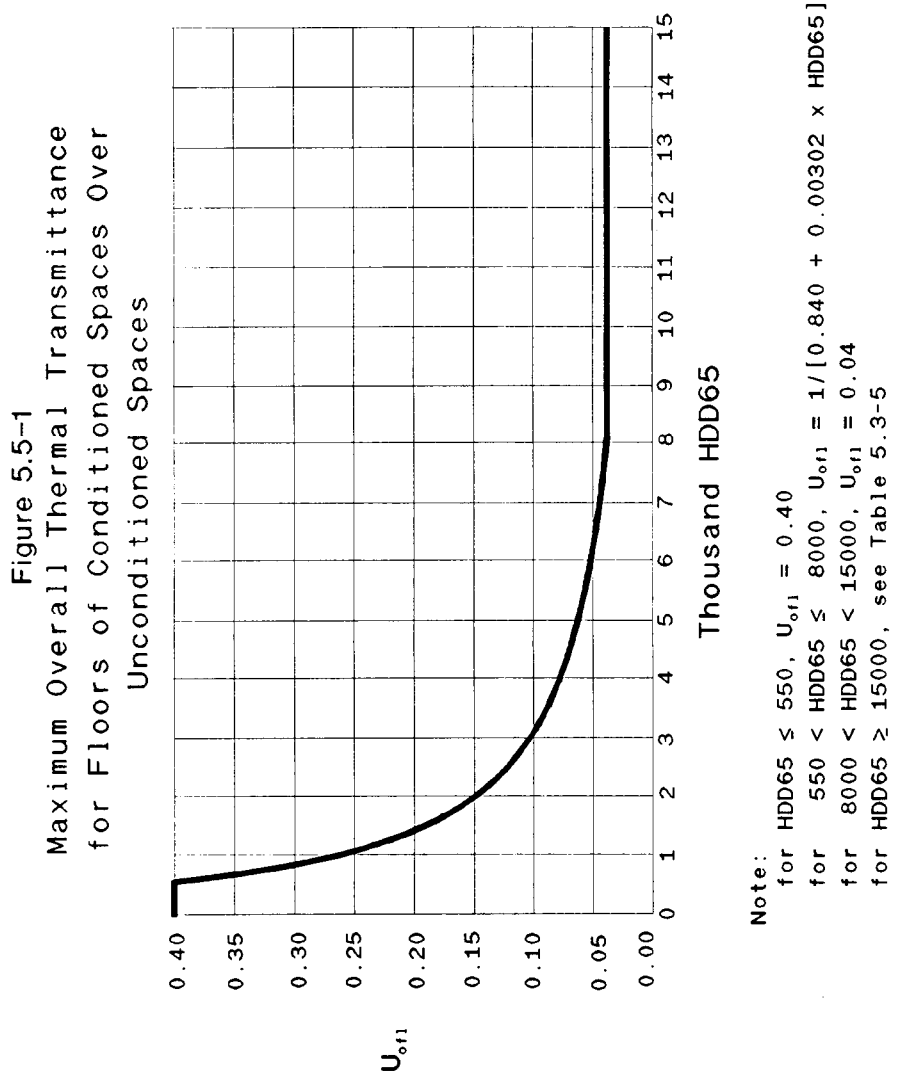
(a) any building that is only heated shall have an overall thermal transmittance value (U_{or}) for the gross area of the roof assembly less than or equal to the value determined by Equation 5.5–1 with CDD65 and CDH80 set equal to zero; and

(b) any building that is only mechanically cooled shall have an overall thermal transmittance value (U_{or}) for the gross area of the roof assembly less than or equal to the value determined by Equation 5.5–1 with HDD65 set equal to zero.

5.5.2 Floor Thermal Transmittance Criteria

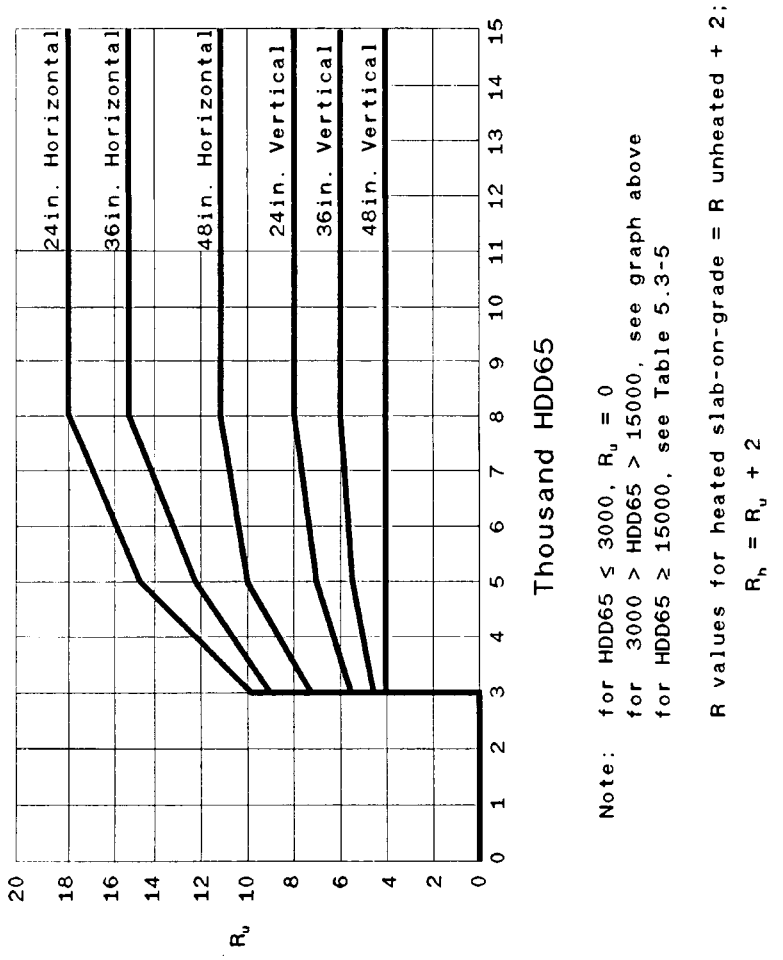
5.5.2.1 The floors of any building that is heated and/or mechanically cooled shall meet the following thermal criteria:

5.5.2.1.1 Floors of conditioned spaces over unconditioned spaces shall have a thermal transmittance (U_{of}) not greater than that specified in Figure 5.5–1.



5.5.2.1.2 Slab-on-grade floors shall have insulation around the perimeter of the floor with the thermal resistance (R_u) of the insulation as specified in Figure 5.5–2. The insulation specified in Figure 5.5–2 shall extend either in a vertical plane downward from the top of the slab for the minimum distance shown or downward to the bottom of the slab for the minimum distance shown then in a horizontal plane beneath the slab. The horizontal length, or vertical depth, of insulation required varies from 24 in. to 48 in. depending upon the R-value selected. For heated slabs, an R of 2 shall be added to the thermal resistance required in Figure 5.5–2.

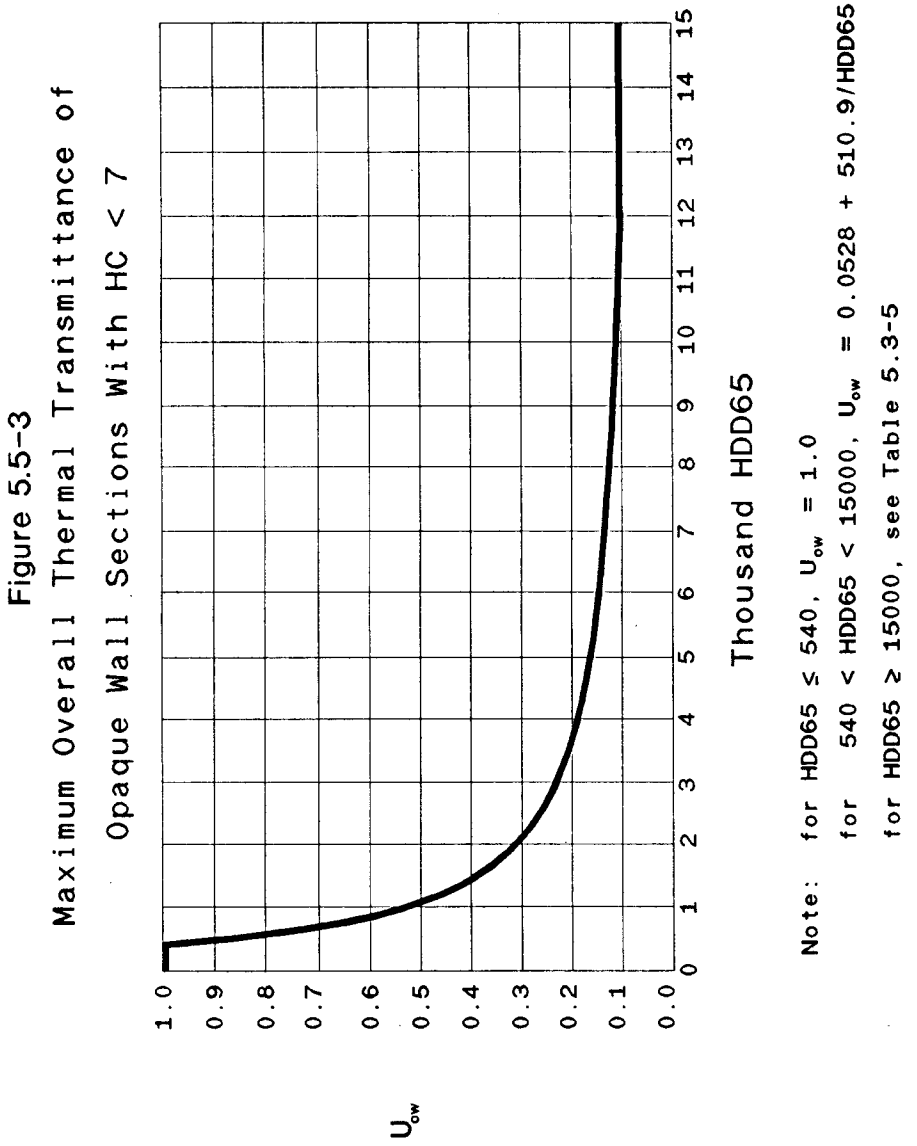
Figure 5.5-2
Thermal Resistance for Unheated Slab on Grade



(a) Vertical insulation is not required to extend below the foundation footing. There are no insulation requirements for slabs in locations having less than 3,000 HDD65 for footings extending less than 18 in. below grade.

5.5.3 Thermal Transmittance Criteria For Opaque Walls Enclosing Conditioned Spaces Exposed to Interior Unconditioned Spaces

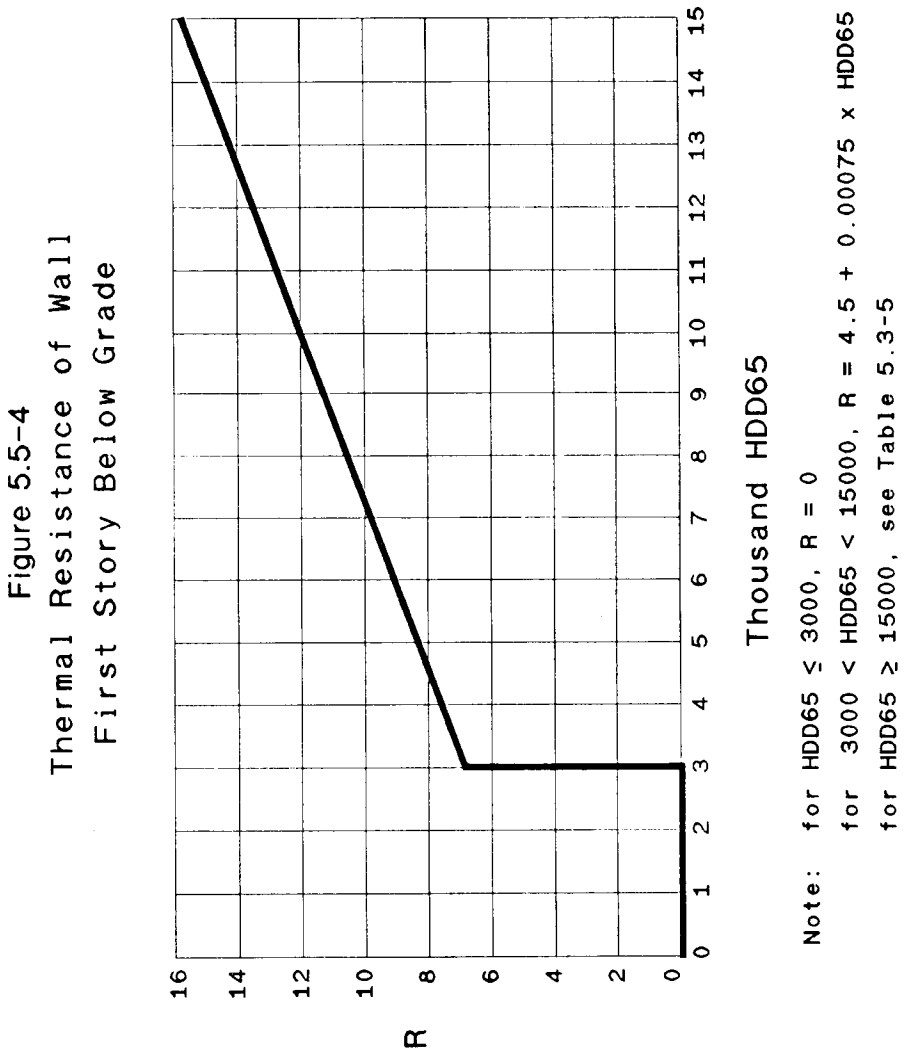
5.5.3.1 All opaque walls enclosing conditioned spaces exposed to interior unconditioned spaces shall have an overall thermal transmittance (U_{ow}) not greater than the value specified in Figure 5.5–3.



5.5.4 Thermal Resistance Criteria for Exterior Wall Insulation Below Grade

5.5.4.1 The thermal resistance (R) of the wall assembly shall be greater than, or equal to the insulation level specified in Figure 5.5–4, or the heat loss calculated in accordance with Chapter 25 of the *ASHRAE Handbook, 1985 Fundamentals Volume* shall be less than, or equal to that of a wall below grade having a thermal resistance equal to that specified in Figure 5.5–4. No insulation is required for climate

locations with less than 3,000 HDD65 for those portions of walls more than one story below grade.



5.5.5 External Wall Criteria for Heating and Cooling

5.5.5.1 The external wall heating criteria (WC_h) and cooling criteria (WC_c) represent limits on cumulative annual heating and cooling energy flux attributable to transmission and solar gain. These limits accommodate variation in internal load and wall heat capacity. They shall be determined for a building envelope design using Equations 5.5–2 and 5.5–6 in Attachment 5B, ''Equations

to Determine External Wall Heating and Cooling Criteria (WC_c and WC_h) and to Determine Compliance (C_i and H_i) With the Criteria.''

5.5.6 Wall Heating and Cooling Compliance Values

5.5.6.1 The wall heating compliance value H_i and the wall cooling compliance value C_i are estimates of the cumulative annual heating and cooling energy flux attributable to heat transmission and solar gains. These estimates consider the effects of variations in internal load and wall heat capacity. They shall be calculated using Equations 5.5–2 and 5.5–6 in Attachment 5B.

5.5.6.3 Applying the Criteria

5.5.6.3.1 The wall criteria shall be applied as follows:

(a) For all buildings that are heated and mechanically cooled, the sum of the calculated wall heating and cooling compliance values, H_i and C_i, for all orientations of the proposed design, as determined in section 5.5.6, shall not exceed the sum of the corresponding wall criteria for all orientations for wall heating (WC_h) and wall cooling (WC_c).

(b) For buildings that are only heated, the sum of the calculated wall heating compliance values, H_i, for all orientations of the proposed design, as determined in section 5.5.6, shall not exceed the sum of the corresponding wall heating criterion WC_h for all orientations.

(c) For buildings that are only mechanically cooled, the sum of the calculated cooling compliance values, C_i, for all orientations of the proposed design, as determined from section 5.5.6, shall not exceed the sum of the corresponding wall cooling criteria, WC_c for all orientations.

5.5.6.4 Constraints on Thermal Transmittance Values

5.5.6.4.1 The compliance calculation procedure in section 5.5.6.3 allows great flexibility in selecting values for envelope components as long as the overall criteria are met. In calculating compliance, two constraints are imposed on thermal transmittance values for opaque wall assemblies and fenestration assemblies comprising the U_o term, as follows:

(a) *Opaque Wall Assemblies:* The opaque portion of walls with heat capacity (HC) less than 7 Btu/ft²÷°F shall have an overall thermal transmittance (U_{ow}) not greater than the value specified in Figure 5.5–4. Procedures, specified in section 5.3, shall be used to determine acceptable combinations of materials that meet the required value.

(b) *Fenestration Assemblies:* The overall thermal transmittance (U_{of}) of fenestration assemblies shall not exceed 0.81 Btu/h•ft²•°F for all locations with more than 3000 HDD65 if the fenestration area exceeds 10% of the total wall area exposed to the outside air. Thermal transmittance for the fenestration shall be determined using the calculation procedures in Section 5.3.1 and shall include the effects of sash, frames, edge effects, and spacers for multiple-glazed units.

5.5.6.5 Constraint on Daylighting Credit

5.5.6.5.1 For a given orientation, daylight credit may be used in Equations 5.5–2 and 5.5–6 only for that portion of the fenestration that is less than or equal to 65% of the gross wall area of the orientation.

5.5.6.6 Lighting Power Density

5.5.6.6.1 The Lighting Power Density used in calculating the compliance value shall be:

(a) The building average unit Interior Lighting Power Allowance of the proposed design in W/ft² as specified in section 3.0;

(b) The average of the Lighting Power Budgets for all activity areas within 15 ft of each exterior wall based on the procedures set forth in section 5.3; or

(c) The actual lighting power density of the proposed design in W/ft², either building average or average of the lighting power within 15 ft of each exterior wall.

5.5.6.7 Equipment Power Density

5.5.6.7.1 The equipment power density used in determining compliance shall be either:

(a) The ''Average Receptacle Power Densities'' from Table 5.4–32, or

(b) The actual average Equipment Unit Power Density, considering diversity, either building average or average in the activity areas within 15 ft of each exterior wall, not to exceed 1 W/ft^2.

5.5.6.8 Occupancy Loads

5.5.6.8.1 An occupancy load of 0.6 W/ft^2 is assumed. If the occupancy loads in the building design are different from this value, use the larger value.

Attachment 5A
List of Cities and Climate Data

NO	CITY	STATE	HDD50	HDD65	VSW	VSEW	VSS	CDD50	CDD65	CDH80	DR	NO HRS 8AM-4PM T<55	NO HRS 8AM-4PM 55≤T≤69	ACP TABLE
Alabama														
28	Birmingham	AL	765	2882	464	789	908	5182	1825	6272	17.5	720	760	5.4- 7
143	Mobile	AL	164	1580	486	816	919	6478	2419	7479	16.6	408	774	5.4- 9
145	Montgomery	AL	491	2261	462	823	981	5821	2116	8473	19.5	609	734	5.4- 9
Alaska														
2	Adak	AK	3562	8913	280	434	652	124	0	0	9.9	2754	156	5.4-30
9	Anchorage	AK	5301	10540	272	538	926	236	0	0	13.8	2398	521	5.4-30
10	Annette Island	AK	2545	7277	285	482	739	756	12	0	10.1	2169	719	5.4-30
24	Bethel	AK	8285	13449	252	453	789	312	0	0	14.3	2555	347	5.4-31
25	Big Delta	AK	9355	14069	249	527	989	777	16	25	19.0	2141	606	5.4-31
76	Fairbanks	AK	9841	14414	241	492	919	922	19	8	18.2	2083	682	5.4-31
93	Gulkana	AK	8865	13846	257	522	943	498	4	6	18.5	2225	615	5.4-31
105	Juneau	AK	4223	9350	254	410	642	348	0	0	12.7	2367	540	5.4-30
106	King Salmon	AK	6843	11992	270	499	860	330	4	6	15.4	2395	502	5.4-31
109	Kodiak	AK	3775	8896	276	509	852	360	6	0	10.6	2519	384	5.4-30
132	McGrath	AK	9967	14868	246	467	841	578	3	0	15.9	2265	596	5.4-31
152	Nome	AK	9061	14418	242	478	871	119	0	0	9.0	2710	210	5.4-31
208	Summit	AK	9210	14530	247	488	893	155	0	0	13.6	2616	298	5.4-31
231	Yakutat	AK	4486	9714	247	402	650	248	0	0	9.3	2471	439	5.4-30
Arizona														
163	Phoenix	AZ	90	1382	488	1116	1310	7830	3647	34521	21.2	373	746	5.4-13
171	Prescott	AZ	1477	4462	473	1090	1334	3385	895	3973	24.0	1021	725	5.4-16
218	Tucson	AZ	178	1601	500	1112	1280	6822	2769	19657	21.9	399	716	5.4-11
229	Winslow	AZ	1695	4603	471	1092	1338	3708	1141	7347	27.7	1130	634	5.4-16
234	Yuma	AZ	43	782	493	1151	1330	8921	4186	37892	23.5	247	697	5.4-13
Arkansas														
79	Fort Smith	AR	1149	3394	462	842	1005	5307	2077	10413	22.4	925	547	5.4-19
121	Little Rock	AR	912	3091	465	831	981	5351	2055	8450	17.5	865	626	5.4- 9
California														
12	Arcata	CA	582	5020	407	724	926	1038	1	0	8.9	1396	1509	5.4- 4
19	Bakersfield	CA	305	2194	474	1053	1211	5879	2294	15447	28.9	645	848	5.4-10
48	China Lake	CA	409	2444	468	1091	1312	6222	2782	26739	27.4	582	772	5.4-11
58	Daggett	CA	237	1916	475	1102	1309	6516	2720	22302	27.0	472	841	5.4-11
71	El Toro	CA	32	1577	486	977	1163	4764	834	2391	22.3	215	1474	5.4- 6
82	Fresno	CA	492	2700	459	1029	1199	5070	1803	13085	31.8	780	785	5.4- 8
122	Long Beach	CA	54	1483	482	956	1144	4947	900	1616	16.1	263	1502	5.4- 6
123	Los Angeles	CA	3	1494	482	962	1146	4456	472	136	14.1	145	1849	5.4- 6
146	Mount Shasta	CA	1947	5583	419	909	1153	2395	556	2073	16.2	1544	756	5.4-22
156	Oakland	CA	157	2922	453	909	1102	2792	82	23	16.4	770	1905	5.4- 5
167	Point Mugu	CA	8	2193	477	936	1131	3435	145	70	12.3	209	2146	5.4- 5
176	Red Bluff	CA	589	2884	428	951	1177	5110	1930	14404	29.5	860	810	5.4- 8
185	Sacramento	CA	381	2753	444	987	1185	4274	1171	7315	34.6	834	990	5.4- 8
191	San Diego	CA	2	1275	490	950	1121	4865	662	383	11.5	102	1911	5.4- 6
192	San Francisco	CA	186	3238	454	941	1146	2496	73	204	20.2	782	1796	5.4- 5
194	Santa Maria	CA	138	3041	476	950	1128	2663	92	513	20.9	414	2016	5.4- 5
209	Sunnyville	CA	142	2708	456	947	1145	3112	204	421	16.9	610	1794	5.4- 5
Colorado														
50	Colorado Springs	CO	2587	5996	435	976	1321	2557	491	2075	24.0	1357	725	5.4-22
62	Denver	CO	2652	6083	428	971	1321	2611	567	2934	25.5	1329	739	5.4-22
68	Eagle	CO	4232	8317	432	976	1296	1480	90	1008	35.4	1650	660	5.4-28
86	Grand Junction	CO	2616	5701	438	1003	1303	3611	1221	6147	27.4	1383	518	5.4-24
173	Pueblo	CO	2223	5285	442	992	1309	3384	971	5899	27.5	1077	720	5.4-22
Connecticut														
95	Hartford	CT	2953	6277	384	646	834	2857	706	2197	23.7	1459	598	5.4-21
Delaware														
227	Wilmington	DE	2133	5084	414	726	921	3602	1078	2188	17.2	1289	617	5.4-20

C.1

NO	CITY	STATE	HDD50	HDD65	VSN	VSEW	VSS	CDD50	CDD65	CDH80	DR	NO HRS T<55	NO HRS 55≤T≤69	ACP TABLE
District of Columbia														
223	Washington	DC	2004	4828	419	724	905	3734	1083	3592	18.6	1205	657	5.4-20
Florida														
11	Apalachicola	FL	163	1366	508	887	971	6967	2695	8289	14.3	322	778	5.4-10
60	Daytona	FL	81	787	503	860	953	7404	2635	5252	14.8	177	641	5.4-10
104	Jacksonville	FL	206	1357	495	849	943	7045	2721	7488	16.4	354	674	5.4-10
136	Miami	FL	3	185	527	874	936	9338	4045	9166	12.4	55	259	5.4-12
160	Orlando	FL	33	532	511	881	974	8288	3312	9757	17.1	131	571	5.4-12
211	Tallahassee	FL	307	1721	495	845	944	6462	2401	7323	16.1	421	747	5.4-10
212	Tampa	FL	37	575	518	890	974	7985	3047	8905	14.9	147	592	5.4-10
224	West Palm Beach	FL	0	177	519	846	906	9203	3904	10324	13.1	22	308	5.4-12
Georgia														
15	Atlanta	GA	866	3070	467	807	930	4837	1566	3799	17.6	915	749	5.4- 7
16	Augusta	GA	664	2584	468	803	933	5458	1904	6904	21.3	690	774	5.4- 7
128	Macon	GA	514	2330	476	822	939	5769	2111	8097	18.7	667	787	5.4- 9
196	Savannah	GA	410	1967	474	805	926	6112	2194	6308	16.6	529	725	5.4- 9
Hawaii														
22	Barbers Point	HI	0	3	592	978	965	9314	3842	3617	11.2	1	97	5.4- 2
97	Hilo	HI	0	0	557	817	805	8494	3019	1112	11.0	0	153	5.4- 2
98	Honolulu	HI	0	0	588	953	932	9625	4150	4537	9.8	0	69	5.4- 2
120	Lihue	HI	0	2	567	895	893	9219	3746	1912	9.6	0	140	5.4- 2
Idaho														
30	Boise	ID	2276	5667	399	916	1228	2828	744	4512	28.9	1542	647	5.4-22
117	Lewiston	ID	2015	5426	370	729	988	2709	645	4121	29.7	1467	748	5.4-20
166	Pocatello	ID	3404	7075	405	935	1262	2330	526	3293	32.8	1681	546	5.4-27
Illinois														
47	Chicago	IL	3000	6151	402	729	936	3339	1015	3190	16.6	1426	613	5.4-21
144	Moline	IL	3085	6250	405	736	959	3204	894	2808	19.5	1357	640	5.4-21
207	Springfield	IL	2490	5448	422	768	962	3675	1158	4038	20.2	1260	600	5.4-23
Indiana														
75	Evansville	IN	1948	4625	426	736	890	4063	1265	4288	18.4	1141	611	5.4-23
80	Fort Wayne	IN	3023	6145	395	664	826	3096	743	1629	17.7	1400	601	5.4-21
101	Indianapolis	IN	2624	5620	407	692	851	3430	951	2263	18.0	1375	602	5.4-21
204	South Bend	IN	3038	6280	396	690	857	2917	684	1840	21.1	1415	635	5.4-21
Iowa														
35	Burlington	IA	3009	6094	419	802	1030	3393	1002	2598	17.1	1354	649	5.4-21
63	Des Moines	IA	3275	6447	413	788	1027	3116	812	2383	17.5	1423	667	5.4-25
130	Mason City	IA	4311	7735	400	783	1053	2708	658	1882	20.8	1548	610	5.4-26
202	Sioux City	IA	3608	6750	406	794	1064	3326	993	3488	18.6	1438	602	5.4-25
Kansas														
66	Dodge City	KS	2280	5131	450	942	1196	4008	1384	7186	26.0	1252	637	5.4-24
84	Goodland	KS	2757	6090	434	935	1228	3047	905	5147	26.3	1358	625	5.4-22
215	Topeka	KS	2458	5201	434	837	1068	4120	1388	5212	22.3	1192	608	5.4-23
Kentucky														
56	Covington	KY	2154	5030	408	687	843	3656	1057	2638	18.3	1316	661	5.4-20
119	Lexington	KY	1921	4649	425	729	872	3904	1157	2853	15.6	1211	618	5.4-23
124	Louisville	KY	1851	4539	424	727	883	4144	1357	4716	17.6	1192	636	5.4-23
Louisiana														
23	Baton Rouge	LA	237	1573	488	806	889	6682	2543	8814	17.2	440	677	5.4- 9
113	Lake Charles	LA	214	1455	489	795	864	6849	2615	7883	14.8	396	668	5.4- 9
148	New Orleans	LA	179	1392	497	838	923	6840	2578	7380	15.1	324	789	5.4- 9
201	Shreveport	LA	447	2265	484	843	954	6022	2365	10039	18.1	687	697	5.4- 9
Maine														
21	Bangor	ME	4132	7998	378	693	950	1853	243	454	21.5	1721	669	5.4-26
38	Caribou	ME	5297	9483	357	649	922	1410	121	203	18.1	1862	692	5.4-29
169	Portland	ME	3531	7305	376	643	856	1946	245	399	19.6	1604	665	5.4-25

C.2

NO	CITY	STATE	HDD50	HDD65	VSN	VSEW	VSS	CDD50	CDD65	CDH80	DR	NO HRS 8AM-4PM T≤55	NO HRS 8AM-4PM 55≤T≤69	ACP TABLE
Maryland														
20	Baltimore	MD	2020	4946	419	739	932	3683	1134	3825	18.6	1268	593	5.4-20
161	Patuxent	MD	1418	4002	429	758	943	4180	1289	2966	12.9	1118	729	5.4-17
Massachusetts														
31	Boston	MA	2416	5775	387	659	849	2810	695	1601	16.5	1495	713	5.4-20
Michigan														
7	Alpena	MI	4282	8164	371	661	862	1928	335	894	17.3	1707	695	5.4-26
64	Detroit	MI	2799	5997	390	676	858	3199	922	2238	18.8	1404	632	5.4-21
78	Flint	MI	3471	6917	379	641	811	2502	473	921	18.1	1563	634	5.4-25
87	Grand Rapids	MI	3392	6777	390	688	872	2680	590	1461	22.2	1562	622	5.4-25
195	Sault Sainte Marie	MI	5087	9282	359	640	858	1399	119	246	21.0	1838	733	5.4-29
216	Traverse City	MI	3934	7654	369	642	818	2193	438	1124	21.0	1651	679	5.4-25
Minnesota														
67	Duluth	MN	5797	9918	355	633	886	1511	157	258	20.0	1882	650	5.4-29
102	International Falls	MN	6414	10535	351	669	962	1473	119	167	22.0	1870	656	5.4-29
140	Minneapolis	MN	4563	8060	380	709	972	2751	773	2509	20.7	1620	566	5.4-26
181	Rochester	MN	4544	8100	383	691	927	2360	442	590	18.8	1584	652	5.4-26
Mississippi														
103	Jackson	MS	546	2424	481	833	942	5927	2330	8789	17.2	646	640	5.4- 9
135	Meridian	MS	546	2446	480	811	905	5723	2148	9508	20.2	613	719	5.4- 9
Missouri														
51	Columbia	MO	2225	4994	431	790	972	3940	1234	4242	21.5	1189	633	5.4-23
186	Saint Louis	MO	2111	4860	432	797	983	4193	1467	5379	18.7	1124	614	5.4-23
206	Springfield	MO	1839	4509	446	812	982	4115	1311	4170	20.4	1215	544	5.4-23
Montana														
26	Billings	MT	3627	7156	380	814	1160	2544	598	2695	25.6	1650	617	5.4-25
57	Cutbank	MT	4718	8941	357	768	1150	1368	117	702	27.6	1834	672	5.4-26
65	Dillon	MT	4140	8210	386	838	1187	1564	159	784	28.6	1814	639	5.4-26
83	Glasgow	MT	5082	8828	361	752	1115	2272	543	2642	26.0	1688	570	5.4-29
88	Great Falls	MT	3728	7454	366	776	1133	2199	450	1886	26.7	1684	641	5.4-25
96	Helena	MT	3926	7817	372	771	1098	1911	328	1771	28.3	1784	651	5.4-25
118	Lewistown	MT	4027	8089	368	753	1084	1629	216	1270	29.8	1740	673	5.4-26
138	Miles City	MT	4435	7989	374	800	1156	2694	773	4364	26.9	1588	565	5.4-26
142	Missoula	MT	3492	7560	363	704	957	1629	221	1513	30.8	1843	658	5.4-25
Nebraska														
85	Grand Island	NE	3315	6477	420	843	1115	3309	996	4580	24.5	1431	611	5.4-25
155	North Platte	NE	3447	6905	419	880	1183	2731	715	3468	26.2	1514	592	5.4-27
159	Omaha	NE	2981	5968	414	806	1066	3618	1130	3883	19.6	1355	586	5.4-21
197	Scottsbluff	NE	3335	6900	413	861	1168	2603	693	3745	28.3	1457	620	5.4-27
Nevada														
72	Elko	NV	3345	7178	420	1000	1332	1997	355	4065	37.8	1540	569	5.4-27
73	Ely	NV	3683	7666	432	1014	1350	1650	157	1317	30.1	1529	683	5.4-27
116	Las Vegas	NV	449	2399	456	1136	1417	6567	3043	26408	25.5	604	719	5.4-11
125	Lovelock	NV	2438	5845	418	1094	1452	2813	745	6659	34.7	1358	606	5.4-22
178	Reno	NV	2181	5841	428	1068	1401	2180	365	4059	39.3	1306	752	5.4-22
214	Tonopah	NV	2308	5652	427	1130	1502	2742	611	3777	28.4	1257	660	5.4-22
228	Winnemucca	NV	2774	6471	418	1014	1350	2264	486	6366	41.0	1383	608	5.4-22
233	Yucca Flats	NV	1664	4802	450	1112	1399	3378	1041	11568	35.9	1004	670	5.4-16
New Hampshire														
54	Concord	NH	3742	7425	375	630	824	2254	463	1865	22.6	1533	683	5.4-25
New Jersey														
114	Lakehurst	NJ	2174	5265	407	712	917	3299	915	3019	20.5	1312	645	5.4-20
151	Newark	NJ	2027	4956	406	710	912	3556	1009	2487	17.7	1325	644	5.4-20

C.3

NO	CITY	STATE	HDD50	HDD65	VSN	VSEW	VSS	CDD50	CDD65	CDH80	DR	NO HRS T<55	NO HRS 55≤T≤69	ACP TABLE
New Mexico														
5	Albuquerque	NM	1633	4423	469	1105	1361	3942	1257	5705	25.3	1148	703	5.4-18
49	Clayton	NM	2138	5176	457	1019	1310	3122	685	2093	20.0	1150	770	5.4-22
184	Roswell	NM	1008	3486	490	1081	1280	4536	1539	11135	26.1	825	677	5.4-18
217	Truth or Consequences	NM	1074	3592	488	1113	1326	4457	1500	6882	23.4	889	744	5.4-18
219	Tucumcari	NM	1344	3922	470	1046	1300	4451	1554	8424	26.9	914	710	5.4-18
New York														
4	Albany	NY	3488	6770	395	719	942	2812	619	1308	19.7	1487	605	5.4-25
27	Binghampton	NY	3885	7397	370	592	733	2373	410	672	18.5	1657	662	5.4-25
34	Buffalo	NY	3213	6721	371	609	746	2476	509	779	19.2	1571	697	5.4-25
131	Massena	NY	4583	8397	380	708	942	2026	365	913	20.9	1674	627	5.4-26
149	New York (Central Pk)	NY	1986	5022	392	650	817	3273	834	911	12.5	1335	790	5.4-20
150	New York (LAG)	NY	1986	5022	392	650	817	3273	834	911	12.5	1335	790	5.4-20
182	Rochester	NY	3482	6995	374	622	771	2557	595	1642	20.1	1612	608	5.4-25
210	Syracuse	NY	3448	6856	371	611	764	2579	513	926	20.2	1521	730	5.4-25
North Carolina														
13	Asheville	NC	1407	4203	449	782	946	3442	763	1298	21.1	1083	915	5.4-15
37	Cape Hatteras	NC	635	2745	460	819	972	4978	1613	2039	10.0	765	820	5.4- 7
43	Charlotte	NC	1086	3412	456	809	968	4698	1549	4299	19.6	892	777	5.4-17
45	Cherry Point	NC	569	2556	461	826	996	5277	1788	3614	15.2	690	757	5.4- 7
90	Greensboro	NC	1261	3760	449	810	994	4274	1298	3642	17.4	1018	718	5.4-17
174	Raleigh	NC	1131	3509	445	774	935	4485	1389	3697	16.5	918	740	5.4-17
North Dakota														
29	Bismarck	ND	5196	8992	371	766	1114	2175	496	2067	27.8	1724	556	5.4-29
77	Fargo	ND	5582	9242	371	751	1077	2388	573	2288	22.2	1730	546	5.4-29
141	Minot	ND	5336	9178	358	724	1059	2064	431	1570	24.5	1800	581	5.4-29
Ohio														
3	Akron	OH	2881	6172	396	664	812	2845	661	1100	17.3	1460	680	5.4-21
53	Columbus	OH	2424	5493	401	671	819	3195	789	2268	22.6	1375	708	5.4-20
59	Dayton	OH	2573	5549	408	696	855	3367	868	1346	17.1	1388	611	5.4-20
213	Toledo	OH	3132	6514	393	676	853	2791	698	1794	17.8	1500	652	5.4-21
232	Youngstown	OH	3129	6557	383	624	760	2593	546	1128	21.4	1523	679	5.4-21
Oklahoma														
157	Oklahoma City	OK	1417	3825	465	875	1053	4901	1834	8878	20.8	980	733	5.4-18
220	Tulsa	OK	1429	3732	453	820	991	5244	2072	10065	19.7	983	591	5.4-19
Oregon														
14	Astoria	OR	1080	5226	350	588	782	1357	29	145	12.3	1571	1236	5.4-14
133	Medford	OR	1531	4893	405	814	1005	2681	568	4081	32.9	1442	749	5.4-15
154	North Bend	OR	629	4678	392	740	977	1429	2	0	11.8	1351	1553	5.4- 4
170	Portland	OR	1151	4577	364	647	841	2321	272	1086	22.8	1421	1060	5.4-14
177	Redmond	OR	2535	6665	395	835	1127	1573	228	2390	34.4	1631	695	5.4-20
187	Salem	OR	1128	4926	373	680	874	1849	172	1224	29.3	1499	916	5.4-14
Pennsylvania														
6	Allentown	PA	2692	5760	401	682	864	3105	698	1146	17.0	1335	710	5.4-21
18	Avoca	PA	2931	6236	389	646	811	2823	652	1547	19.7	1505	705	5.4-21
74	Erie	PA	3006	6426	384	646	792	2527	472	378	14.8	1532	716	5.4-21
94	Harrisburg	PA	2302	5251	404	687	864	3518	992	2860	20.1	1342	648	5.4-20
162	Philadelphia	PA	2044	4923	408	701	889	3661	1065	3172	17.1	1286	646	5.4-20
165	Pittsburgh	PA	2773	5907	392	642	780	2989	648	1040	19.0	1426	700	5.4-21
Rhode Island														
172	Providence	RI	2610	6022	393	677	874	2756	693	1284	16.8	1429	684	5.4-21
South Carolina														
41	Charleston	SC	435	2194	467	796	925	5722	2005	5249	16.4	570	767	5.4- 9
52	Columbia	SC	694	2666	467	816	953	5613	2110	8541	19.5	741	705	5.4- 9
91	Greenville	SC	907	3220	459	814	971	4563	1400	3494	17.7	866	851	5.4- 7

C.4

NO	CITY	STATE	HDD50	HDD65	VSN	VSEW	VSS	CDD50	CDD65	CDH80	DR	NO HRS T<55	NO HRS 55≤T≤69	ACP TABLE
South Dakota														
100	Huron	SD	4820	8351	390	769	1044	2718	774	3739	24.5	1630	545	5.4-26
164	Pierre	SD	4028	7358	392	822	1147	3079	934	5262	24.2	1564	557	5.4-26
175	Rapid City	SD	3672	7229	394	819	1142	2581	663	3477	28.2	1530	572	5.4-25
203	Sioux Falls	SD	4240	7683	394	778	1078	2811	779	3029	20.2	1553	599	5.4-26
Tennessee														
44	Chattanooga	TN	1232	3595	444	738	869	4652	1541	5079	17.6	1050	684	5.4-17
108	Knoxville	TN	1283	3818	446	762	898	4455	1514	3840	17.8	1076	703	5.4-17
134	Memphis	TN	1034	3259	460	806	935	5319	2069	7807	19.2	865	851	5.4-19
147	Nashville	TN	1165	3609	443	749	863	4583	1552	5078	18.2	897	749	5.4-17
Texas														
1	Abilene	TX	792	2714	494	924	1066	5968	2416	13206	21.5	760	648	5.4-10
8	Amarillo	TX	1592	4331	471	1013	1253	4113	1377	6763	23.9	1109	680	5.4-18
17	Austin	TX	271	1735	503	877	972	6873	2862	14093	19.3	564	664	5.4-10
32	Brownsville	TX	35	642	547	908	908	8531	3664	12218	14.8	191	422	5.4-12
55	Corpus Christi	TX	106	889	529	906	946	8200	3508	13109	17.2	249	543	5.4-12
61	Del Rio	TX	186	1397	511	903	1008	7376	3112	14870	19.8	474	732	5.4-10
70	El Paso	TX	522	2605	503	1133	1306	5617	2225	13224	21.3	660	735	5.4-10
81	Fort Worth	TX	605	2354	485	875	994	6174	2448	13682	20.5	673	772	5.4-10
99	Houston	TX	195	1346	490	805	883	7215	2891	10569	18.2	352	703	5.4- 9
107	Kingsville	TX	49	874	527	881	922	8302	3652	15512	19.2	260	523	5.4-12
115	Laredo	TX	65	842	532	900	936	8827	4130	25225	21.4	286	598	5.4-13
126	Lubbock	TX	1173	3643	488	1070	1267	4754	1749	9827	25.1	917	743	5.4-18
127	Lufkin	TX	370	1846	492	848	942	6667	2668	11737	21.5	478	681	5.4-10
137	Midland	TX	634	2573	504	1079	1247	5695	2159	11177	25.9	698	729	5.4-10
168	Port Arthur	TX	167	1416	497	824	900	6888	2662	8837	17.4	384	697	5.4- 9
189	San Angelo	TX	538	2110	503	944	1076	6522	2619	14621	20.6	641	619	5.4-10
190	San Antonio	TX	261	1579	510	878	955	7170	3013	13841	20.1	462	690	5.4-10
200	Sherman	TX	699	2708	476	862	996	5844	2378	12065	20.2	785	721	5.4-10
221	Waco	TX	488	2166	495	874	972	6676	2879	15658	21.1	651	622	5.4-10
226	Wichita Falls	TX	984	3049	480	911	1077	5708	2299	14487	18.8	802	723	5.4-10
Utah														
33	Bryce Canyon	UT	4709	9288	445	1063	1386	899	4	69	30.0	1660	841	5.4-28
40	Cedar City	UT	2592	5888	447	1054	1342	2802	624	3119	27.1	1392	629	5.4-22
188	Salt Lake City	UT	2570	5975	422	975	1266	3011	941	7030	29.1	1426	586	5.4-22
Vermont														
36	Burlington	VT	4211	7932	382	698	925	2118	365	490	18.3	1697	637	5.4-26
Virginia														
153	Norfolk	VA	1185	3609	443	792	964	4636	1586	4554	15.0	1014	685	5.4-17
179	Richmond	VA	1322	3895	430	745	923	4225	1323	4021	17.6	996	716	5.4-17
180	Roanoke	VA	1520	4192	433	763	946	3986	1183	3306	19.0	1148	713	5.4-17
Washington														
158	Olympia	WA	1546	5550	351	619	819	1550	79	466	26.4	1577	985	5.4-14
198	Seattle/Tacoma	WA	1382	5281	350	621	828	1683	106	256	16.5	1700	982	5.4-14
205	Spokane	WA	2983	6727	363	758	1064	2094	363	1595	25.3	1669	640	5.4-21
225	Whidbey Island	WA	1179	5274	344	630	878	1403	22	7	14.8	1671	1169	5.4-14
230	Yakima	WA	2323	5877	373	790	1091	2370	449	3285	31.2	1413	703	5.4-20
West Virginia														
42	Charleston	WV	1816	4587	409	667	798	3712	1008	3054	20.8	1215	704	5.4-20
Wisconsin														
69	Eau Claire	WI	4751	8285	376	683	923	2545	603	1898	18.2	1565	661	5.4-26
89	Greenbay	WI	4310	8039	380	696	947	2172	426	957	22.1	1604	651	5.4-26
112	La Crosse	WI	3838	7243	386	701	937	2786	716	2121	18.9	1568	644	5.4-25
129	Madison	WI	4009	7466	391	717	955	2559	542	1329	19.1	1511	658	5.4-26
139	Milwaukee	WI	3586	7121	396	724	941	2427	487	1013	17.1	1587	618	5.4-25

NO	CITY	STATE	HDD50	HDD65	VSN	VSEW	VSS	CDD50	CDD65	CDH80	DR	NO HRS T<55	NO HRS 8AM-4PM 55≤T≤69	ACP TABLE
Wyoming														
39	Casper	WY	3824	7617	403	961	1343	2177	495	2699	29.8	1670	535	5.4-27
46	Cheyenne	WY	3435	7218	416	906	1267	1963	271	1040	26.4	1618	608	5.4-27
183	Rock Springs	WY	4407	8391	411	1012	1395	1698	207	702	29.1	1828	552	5.4-28
199	Sheridan	WY	3605	7366	387	806	1133	2074	360	2105	30.8	1650	574	5.4-25
Other Locations Outside U.S.A.														
92	Guantanamo Bay	CU	0	0	612	1045	1018	11071	5596	18452	15.5	0	17	5.4- 3
110	Koror Island	PN	0	0	662	890	827	11435	5960	14548	9.5	0	0	5.4- 3
111	Kwajalein Island	PN	0	0	678	961	888	11635	6160	16217	8.2	0	0	5.4- 3
193	San Juan	PR	0	0	608	963	931	10648	5173	11563	12.7	0	14	5.4- 3
222	Wake Island	PN	0	0	609	1002	977	10869	5394	10167	9.7	0	0	5.4- 3

ATTACHMENT 5B TO SECTION 435.105
EQUATIONS TO DETERMINE EXTERNAL WALL HEATING AND COOLING CRITERIA
AND
TO DETERMINE COMPLIANCE WITH THE CRITERIA

5B.1 Equations and Coefficients

This attachment contains the external wall equations for use in determining external wall heating and cooling criteria (WC_h and WC_c) and for determining compliance (H_i and C_i) with the criteria for north, east, south and west orientations. For NE, NW, SW and SE orientations, WC_h, WC_c, H_i and C_i shall be determined by treating half of each wall area as though it faces each of the adjacent cardinal directions, e.g., treat NE as half north and half east.

Equations 5.5-2 and 5.5-6 are statistical regression equations that correlate envelope cooling and heating loads, respectively, from thermal transmission and solar gains, as modified by internal gain and mass, to the physical components of the envelope. Seven individual terms are identified for both cooling and heating that correlate variables with physical meaning such as U-values, internal gains, and weather related variables. They are as follows:

1. CLU, CLUO, CLXUO: Terms that correlate cumulative annual cooling loads with thermal transmittance of the wall.

2. CLM: Term that correlates cumulative annual cooling loads with heat capacity of the wall.

3. CLG: Term that correlates cumulative annual cooling loads with internal gains from occupant light and equipment.

4. CLS: Term that correlates cumulative annual cooling loads with incident solar gains.

5. CLC: Term that correlates cumulative annual cooling loads with climate variables for a specific location.

6. HLU, HLUO, HLXUO: Terms that correlate cumulative annual heating loads with thermal transmittance of the wall.

7. HLM: Term that correlates cumulative annual heating loads with heat capacity of the wall.

8. HLG: Term that correlates cumulative annual heating loads with internal gains from occupants, lights, and equipment.

9. HLS: Term that correlates cumulative annual heating loads with incident solar gains.

10. HLC: Term that correlates cumulative annual heating loads with climate variables for a specific location.

The cooling and heating equations with their coefficients follow.

Cooling Equation

$$WC_c \text{ or } C_1 = CLU_i + CLUO_i + CLXUO_i + CLM_i + CLG_i + CLS_i + CLC_i$$

Equation 5.5-2

Where:

i = for each orientation

j = for each wall mass construction type for the orientation

$$CLU = FO \times U_{OW} \times [\, CU1 \times CDH80 + CU2 \times CDH80^2 + CU3 \times (VS \times CDH80)^2 + CU4 \times DR \,]$$

$$CLUO = FC \times UOC \times [\, CUO1 \times EA \times VS \times CDD50 + CUO2 \times G + CUO3 \times G^2 \times EA^2 \times VS \times CDD50 + CUO4 \times G^2 \times EA^2 \times VS \times CDD65 \,]$$

$$CLXUO = FC \times 1/UOC \times [\, CXUO1 \times EA \times VS \times CDD50 + CXUO2 \times EA \times (VS \times CDD50)^2 + CXUO3 \times G \times CDD50 + CXUO4 \times G^2 \times EA^2 \times VS \times CDD50 + CXUO5 \times G^2 \times CDD65 \,]$$

$$CLM = FO_j \times CMC_i \times [\, CM1 + CM2 \times EA \times VS \times CDD50 + CM3 \times EA \times VS \times CDD65 + CM4 \times EA^2 \times VS \times CDD50 + CM5 \times G^2 \times CDD65 + CM6 \times G \times CDD50 + CM7 \times G \times CDD65 + CM8 \times G \times EA \times VS \times CDD50 \,]$$

$$CLG = FC \times \{\, G \times [\, CG1 + CG2 \times CDD50 + CG3 \times EA \times (VS \times CDD50)^2 + CG4 \times EA^2 \times VS \times CDD50 + CG5 \times CDD65 + CG6 \times CDD50^3 + CG7 \times CDD65^3 \,] + G^2 \times [\, CG8 \times EA \times VS \times CDD50 + CG9 \times EA^2 \times VS \times CDD50 \,] \,\}$$

$$CLS = FC \times (EA \times [CS1 + CS2 \times VS \times CDD50 + CS3 \times (VS \times CDD50)^2 + CS4 \times VS \times CDD65 + CS5 \times (VS \times CDD65)^2] + EA^2 \times [CS6 + CS7 \times (VS \times CDD65)^2])$$

$$CLC = FC \times [CC1 \times CDD50 + CC2 \times CDD50^2 + CC3 \times CDH80 + CC4 \times CDH80^2 + CC5 \times CDD65 + CC6 \times (VS \times CDD65)^2 + CC7 \times VS \times CDD50 + CC8 \times (VS \times CDD50)^2 + CC9 \times (VS \times CDH80)^2 + CC10 \times VS + CC11 \times DR + CC12 \times DR^2 + CC13]$$

NOTE: The coefficients for various orientations in the equations listed above are found in Table 5B-2. If WC_c or C_1 is less than 0.0, WC_c or C_1 is set equal to 0.0.

Where:

Climate Data

CDD50 = Cooling degree-days base 50 °F

CDD65 = Cooling degree-days base 65 °F

CDH80 = Cooling degree-hours base 80 °F

DR = Average daily temperature range for warmest month.

VS = Annual average daily incident solar energy on facade under consideration, Btu/ft^2/day.

Building Data

FC = Wall area (opaque and glazed) of zone under consideration divided by total wall area (opaque and glazed) of all zones.

FO = Opaque wall area of zone under consideration divided by total wall area (opaque and glazed) of all zones. If multiple mass constructions are present, the FO_j is calculated for each construction j and used to form the area weighted mass correction.

U_{OW} = Area average U-value of opaque walls (including those of mass construction) in zone under consideration.

UOC = Area average U-value of wall (opaque and glazed, evaluated under cooling conditions) in zone under consideration. UOC is equal to UOH.

WWR = Window wall ratio for zone under consideration; defined as fenestration area divided by total wall area (opaque and glazed).

EA = Effective aperature fraction for zone under consideration, where:

$$EA = WWR \times SC_x \times S_{ec}$$

Equation 5.5-3

Where:

S_{ec} = The cooling adjustment factor for horizontal external shading projections:

For $0.0 \leq PF \leq 0.5$ from Equation 5.4-1

For the north orientation:

$$S_{ec} = 1 - 0.4 \times PF$$

Equation 5.5-3a

For the east, south and west orientations:

$$S_{ec} = 1.0 - 1.4877 \times PF + 1.0489 \times PF^2$$

Equation 5.5-3b

G = Effective internal gain (W/ft^2) for zone under consideration, where:

$$G = E_p + L_p \times (1 - R_c \times K_d) + O_l$$

Equation 5.5-4

Where:

L_p = Lighting power, from Section 5.5.7.4

E_p = Equipment power, from Section 5.5.7.5

R_c = The ratio of the electric lights in the same space served by the orientation that have automatic controls for daylighting.

O_l = Occupant load adjustment, from Section 5.5.7.6

$$K_d = 5.871 \left(WWR \times VLT \times S_{ec} \right) - 13.311 \left(WWR \times VLT \times S_{ec} \right)^2$$

Equation 5.5-4a

If (WWR x VLT x S_{ec}) > 0.22, then K_d = 0.647

Where:

WWR = As defined above, but not to exceed a maximum value of 0.65 in Equation 5.5-4a, per Section 5.5.7.3.

VLT = Visible light transmittance of the glazing material, as defined in Section 5.5.2.1, including any shading devices present that modify the visible transmittance of the glazing material.

CMC = Mass correction (Cooling Delta Load Factor) from Equation 5.5-5. If multiple mass constructions are present, each CMC_j is evaluated separately and combined by area weighting. If the U-value of the mass wall is less than 0.05, then U_{ow} = 0.05 shall be used to calculate the CMC. If the value of HC is greater than 20, then HC = 20 shall be used to calculate the CMC.

COOLING DELTA LOAD FACTOR EQUATIONS

Equation 5.5-5 is used to predict the Cooling Delta Load Factor values.

CMC = Cooling Delta Load Factor =

$$\left[\left(1 - e^{-CP_1(HC-1)}\right)\left(CP_2 + CP_3U - \frac{CP_4}{1 + (CP_5 + CP_6U)e^{-(CP_7+CP_8U^2)(HC-1)}}\right)\right]^{\frac{1.0}{0.7}}$$

Equation 5.5-5

Where:

HC = Wall Heat Capacity (Btu/$ft^{2\cdot}{}^{o}F$).

U = Wall U-Value (Btu/h/$ft^{2\cdot}{}^{o}F$).

A = (Cooling degree-hours base 80 ^{o}F)/10000 + 2 ($^{o}F\cdot h$).

B = (Daily Range)/10 + (^{o}F).

Where:

$CP_1 = C_5$

$CP_2 = C_{15}/B^3 + C_{16}/(A^2B^2)+C_{17}$

$CP_3 = C_1/A^3 + C_2B^3 + C_2B^3 + C^3/(A^2\sqrt{B}) + C_4$

$CP_4 = C_{12}/(A^2B^2) + C_{13}/B^3 + C_{14}$

$CP_5 = C_{18}$

$CP_6 = C_6 LN(A)\sqrt{B} + C_7$

LN = Natural Logarithm

$CP_7 = C_{19}/(A^2B^2) + C_{20}/(AB) + C_{21}A^2/\sqrt{B} + C_{22}$

$CP_8 = C_8/(A^2B^2) + C_9/(AB) + C_{10}A^2/\sqrt{B} + C_{11}$

The coefficients C1 through C22 are taken from the following table, Table 5B-1.

HEATING EQUATION

$$WC_h \text{ or } H_1 = \Sigma (HLU_i + HLUO_i + HLXUO_i + HLM_i + HLG_i + HLS_i + HLC_i)$$

Equation 5.5-6

Where:

i = for each orientation

j = for each wall mass construction type for the orientation

HLU = $FO \times U_{ow} \times$ [HU1 x HDD50 + HU2 x (VS x HDD65)^2]

HLUO = FC x UOH x [HUO1 x HDD50 + HUO2 x HDD65 + HUO3 x EA x VS x HDD65]

HLXUO = FC x { (1/UOH) x [HXUO1 x EA x (VS x HDD50)^2 + HXUO2 x EA x (VS x HDD65)^2] + (1/UOH^2) x [HXUO3 x EA^2 x VS x HDD65] }

HLM = $FO_j \times HMC_j \times$ [HM1 + HM2 x G x UOH x HDD65 + HM3 x G^2 x EA^2 x VS x HDD50 + HM4 x UOH x EA x VS x HDD65 + HM5 x UOH x HDD50 + HM6 x EA x (VS x HDD65)^2 + HM7 x EA^2 x VS x HDD65/UOH]

$$HLG = FC \times \{ G \times [HG1 \times HDD65 + HG2 \times UOH \times HDD65 + HG3 \times EA \times VS \times HDD65 + HG4 \times EA^2 \times VS \times HDD50] \times G^2 \times [HG5 \times HDD65 + HG6 \times EA^2 \times VS \times HDD65] \}$$

$$HLS = FC \times \{ EA \times [HS1 \times VS \times HDD65 + HS2 \times (VS \times HDD50)^2] + EA^2 \times [HS3 \times VS \times HDD50 + HS4 \times VS \times HDD65] \}$$

$$HLC = FC \times [HC1 + HC2 \times HDD65 + HC3 \times HDD65^2 + HC4 \times VS^2 + HC5 \times VS \times HDD50 + HC6 \times VS \times HDD65 + HC7 \times (VS \times HDD50)^2]$$

NOTE: The coefficients for various orientations in the equations listed above are found in Table 5B-4. If WC_h or H_1 is less than 0.0, WC_h or H_1 is set equal to 0.0.

Where:

Climate Data

HDD50 = Heating degree-days base 50 °F.

HDD65 = Heating degree-days base 65 °F.

VS = Annual average daily incident solar energy on facade under consideration, Btu/ft^2-day.

Building Data

FC = Wall area (opaque and glazed) of zone under consideration divided by total wall area (opaque and glazed) of all zones.

FO = Opaque wall area of zone under consideration divided by total wall area (opaque and glazed) of all zones. If multiple mass constructions are present, the FO_j is calculated for each and used to form the area weighted mass correction.

U_{OW} = Area average U-value of opaque walls (including those of mass construction) in zone under consideration.

UOH = Area average U-value of wall (opaque and glazed, evaluated under heating conditions) in zone under consideration. UOH is equal to UOC.

WWR = Window wall ratio for zone under consideration; defined as fenestration area divided by total wall area (opaque and glazed).

EA = Effective aperature fraction for zone under consideration.

$$EA = WWR \times SC_x \times S_{eh}$$

Equation 5.5-7

Where:

For $0.0 \leq PF \leq 0.5$, from Equation 5.4-1:

For the north orientation:

$$S_{eh} = 1 - 0.3 \times PF$$

Equation 5.5-7a

For the east, south and west orientation:

$$S_{eh} = 1 - 0.986 \times PF + 0.4513 \times PF^2$$

Equation 5.5-8

G = Effective internal gain (W/ft^2) for zone under consideration.

$$G = E_p + L_p \times (1 - R_c \times K_d) + O_l$$

Equation 5.5-8

Where:

L_p = Lighting power, from Section 5.5.7.4.

E_p = Equipment power, from Section 5.5.7.5.

O_l = Occupant load adjustment, from Section 5.5.7.6

R_c = The ratio of the electric lights in the space served by the orientation that have automatic controls for daylighting.

K_d = $5.871 (WWR \times VLT \times S_{eh}) - 13.311 (WWR \times VLT \times S_{eh})^2$

Equation 5.5-8a

If WWR x VLT x S_{eh} > 0.22, then K_d = 0.647

Where:

WWR = As defined above, but not to exceed a maximum value of 0.65 in Equation 5.5-8a per Section 5.5.7.3.

VLT = Visible light transmittance of the glazing material, as defined in Section 5.5.2.1 including any shading devices present that modify the visible transmittance of the glazing material.

HMC = Mass correction from Equation 5.5-9. If multiple mass constructions are present, each HMC_j is evaluated separately and combined by area weighting. If the U-value of the mass wall is greater than 0.40, then U_{ow} = 0.4 shall be used to calculate the HMC. If the U-value of the mass wall is less than 0.05, then U_{ow} = 0.05 shall be used to calculate the HMC. If the value of HC is greater than 20, then HC = 20 shall be used to calculate the HMC.

HEATING DELTA LOAD FACTOR EQUATIONS

Equation 5.5-9 is used to predict the heating Delta Load Factor values.

HMC = Heating Delta Load Factor =

$$\left|1 - e^{-HP_1(HC-1)}\right| \left| HP_2 + HP_3U - \frac{HP_4}{1 + (HP_5 + HP_6U)e^{-(HP_7+HP_8U^2)(HC-1)}} \right| \frac{1.0}{0.7}$$

Equation 5.5-9

Where:

HC = Wall Heat Capacity (Btu/$ft^{2-o}F$)

U = Wall U-Value (Btu/$h \cdot ft^{2-o}F$)

A = (Heating degree-days base 65 ^oF/100 + 2 ($^oF \cdot$days)

Where:

$HP_1 = H_6$

$HP_2 = H_{14}LN(A)+H_{15}$

LN = Natural Logarithm

$HP_3 = H_1A^3+H_2A^2+H_3/ \sqrt{A} + H_4 \sqrt{A} + H_5$

$HP4 = H_{11}A^2+H_{12}/A^2+H_{13}$

$HP_5 = H_{16}$

$HP_6 = H_7A+H_8$

$HP_7 = H_{17}/A^3+H_{18}$

$HP_8 = H_9/A^3+H_{10}$

The coefficients H1 through H18 are taken from the following table, Table 5B-3.

5B.2 Determining Heating and Cooling Criteria Using Equations in Section 5B.1

To determine the wall thermal criteria for a building design, the following inputs to the equations in Section 5B.1 shall be used.

(1) **Aspect Ratio.** An aspect ratio of 2:1 with longer dimensions facing east and west.

(2) **Shading.** No use of external shading projections or screens.

(3) **Daylight Controls.** No use of automatic daylight controls for the lighting system.

(4) **Internal Gain (G).** The sum of the lighting power density (L_p), the equipment power density (E_p) and the occupant load adjustment (O_l), or 3.0 W/ft^2, whichever is smaller, shall be used. In determining L_p, the value of R_c and VLT shall be set equal to 0.0 in Equations 5.5-4 and 5.5-8.

(5) **Wall Area Factor, Opaque and Glazed (FC).** The combined opaque and glazed area for the orientation for the building design, divided by the total wall area (opaque and glazed) of all orientations, shall be used. Note that if one changes the wall area or floor area in a zone, this changes the geometry of the building. The criteria and compliance values will change for all zones because both values for each zone are weighted by the relative size of that zone.

(6) **Window Wall Ratio (WWR).** The smaller of the values of WWR_c and WWR_h determined from (a) and (b) below shall be used.

(a) Using the value for internal gain (G) determined in (4) above, the WWR_c for cooling by interpolation of

the results of (a) and (b) below, shall be determined using Equation 5.5-10:

Where: WWR_{g0} is the window to wall ratio at 0.0 W/ft^2 internal load (G = 0.0 W/ft^2).

WWR_{g30} is the window to wall ratio at 3.0 W/ft^2 internal load (G = 3.0 W/ft^2).

$$WWR_c = WWR_{g0} - (G / 3.0) \times (WWR_{g0} - WWR_{g30})$$

Equation 5.5-10

For G = 0.0:

If CDD50 x VSEW < 8,000,000, then Equation 5.5-11 shall be used.

$$WWR_{g0} = 0.48 - (CDD50 \times VSEW \times 1.625 \times 10^{-8})$$

Equation 5.5-11

If CDD50 x VSEW $\geq$ 8,000,000, then Equation 5.5-12 be used:

$$WWR_{g0} = 0.34$$

Equation 5.5-12

For G = 3.0:

If CDD50 x VSEW < 8,000,000, then Equation 5.5-13 shall be used:

$$WWR_{g30} = 0.28 - (CDD50 \times VSEW \times 5.0 \times 10^{-9})$$

Equation 5.5-13

If CDD50 x VSEW $\geq$ 8,000,000, then Equation 5.5-14 shall be used:

$$WWR_{g30} = 0.24$$

Equation 5.5-14

(b) The WWR_h for heating shall be determined using Equation 5.5-15 or Equation 5.5-16.

If HDD65 < 4000, then Equation 5.5-15 shall be used:

$$WRR_h = 0.4 - (HDD65 \times 2.5 \times 10^{-5})$$

Equation 5.5-15

If HDD65 $\geq$ 4000, then Equation 5.5-16 shall be used:

$$WRR_h = 0.3$$

Equation 5.5 16

(7) **Opaque Wall Area Factor (FO).** The value of FO shall be determined from Equation 5.5-17.

$$FO = FC \times (1 - WWR)$$

Equation 5.5-17

(8) **Shading Coefficient (SC_x).** The value of SC_x shall be determined from (a) or (b) below, or as shown in Figure 58-3.

(a) If the heating degree-days base 65 ^{o}F for the building location is $\leq$ to 3000, either Equation 5.5-18 or Equation 5.5-19 shall be used:

If CDD50 x VSEW < 4,000,000, then Equation 5.5-18 shall be used:

$$SC_x = 0.85 - (CDD50 \times VSEW \times 8.75 \times 10^{-8})$$

Equation 5.5-18

If CDD50 x VSEW $\geq$ 4,000,000, then Equation 5.5-19 shall be used:

$$SC_x = 0.5$$

Equation 5.5-19

(b) If the heating degree days base 65 °F for the building location is > 3000, either Equation 5.5-20 or Equation 5.5-21 shall be used:

If CDD50 x VSEW < 4,000,000, then Equation 5.5-20 shall be used:

$$SC_x = 0.85 - (CDD50 \times VSEW \times 1.25 \times 10^{-7})$$

Equation 5.5-20

If CDD50 x VSEW $\geq$ 4,000,000, then Equation 5.5-21 shall be used:

$$SC_x = 0.35$$

Equation 5.5-21

(9) **External Shading Projection (S_{eh}).** The value of S_{eh} shall be set equal to 0.0.

(10) **Opaque Wall U-Value (U_{ow}).** The value of U_{ow} shall be determined from either Equation 5.5-22 or Equation 5.5-23, as shown in Figure 5B-4.

If HDD65 < 196, then Equation 5.5-22 shall be used:

$$U_{ow} = 1.0$$

Equation 5.5-22

If HDD65 $\geq$ 196, then Equation 5.5-23 shall be used:

$$U_{ow} = 42.787 \times HDD65^{(-0.712)}$$

Equation 5.5-23

(11) **Heat Capacity of Opaque Wall (HC).** The value of HC shall be set equal to 1.0.

(12) **Fenestration Assembly U-Value (U_{of}).** The value of U_{of} shall be determined from either Equation 5.5-24, 5.5-25, or 5.5-26; or as shown in Figure 5B-5.

If HDD65 < 3000, then Equation 5.5-24 shall be used:

$$U_{of} = 1.15$$

Equation 5.5-24

If HDD $\geq$ 3000 and HDD65 < 7500, then Equation 5.5-25 shall be used:

$$U_{of} = 0.81 - [(HDD65 - 3000) \times 8.0 \times 10^{-5}]$$

If HDD $\geq$ 7500, then Equation 5.5-26 shall be used:

$$U_{of} = 0.45$$

Equation 5.5-26

(13) For all other inputs to the equations in Section 5B.1, the values for the building envelope design under consideration shall be used.

Table 5B-1
COOLING DELTA LOAD COEFFICIENTS

COEFFICIENT LABEL	INSULATION POSITION		
	EXTERIOR	INTEGRAL	INTERIOR
C1	220.724503	139.105667	181.616776
C2	-.056589	-.033991	-.055196
C3	-118.835388	-10.326704	-34.158966
C4	-13.674420	-20.867386	-25.591934
C5	.236381	.283882	.081029
C6	.959588	.305851	1.418998
C7	-.255004	.022622	.432421
C8	-905.677979	-307.943848	-1882.926758
C9	425.191895	80.209610	443.195801
C10	-2.510600	.049955	.430200
C11	-43.387955	-5.989545	-28.285065
C12	-259.723389	-11.396114	-63.562256
C13	-33.975525	.366851	20.844650
C14	20.488235	30.253494	9.817521
C15	-26.209152	8.833706	24.459824
C16	-241.173386	-22.254623	-70.337494
C17	18.897781	29.329697	9.884280
C18	-.353790	-.023878	-.114646
C19	156.305634	63.322754	326.344727
C20	-74.098999	-16.334656	-77.635498
C21	.445363	-.011114	-.074788
C22	7.496696	1.295576	5.204088

TABLE 5B-2
COOLING COEFFICIENTS

	NORTH	EAST	SOUTH	WEST
CU1	0.001539	0.003315	0.003153	0.00321
CU2	-0.308548E-07	-0.896618E-07	-0.712993E-07	-0.810530E-07
CU3	0.799493E-13	0.379280E-13	0.183083E-13	0.339810E-13
CU4	-0.079647	0.163114	0.286458	0.11178
CM1	0.32314	0.515262	0.71477	0.752643
CM2	0.153060E-05	0.138197E-05	0.161630E-05	0.142228E-05
CM3	-0.204322E-05	-0.160240E-05	-0.211063E-05	-0.197938E-05
CM4	-0.753665E-06	-0.767849E-06	-0.664430E-06	-0.740067E-06
CM5	-0.100472E-05	0	0.801057E-05	0.315193E-05
CM6	0.366708E-04	0.356503E-04	0.448106E-04	0.296012E-04
CM7	-0.673045E-04	-0.640938E-04	-0.000119	-0.766719E-04
CM8	-0.238335E-07	-0.472534E-07	-0.497469E-07	0
CUO1	-0.651094E-05	-0.838669E-05	-0.888996E-05	-0.756465E-05
CUO2	-1.040207	-1.507235	-1.512625	-1.238545
CUO3	-0.438254E-05	-0.278828E-05	-0.231352E-05	-0.412567E-05
CUO4	0.126580E-04	0.809874E-05	0.736219E-05	0.106712E-04
CXUO1	0.103744E-05	0.119338E-05	0.118588E-05	0.123251E-05
CXUO2	-0.132180E-12	-0.134656E-12	-0.116252E-12	-0.130002E-12
CXUO3	0.275554E-04	0.202621E-04	0.202365E-04	0.236964E-04
CXUO4	0.974090E-07	0.117514E-06	0.939207E-07	0.136276E-06
CXUO5	-0.118247E-04	-0.909694E-05	-0.909192E-05	-0.111077E-04
CG1	0.891286	0.583388	0.393756	0.948654
CG2	0.001479	0.001931	0.002081	0.001662
CG3	-0.552042E-12	-0.282139E-12	-0.284766E-12	-0.455720E-12
CG4	0.252311E-05	0.370821E-05	0.430536E-05	0.591511E-05
CG5	-0.001151	-0.001745	-0.001864	-0.00153
CG6	0.195243E-11	0	-0.296055E-11	0.316358E-11
CG7	-0.835805E-11	0.101089E-10	0.330027E-10	0
CG8	0.141022E-05	0.753875E-06	0.713300E-06	0.970752E-06
CG9	-0.238887E-05	-0.164961E-05	-0.163927E-05	-0.197363E-05
CS1	46.9871	33.9683	18.32016	29.3089
CS2	0.348091E-04	0.374118E-04	0.340490E-04	0.502498E-04
CS3	0	0	0.271313E-11	0
CS4	-0.166409E-04	0.694779E-05	-0.282181E-04	-0.277158E-04
CS5	0.842765E-11	0	-0.304677E-11	0.291137E-11
CS6	-56.5446	0	26.9954	14.9771
CS7	-0.134764E-10	-0.588097E-11	-0.650089E-11	-0.789218E-11

TABLE 5B-2 (Continued)
COOLING COEFFICIENTS

	NORTH	EAST	SOUTH	WEST
CC1	0.002747	0	0.010349	0.001865
CC2	0	0.318928E-06	-0.304413E-06	0
CC3	-0.000348	0.000319	0.00024	0.000565
CC4	0.122123E-07	-0.775318E-07	-0.271443E-07	-0.544380E-07
CC5	0.012112	0.011894	0.013248	0.009236
CC6	0.104027E-11	-0.622661E-12	-0.205178E-11	0
CC7	-0.124013E-04	-0.706280E-05	-0.165377E-04	-0.602685E-05
CC8	0	0	0.820869E-12	0
CC9	-0.375797E-13	0.606235E-13	0.197598E-13	0.389425E-13
CC10	0.030056	0.023121	0.0265	0.01704
CC11	0	0	-0.271026	-0.244274
CC12	0.002138	0.001103	0.006368	0.007323
CC13	-12.8674	-13.16522	-18.271	-10.1285

Table 5B-3
HEATING DELTA LOAD COEFFICIENTS

COEFFICIENT LABEL	INSULATION POSITION		
	EXTERIOR	INTEGRAL	INTERIOR
H1	.000006	.000007	.000006
H2	-.001537	-.001799	-.001492
H3	13.388575	15.116148	19.831360
H4	1.933217	2.105596	1.457923
H5	-11.896660	-13.305299	-15.562034
H6	.464317	.183966	.071887
H7	.009447	.025504	.026392
H8	-.099954	.045871	.775432
H9	-1223.396240	-622.080078	.200792
H10	-.945353	-.519158	-.637875
H11	-.000067	-.000069	-.000007
H12	3.858493	4.137914	2.424339
H13	7.582887	6.238024	7.980392
H14	-.777369	-.771123	-.169907
H15	9.014718	7.722863	8.585447
H16	.200680	.208271	-.038589
H17	206.638214	105.984894	3.139744
H18	.257293	.198297	.186262

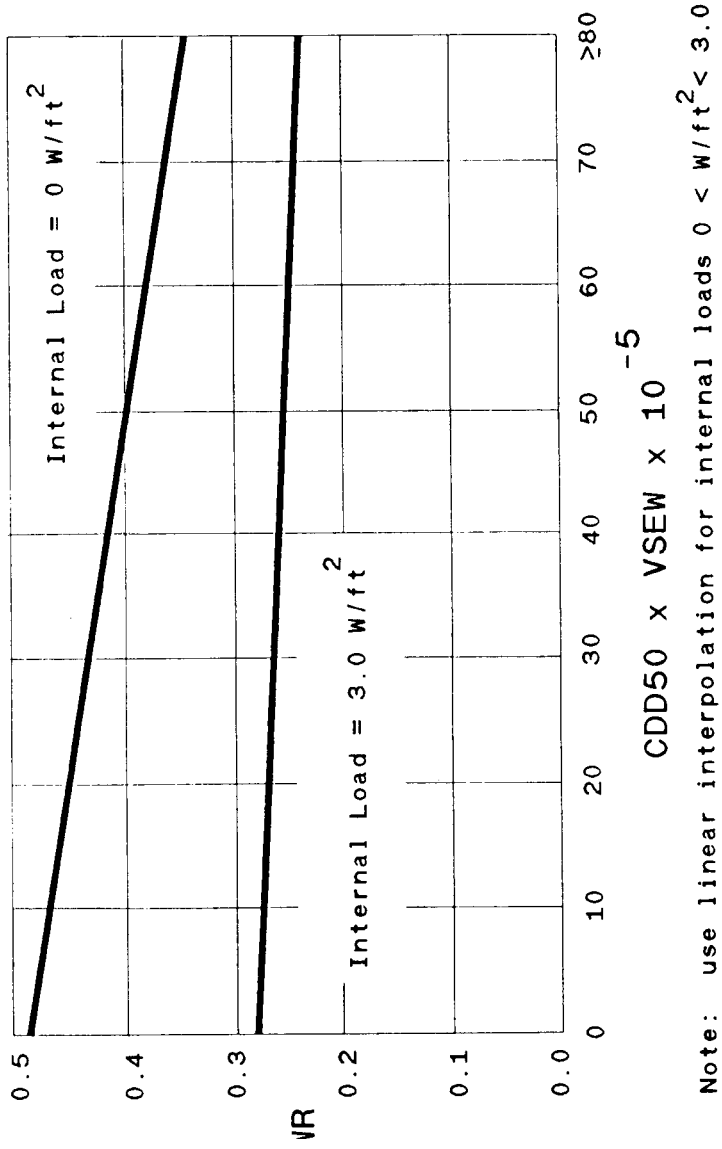
Table 5B-4
HEATING COEFFICIENTS

	NORTH	EAST	SOUTH	WEST
HU1	0.006203	0.007691	0.006044	0.006672
HU2	-0.135868E-11	-0.571616E-12	-0.268998E-12	-0.435663E-12
HM1	0.531005	0.545732	0.837901	0.616936
HM2	0.000152	0.000107	0.000208	0.00015
HM3	-0.531826E-06	-0.106191E-06	-0.682531E-06	-0.264566E-06
HM4	-0.773813E-06	-0.147870E-05	0.211938E-05	-0.457827E-06
HM5	-0.000712	-0.000484	-0.001042	-0.000625
HM6	0.334859E-12	0.495762E-13	0.770190E-13	0.737105E-13
HM7	0.239071E-06	0.275045E-06	-0.389887E-06	0
HUO1	0.004943	0.008683	0.009028	0.008566
HUO2	0.013686	0.011055	0.010156	0.01146
HUO3	-0.110178E-04	-0.868956E-05	-0.732317E-05	-0.898665E-05
HXUO1	0.126940E-11	0.785644E-13	-0.282023E-12	0.304904E-13
HXUO2	-0.730582E-12	-0.810900E-13	0.745599E-13	-0.747184E-13
HXUO3	0.197090E-06	0.194026E-06	0.987587E-07	0.195776E-06
HG1	-0.001051	-0.000983	-0.000981	-0.000948
HG2	-0.001063	-0.00093	-0.000815	-0.000975
HG3	0.299013E-05	0.262269E-05	0.241880E-05	0.249976E-05
HG4	0.749049E-06	-0.111056E-05	-0.216687E-05	-0.856049E-06
HG5	0.000109	0.934310E-04	0.975523E-04	0.862389E-04
HG6	-0.555914E-06	-0.315801E-06	-0.260999E-06	-0.291334E-06
HS1	-0.218248E-04	-0.209216E-04	-0.210885E-04	-0.202049E-04
HS2	0.339179E-11	0.190500E-11	0.148388E-11	0.218215E-11
HS3	-0.653253E-05	-0.223413E-04	-0.184726E-04	-0.240488E-04
HS4	0.223087E-04	0.241331E-04	0.245412E-04	0.230538E-04
HC1	-0.106468	-5.19297	-3.66743	-5.29681
HC2	0.00729	0.007684	0.007175	0.007672
HC3	-0.297600E-06	-0.307837E-06	-0.264192E-06	-0.307127E-06
HC4	0.201569E-05	0.630350E-05	0.332112E-05	0.643491E-05
HC5	0.129061E-04	0.477552E-05	0.325089E-05	0.483233E-05
HC6	-0.128594E-04	-0.618539E-05	-0.463086E-05	-0.625101E-05
HC7	0.275861E-11	0.820051E-12	0.438148E-12	0.809106E-12

Figure 5B–1

Maximum Window to Wall Ratio

Cooling



Note: use linear interpolation for internal loads 0 < W/ft^2 < 3.0

Figure 5B-2
Maximum Window to Wall Ratio
Heating

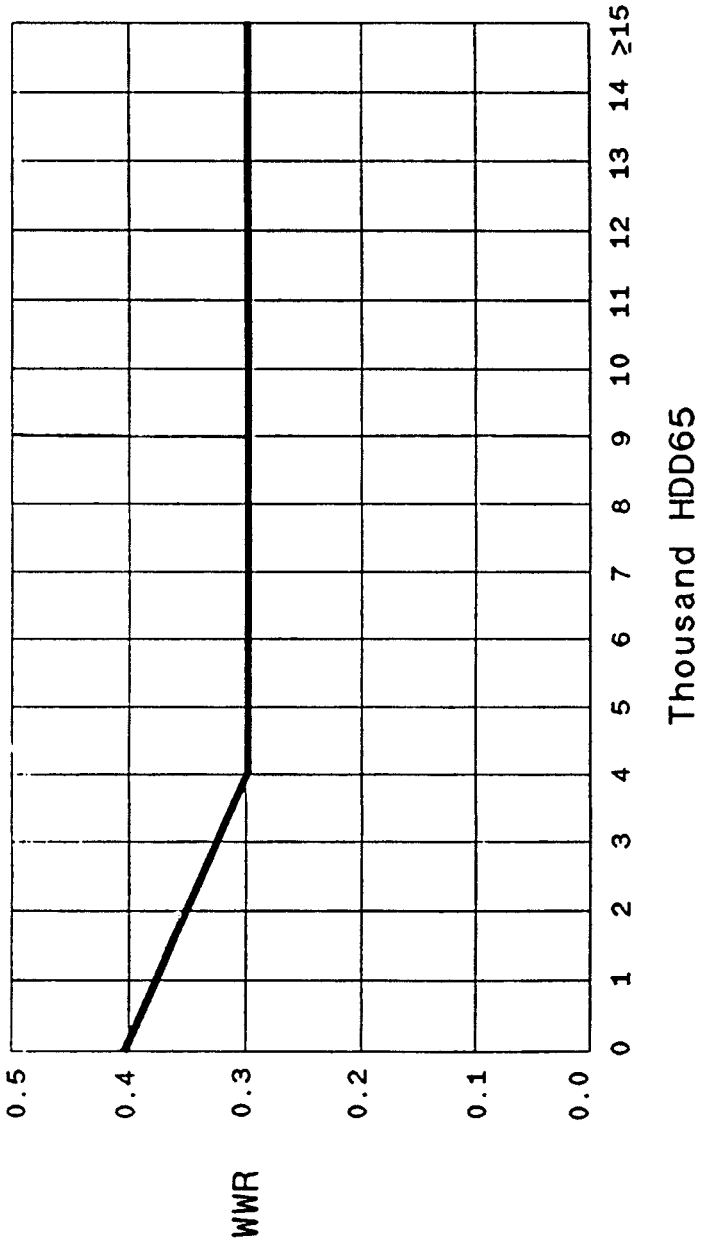


Figure 5B–3

Maximum Shading Coefficient

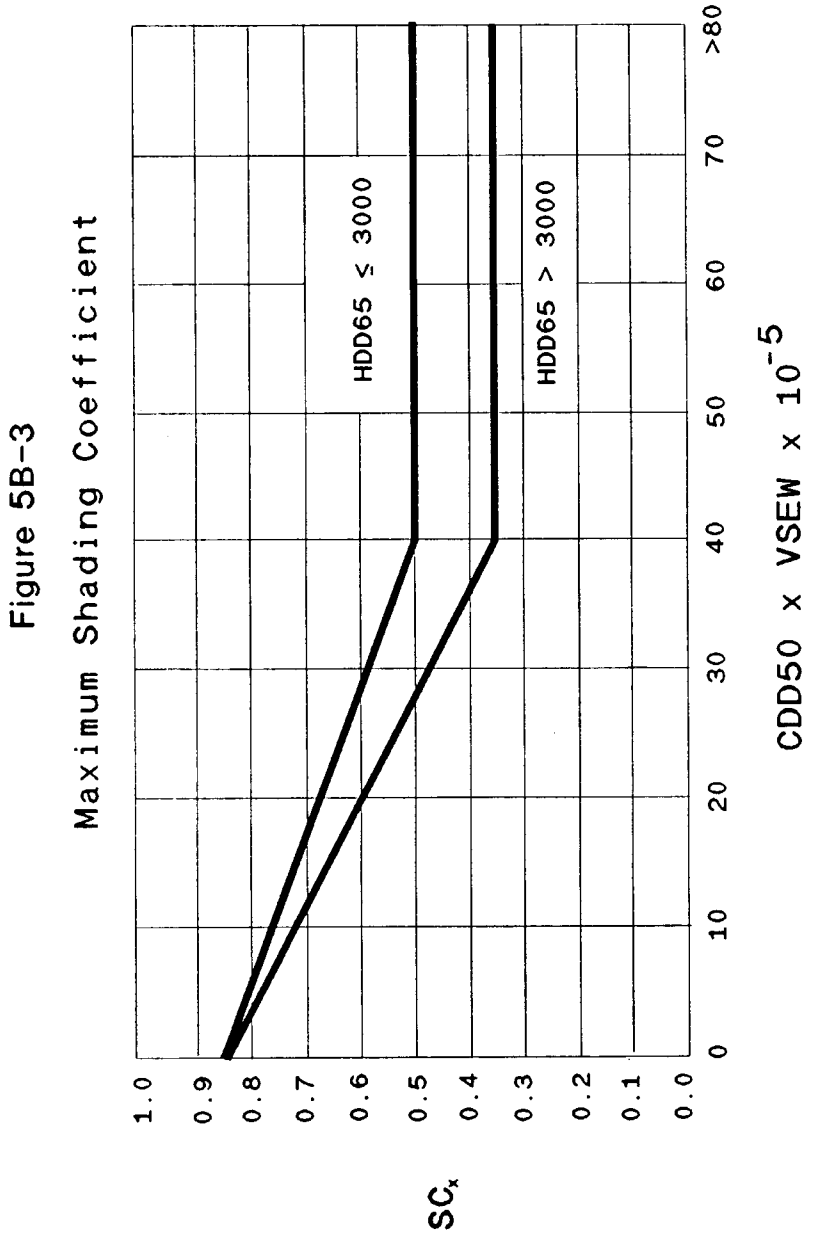
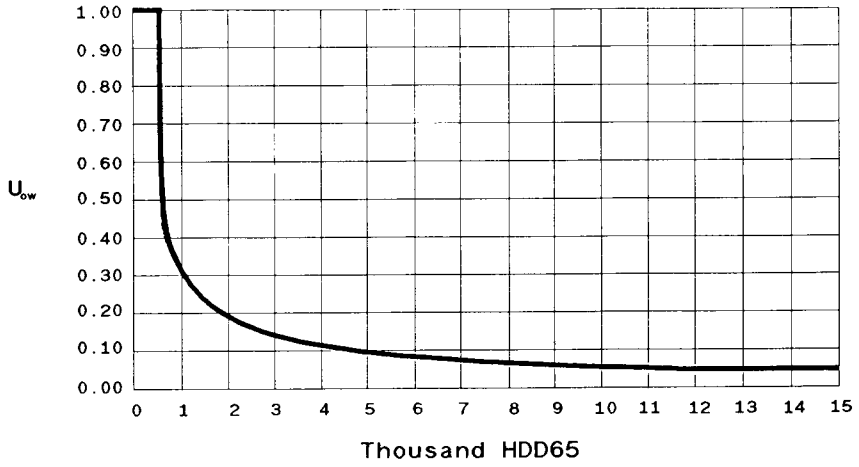


Figure 5B-4

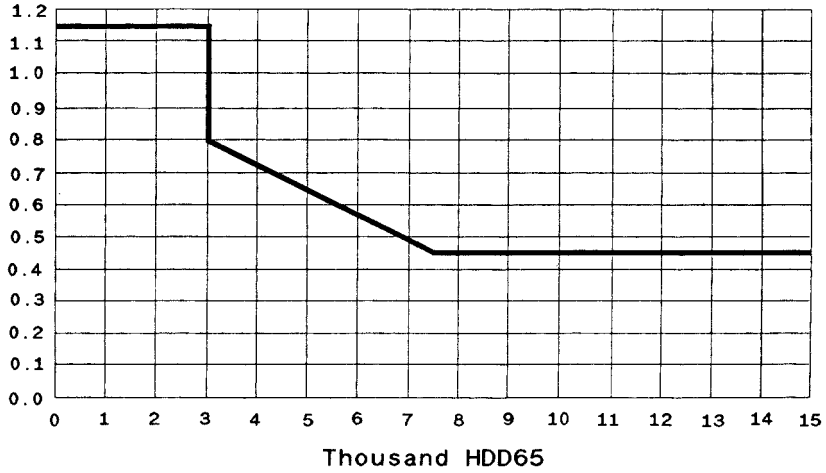
Overall Thermal Transmittance of Opaque Wall Sections



Note: for HDD65 < 196, $U_{ow} = 1.0$
for 196 ≤ HDD65 ≤ 15000, $U_{ow} = 42.787/HDD65^{0.712}$

Figure 5B-5

Maximum Overall Thermal Transmittance of Fenestration Assemblies



ATTACHMENT 5C TO 435.105
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Volume 2: Description of the Development Process; Appendix A: Envelope Research Documentation.

Volume 3: Description of the Testing Process; Appendix B: Envelope Compliance Code Documentation.

Volume 4: Documentation of Test Results: (Each in 3 volumes): A: Small Office Building (Branch Bank); B: Medium Office Building; C: Large Office Building; D: Retail Store (Anchor Store); E: Strip Store; F: Apartment House; G: Hotel; H: Warehouse; I: Assembly Building (Church); J: School.

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§ 435.106 Electric power and distribution.

6.1 General

6.1.1 This section contains minimum requirements for all building electrical systems, except required emergency systems.

6.1.2 A building shall be considered in compliance with this section if the minimum requirements of section 6.3 are met.

6.2 Principles of Design

6.2.1 Electric Distribution Systems

6.2.1.1 Transformers and generating units shall be sized as close as possible to the actual anticipated load (i.e., oversizing is to be avoided so that fixed thermal losses are minimized).

6.2.1.2 Distribution of electric power at the highest practical voltage and load selection at the maximum power factor consistent with safety shall be considered. The use of distribution system transformers shall be minimized.

6.2.1.3 Tenant submetering can be one of the most cost-effective energy conservation measures available. A large portion of the energy use in tenant facilities occurs simply because there is no economic incentive to conserve.

6.3 Minimum Requirements

6.3.1 Electrical Distribution System

6.3.1.1 All commercial or multi-family high rise residential buildings, having designed connected electric service over 250 kVA, shall have electrical energy consumption check metered on the basis of usage category or tenant occupancy, depending on conditions defined below. For buildings that are occupied by multiple tenants, the metering shall be per tenant, if the tenant has a connected load of 100 kVA or more. HVAC and service hot water systems, shared among tenants, need not meet this requirement but shall be separately metered.

6.3.1.2 The electrical power feeders for each facility for which check-metering is required shall be by tenant and shall be subdivided in accordance with the following categories:

6.3.1.2.1 Lighting and receptacle outlets;

6.3.1.2.2 HVAC and service water heating systems and equipment; and

6.3.1.2.3 Special occupant equipment or systems of more than 20 kW, such as elevators, computer rooms, kitchens, printing equipment, and baling presses.

6.3.1.2.4 *Exception to Section 6.3.1.2:*

(a) 10% or less of the loads on a feeder may be from another usage category.

6.3.1.3 The power feeders for each category shall contain portable or permanent submetering prior to or within any primary or secondary distribution panels. Such provisions shall include a separate compartment or panel of adequate size and design to house the necessary voltage and current transformers. An accessible means of attaching clamp-on meters or split-core current transformers shall be provided.

6.3.1.4 The locations of these points of measurement may be central or distributed throughout the building, as

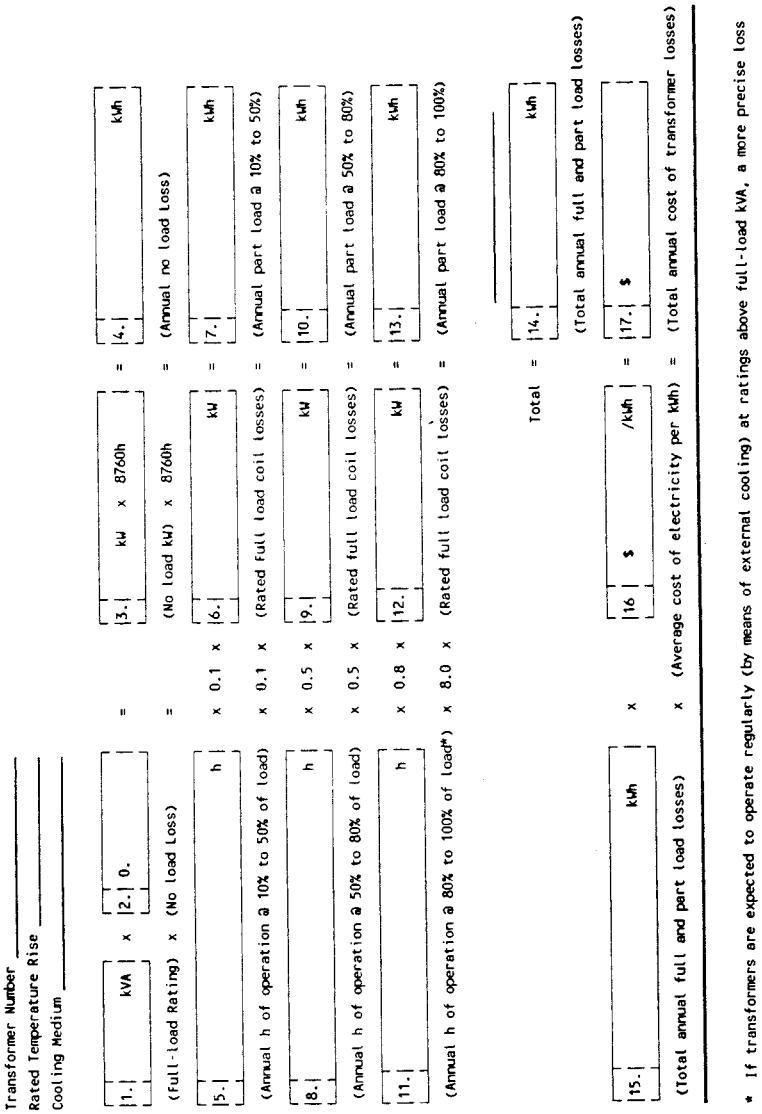
appropriate to the layout of the building. A minimum arrangement shall provide a safe method for access to the enclosures through which feeder conductors pass, and have sufficient space to attach clamp-on or split-core current transformers. These enclosures may be separate compartments or combined with electrical cabinets serving another function. Enclosures so furnished shall be identified by available measuring function. A preferred arrangement would include kWh meters and demand registers, or a means to transmit such information to a building energy management control system.

6.3.1.5 In multiple-tenant buildings, where designed connected electrical service is over 250 kVA, each tenant space having a total connected load of more than 100 kVA shall have provision made to permit check-metering of the total tenant load. If the building is served by a common HVAC system, the HVAC loads need not be check metered for each tenant.

6.3.2 Transformers

6.3.2.1 All permanently wired transformers, that are part of the building electrical distribution system, except utility-owned transformers, shall be selected to minimize the combination of no-load, part-load, and full-load losses, without compromising the electrical system operating and reliability requirements.

6.3.2.2 If the total capacity of the transformers exceeds 300 kVA, a calculation of total estimated annual operating costs of the transformer losses shall be made. This calculation shall be based on estimated hours of transformer operation at projected part-load and full-load conditions, and the associated transformer core and coil losses. If appropriate data for projecting this calculation is unavailable, use Form 6.3–1 ''Transformer Loss Calculation Estimate'' as a basis for making the estimate. The calculations made in accordance with this section shall be used to compare among types of transformers and configurations available to the designer to balance energy costs with necessary operating flexibility, reliability (redundancy), and safety. The projected annual energy costs for the losses of the selected arrangement shall be retained as part of the electrical design documentation.



6.3.3 Electric Motors

6.3.3.1 All permanently wired polyphase motors of 1 hp or more serving the building, shall meet the requirements of this section. Motors expected to operate more than 500 hours per year shall have a minimum acceptable nominal full-load motor efficiency no less than that shown in Table 6.3–1.

6.3.3.1.1 Table 6.3–1 applies to motors having nominal 1200, 1800, or 3600 RPM; with open, drip-proof, or TEFC enclosures. Other motor types are exempted from the minimum efficiency requirements of these standards.

6.3.3.1.2 Motor efficiency ratings shall be based on a statistically valid quality control procedure conforming

with *ANSI/IEEE 112–1984, Test Method B (Dynamometer)* using *NEMA MG 1–1987* (MG 1–12.54 and MG 1–12.55) for motors below 500 hp. For motors 500 hp and above, *ANSI/IEEE 112–1984, Test Method B or Method F* (Equivalent Circuit Calculation), shall be used.

6.3.3.1.3 Values listed in Table 6.3–1 are nominal efficiencies. Minimum motor efficiencies shall not be less than the corresponding values provided in *NEMA MG 1–12.54.*

TABLE 6.3-1
MINIMUM ACCEPTABLE FULL-LOAD MOTOR EFFICIENCIES FOR SINGLE SPEED POLYPHASE MOTORS[1]

HORSEPOWER	MINIMUM RATES EFFICIENCY PERCENT
1-4	78.5
5-9	84.0
10-19	85.5
20-49	88.5
50-99	90.2
100-124	91.7
125 and above	92.4

1 Motors operating more than 750 hours per year are likely to be cost-effective with efficiencies greater than those listed. The more efficient motors are classified by most manufacturers as "high-efficiency," and are presently available for common applications with typical nominal efficiencies of: 5hp, 89.5%; 10hp, 91.0%; 50hp, 94.1%; 100hp, 95.1%; 200hp, 96.2%. Guidance for evaluating the cost effectiveness of high efficiency motor applications is given in NEMA MG 10-83 (name).

6.3.3.1.4 Motor efficiency shall be tested using a statistically valid quality control procedure conforming with the *IEEE 112A, Test Method B (1978)* (Dynmometer) fan motors E below 500 hp, or *Test Method F (1978)* (Equivalent Circuit Calculation) based on no-load measurements for motors 500 hp and larger.

6.3.3.2 Motor nameplates shall list the minimum and the nominal full-load motor efficiencies and the full-load power factor.

6.3.3.3 Full-load motor power factor for three-phase motors can be calculated from nameplate data by Equation 6.3–1:

$$\% \text{ Power Factor} = (hp \times 745 \times 100)/(\text{nominal efficiency} \times \text{full-load amps} \times \text{rated voltage} \times 3^{0.5})$$

Equation 6.3–1

6.3.3.4 Motor horsepower rating shall not exceed 125% of the calculated maximum load being served, or the next larger standard motor size if a

standard rating does not fall within this range.

6.3.4 Operation and Maintenance of Electrical Systems

6.3.4.1 The designer shall specify that building owners be provided with written information that provides basic data relating to the design, operation, and maintenance of the electrical distribution system for the building. This shall include:

6.3.4.1.1 a single-line diagram of the ''as-built'' building electrical system;

6.3.4.1.2 schematic diagrams of electrical control systems (other than HVAC, covered elsewhere);

6.3.4.1.3 manufacturers' operating and maintenance manuals on active electrical equipment; and

6.3.4.1.4 the Transformer Loss Calculation Estimate if required by Section 6.3.2.2.

§ 435.107 Heating, Ventilation, and Air-Conditioning (HVAC) systems.

7.1 General

7.1.1 This section contains minimum and prescriptive requirements for the design of HVAC systems. It is recommended that the designer evaluate other energy conservation measures that may be applicable to the proposed design.

7.1.2 A building shall be considered in compliance with this section if the following conditions are met:

7.1.2.1 The minimum requirements of Section 7.3 are met; and

7.1.2.2 The HVAC system design complies with the prescriptive criteria of section 7.4. For the design of HVAC systems that incorporate innovative or alternate design strategies, the compliance paths set forth in Section 11.0 or 12.0 should be used.

7.2 Principles of Design

7.2.1 Control of Equipment Loads

7.2.1.1 The thermal impact of equipment and appliances shall be minimized by use of hoods, radiation shields, or other confining techniques, and by use of controls to assure that such equipment is turned off when not needed. In addition, major heat-generating equipment shall, where practical, be located where it can balance other heat losses. For example, computer centers or kitchen areas could be located in the north or northwest perimeter areas of buildings depending on climate and prevailing wind directions. In addition, heat recovery shall be specifically considered for this equipment.

7.2.2 HVAC System Design

7.2.2.1 Separate HVAC systems shall be considered to serve areas expected to operate on widely differing operating schedules or design conditions. For instance, systems serving office areas should generally be separate from those serving retail areas. When a single system serves a multi-tenant building, provisions shall be made to shut-off or set-back the heating and cooling to each area independently.

7.2.2.2 Spaces with relatively constant and weather-independent loads may be served with systems separate from those serving perimeter spaces. Areas with special temperature or humidity requirements, such as computer rooms, shall be served by systems separate from those serving areas that require comfort heating and cooling only, alternatively, these areas shall be served by supplementary or auxiliary systems.

7.2.2.3 The supply of zone cooling and heating shall be sequenced to prevent the simultaneous operation of heating and cooling systems for same space. Where this is not possible due to ventilation or air circulation requirements, air quantities shall be reduced as much as possible before reheating, recooling, or mixing hot and cold air streams. Finally, supply air temperature shall be reset to extend economizer operations and to reduce reheat, recool, or mixing losses.

7.2.2.4 Systems serving areas with significant internal heat gains (lighting, equipment, and people), especially interior zones with little or no exposure to outside air, shall be designed to take advantage of mild or cool weather conditions to reduce cooling energy if heat recovery systems are not used. These systems, called air or water economizers, shall be designed to provide a partial reduction in cooling loads even when mechanical cooling must be used to provide the remainder of the load. Economizer controls shall

be integrated with the mechanical cooling (leaving air temperature) controls so that mechanical cooling is only operated when necessary and so supply air is not overcooled to a temperature below the desired supply temperature. The systems and controls shall be designed so that economizer operation does not increase heating energy use. For instance, single fan dual duct or multizone systems that use the same mixed air plenum for both heating and cooling supplies shall not be used.

7.2.2.5 Controls shall be provided to allow systems to operate in an occupied mode and an unoccupied mode. In the occupied mode, controls shall provide for a gradually changing control point as system demands change from cooling to heating. In the unoccupied mode, ventilation and exhaust systems shall be shut off if possible, and comfort heating and cooling systems shall be shut off except to maintain ''setback'' space conditions. The setback conditions shall be the minimum and maximum levels required to prevent damage to the building or its contents and provide for a reasonable morning pick-up period. Note however that night setback may not conserve energy in buildings with large amounts of thermal mass.

7.2.2.6 In areas where diurnal temperature swings and humidity levels permit, the judicious coupling of air distribution systems and building structural mass may be considered to allow the use of night-time precooling to reduce the use of day-time mechanical cooling.

7.2.2.7 High ventilation, such as in hospital operating rooms, can impose enormous heating and cooling loads on HVAC equipment. In these cases, consideration shall be given to the use of recirculating filtered and cleaned air, rather than 100% outside air, and preheating outside air with solar systems or reclaimed heat from other sources.

7.2.3 Energy Transport Systems

7.2.3.1 Energy shall be transported by the most energy efficient means possible. The following options, are listed in order of efficiency from the (most efficient) lowest energy transport burden to the highest:

7.2.3.1.1 Electric Wire or Fuel Pipe,

7.2.3.1.2 Two-Phase Fluid Transfer (Steam or Refrigerant),

7.2.3.1.3 Single-Phase Liquid Fluid (Water, Glycol, Etc.), and

7.2.3.1.4 Air.

7.2.3.2 The distribution system shall be selected to complement other system parameters such as control strategies, storage capabilities, and conversion and utilization system efficiencies.

7.2.3.3 Steam Systems

7.2.3.3.1 Provisions for seasonal or ''non-use time'' shutdown shall be incorporated.

7.2.3.3.2 The venting of steam and ingestion of air shall be minimized with the design directed toward full vapor performance.

7.2.3.3.3 Subcooling shall generally be prevented.

7.2.3.3.4 Condensate shall be returned to boilers or source devices at the highest possible temperature.

7.2.3.4 Water Systems

7.2.3.4.1 Design flow quantity shall be minimized by designing for the maximum practical temperature differential.

7.2.3.4.2 Flow quantity shall be varied with load where possible.

7.2.3.4.3 Designs shall be for lowest practical pressure rise (or drop).

7.2.3.4.4 Operating and idle control modes shall be provided.

7.2.3.4.5 When locating equipment, the critical pressure path shall be identified and the runs sized for minimum practical pressure drop.

7.2.3.5 Air Systems

7.2.3.5.1 Air flow quantity shall be minimized by careful load analysis and an effective distribution system. If the psychometric nature of the application allows, the supply air quantity shall vary with the sensible load (i.e., VAV systems). The fan pressure requirement shall be held to the lowest practical value. Fan pressure shall be avoided as a source for control power.

7.2.3.5.2 Each fan system shall be designed and controlled to reduce mechanical cooling requirements by taking advantage of favorable weather conditions.

7.2.3.5.3 ''Normal'' and ''idle'' control modes shall be provided for the fan systems as well as the psychometric systems.

7.2.3.5.4 Duct run distances shall be as short as possible, and the runs on the critical pressure path sized for minimum practical pressure drop.

7.2.4 Radiant Heating

7.2.4.1 Radiant heating systems shall be considered in lieu of convective or all-air heating systems to heat areas which experience infiltration loads in excess of two (2) air changes per hour at design heating conditions.

7.2.4.2 Radiant heating systems should be considered for areas with high ceilings, for spot heating, and for other applications where radiant heating may be more energy efficient than convective or all-air heating systems.

7.2.5 Energy Recovery

7.2.5.1 Systems that recover energy should be considered when rejected fluid is of adequate temperature and a simultaneous need for energy exists for a significant number of operating hours.

7.3 Minimum Requirements

7.3.1 Calculation Procedures

7.3.1.1 Heating and cooling system design loads for the purpose of sizing systems and equipment shall be determined in accordance with the procedures described in the *ASHRAE Handbook, 1985 Fundamentals Volume,* or a similar computation procedure. The design parameters specified in sections 7.3.1.2 through 7.3.1.10 shall be used for calculational purposes only and are not requirements or recommendations for operating setpoints.

7.3.1.2 *Indoor Design Conditions.* Indoor design temperature and humidity conditions for general comfort applications shall be in accordance with the comfort criteria established in *ANSI/ASHRAE Standard 55–1981,* ''Thermal Environmental Conditions for Human Occupancy,'' and/or Chapter 8 of the *ASHRAE Handbook, 1985 Fundamentals Volume,* except that winter humidification and summer dehumidification are not required.

7.3.1.2.1 *Exceptions to Section 7.3.1.2:*

(a) Health care institutions and similar facilities where the indoor conditions may not be appropriate for the health and safety of occupants; and

(b) Where special room temperature and/or humidity conditions are required by a process or procedure, other than comfort, such as rooms used for surgery or data processing.

7.3.1.3 *Outdoor Design Conditions.* Outdoor design conditions shall be selected for listed locations from the *ASHRAE Handbook, 1985 Fundamentals Volume,* from the columns of 99% values for heating design and 2.5% values for cooling design. Local weather data from the National Weather Service of the National Oceanic and Atmospheric Administration based on the same 99% and 2.5% values (or statistically similar annualized values such as 0.2% winter and 0.5% summer) may be used.

7.3.1.3.1 *Exception to Section 7.3.1.3:*

(a) Where necessary to assure the prevention of damage to the building or to material and equipment within the building, the median of annual extremes for heating and 1% column for cooling may be used.

7.3.1.4 *Ventilation.* Outdoor air ventilation rates shall be selected from section 6.1 of *ASHRAE Standard 62–1981,* ''Ventilation for Acceptable Indoor Air Quality.''

7.3.1.4.1 *Exception to Section 7.3.1.4:*

(a) Outdoor air quantities, exceeding those shown in *ASHRAE Standard 62–1981,* required because of special occupancy or process requirements, source control of air contamination, or local codes.

7.3.1.5 *Infiltration.* Infiltration for heating and cooling design loads shall be calculated by the procedures in the *ASHRAE Handbook, 1985 Fundamentals Volume,* or a similar computation procedure.

7.3.1.6 *Envelope.* Building envelope heating and cooling loads shall be based on envelope characteristics, such as thermal conductance, shading coefficient and air leakage, consistent with

the values used in the proposed building design to demonstrate compliance with section 5.0.

7.3.1.7 *Lighting.* Lighting loads shall be based on proposed design lighting levels or power budgets consistent with section 3.0. Lighting may be ignored for heating load calculations.

7.3.1.8 *Other Loads.* Other HVAC system loads, such as those due to people and equipment, shall be based on design data compiled from at least one of the following sources:

7.3.1.8.1 Actual information based on the intended use of the building;

7.3.1.8.2 Published data from manufacturers' technical publications and from technical society publications such as the *ASHRAE Handbook, 1987 HVAC Systems Applications Volume;*

7.3.1.8.3 Alereza, ''Estimates of Recommended Heat Gains Due to Commercial Appliances and Equipment,'' *ASHRAE Transactions 90 (Pt. 2A), 25–28* (1984);

7.3.1.8.4 Default values to be used in determining the design energy budget in section 11.0 or 12.0 taken from Tables 11–2, 11–3, 11–4 and 11–6; and

7.3.1.8.5 Other data based on designer's experience of expected loads and occupancy patterns.

7.3.1.8.6 *Exception to Section 7.3.1.8:*

(a) Internal heat gains may be ignored for heating load calculations.

7.3.1.9 *Safety Factor.* Design loads may, at the designer's option, be increased by as much as 10% to account for unexpected loads or changes in space usage.

7.3.1.10 *Pick-up Loads.* Transient loads such as warm-up or cool-down loads that occur after off-hour setback or shutoff, may be calculated from basic principles, based on the heat capacity of the building and its contents, the degree of setback, and desired recovery time, or may be assumed to be up to 30% for heating and 10% for cooling of the steady-state design loads.

7.3.2 System and Equipment Sizing

7.3.2.1 HVAC systems and equipment shall be sized to provide no more than the space and system loads require, as calculated in accordance with section 7.3.1.

7.3.2.1.1 *Exceptions to Section 7.3.2.1:*

(a) Equipment capacity may exceed the design load if the equipment selected is the smallest size needed to meet the load within available options of equipment;

(b) Equipment whose capacity exceeds the design load may be specified if calculations demonstrate that oversizing can be shown not to increase annual energy use;

(c) Stand-by equipment may be installed if controls and devices are provided that allow stand-by equipment to operate automatically only when the primary equipment is not operating;

(d) Multiple units of the same equipment type, such as multiple chillers and boilers, with combined capacities exceeding the design load may be specified to operate concurrently only if controls are provided that sequence or otherwise optimally control the operation of each unit based on cooling or heating load;

(e) For unitary equipment with both heating and cooling capability, only one function, either the heating or the cooling, need meet the requirements of this subsection. Capacity for the other function shall be, within available equipment options, the smallest size necessary to meet the load; and

(f) For buildings complying with section 11.0 or 12.0, equipment of higher capacity than the design load may be specified if the oversized equipment is modeled in the building energy analysis of the proposed design and the proposed design complies with the standards.

7.3.3 Separate Air Distribution Systems

7.3.3.1 Zones in a building that are expected to operate non-concurrently for 750 or more hours per year shall either be served by separate air distribution systems, or off-hour controls shall be provided in accordance with section 7.3.5.3.

7.3.3.2 Zones with special process temperature and/or humidity requirements shall be served by separate air distribution systems from those serving zones requiring only comfort heating and/or cooling, or supplementary provisions shall be included to allow the primary systems to be specifically controlled for comfort purposes only.

7.3.3.2.1 *Exception to Section 7.3.3.2:*

(a) Zones, requiring comfort heating and/or cooling, that are served by a system primarily used for process temperature and humidity control, need not be served by a separate system if the total supply air to these zones is no more than 25% of the total system supply air, or the zones total conditioned floor area is less than 1000 ft^2.

7.3.3.3 Zones having substantially different heating or cooling load characteristics, such as perimeter zones in contrast to interior zones, shall not be served by a single multiple zone air distribution system.

7.3.4 Temperature Controls

7.3.4.1 *System Control.* Each HVAC system shall include at least one temperature control device.

7.3.4.2 *Zone Controls.* The supply of heating and/or cooling energy to each zone shall be controlled by an individual thermostat located within the zone.

7.3.4.2.1 *Exceptions to Section 7.3.4.2:*

(a) Independent perimeter systems may serve multiple zones of the primary/interior system with the following limitations:

(1) The perimeter system shall include at least one thermostatic control zone for each major building exposure having exterior walls facing only one orientation for 50 contiguous feet or more; and

(2) The perimeter system heating and/or cooling supply shall be controlled by thermostat controls located within the zone(s) served by the system; and

(b) A dwelling unit may be considered a single zone.

7.3.4.3 Zone thermostats used to control comfort heating shall be capable of being set, locally or remotely, by adjustment or selection of sensors, down to 55 °F.

7.3.4.4 Zone thermostats used to control comfort cooling shall be capable of being set, locally or remotely, by adjustment or selection of sensors, up to 85 °F.

7.3.4.5 Zone thermostats used to control both heating and cooling shall be capable of providing a temperavure range or dead band of at least 5 °F within which the supply of heating and cooling energy to the zone is shut off or reduced to a minimum.

7.3.4.5.1 *Exceptions to Section 7.3.4.5:*

(a) For buildings complying with Section 11.0 or 12.0, dead band controls are not required if, in the building energy analysis, heating and cooling thermostat setpoints are set to the same value between 70 °F and 75 °F and assumed to be constant throughout the year;

(b) Special occupancy, special usage or construction code requirements where dead band controls are not appropriate, adjustable single setpoint thermostats may be used; and

(c) Thermostats that require manual changeover between heating and cooling modes.

7.3.5 Off-hour Controls

7.3.5.1 Each HVAC system shall have automatic control setback and/or shutdown of equipment during periods of non-use or alternate use of the spaces served by the system.

7.3.5.1.1 *Exceptions to Section 7.3.5.1:*

(a) Systems serving areas expected to operate continuously;

(b) Where equipment with a full load demand of 2kW (6826 Btu/h) or less may be controlled by readily accessible manual off-hour controls;

(c) Where setback or shutdown will not result in a decrease in overall building energy use.

7.3.5.2 Outside air supply and/or exhaust systems shall be equipped with motorized or gravity dampers or other means of automatic volume shutoff or reduction during periods of non-use or alternate use of the spaces served by the system.

7.3.5.2.1 *Exceptions to Section 7.3.5.2:*

(a) Individual ventilation systems when design air flow is 3000 cfm or less;

(b) Systems that operate continuously;

(c) When restricted by code, such as at combustion air intakes; or

(d) When gravity and other non-electrical ventilation systems may be controlled by readily accessible manual damper controls.

7.3.5.2.2 Dampers may be required in some climates to prevent equipment damage due to freezing and/or to provide proper warm-up control.

7.3.5.3 Systems that serve areas that operate non-concurrently for 750 or more hours per year shall have isolation devices and controls for shut off or set back of heating and cooling to each zone independently. Isolation is not required for zones expected to operate continuously or expected to be inoperative only when all other zones are inoperative.

7.3.5.3.1 For buildings where occupancy patterns are not known at the time of system design, isolation areas may be predesignated.

7.3.5.3.2 Zones may be grouped into a single isolation area providing the total conditioned floor area does not exceed 25,000 ft^2 per group nor include more than one floor.

7.3.6 Humidity Control

7.3.6.1 If a system maintains specific relative humidities by adding moisture, a humidistat shall be provided.

7.3.6.2 If comfort humidification is provided, the system shall be designed to prevent the use of fossil fuel or electricity to maintain relative humidity in excess of 30%.

7.3.6.3 If comfort dehumidification is provided, the system shall be designed to prevent the use of fossil fuel or electricity to reduce relative humidity below 60%.

7.3.7 Materials and Construction

7.3.7.1 Insulation required by section 7.3.7.2 and 7.3.7.3 shall be suitably protected from damage. Insulation shall be installed in accordance with the *Midwest Insulation Contractors Association ''Commercial and Industrial Insulation Standards,''* 1983.

7.3.7.2 *Piping Insulation.* All HVAC system piping installed to serve buildings and within buildings shall be thermally insulated in accordance with Table 7.3–1.

Table 7.3-1
Minimum Pipe Insulation (In.)[1]

Fluid Design Operating Temperature Range, °F	Insulation Conductivity		Nominal Pipe Diameter (In.)					
	Conductivity Range Btu·in./F·h·ft²	Mean Rating Temperature °F	Runouts[2] up to 2	1 and less	1-1/4 to 2	2-1/2 to 4	5 & 6	8 and up
Heating Systems (Steam, Steam Condensate, & Hot Water)								
351-450	0.32-0.34	250	1.5	2.5	2.5	3.0	3.5	3.5
251-350	0.29-0.31	200	1.5	2.0	2.5	2.5	3.5	3.5
201-250	0.27-0.30	150	1.0	1.5	1.5	2.0	2.0	3.5
141-200	0.25-0.29	125	0.5	1.5	1.5	1.5	1.5	1.5
105-140	0.24-0.28	100	0.5	1.0	1.0	1.0	1.5	1.5
Domestic and Service Hot Water Systems[3]								
105-140	0.24-0.28	100	0.5	1.0	1.0	1.5	1.5	1.5
Cooling Systems (Chilled Water, Brine, & Refrigerant)[4]								
40-55	0.23-0.27	75	0.5	0.5	0.75	1.0	1.0	1.0
Below 40	0.23-0.27	75	1.0	1.0	1.5	1.5	1.5	1.5

1. For minimum thicknesses of alternative insulation types, see Section 7.3.7.2.2.
2. Runouts to individual terminal units not exceeding 12 ft in length.
3. Applies to recirculating sections of service or domestic hot water systems and first 8 ft from storage tank for non-recirculating systems.
4. The required minimum thicknesses do not consider water vapor transmission and condensation. Additional insulation and/or vapor retarders may be required to limit water vapor transmission and condensation.

7.3.7.2.1 *Exceptions to Section 7.3.7.2:*

(a) For manufacturer installed piping within HVAC equipment tested and rated in accordance with Section 8.3;

(b) For piping conveying fluids at temperatures between 55 °F and 105 °F;

(c) For piping conveying fluids that have not been heated or cooled through the use of fossil fuels or electricity; and

(d) When calculations demonstrate that heat gain and/or heat loss to or from piping without insulation will not increase building energy use.

7.3.7.2.2 *Alternative Insulation Types.* Insulation thicknesses in Table 7.3–1 are based on insulation with thermal conductivities listed in Table 7.3–1 for each fluid operating temperature range, rated in accordance with *ASTM C 335–84*, ''Test Method for Steady-State Heat Transfer Properties of Horizontal Pipe Insulations,'' at the mean temperature listed in the table. For insulating materials having conductivities more than of those shown in the Table 7.3–1 for the applicable fluid operating temperature range and at the mean rating temperature shown, when rounded to the nearest 1/100th Btu/h•°F•ft², the minimum thickness shall be determined in accordance with Equation 7.3–1:

$$T = PR \times [(1 + t/PR)^{K}/k - 1]$$

Equation 7.3–1

Where:

T=minimum insulation thickness for material with conductivity K, in.
PR=pipe actual outside radius, in.
t=insulation thickness from Table 7.3–1, in.
K=conductivity of alternate material at the mean rating temperature indicated in Table 7.3–1 for the applicable fluid temperature range, Btu• in./h•°F•ft^2
k=the lower value of conductivity listed in Table 7.3–1 for the applicable fluid temperature range, Btu• in./h•°F•ft^2

7.3.7.3 *Air Handling System Insulation.* All air handling ducts, plenums, and other enclosures installed as part of an HVAC air distribution system shall be thermally insulated in accordance with Table 7.3–2 (This table comes from section 1005 of the 1985 Uniform Mechanical Code).

Table 7.3-2
Minimum Duct Insulation

Duct Location	Cooling[2]		Heating[3]	
	Annual Cooling Degree Days Base 65 °F	Insulation R-value[4] ft²·h·°F/Btu	Annual Heating Degree Days Base 65 °F	Insulation R-value[4] ft²·h·°F/Btu
Exterior of building	below 500	3.3	below 1500	3.3
	500 to 1150	5.0	1500 to 4500	5.0
	1151 to 2000	6.5	4501 to 7500	6.5
	above 2000	8.0	above 7500	8.0
Inside of building envelope or in unconditioned spaces[7]				
TD[5] <=15		None Requ'd		None Req'd
40 >= TD[5] > 15	----	3.3	----	3.3
TD[5] > 40	----	5.0[6]	----	5.0[6]

1. Insulation R-values shown are for the insulation as installed and do not include film resistance. The required minimum thicknesses do not consider water vapor transmission and condensation. Additional insulation and/or vapor retarders may be required to limit vapor transmission and condensation. For ducts which are designed to convey both heated and cooled air, duct insulation shall be as required by the most restrictive condition. Where exterior walls are used as plenum walls, wall insulation shall be as required by the most restrictive condition of this Section or Section 5.0.
2. Cooling ducts are those designed to convey mechanically heated air or return ducts in such systems.
3. Heating ducts are those designed to convey mechanically heated air or return ducts in such systems.
4. Insulation resistance measured on a horizontal plane in accordance with ASTM C518-85 at a mean temperature of 75 °F at the installed insulation thickness.
5. TD is defined as the temperature difference at design conditions (see Section 7.3.1) between the space within which the duct is located and the design air temperature in the duct.
6. Insulation resistance for runnouts to terminal devices less than 10 feet in length need not exceed 3.3 ft²·h·F/Btu.
7. Unconditioned spaces include crawl spaces and attics.

7.3.7.3.1 *Exception to section 7.3.7.3:* Duct insulation is not required in any of the following cases:

(a) Manufacturer installed plenums, casings or ductwork furnished as a part of HVAC equipment tested and rated in accordance with section 8.3; and

(b) When calculations demonstrate that heat gain and/or heat loss to or

from ducts without insulation will not increase building energy use.

7.3.7.4 *Duct Construction.* All air handling ductwork and plenums shall be constructed, erected and tested in accordance with the following Sheet Metal and Air Conditioning Contractors National Association (SMACNA) Standards: *HVAC Duct System Design Manual,* 1986; *HVAC Duct Leakage Test Manual,* 1985; and *Fibrous Glass Construction Standards,* 5th edition, 1979.

7.3.7.4.1 Ductwork designed to operate at static pressure differences greater than 3 in. W.C. shall be leak tested and conform with the following requirements of the *HVAC Duct Leakage Manual, 1985:* Test procedures shall be in accordance with those outlined in section 5.0 of the manual, or equivalent; test reports shall be provided in accordance with section 6.0 of the manual, or equivalent; the tested duct leakage class at a test pressure equal to the design duct pressure class rating shall be equal to or less than leakage class 6 as defined in section 4.1 of the manual. Leakage testing may be limited to representative sections of the duct system but in no case shall such tested sections include less than 25% of the total installed duct area for the designated pressure class.

7.3.7.4.2 Where supply ductwork designed to operate at static pressure differences from ¼ in. to 2 in. W.C. are located outside of the conditioned space, including return plenums, joints shall be sealed in accordance with Seal Class C, as defined in the SMACNA manuals referenced above. Pressure sensitive tape shall not be used as the primary sealant for such ducts designed to operate at 1 in. W.C. pressure difference or greater.

7.3.8 Completion Requirements

7.3.8.1 An operating and maintenance manual shall be provided to the building owner. The manual shall include basic data relating to the operation and maintenance of HVAC systems and equipment. Required routine maintenance actions shall be clearly identified. Where applicable, HVAC controls information such as diagrams, schematics, control sequence descriptions, and maintenance and calibration information shall be included.

7.3.8.2 Air system balancing shall be accomplished in a manner to minimize throttling losses and then fan speed shall be adjusted to meet design flow conditions. Balancing procedures shall be in accordance with those established by the National Environmental Balancing Bureau (NEBB), the Association of Air Balancing Council (AABC), or similar procedures.

7.3.8.2.1 *Exception to section 7.3.8.2:*

(a) Damper throttling may be used for air system balancing with fan motors of 1 hp or less, or if throttling results in no greater than ⅓ hp fan horsepower draw above that required if the fan speed were adjusted.

7.3.8.3 Hydronic system balancing shall be accomplished in a manner to minimize throttling losses and then the pump impeller shall be trimmed or pump speed shall be adjusted to meet design flow conditions.

7.3.8.3.1 *Exceptions to section 7.3.8.3:* Valve throttling may be used for hydronic systems balancing under any of the following conditions:

(a) Pumps with pump motors of 10 hp and less;

(b) If throttling results in pump horsepower draw no greater than 3 hp above that required if the impeller were trimmed;

(c) To reserve additional pump pressure capability in open circuit piping systems subject to fouling. Valve throttling pressure drop shall not exceed that expected for future fouling; or

(d) Where it can be shown that throttling will not increase overall building energy use.

7.3.8.4 HVAC control systems shall be tested to assure that control elements are calibrated, adjusted, and in proper working condition.

7.4 Heating, Ventilation and Air-Conditioning (HVAC) Systems—Prescriptive Compliance Alternative

7.4.1 Zone Controls

7.4.1.1 Zone thermostatic and humidistatic controls shall be capable of operating in sequence, the supply of heating and cooling energy to the zone. The controls shall prevent:

7.4.1.1.1 Reheating (heating air that is cooler than system mixed air);

7.4.1.1.2 Recooling (cooling air that is warmer than system mixed air);

7.4.1.1.3 Mixing or the simultaneous supply of air that has been previously mechanically heated and air that has been previously cooled, either by mechanical refrigeration or by economizer systems; and

7.4.1.1.4 Other simultaneous operation of heating and cooling systems to one zone.

7.4.1.2 *Exceptions to section 7.4.1.1:*

7.4.1.2.1 Variable air volume systems that, during periods of occupancy, are designed to reduce the air supply to each zone to a minimum before reheating, recooling, or mixing during periods of occupancy. The minimum volume setting shall be no greater than the larger of the following:

(a) 30% of the peak supply volume;

(b) The minimum volume required to meet the ventilation requirements of section 7.3.1.4; and

(c) 0.4 cfm/ft^2 of conditioned zone area. In addition, supply air temperatures shall be automatically reset based on representative building loads or outside air temperature by at least 25% of the difference between the design supply air and room air temperature. Zones expected to experience relatively constant loads, such as interior zones, shall be designed for the fully reset supply temperature. Supply air reset control is not required if calculations demonstrate that it increases overall building energy use;

7.4.1.2.2 Zones where special pressurization relationships or cross-contamination requirements are such that variable air volume systems are impractical, such as some areas of hospitals and laboratories. In these cases, systems shall include automatic supply air reset controls in accordance with section 7.4.1.2.1 above;

7.4.1.2.3 At least 75% of the energy for reheating or providing warm air in mixing systems is provided from site-recovered energy that would otherwise be wasted, or from non-depletable energy sources;

7.4.1.2.4 Zones where specific humidity levels are required to satisfy process needs, such as computer rooms and museums (see section 7.3.3.2); and

7.4.1.2.5 Zones with a peak supply air quantity of 300 cfm or less.

7.4.2 Economizer Controls

7.4.2.1 Each fan system shall be designed to take advantage of favorable weather conditions to reduce mechanical cooling requirements. The system shall include either of the following:

7.4.2.1.1 A temperature or enthalpy air economizer system that is capable of automatically modulating outside air and return air dampers to provide up to 85% outside air for cooling; or

7.4.2.1.2 A water economizer system that is capable of cooling supply air by direct and/or indirect evaporation. The system shall be designed and controlled to be able to provide 100% of the system cooling load at outside air temperatures of 50 °F dry-bulb/45 °F wet-bulb and below. Each economizer system shall be capable of providing partial cooling even when additional mechanical cooling is required to meet the remainder of the cooling load.

7.4.2.1.3 *Exceptions to section 7.4.2.1:*

(a) individual fan/cooling units with supply capacity of less than 3,000 cfm or a total cooling capacity less than 90,000 Btu/h. The total capacity of such units per building complying by this exception shall not exceed 600,000 Btu/h per building or 10% of the total installed cooling capacity, whichever is larger;

(b) Systems with air or evaporatively cooled condensers and for which one of the following is true:

(1) The system is located where the quality of the air, as defined in *ASHRAE Standard 62–1981,* is so poor as to require extensive treatment of the air, and

(2) Calculations indicate that the use of outdoor air cooling affects the operation of other systems, such as humidification, dehumidification, and supermarket refrigeration systems and will increase overall building energy use;

(c) Calculations demonstrate that the overall building energy use for alternative designs, such as internal/external zone heat recovery systems, are less than those for an economizer system;

(d) The system is located where the outdoor summer wet-bulb design condition (2.5% occurrence, *ASHRAE Handbook, 1985 Fundamentals Volume)* is more than 72 °F and annual HDD65 are less than 2,000;

(e) Systems that serve envelope dominated spaces whose design space sensible cooling load, excluding transmission and infiltration loads, is less than or equal to transmission and infiltration losses at an outdoor temperature of 60 °F;

(f) Systems serving residential spaces including hotel/motel rooms;

(g) Cooling systems for which 75% of its annual energy consumption is provided by site-recovered energy that would otherwise be wasted, or from non-depletable energy sources; and

(h) The zone(s) served by the system each have operable openings (windows, doors, etc.), the openable area of which is greater than 5% of the conditioned floor area. This exception applies only to spaces open to and within 20 ft of the operable openings. Automatic controls shall be provided that lockout system mechanical cooling when outdoor air temperatures are less than 60 °F.

7.4.2.2 Economizer systems shall be capable of providing partial cooling even when additional mechanical cooling is required to meet the remainder of the cooling load.

7.4.2.2.1 *Exceptions to section 7.4.2.2.*

(a) Direct expansion systems may include controls to reduce the quantity of outside air as required to prevent coil frosting at the lowest step of compressor unloading. Individual direct expansion units that have a cooling capacity of 180,000 Btu/h or less may use economizer controls that preclude economizer operation whenever mechanical cooling is required simultaneously; and

(b) Systems in climates with less than 750 average hours per year between 8 a.m. and 4 p.m. when the ambient dry bulb temperatures are between 55 °F and 69 °F inclusive. See Attachment 5A for climate data for 234 U.S. cities.

7.4.2.3 System design and economizer controls shall be such that economizer operation does not increase the building heating energy use during normal operation.

7.4.2.3.1 *Exception to section 7.4.2.3:*

(a) At least 75% of the energy for heating is provided from site-recovered energy that would otherwise be wasted, or from non-depletable energy sources.

7.4.3 Fan System Design Requirements.

7.4.3.1 The following design criteria apply to all HVAC fan systems used for comfort heating, ventilating and/or cooling. For the purposes of this subsection, the energy demand of a fan is the sum of the demand of all fans that are required to operate at design conditions to supply air from the heating and/or cooling source to the conditioned space(s) and return it back to the source or exhaust it to the outdoors.

7.4.3.1.1 *Exceptions to section 7.4.3.1:*

(a) Systems with total fan system motor horsepower of 10 hp or less;

(b) Unitary equipment for which the energy used by the fan is considered in the efficiency ratings of Section 8.0; and

(c) Total fan energy demand need not include the additional power required by air treatment or filtering systems with final pressure drops in excess of 1 in. W.C.

7.4.3.2 Constant Volume Fan Systems.

7.4.3.2.1 For supply and return fan systems that provide a constant air volume whenever the fans are operating, the power required for the combined fan system at design conditions shall not exceed 0.8 W/cfm of supply air.

7.4.3.3 Variable Air Volume (VAV) Fan Systems.

7.4.3.3.1 For supply and return fan systems that vary system air volume automatically as a function of load, the power required by the motors for the combined system at design conditions shall not exceed 1.25 W/cfm.

7.4.3.3.2 Individual VAV fans with motors 75 hp and larger shall include controls and devices necessary for the fan motor to control demand to no more than 50% of design wattage at 50% of design air volume, based on manufacturer's test data.

7.4.4 Pumping System Design Criteria.

7.4.4.1 The following design criteria apply to all HVAC pumping systems used for comfort heating and/or cooling. For the purposes of this section, the energy demand of a pumping system is the sum of the demand of all

pumps that are required to operate at design conditions to supply fluid from the heating and/or cooling source to the conditioned space(s) or heat transfer device(s) and return it to the source.

7.4.4.1.1 *Exception to section 7.4.4.1:*

(a) Systems with total pump system motor horsepower of 10 hp or less.

7.4.4.2 *Friction Rate.* Piping systems shall be designed at a design friction pressure loss rate of no more than 4.0 ft of water per 100 equivalent ft of pipe. Lower friction rates may be required for proper noise or corrosion control.

7.4.4.3 *Variable Flow.* Pumping systems that serve control valves designed to modulate or step open and close as a function of load, shall be designed for variable fluid flow. The system shall be capable of reducing flow to 50% of design flow or less. Flow may be varied by one of several methods, including, but not limited to, variable speed driven pumps, staged multiple pumps, or pumps riding their characteristic performance curves.

7.4.4.3.1 *Exceptions to section 7.4.4.3:*

(a) Systems where a minimum flow greater than 50% of the design flow is required for the proper operation of equipment served by the system, such as chillers;

(b) Systems that serve no more than one control valve;

(c) Where the overall building energy use resulting from an alternative design, such as a constant flow/variable temperature pumping system, is no more than those from a variable flow system; and

(d) Systems that include supply temperature reset controls in accordance with section 7.4.5.2 without exception.

7.4.5 System Temperature Reset Controls.

7.4.5.1 *Air Systems.* Systems supplying heated or cooled air to multiple zones shall include controls that automatically reset supply air temperatures by representative building loads or by outside air temperature. Temperature shall be reset by at least 25% of the design supply-air-to-room-air temperature difference. Zones that are expected to experience relatively constant loads, such as interior zones, shall be designed for the fully reset supply temperature.

7.4.5.1.1 *Exceptions to section 7.4.5.1:*

(a) Systems which comply with section 7.4.1 without using exceptions in sections 7.4.1.2.1 or 7.4.1.2.2; and

(b) Where it can be shown that supply air temperature reset increases overall building annual energy costs.

7.4.5.2 *Hydronic Systems.* Systems supplying heated and/or chilled water to comfort conditioning systems shall include controls that automatically reset supply water temperatures by representative building loads (including return water temperature) or by outside air temperature. Temperature shall be reset by at least 25% of the design supply-to-return water temperature difference.

7.4.5.2.1 *Exceptions to section 7.4.5.2:*

(a) Systems that comply with section 7.4.4.3 without exception;

(b) Where it can be shown that supply temperature reset increases overall building annual energy use;

(c) Systems for which supply temperature reset controls cannot be implemented without causing improper operation of heating, cooling, humidification, or dehumidification systems; or

(d) Systems with less than 600,000 Btu/h design capacity.

§ 435.108 Heating, ventilation and air-conditioning (HVAC) equipment.

8.1 General

8.1.1 This section contains minimum requirements for fundamental to good practice and/or the minimum acceptable state-of-the-art in energy efficient HVAC equipment.

8.1.2 A building shall be considered in compliance with this section if the minimum requirements of Section 8.3 are met.

8.2 Principles of Design

8.2.1 The rate of energy input(s) and the heating or cooling output(s) of all HVAC products shall be ascertained. This information shall be based on equipment in new condition, and shall cover full load, partial load, and standby conditions. The information shall also include performance data for modes of equipment operation and at ambient conditions as specified in the

minimum equipment performance requirements below.

8.2.2 Source Systems

8.2.2.1 To allow for HVAC equipment operation at the highest efficiencies, conversion devices shall be matched to load increments, and operation of modules shall be sequenced. Oversized or large scale systems shall never be used to serve small seasonal loads (e.g., a large heating boiler to serve a summer service water heating load). Specific ''low load'' units shall be incorporated in the design where prolonged use at minimal capacities is expected.

8.2.2.2 Storage techniques should be used to level or distribute loads that vary on a time or spatial basis to allow operation of a device at maximum (full-load) efficiency.

8.2.2.3 All equipment shall be the most efficient (or highest COP) practical, at both design and reduced capacity (part-load) operating conditions.

8.2.2.4 Fluid temperatures for heating equipment shall be as low as practical and for cooling equipment as high as practical, while meeting loads and minimizing flow quantities.

8.3 Minimum Requirements

8.3.1 Equipment Efficiency

8.3.1.1 *Minimum Equipment Efficiency.* Equipment shall have a minimum efficiency at the specified rating conditions, not less than the values shown in Tables 8.3–1 through 8.3–10. Minimum efficiencies for equipment using chlorofluorocarbons (CFCs) refrigerants reflect the assumption that the use of certain refrigerants may be restricted because of ozone layer depletion concerns.

8.3.1.2 Data furnished by the equipment supplier or certified under a nationally-recognized certification program or rating procedure may be used to satisfy these requirements.

8.3.1.3 Integrated Part-Load Value (IPLV) is the descriptor for part-load efficiency for certain types of equipment. The IPLVs are found in the referenced ARI Standards. Compliance with minimum efficiency requirements specified for certain HVAC equipment shall include compliance with part-load requirements as well as standard or full-load requirements.

8.3.1.4 If nationally-recognized test procedures for combined equipment are not available, efficiencies for service water heating shall be determined using data provided by equipment and component manufacturers, employing reasonable assumptions concerning uncertain parameters.

8.3.1.5 Omission of minimum performance requirements for certain classes of HVAC equipment does not preclude use of such equipment where appropriate.

8.3.2 Field Assembled Equipment and Components

8.3.2.1 Where components, such as indoor or outdoor coils, from more than one manufacturer are used as parts of a cooling or heating unit, it shall be the responsibility of the system designer to specify component efficiencies, which when combined will provide equipment that is in compliance with the requirements of these standards, based on data provided by the component manufacturers.

8.3.2.2 Total on-site energy input to the equipment shall be determined by combining the energy inputs to all components, elements, and accessories including but not limited to compressor(s), internal circulating pump(s), condenser-air fan(s), evaporative-condenser cooling water pump(s), purge devices, viscosity control heaters, and controls.

8.3.2.3 *Heat-Operated Water Chilling Package.* Double-effect, heat-operated water chilling packages shall be used in lieu of single-effect equipment, due to their higher efficiency, except where the energy input is from low temperature waste-heat or non-depletable energy sources.

8.3.3 Equipment Controls

8.3.3.3 Heat pumps equipped with supplementary resistance heaters for comfort heating shall be installed with a control to prevent heater operation when the heating load can be met by the heat pump. A two-stage room thermostat, that controls the supplementary heat on its second stage, will meet this requirement. Supplementary heater operation is permitted where it

can be shown that supplementary heating reduces energy use. Supplementary heater operation is permitted during short transient periods of less than 15 minutes during defrost cycles.

8.3.3.3.1 Controls shall provide a means of activating the supplementary heat source on an emergency basis and a visible indicator shall be provided to indicate the emergency heat status.

8.3.3.4 *Cooling Equipment Auxiliary Controls.* Evaporator coil frosting and excessive compressor cycling at part-load conditions shall not be controlled by use of either hot gas by-pass or evaporator pressure regulator control.

8.3.4 Comfort Heating Equipment

8.3.4.1 The designer shall obtain data and information from the manufacturer of electric resistance comfort heating equipment regarding full-load and part-load energy consumption of the heating equipment over the range of voltages at which the equipment is intended to operate. All auxiliaries required for the operation of the heater equipment such as, but not limited to fans, pumps, viscosity control heaters, fuel handling equipment, and blowers shall be included in the energy input data provided by the manufacturer(s).

8.3.5 Maintenance

8.3.5.1 Provisions shall be made to provide necessary preventive maintenance information to maintain efficient operation of all HVAC equipment.

Table 8.3-1
Standard Rating Conditions and Minimum Performance
Unitary Air Conditioners and Heat Pumps - Air-Cooled, Electrically-Operated
<135,000 Btu/h Cooling Capacity - Except Packaged Terminal and Room Air Conditioners

Reference Standards	Category	Phases	Subcategory & Rating Condition (Outdoor Temps. °F)	Minimum Performance
	<65,000 Btu/h		Seasonal Rating[1]	
ARI 210-81	Cooling Capacity	1	Split-System	10.0 SEER
ARI 240-81	Cooling Mode		Single-Package	9.7 SEER
ARI 210/ 240-84	<65,000 Btu/h		Standard Rating (95 db)	
	Cooling Capacity	3	Split-System & Single-Pkg.	9.5 EER
	Cooling Mode		Integrated Part-Load Value (80 db)	
			Split-System & Single-Pkg.	8.5 IPLV
	≥65,000 <135,000 Btu/h		Standard Rating (95 db)	8.9 EER
	Cooling Mode	All	Integrated Part-Load Value (80 db)	8.3 IPLV
	<65,000 Btu/h		Seasonal Rating[1]	
	Cooling Capacity	1	Split-Systems	6.6 HSPF
	Heating Mode (Heat Pumps)		Single-Package	6.6 HSPF
	<65,000 Btu/h		Split-System & Single Pkg.	
	Cooling Capacity	3	High Temp. Rating (47db/43wb)	3.0 COP
	Heating Mode		Low Temp. Rating (17db/15/wb)	2.0 COP
	≥65,000 <135,000 Btu/h		Split-System & Single Pkg.	
	Cooling Capacity	All	High Temp. Rating (47db/45wb)	3.0 COP
	Heating Mode		Low Temp. Rating (17db/15wb)	2.0 COP

1. To be consistent with National Appliance Energy Conservation Act of 1987 (Pub. L. 100-12)

Table 8.3-2
Standard Rating Conditions and Minimum Performance
Unity Air Conditioners and Heat Pumps - Evaporatively-Cooled, Electrically-Operated - Cooling Mode
<135,000 Btu/h Cooling Capacity - Except Packaged Terminal and Room Air Conditioners

Reference Standards	Category	Rating Condition °F Indoor Temp.	Outdoor Temp.	Minimum Performance
ARI 210-81	<65,000 Btu/h Cooling Capacity	Standard Rating 80db/67wb	95db/75wb	9.3 EER
	<65,000 Btu/h	Integrated Part-Load Value (80db/67wb)		8.5 IPLV
ARI 210/270-84	≥65,000 <135,000 Btu/h	Standard Rating 80db/67wb	95db/75wb	10.5 EER
CTI 201 (86)	≥65,000 <135,000 Btu/h	Integrated Part-Load Value (80db/67wb)		9.7 IPLV

Table 8.3-3
Standard Rating Conditions & Minimum Performance
Water-Cooled Air Conditioners and Heat Pumps -Cooling Mode
<135,000 Btu/h Cooling Capacity - Electrically-Operated

Reference Standard	Category	Rating Condition °F Indoor Air / Entering Water	Minimum Performance
Water-Source Heat Pumps ARI 320-86 CTI 201 (86)	<65,000 Btu/h Cooling Capacity	Standard Rating 80db/67wb / 85	9.3 EER
		Low Temperature Rating 80db/67wb / 75	10.2 EER
	>65,000 <135,000 Btu/h Cooling Capacity	Standard Rating 80db/67wb / 85	10.5 EER
Groundwater-Cooled Heat Pumps ARI 325-85	<135,000 Btu/h Cooling Capacity	Standard Rating 70 F Entering Water	11.0 EER
		Low Temperature Rating 50 F Entering Water	11.5 EER
Water-Cooled Unitary Air Conditioners ARI 210-81 ARI 210/240-84 CTI 201 (86)	<65,000 Btu/h Cooling Capacity	Standard Rating 80db/67wb / 85	9.3 EER
		Integrated Part-Load Value 75 F Entering Water	8.3 IPLV
	≥65,000 <135,000 Btu/h Cooling Capacity	Standard Rating 80db/67wb / 85	10.5 EER

Table 8.3-4a
Standard Rating Conditions and Minimum Performance
Packaged Terminal Air Conditioners and Heat Pumps
Air-Cooled, Electrically-Operated

Reference Standards	Category	Subcategory & Rating Condition (Outdoor Temps. °F)	Minimum Performance
ARI 310-87	PTAC's & PTAC H.P.'s[2] Cooling Mode	Standard Rating (95 db)	10.0-(.16 x Cap. (Btu/h)/1000) EER
		Low Temp. Rating (82 db)[1]	12.2-(.20 x Cap. (Btu/h)/1000) EER
ARI 380-87	PTAC H.P.'s - Heating Mode	Standard Rating (47db/43wb)	2.7 COP

1. For multi-capacity equipment the minimum performance shall apply to each capacity step provided and allowed by the controls.
2. If the unit's capacity is less than 7000 Btu/h, use 7000 Btu/h in the calculation. If the unit's capacity is greater than 15000 Btu/h, use 15000 Btu/h in the calculation.

Table 8.3-4b
Standard Rating Conditions & Minimum Performance
Room Air Conditioners and Room Air Conditioner Heat Pumps

Reference ANSI/AHAM RAC-1-82	Category	Minimum Performance[1]
	Without Reverse Cycle and With Louvered Sides	
	< 6000 Btu/h	8.0 EER
	≥ 6000 < 8000 Btu/h	8.5 EER
	≥ 8000 < 14000 Btu/h	9.0 EER
	≥ 14000 < 20000 Btu/h	8.8 EER
	≥ 20000 Btu/h	8.2 EER
	Without Reverse Cycle and Without Louvered Sides	
	< 6000 Btu/h	8.0 EER
	≥ 6000 < 20000 Btu/h	8.5 EER
	≥ 20000 Btu/h	8.0 EER
	With Reverse Cycle and With Louvered Sides	8.5 EER
	With Reverse Cycle, Without Louvered Sides	8.0 EER

1. To be consistent with National Appliance Energy Conservation Act of 1987 (Pub. L. 100-12).

Table 8.3-5
Standard Rating Conditions and Minimum Performance
Water-Source and Groundwater-Source Heat Pumps - Electrically-Operated
<135000 Btu/h Cooling Capacity

Reference Standards	Rating Condition °F[1]	Minimum Performance
Water-Source Heat Pumps ARI 320-86 CTI 201 (86)	Standard Rating 70 F Entering Water[2]	3.8 COP
Groundwater-Source Heat Pumps ARI 325-85	1. High Temperature Rating 70 F Entering Water[2]	3.4 COP
	2. Low Temperature Rating 50 F Entering Water[2]	3.0 COP

1. Air entering indoor section 70db/60wb (max.).
2. Water Flow Rate Per Manufacturer's Specifications.

Table 8.3-6
Standard Rating Conditions and Minimum Performance
Large Unitary Air Conditioners and Heat Pumps - Electrically-Operated
≥ 135,000 BTU/H Cooling Capacity

Category/ Reference Standards	Efficiency Rating	Minimum Performance	
Air Conditioners	EER	≤ 760,000 Btu/h	> 760,000 Btu/h
Air-Cooled ARI 360-65	IPLV	7.5	
Air Conditioners	EER	9.6	
Water/Evap.-Cooled	IPLV	9.0	
ARI 360-85, CTI 201 (86)			
Heat Pumps			
-Air-Cooled - Cooling	EER	≤ 760,000 Btu/h	> 760,000 Btu/h
	IPLV	7.5	
-Air-Cooled - Heating	COP (47 °F)	2.9	
ARI 340-86	COP (17 °F)	2.0	
Condensing Units	EER	9.9	
Air Cooled ARI 365-87	IPLV	11.0	
Condensing Units	EER	12.9	
Water/Evap.-Cooled	IPLV	12.9	
ARI 365-87, CTI 201 (86)			

1. For units that have a heating section, deduct 0.2 from all required EER's and IPLV's.
2. Condensing unit requirements are based on single-number ratings defined in paragraph 5.1.3.2 of ARI Standard 365-87.

Table 8.3-7
Standard Rating Conditions and Minimum Performance
Water-Chilling Packages - Water- and Air-Cooled - Electrically-Operated

Reference Standards	Category	Efficiency Rating	Minimum Performance
	Water - Cooled		
ARI 550-86 &	≥ 300 tons	COP	5.2[1]
ARI 590-86		IPLV	5.3[1]
CTI 201 (86)	≥ 150 Tons < 300 tons	COP	4.2
		IPLV	4.5
	< 150 tons	COP	3.8
		IPLV	3.9
	Air-Cooled With Condenser		
	≥ 150 tons	COP	2.5
		IPLV	2.5
	< 150 tons	COP	2.7
		IPLV	2.8
	Condenserless, Air-Cooled		
	All Capacities	COP	3.1
		IPLV	3.2

1. Where R-22 or CFC refrigerants with equivalent ozone depletion factors are used these requirements are reduced to 4.7 COP and 4.8 IPLV (see Section 8.3.1.1)

NOTE: The levels above are minimum performance levels. Better energy efficiencies may be available, and their use is encouraged.

Table 8.3-8
Standard Rating Conditions and Minimum Performance
Boilers: Gas- and Oil-Fired

Reference	Category	Rating Condition	Minimum Performance
DOE Test Procedure 10 CFR, Part, 30 App N	Gas-Fired <300,000 Btu/h	Seasonal Rating	AFUE 80%[1,3]
	Oil-Fired <300,000 Btu/h	Seasonal Rating	AFUE 80%[1]
AGA Z21.13-82 H.I. Htg. Boiler Std. 86 ASME PTC4.1-64 U.L. 795-73	Gas-Fired ≤300,000 Btu/h	1. Max. Rated Cap.[2] Steady-State	E_c[4] 80%
		2. Min. Rated Cap.[2] Steady-State	E_c[4] 80%
U.L. 726-75 H.I. Htg. Boiler Std. 86 ASME PTC 4.1-64	Oil-Fired ≥300,000 Btu/h	1. Max. Rated Cap.[2] Steady-State	E_c[4] 83%
		2. Min. Rated Cap.[2] Steady-State	E_c[4] 83%
H.I. Htg. Boiler Std. 86 ASME PTC 4.1-64	Oil-Fired (Residual) ≥300,000 Btu/h	1. Max. Rated Cap.[2] Steady-State	E_c[4] 83%
		2. Min. Rated Cap.[2] Steady-State	E_c[4] 83%

1. To be consistent with National Appliance Energy Conservation Act of 1987 (Pub. L. 100-12).
2. Provided and allowed by the controls.
3. Except for gas-fired steam boilers for which minimum AFUE is 75%.
4. E_c = combustion efficiency, 100% - flue losses.

Table 8.3-9
Standard Rating Conditions and Minimum Performance
Warm-Air Furnaces and Combination Warm-Air Furnaces/Air-Conditioning Units

Reference	Category	Rating Condition	Minimum Performance
DOE Test Procedure 10 CFR, Part 30 App. N	Gas-Fired <225,000 Btu/h	Seasonal Rating	AFUE 78% [1,3]
	Oil-Fired <225,000 Btu/h	Seasonal Rating	AFUE 78% [1]
AGA Z21.47-83	Gas-Fired ≥225,000 Btu/h	1. Max. Rated Cap.[2] Steady-State	E_t[4] 80%
		2. Min. Rated Cap.[2] Steady-State	E_{t4} 78%
U.L. 727-86	Oil-Fired ≥225,000 Btu/h	1. Max. Rated Cap.[2] Steady-State	E_t[4] 81%
		2. Min. Rated Cap.[2] Steady-State	E_t[4] 81%

1. To be consistent with National Appliance Energy Conservation Act of 1987 (Pub. L. 100-12).
2. Provided and allowed by the controls.
3. Minimum performance requirements for furnaces <45,000 Btu/h capacity are to be established by DOE under Pub. L. 100-12.
4. E_t = thermal efficiency, 100% - flue losses.

Table 8.3-10
Warm Air Duct Furnaces and Unit Heaters

Reference	Category	Rating Conditions	Minimum Performance
AGA Z83.9-86	Duct Furnaces Gas-Fired	1. Max. Rated Cap.[1] Steady-State	E_t[2] 78%
		2. Min. Rated Cap.[1] Steady-State	E_t[2] 75%
AGA Z83.8-85	Unit Heaters Gas-Fired	1. Max. Rated Cap.[1] Steady-State	E_t[2] 78%
		2. Min. Rated Cap.[1] Steady-State	E_t[2] 75%
U.L 731-75	Unit Heaters Oil-Fired	1. Max. Rated Cap.[1] Steady-State	E_t[2] 81%
		2. Min. Rated Cap.[1] Steady-State	E_t[2] 78%

1. Provided and allowed by the controls.
2. E_t = thermal efficiency, 100% -flue losses.

§ 435.109 Service water heating systems.

9.1 General

9.1.1 This section contains minimum and prescriptive requirements for the design of Service Water Heating Systems.

9.1.2 A building shall be considered in compliance with this section if the following conditions are met:

9.1.2.1 The minimum requirements of section 9.3 are met; and

9.1.2.2 The Service Water Heating System design complies with the prescriptive criteria of section 9.4.

9.2 Principles of Design

9.2.1 Showerheads shall be designed to provide and maintain user comfort and energy savings. They should not use removable flow restricting inserts to meet flow limitation requirements.

9.2.2 Point of use water heaters shall be considered where their use will reduce energy consumption and is life cycle cost effective.

9.2.3 High temperature condensate, when returned to condensation pump tanks or other vented tanks, will have a certain portion flashed into steam, thus wasting energy. To conserve this energy, a heat exchanger shall be considered for use in the condensate return line to heat or preheat the service water, cool the condensate, and prevent flashing.

9.2.4 Storage may be used to optimize heat recovery when the flow of heat to be recovered is out of phase with the demand for heated water, or when energy use for water heating can be shifted to take advantage of off-peak rates.

9.3 Minimum Requirements

9.3.1 Sizing of Systems

9.3.1.1 Service water heating system design loads for the purpose of sizing and selecting systems shall be determined in accordance with the procedures described in chapter 54 of the *ASHRAE Handbook, 1987 HVAC Systems and Applications Volume,* or a similar computation procedure.

9.3.2 Equipment Efficiency

9.3.2.1 All water heaters and hot water storage tanks shall meet the criteria of Table 9.3–1. Where multiple criteria are listed, all criteria shall be met. Where no criteria are provided, no requirements need be met.

TABLE 9.3–1.—STANDARD RATING CONDITIONS AND MINIMUM PERFORMANCE OF WATER HEATING EQUIPMENT

[January 30, 1989]

Type	Fuel	Storage capacity (gal)	Input rating	Applicable test procedure	Minimum performance	
					DOE rating	Eff.
Storage water heaters	Electric	<120	<12 kW	DOE Test Procedures, 1985 Code of Federal Regulations Title 10, Part 430.	EF ..... gt;0.95–0.00132V.	
	.....	gt;120 (or) ...	gt;12 kW	ANSI C72.1—1972	.....	
	Gas	<100	<75,000 Btu/h	DOE Test Procedures, 1985 Code of Federal Regulations Title 10, Part 30.	EF gt;0.62–0.0019V	
	.....	gt;100 (or) ...	gt;75,000 Btu/h	ANSI Z21.10.3–198 Gas Water Heaters w/Addenda Z21.10.3a—1985.	.....	E_t 77%
	Oil	..... <50.	<75,000 Btu/h	DOE Test Procedures, 1985 Code of Federal Regulations Title 10, Part 430.	EF gt;0.59–0.0019V	
	.....	.....	<105,000 Btu/h	.....	gt;0.59–0.0019V	
	.....	gt;50 (or)	gt;105,000 Btu/h	.....	.....	E_c 83%

TABLE 9.3–1.—STANDARD RATING CONDITIONS AND MINIMUM PERFORMANCE OF WATER HEATING EQUIPMENT (CONT.)

[January 30, 1989]

Class	Fuel	Type		Applicable test procedure	Minimum performance	
		Capacity	Input rating			
Unfired Storage	1	All Volume	All Inputs	.....	..... HL. <6.5 Btu/h ft^2.	
Instantaneous	Gas	.....	All Inputs	ANSI Z21.10.3—1984	E_t 80%	
	Distill Oil	.....	All Inputs	.....	E_c 83%	
Pool Heaters	Gas/Oil	.....	All Inputs	ANSI Z21.56—1986	E_t ..... 78%[c]	

Notes for Table 9.3–1:

Terms Defined:

1. EF = Energy factor, overall heater efficiency by DOE Test Procedure E_t = Thermal efficiency with 70°F, eT E_c = Combustion efficiency, 100 percent—flue loss when smoke = 0 (trace is permitted) HL = Heat loss of tank surface area V = Storage volume in gallons

9.3.2.1.1 *Exception to section 9.3.2.1*

(a) storage water heaters and hot water storage tanks having more than 500 gallons of storage capacity need not meet the heat loss (HL) requirements of Table 9.3–1 if the tank surface area is thermally insulated to R–12.5 and if a standing pilot light is not used.

9.3.2.2 *Heat Traps.* Storage water heaters not equipped with integral heat traps and having vertical pipe risers shall be installed with heat traps on both the inlet and outlets. The heat trap shall be installed directly, or as close as possible to the outlet fittings. Circulating systems need not employ heat traps.

9.3.2.2.1 A heat trap may take the form of a bent piece of tubing that forms a loop of 360 degrees; an arrangement of pipe fittings, such as elbows, connected so that the inlet and outlet piping make vertically upward runs just before turning downward to connect to the water heater's inlet and outlet fittings; a commercially available heat trap; or any other type that effectively restricts the natural tendency of hot water to rise in the vertical pipe during standby periods.

9.3.2.2.2 When the water heater outlet is directly horizontal out of the tank, or is piped with an elbow on the vertical outlet and then downward, this piping arrangement itself is effectively a heat trap and a separate heat trap is not then needed.

9.3.3 Piping Insulation

9.3.3.1 For circulating systems, piping insulation shall conform to the requirements of Table 7.3–1 or an equivalent level as calculated in accordance with Equation 7.3–1.

9.3.3.2 For non-circulating systems, the first 8 ft of piping from a storage system that is maintained at a constant temperature shall be insulated in accordance with Table 7.3–1, or an equivalent level as calculated in accordance with Equation 7.3–1. Systems without a heat trap to prevent circulation due to natural convection shall be considered circulating systems.

9.3.4 Controls

9.3.4.1 *Temperature.* Service water heating systems shall be equipped with temperature controls capable of adjustment from 90 °F to a temperature setting compatible with intended use, except for systems serving residential dwelling units may be equipped with controls capable of adjustment down to 110 °F only. (See *ASHRAE Handbook, 1987 Systems and Applications Volume,* Chapter 54, Table 3).

9.3.4.1.1 Where temperatures higher than 120 °F are required at certain outlets for a particular intended use, separate remote heaters or booster heaters shall be installed for those outlets unless it can be shown by calculation that either energy is not saved by the application of this requirement or that the total cost over the life of the equipment is not reduced.

9.3.4.1.2 *Circulating Hot Water Systems and Heated Pipes.* Systems designed to maintain temperatures in hot water pipes, including circulating hot water systems and heat tape on water pipes, shall be equipped with automatic controls that can be set to turn off the system when hot water is not required.

9.3.5 Equipment and Control Requirements for the Conservation of Hot Water

9.3.5.1 Showers used for other than safety reasons shall limit the maximum hot water discharge to 2.75 gpm when tested according to *ANSI A112.18.1M–1979,* ''Finished and Rough Brass Plumbing Fixtures''. The designer shall evaluate the use of lower flow showerheads than 2.75 gpm, particularly for heavily used facilities. Removable flow restricting inserts shall not be used in showerheads to meet this criterion. When flow restricting inserts are used as a component part of a showerhead, they shall be mechanically retained at the point of manufacture. [Mechanically retained means a pushing or pulling force to remove the flow restricting insert at 8 pounds or more.] This requirement shall not apply to showerheads that will cause water to leak significantly from areas other than the spray face, if the flow restricting insert were removed.

9.3.5.2 Lavatories in public restrooms, with the exception of lavatories for physically handicapped persons, shall be equipped with devices that:

9.3.5.2.1 Limit the flow of hot water to either:

(a) A maximum of 0.5 gpm;

(b) 0.75 gpm if a device or fitting is used that limits the period of water discharge, such as a foot switch, fixture occupancy sensor; or

(c) 2.5 gpm if equipped with a self-closing valve;

9.3.5.2.2 Either be equipped with a foot switch or occupancy sensor or similar device or limit delivery with a self-closing valve or a foot switch to a maximum of 0.25 gallons of hot water for circulating systems;

9.3.5.2.3 Limits delivery with a self-closing valve or a foot switch to a maximum of 0.50 gallons for non-circulating systems; and

9.3.5.2.4 Limits the outlet temperature to a maximum 110 °F.

9.3.6 Swimming Pools

9.3.6.1 *Pool Heaters.* All pool heaters shall meet the criteria of Table 9.3–1 and be equipped with a readily accessible ''on-off'' switch to allow system shut-off without adjusting the thermostat setting and, when applicable, allow restarting without manually relighting the pilot light.

9.3.6.2 *Pool Covers.* Outdoor heated swimming pools shall be equipped with a pool cover. However, pools deriving over 70% of the energy for heating from non-depletable sources or from recovery of energy that would otherwise be wasted (computed over an operating season) need not be equipped with pool covers.

9.3.6.3 *Time Switches.* Time switches shall be installed on all swimming pool pumps and all electric swimming pool heaters. These switches shall allow for the shutdown of heaters during hours of peak utility demand except as is necessary in peak period operation to maintain water in a clear and sanitary condition in keeping with applicable public health standards.

9.3.6.3.1 *Exceptions to section 9.3.5.3:*

(a) Where public health standards require 24 hour operation of pumps; and

(b) Pumps are required to operate solar pool heating systems.

9.4 Service Hot Water Heating Systems—Prescriptive Compliance Alternative

9.4.1 Combination Service Water Heating/Space Heating Equipment

9.4.1.1 Water heaters used for combination service water and space heating shall meet the appropriate minimum efficiency requirements of both section 8.3 and 9.3.

9.4.1.2 Combination space heating and service water heating equipment shall only be used when at least one of the following conditions is met:

9.4.1.2.1 where the annual space heating energy use is less than 50% of the annual service water heating energy use;

9.4.1.2.2 where the energy input or storage volume of the combined boiler or water heater is less than twice the size of the smaller of the separate boilers or water heaters otherwise required;

9.4.1.2.3 where calculations show that the combined system uses no more energy than separate systems that meet the requirements of sections 8.3 and 9.3; or

9.4.1.2.4 where the input to the combined boiler is less than 150,000 Btu/h.

9.4.1.3 Combination function equipment (space heating, service water heating, cooling, etc.) shall comply with minimum efficiency requirements in accordance with nationally recognized test procedures. Where such procedures are not available for particular equipment designs, compliance shall be determined based on the function representing the maximum annual energy consumption, using data provided by equipment and component manufacturers.

9.4.2 Additional Equipment Efficiency Measures

9.4.2.1 *Electric Water Heaters.* In applications where water temperatures not greater than 145 °F are required, an economic evaluation shall be made on the potential benefit of using an electric heat pump water heater(s) instead

of electric resistance water heater(s). The analysis shall compare the extra costs of the heat pump unit with the benefits in reduced energy costs, less increased maintenance costs, over the estimated service life of the heat pump water heater.

9.4.2.1.1 *Exception to section 9.4.2.1:*

(a) Electric resistance water heaters used in conjunction with site-recovered or non-depletable energy sources or off-peak heating with thermal storage.

9.4.2.2 *Gas-Fired Water Heaters.* All gas-fired storage water heaters that use indoor air for combustion or draft hood dilution and that are installed in a conditioned room shall be equipped with a vent damper unless the water heater is already so equipped. Unless the water heater has an available electrical supply, the installation of such a vent damper shall not require an electrical connection. The vent damper shall be listed as meeting appropriate ANSI standards and shall be installed in accordance with manufacturer's instructions and local codes.

9.4.2.2.1 *Exception to section 9.4.2.2:*

(a) where the cost of the damper exceeds the value of reduced energy costs over the damper's lifetime.

9.4.3 Use of Waste Heat, Solar Energy, and Thermal Storage

9.4.3.1 An evaluation shall be made of the potential for the use of condenser heat, waste energy, solar energy, or off-peak heating with thermal storage to reduce water heating energy cost.

9.4.3.2 Storage shall be used to optimize heat recovery when the flow of heat to be recovered is out of phase with the demand for heated water, or when energy use for water heating can be shifted to take advantage of off-peak rates.

[54 FR 4554, Jan. 30, 1989, as amended at 55 FR 23869, June 12, 1990; 59 FR 18294, Apr. 18, 1994]

§ 435.110 Energy management.

10.1 General

10.1.1 This section contains minimum requirements for building energy management systems. It describes the energy measurement, control, testing and documentation that shall be provided to the building owner. The intent is to minimize energy use by providing the building operator with design, construction and equipment data, along with a means of testing the completed facility.

10.1.2 A building shall be considered in compliance with this section if the minimum requirements of Section 10.3 are met.

10.2 Principles of Design

10.2.1 Energy Management Control Systems

10.2.1.1 An energy management control system is critical to the effective management of building energy. Energy management systems require measurements at key points in the building system and must be capable of part-load operation recognition and be equipped with controls to match system capacity to load demands.

10.2.1.2 Controls cannot correct inadequate source equipment, poorly selected components, or mismatched systems. Energy efficiency requires a design that is optimized by realistic loads prediction, careful system selection, and full control provisions.

10.2.2 Building Operating Documentation

10.2.2.1 The building construction drawings and specifications must show system types, sizes, performance criteria, controls, and materials intended for use prior to construction. The system designer shall provide or specify that documentation be provided for the education and guidance of the building operator showing the actual elements that have been installed, how they have been installed, how they performed during testing, and how they operate as a system in the completed facility. Since minimum energy use is the ultimate goal, operating procedures are one of the major factors in controlling energy use in buildings. The activities of building occupants and operators can result in differences as great as two to one in the energy consumption of essentially similar buildings. While neither the designer nor these standards can control the way the building is actually operated, the designer shall contribute to the

education and guidance of the building operator by including this documentation in the contract specifications.

10.2.2.2 The building operator shall be provided with the following:

10.2.2.2.1 As-built drawings and specifications;

10.2.2.2.2 Operating manuals with a schematic diagram, sequence of operation and system operating criteria for each and all systems installed;

10.2.2.2.3 Where the building systems are complex, a comprehensive balancing and testing program and report to demonstrate the energy performance capabilities of the system; and

10.2.2.2.4 Maintenance manuals with complete information for all major components in the facility.

10.3 Minimum Requirements

10.3.1 Each distinct utility-provided energy service shall be metered. This shall apply to central and individual tenant meters. Such meters shall be located, or arranged, so that the meter can be visually monitored.

10.3.2 Each distinct commercially-provided energy service shall have a system to measure and record the amount of energy being delivered, based on the energy content.

10.3.3 The energy delivery systems shall be arranged to allow individual measurement of occupant lighting and outlet services, production processes, auxiliary systems, service water heating, space heating, space cooling, and HVAC delivery systems.

10.3.4 Provisions shall be made for the measurement of energy inputs and outputs (flow, temperature, pressure, etc.) to determine equipment energy consumption and/or installed performance capabilities and efficiencies of all heating, cooling, and HVAC delivery systems equipment, greater than 20 kVA or 60,000 Btu/h energy input.

10.3.5 Energy Measurement lnstrumentation

10.3.5.1 In buildings or tenant areas with electric service greater than 150 kVA or fuel use greater than 500,000 Btu/h, energy use shall be measured for electrical lighting, miscellaneous power outlets, HVAC systems and equipment, service hot water, and process loads and when the peak use of:

10.3.5.1.1 Production processes, including manufacturing, computers, laundries, kitchens, etc., is greater than 100 kVA or 300,000 Btu/h;

10.3.5.1.2 Auxiliary systems and service water heating is greater than 100 kVA or 300,000 Btu/h;

10.3.5.1.3 Space heating (including reheat) is greater than 100 kVA or 300,000 Btu/h;

10.3.5.1.4 Space cooling is greater than 100 kVA or 300,000 Btu/h; and

10.3.5.1.5 HVAC delivery systems is greater than 100 kVA or 300,000 Btu/h.

10.3.5.1.6 *Exception to section 10.3.5.1:*

(a) When there is an energy service for only 2 of the 6 categories listed, a single measurement may be made for the larger of the two energy services and the second use determined by subtraction from the primary service measurements.

10.3.6 HVAC System Controls

10.3.6.1 The designer shall designate, specify, or otherwise show in the construction documents the type of controls and control systems needed. This shall include a description or sequence of control of the system's operational procedures.

10.3.6.2 Controls may be electric, pneumatic, electronic, or direct digital. Control action may be ''on/off'', or proportional that can use manual, automatic, or remote reset and can have rate of action or derivative action compensation as designated by the designer. Control devices may be provided by the manufacturers of equipment or by the field installers, but all shall be compatible with the design sequence of control. The designer shall designate accuracy and long term requirements for controls.

10.3.6.3 All primary energy conversion equipment such as boilers, heat exchangers, refrigeration units, furnaces and heat pumps shall have a load activated local control loop for each piece of equipment. Controls for multiple equipment shall integrate the individual control units or provide system control for all the units.

10.3.6.4 All energy delivery systems shall have a local control loop for each system.

10.3.6.5 Energy consuming systems or components with a peak use greater

than 1 kW or 3,500 Btu/h shall be provided with a means of shut-off when occupancy or weather conditions do not require its operation.

10.3.6.6 The control equipment provided for local control loops except for ''on/off'' and self-contained sensor devices shall be arranged so that sensing, control action, and control setting variables can be read or tested at the device.

10.3.6.7 Control loops for terminal unit zones with less than 24 hours per day or 7 days per week occupancy shall have separate control points for day and night heating and cooling. The devices shall be capable of local resetting, and have provisions for remote management system selection of the occupied or unoccupied heating or cooling mode of operation.

10.3.7 Central Monitoring and Control Systems

10.3.7.1 A central monitoring and control system shall be provided in any building or submetered tenant space exceeding 40,000 ft^2 in gross floor area.

10.3.7.2 The minimum energy management requirements for such a system shall be to:

10.3.7.2.1 Read and retain daily totals for all energy measurement instruments;

10.3.7.2.2 Total all energy values weekly and record and retain values placed on a summary report;

10.3.7.2.3 Record and plot hourly outdoor and indoor temperatures against real time and summarize and report for each year in a format compatible with degree-days or bin temperature;

10.3.7.2.4 Based on time schedules, turn on or off any HVAC or service water heating system or equipment;

10.3.7.2.5 Based on time schedules, turn on or off major building lighting and occupancy power circuits;

10.3.7.2.6 Reset local loop control systems for HVAC equipment;

10.3.7.2.7 Monitor and verify operation of heating, cooling and energy delivery systems;

10.3.7.2.8 Monitor and verify operation of lighting and occupant power, auxiliary and service hot water systems;

10.3.7.2.9 Provide readily accessible override controls so that time-based HVAC and lighting controls may be temporarily overridden during off hours; and

10.3.7.2.10 Provide optimum start/stop for HVAC systems.

10.3.8 Completion Requirements

10.3.8.1 The building construction documents shall describe the requirements for placing all energy management systems in operation. This includes check-out procedures and all controls and metering equipment operational information.

10.3.8.2 The building construction documents shall describe the requirements for balancing and check-out procedures for all HVAC systems and equipment. All HVAC system balancing shall be required to be accomplished in a manner to minimize throttling losses. In air systems, fan speeds shall be required to be adjusted to meet design conditions. Water systems shall be required to be proportionally adjusted to minimize throttling losses and then corrected to design flow conditions by trimming the pump impeller or changing pump speed. The design specifications shall state that a pump shall not be brought to final flow conditions by valving.

10.3.8.3 The building construction documents shall describe the requirements for control system testing to assure that control elements are calibrated, ranges adjusted, set points ascertained, and full travel of moveable elements assured. All elements in the control system shall be tested with the system in operation.

10.3.9 Energy Performance Testing

10.3.9.1 The building construction documents shall describe the requirements for determining building energy performance in the completed, operational building.

10.3.9.2 The building energy performance testing shall be performed in winter for heating and in summer for cooling. These tests shall ascertain the in-site capabilities of all HVAC systems and equipment. Internal building loads shall be accounted for in assessing cooling performance. Heating performance shall be determined during

unoccupied night time periods during winter weather. If any internal load, such as lighting, contributes to building heating, such loads shall be accounted for in assessing heating performance.

10.3.9.3 Energy use measurements shall be made for the overall building system while HVAC system performance is being tested. Each energy management and control system shall be used to determine energy use for:

10.3.9.3.1 Utility energy;

10.3.9.3.2 Commercial service energy:

10.3.9.3.3 Occupant lighting and receptacle power;

10.3.9.3.4 Production process energy;

10.3.9.3.5 Auxiliary systems and service water heating energy;

10.3.9.3.6 Space heating energy;

10.3.9.3.7 Space cooling energy; and

10.3.9.3.8 HVAC delivery system energy.

10.3.9.3.9 Test periods shall be at least six (6) hours in duration. Hourly outdoor and indoor temperatures, solar intensity during a day test, and wind speed during a night test shall be recorded.

10.3.9.4 The building energy performance test data shall, at minimum, measure energy use and outdoor temperatures hourly for each test period.

10.3.10 Documentation Data Requirements

10.3.10.1 As-built information shall be provided for all the following energy-related features of the building:

10.3.10.1.1 Thermal and solar/optical transmission characteristics of the building envelope, including infiltration;

10.3.10.1.2 The operating characteristics of the HVAC, lighting, and service water heating equipment and systems;

10.3.10.1.3 Internal heat gain contributed by equipment and processes; and

10.3.10.1.4 The operating characteristics of controls.

10.3.10.2 A summary report shall be provided outlining the design basis data for the building envelope, the internal heat gains, the weather extremes, major heating/cooling equipment sizes and sequence of operation.

10.3.10.3 The construction documents shall require that shop drawings, schematic diagrams, control sequence, maintenance manuals, and operating instructions, with data on all HVAC, auxiliary equipment and service water heating systems be provided to the owner.

10.3.10.4 A system balancing report shall be provided that follows National Environmental Balancing Bureau or the Association of Air Balancing Council formats with an extra section summarizing the energy-related values gathered during balancing.

10.3.10.5 An energy performance test report shall be provided showing all the data gathered during the energy performance tests. The results shall be presented in a format that provides convenient comparison with design values.

§ 435.111 Building energy cost compliance alternative.

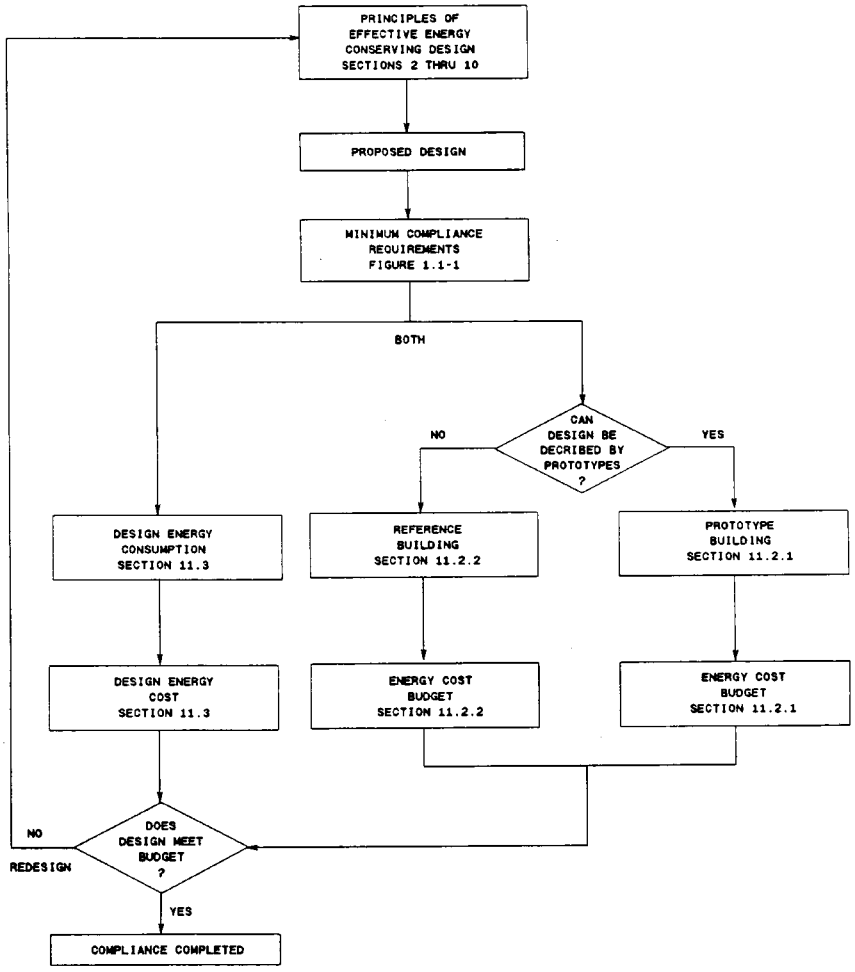
11.1 General

11.1.1 This section provides an alternative compliance path that allows greater flexibility in the design of energy efficient buildings using an annual energy cost method. Energy cost is used as the common denominator in determining compliance. Using unit costs rather than units of energy or power such as Btu, kWh or kW allows the energy use contribution of different fuel sources at different times to be added and compared. This path allows for innovation in designs, materials, and equipment, such as daylighting, passive solar heating, heat recovery, better zonal temperature control, thermal storage, and other applications of off-peak electrical energy, that cannot be adequately evaluated by the prescriptive or system performance alternatives found in sections 3.4, 3.5, 5.4, 5.5, and 7.4. This compliance path is intended for design comparisons only and is not intended to be used to either predict, document, or verify annual energy consumption or annual energy costs.

11.1.2 The Building Energy Cost Compliance Alternative is to be used in lieu of the prescriptive or system performance methods and in conjunction with the minimum requirements found in sections 3.3, 4.3, 5.3, 6.3, 7.3, 8.3, 9.3 and 10.3.

11.1.3 *Compliance.* Compliance under this method requires detailed energy analyses of the entire Proposed Design, referred to as the Design Energy Consumption; an estimate of annual energy cost for the proposed design, referred to as the Design Energy Cost; and comparison against an Energy Cost Budget. Compliance is achieved when the estimated Design Energy Cost is less than or equal to the Energy Cost Budget (see Figure 11–1). This section provides instructions for determining the Energy Cost Budget and for calculating the Design Energy Consumption and Design Energy Cost. The Energy Cost Budget shall be determined through the calculation of monthly energy consumption and energy cost of a Prototype or Reference Building design configured to meet the requirements of sections 3.0 through 10.0.

Figure 11-1 Building Energy Cost Compliance Alternative



11.1.4 Designers are encouraged to employ the Building Energy Cost Budget compliance method set forth in this section for evaluating proposed design alternatives in preference to using the prescriptive/system methods. The Building Energy Cost Budget establishes the relative effectiveness of each design alternative in energy cost savings, providing an energy cost basis upon which the building owner and designer may select one design over another. This Energy Cost Budget is the highest allowable calculated Energy Cost Budget for a specific building design. Other alternative designs are likely to have lower annual energy costs and life cycle costs than those that minimally meet the Energy Cost Budget.

11.1.5 The Energy Cost Budget is a numerical target for annual energy cost. It is intended to assure neutrality with respect to choices of HVAC system type, architectural design, fuel choice, etc., by providing a fixed, repeatable budget target that is independent of any of these choices wherever possible (i.e., for the prototype buildings). The Energy Cost Budget for a given building size and type will vary only with climate, the number of stories, and the choice of simulation tool. The specifications of the prototypes are necessary to assure repeatability, but have no other significance. They are not recommended energy conserving practice, or even physically reasonable practice for some climates or buildings, but represent a reasonable worst case of energy cost resulting from compliance with the spirit and the letter of sections 3.0 through 10.0.

11.2 Determination of the Annual Energy Cost Budget

11.2.1 The annual Energy Cost Budgets shall be determined in accordance with the Prototype Building Method in section 11.2.5, or the Reference Building Method in section 11.2.5. Both methods calculate an annual Energy Cost by summing the 12 monthly Energy Cost Budgets. Each monthly Energy Cost Budget is the product of the monthly Building Energy Consumption of each type of energy used multiplied by the monthly Energy Cost per unit of energy for each type of energy used.

11.2.2 The Energy Cost Budget shall be determined in accordance with Equation 11–1 as follows:

$$ECB = ECB_{jan} + \ldots ECB_{m} + \ldots + ECB_{dec}$$

Equation 11–1

Based on:

$$ECB_{m} = BECON_{m1} \times ECOS_{m1} + \ldots + BECON_{mi} \times ECOS_{mi}$$

Equation 11–2

Where:

ECB=The annual Energy Cost Budget
ECB_{m}=The monthly Energy Cost Budget
$BECON_{mi}$=The monthly Budget Energy Consumption of the ith type of energy
$ECOS_{mi}$=The monthly Energy Cost, per unit of the ith type of energy

11.2.3 The monthly Energy Cost Budget shall be determined using current rate schedules or contract prices available at the building site for all non-depletable types of energy purchased. These costs shall include demand charges, rate blocks, time of use rates, interruptable service rates, delivery charges, taxes, and all other applicable rates for the type, location, operation, and size of the proposed design. The monthly Budget Energy Consumption shall be calculated from the first day through the last day of each month, inclusive.

11.2.4 The Energy Cost Budget, Design Energy Consumption and Design Energy Cost calculations are applicable only for determining compliance with these standards. They are not predictions of actual energy consumption or costs of the proposed building after construction. Actual experience will differ from these calculations due to variations such as occupancy, building operation and maintenance, weather, energy use not covered by these standards, changes in energy rates between design of the building and occupancy, and precision of the calculation tool.

11.2.5 Prototype Building Procedure

11.2.5.1 The Prototype Building procedure shall be used for all building types listed below. For mixed-use buildings the Energy Cost Budget is derived by allocating the floor space of each building type within the floor space of the prototype building. For buildings not listed below, the Reference Building procedure of section 11.2.5 shall be used.

11.2.5.1.1 Prototype buildings include:

(a) Assembly;
(b) Office (Business);
(c) Retail (Mercantile);
(d) Warehouse (Storage);
(e) School (Educational);
(f) Hotel/Motel;
(g) Restaurant;
(h) Health/Institutional; and
(i) Multi-Family.

11.2.5.2 Use of the Prototype Building to Determine the Energy Cost Budget

11.2.5.2.1 Determine the building type of the Proposed Design using the categories in section 11.2.5.1. Using the appropriate Prototype Building characteristics from Tables 11–1 through 11–8,

the building shall be simulated using the same gross floor area and number of floors for the Prototype Building as in the Proposed Design.

11.2.5.2.3 The form, orientation, occupancy and use profiles for the Prototype Building shall be fixed as described in section 11.5.3. Envelope, lighting, other internal loads and HVAC systems and equipment shall meet the prescriptive or system requirements of section 3.0 through 10.0 and are standardized inputs.

11.2.6 Reference Building Method

11.2.6.1 The Reference Building procedure shall be used only when the Proposed Design cannot be represented by one or a combination of the Prototype Building listed in section 11.2.5.1 or the assumptions for the Prototype Building in section 11.5, such as occupancy and use-profiles, do not reasonably represent the Proposed Design.

11.2.6.2 Use of the Reference Building to Determine the Energy Cost Budget

11.2.6.2.1 Each floor shall be oriented in the same manner for the Reference Building as in the Proposed Design. The form, gross and conditioned floor areas of each floor and the number of floors shall be the same as in the Proposed Design. All other characteristics, such as lighting, envelope and HVAC systems and equipment, shall meet the prescriptive/system requirements of section 3.0 through 10.0.

11.2.7 Calculation Procedure and Simulation Tool

11.2.7.1 The Prototype or Reference Buildings shall be modeled using the criteria of section 11.5 and section 11.6. The modeling shall use a climate data set appropriate for both the site and the complexity of the energy conserving features of the design. ASHRAE Weather Year for Energy Calculations (WYEC) data or bin weather data shall be a default choice.

11.3 Determination of the Design Energy Consumption and Design Energy Cost

11.3.1 The Design Energy Consumption shall be calculated by modeling the Proposed Design using the same methods, assumptions, climate data, and simulation tool as were used to establish the Energy Cost Budget, except as explicitly stated in 11.5. The Design Energy Cost shall be calculated per Equation 11–3. If the Proposed Design includes cogeneration or non-depletable energy sources designed for the sale of energy off-site, then energy cost and income resulting from outside sales shall not be used to reduce the Design Energy Costs. Such systems shall be modeled as operating to supply energy needs of the Proposed Design only.

$$DECOS = DECOS_{jan} + \ldots DECOS_{m} \ldots + DECOS_{dec} \quad \ldots\ldots$$

Equation 11–3

Based on:

$$DECOS_{m} = DECON_{m1} \times ECOS_{m1} + \ldots + DECON_{mi} \times ECOS_{mi} \quad \ldots$$

Equation 11–4

Where:

$DECOS$ = The annual Design Energy Cost

$DECOS_{m}$ = The monthly Design Energy Cost

$ICON_{mi}$ = The monthly Design Energy Consumption of the ith type of energy

$ECOS_{mi}$ = The monthly Energy Cost per unit of the ith type of energy

The $DECON_{mi}$ shall be calculated from the first day through the last day of the month, inclusive.

11.4 Compliance

11.4.1 If the Design Energy Cost is less than or equal to the Energy Cost Budget, and all of the minimum requirements of sections 3.0 through 10.0 are met, the Proposed Design complies with the standards.

11.5 Standard Calculation Procedure

11.5.1 The Standard Calculation Procedure consists of methods and assumptions for calculating the Energy Cost Budget for the Prototype or Reference Building and the Design Energy Consumption and Design Energy Cost of the Proposed Design. In order to maintain consistency between the Energy Cost Budget and the Design Energy Cost, the input assumptions to be used are stated below. These inputs shall be used to determine the Energy Cost Budget and the Design Energy Consumption.

11.5.2 Prescribed assumptions shall be used without variation. Default assumptions shall be used unless the designer can demonstrate that a different assumption better characterizes the building's energy use over its expected life. No modified default assumptions shall be used in modeling both the Prototype or Reference Building and the Proposed Design unless the designer demonstrates clear cause to do otherwise. Special procedures for speculative buildings are discussed in section 11.5.9. Shell buildings may not use section 11.0.

11.5.3 Orientation and Shape

11.5.3.1 The Prototype Building shall consist of the same number of stories, and gross and conditioned floor area as the Proposed Design, with equal area per story. The building shape shall be rectangular, with a 2.5:1 aspect ratio. The long dimensions of the building shall face East and West. This is intended to provide an energy budget that can be met even if there are unfavorable site constraints. The fenestration shall be uniformly distributed in proportion to exterior wall area.

11.5.3.2 Floor-to-floor height for the Prototype Building shall be 13 ft except for dwelling units in hotels/motels and multi-family high rise residential buildings where floor-to-floor height shall be 9.5 ft.

11.5.3.3 The Reference Building shall consist of the same number of stories, and gross floor area for each story as the Proposed Design. Each floor shall be oriented in the same manner as the Proposed Design. The geometric form shall be the same as the Proposed Design.

11.5.4 Internal Loads

11.5.4.1 The systems and types of energy specified in this section are intended only as constraints in calculating the Energy Cost Budget. They are not intended as either requirements or recommendations for either systems or the type of energy to be used in the Proposed Design or for calculation of Design Energy Cost.

11.5.4.2 Internal loads for multi-family high rise residential buildings are presented in Table 11–1. These assumptions shall be prescribed assumptions. Internal loads for other building types shall be modeled as noted in this subsection.

11.5.4.2.1 Occupancy

(a) Occupancy schedules shall be Default Assumptions. The same assumptions shall be made in computing Design Energy Consumption as were used in calculating the Energy Cost Budget.

(b) Table 11–2, Occupancy Density, establishes the density, in ft^2/person of conditioned floor area, to be used for each building type. Table 11–3, Building Schedule Percentage Multipliers, establishes the percentage of total occupants in the building by hour of the day for each building type.

11.5.4.2.2 Lighting

(a) Interior Lighting Power Allowance (ILPA), for calculating the Energy Cost Budget shall be determined from section 3.0. The lighting power used to calculate the Design Energy Consumption shall be the actual adjusted power for lighting in the Proposed Design. If the lighting controls in the Proposed Design are more effective at saving energy than those required by section 3.3, the actual installed lighting power shall be used along with the schedules reflecting the action of the controls to calculate the Design Energy Consumption. This actual installed lighting power shall not be adjusted by the Power Adjustment Factors listed in Table 3.5–2.

(b) Lighting energy profiles are shown in Table 11–3 that establish the percentage of the lighting load switched-on in each Prototype or Reference Building by hour of the day. These profiles are default assumptions and can be changed when calculating the Energy Cost Budget to provide, for example, a 12 hour rather than an 8 hour work day.

11.5.4.2.3 Receptacles

(a) Receptacle loads and profiles are default assumptions. The same assumptions shall be made in calculating Design Energy Consumption as were used in calculating the Energy Cost Budget.

(b) Receptacle loads include all general service loads that are typical in a

building. These loads exclude any process electrical usage and HVAC primary or auxiliary electrical usage. Table 11–4, Receptacle Power Densities, establishes the density, in W/ft^2, to be used for each building type. The receptacle energy profiles shall be the same as the lighting energy profiles in Table 11–3. This profile establishes the percentage of the receptacle load that is switched on by hour of the day and by building type.

11.5.5 Building Exterior Envelope

11.5.5.1 Insulation and Glazing

11.5.5.1.1 The insulation and glazing characteristics of the Prototype and Reference Building envelope shall be determined by using the first column under ''Base Case'', with no assumed overhangs for the appropriate Alternate Component Tables (ACP) in section 5.0, as defined by climate range. The insulation and glazing characteristics from this ACP are Prescribed Assumptions for Prototype and Reference Buildings for calculating the Energy Cost Budget. In calculating the Design Energy Consumption of the Proposed Design, the envelope characteristics of the Proposed Design shall be used.

11.5.5.2 Infiltration

11.5.5.2.1 For Prototype and Reference Buildings, infiltration assumptions shall be prescribed assumptions for calculating the Energy Cost Budget and default assumptions for the Design Energy Consumption. Infiltration shall impact perimeter zones only.

11.5.5.2.2 When the HVAC system is switched ''on'', no infiltration shall be assumed. When the HVAC system is switched ''off'', the infiltration rate for buildings with or without operable windows shall be assumed to be 0.038 cfm/ft^2 of gross exterior wall. Hotels/motels and multi-family high rise residential buildings shall have infiltration rates of 0.038 cfm/ft^2 of gross exterior wall area at all times.

11.5.5.3 Envelope and Ground Absorptivities

11.5.5.3.1 For Prototype and Reference Buildings, absorptivity assumptions shall be prescribed assumptions for computing the Energy Cost Budget and default assumptions for computing the Design Energy Consumption. The solar absorptivity of opaque elements of the building envelope is assumed to be 70%. The solar absorptivity of ground surfaces is assumed to be 80% (20% reflectivity).

11.5.5.4 Window Management

11.5.5.4.1 For the Prototype and Reference Building, window management drapery assumptions shall be prescribed assumptions for setting the Energy Cost Budget. No draperies shall be the default assumption for computing the Design Energy Consumption. Glazing is assumed to be internally shaded by medium-weight draperies, closed one-half time. The draperies shall be modeled by assuming that one-half the area in each zone is draped and one-half is not. If manually-operated draperies, shades, or blinds are to be used in the Proposed Design, the Design Energy Consumption shall be calculated by assuming they are effective over one-half the glazing area in each zone.

11.5.5.5 Shading

11.5.5.5.1 For Prototype and Reference buildings and the Proposed Design, shading by permanent structures, terrain, and vegetation shall be taken into account for computing energy consumption, whether or not these features are located on the building site. A permanent fixture is one that is likely to remain for the life of the Proposed Design.

11.5.6 HVAC Systems and Equipment

11.5.6.1 The specifications and requirements for the HVAC systems of the Prototype and Reference Buildings shall be those in Table 11–5, HVAC Systems for Prototype and Reference Buildings. For the calculation of the Design Energy Consumption, the HVAC systems and equipment of the Proposed Design shall be used.

11.5.6.2 The systems and types of energy presented in Table 11–5 are intended only as constraints in calculating the Energy Cost Budget. They are not intended as either requirements or recommendations for either systems or the type of energy to be

used in the Proposed Building or for the calculation of the Design Energy Cost.

11.5.6.3 HVAC Zones

11.5.6.3.1 HVAC zones for calculating the Energy Cost Budget of the Prototype or Reference Building shall consist of at least four perimeter and one interior zones per floor. Prototype Buildings shall have one perimeter zone facing each cardinal direction. The perimeter zones of Prototype and Reference Buildings shall be 15 ft in width, or one-third the narrow dimension of the building, when this dimension is between 30 ft and 45 ft inclusive, or one-half the narrow dimension of the building when this dimension is less than 30 ft. Zoning requirements shall be a default assumption for calculating the Energy Cost Budget. For multi-family high rise residential buildings, the prototype building shall have one zone per dwelling unit. The proposed design shall have one zone per unit unless zonal thermostatic controls are provided within units; in this case, two zones per unit shall be modeled. Building types such as assembly or warehouse may be modeled as a single zone if there is only one space.

11.5.6.3.2 For calculating the Design Energy Consumption, no fewer zones shall be used than were in the Prototype and Reference Buildings. The zones in the simulation shall correspond to the zones provided by the controls in the Proposed Design. Thermally similar zones, such as those facing one orientation on different floors, may be grouped together for the purposes of either the Design Energy Consumption or Energy Cost Budget simulation.

11.5.6.4 Equipment Sizing and Redundant Equipment

11.5.6.4.1 For calculating the Energy Cost Budget of Prototype or Reference Buildings, HVAC equipment shall be sized to meet the requirements of section 7.3.2, without using any of the exceptions. The size of equipment shall be that required for the building without process loads considered. The designer shall determine the final equipment sizing including the process loads by separate calculations. Redundant and/or emergency equipment need not be simulated if it is controlled so that it will not be operated during normal operations of the building. The designer shall document the installation of process equipment and the size of process loads.

11.5.6.4.2 For calculating the Design Energy Consumption, actual air flow rates and installed equipment size shall be used in the simulation, except that excess capacity provided to meet process loads need not be modeled if the process load was not modeled in setting Energy Cost Budget. Equipment sizing in the simulation of the Proposed Design shall correspond to the equipment actually selected for the design and the designer shall not use equipment sized automatically by the simulation tool.

11.5.6.4.3 Redundant and/or emergency equipment need not be simulated if it is controlled to not be operated during normal operations of the building.

11.5.7 Service Water Heating

11.5.7.1 The service water loads for Prototype and Reference Buildings are defined in terms of Btu/h per person in Table 11–6. The service water heating loads from Table 11–6 are prescribed assumptions for multi-family high rise residential buildings and default assumptions for all other buildings. The same service water heating load assumptions shall be made in calculating Design Energy Consumption as were used in calculating the Energy Cost Budget.

11.5.7.2 The service water heating system, including piping losses for the Prototype Building, shall be modeled using the methods of the *ASHRAE Handbook, 1987 HVAC Systems and Applications Volume* using a system that meets all requirements of section 9.0. The service water heating equipment for the Prototype or Reference Building shall be either natural gas or #2 fuel oil, if natural gas is not available at the site, or an electric heat pump.

11.5.7.3 *Exception to section 11.5.7:*

11.5.7.3.1 If electric resistance service water heating is preferable to an electric heat pump when analyzed according to the criteria of section 9.3.7.1

or when service water temperatures exceeding 145 °F are required for a particular application, electric resistance water heating may be used.

11.5.8 Controls

11.5.8.1 All occupied conditioned spaces in the Prototype, Reference and Proposed Design Buildings in all climates shall be simulated as being both heated and cooled. The assumptions in this subsection are prescribed assumptions. If the Proposed Design does not include equipment for cooling or heating, the Design Energy Consumption shall be determined by the specifications for calculating the Energy Cost Budget as described in Table 11–7.

11.5.8.2 *Exceptions to section 11.5.8:*

11.5.8.2.1 If a building is to be provided with only heating or cooling, both the Prototype or Reference Building and the Proposed Design shall be simulated, using the same assumptions. If such an assumption is made, the analysis shall show that the building interior temperature meets the comfort criteria of *ANSI/ASHRAE 55–1981* ''Thermal Environmental Conditions for Human Occupancy,'' at least 98% of the occupied hours during the year.

11.5.8.2.2 If warehouses are not intended to be mechanically cooled, both the Energy Cost Budget and Design Energy Consumption shall be modeled assuming no mechanical cooling; and

11.5.8.2.3 In climates where winter design temperature (97.5% occurrence) is greater than 59 °F, space heating need not be modeled.

11.5.8.3 Space temperature controls for the Prototype or Reference Building, except multi-family high rise residential buildings shall be set at 70 °F for space heating and 75 °F for space cooling with a deadband per section 7.3.4.5. The system shut off during off-hours shall be according to the schedule in Table 11–3, except that the heating system shall cycle on if any space should drop below the night setback setting of 55 °F. There shall be no similar setpoint during the cooling season. Lesser deadband ranges may be used in calculating the Design Energy Consumption.

11.5.8.3.1 *Exceptions to section 11.5.8.3:*

(a) Setback shall not be modeled in determining either the Energy Cost Budget or Design Energy Cost if setback is not realistic for the Proposed Design, such as 24 hour/day operations. Health facilities need not have night setback during the heating season;

(b) Hotel/motels and multi-family high rise residential buildings shall have a night setback temperature of 60 °F from 11:00 p.m. to 6:00 a.m. during the heating season; and

(c) If deadband controls are not to be installed, the Design Energy Cost shall be calculated with both heating and cooling thermostat setpoints set to the same value between 70 °F and 75 °F inclusive, assumed to be constant for the year.

11.5.8.3.2 For multi-family buildings, the thermostat schedule for the dwelling units shall be as in Table 11–8.

(a) The Prototype Building shall use the single zone schedule. The Proposed Design shall use the two-zone schedule only if zonal thermostatic controls are provided. For Proposed Designs that use heat pumps employing supplementary heat, the controls used to switch on the auxiliary heat source during morning warm-up periods shall be simulated accurately. The thermostat assumptions for multi-family high-rise buildings are prescribed assumptions.

11.5.8.4 When providing for outdoor air ventilation in calculating the Energy Cost Budget, controls shall be assumed to close the outside air intake to reduce the flow of outside air to 0 cfm during setback and unoccupied periods. Ventilation using inside air may still be required to maintain scheduled setback temperature. Outside air ventilation, during occupied periods, shall be as required by *ASHRAE Standard 62–1981,* ''Ventilation for Acceptable Indoor Air,'' or the Proposed Design, whichever is greater.

11.5.8.5 If humidification is to be used in the Proposed Design, the same level of humidification and system type shall be used in the Prototype or Reference Building. If dehumidification requires subcooling of supply air, then reheat for the Prototype or Reference Building shall be from recovered waste heat such as condenser waste heat.

11.5.9 Speculative Buildings

11.5.9.1 Lighting

11.5.9.1.1 The interior lighting power allowance (ILPA) for calculating the Energy Cost Budget shall be determined from Table 3.4–1. The Design Energy Consumption may be based on an assumed adjusted lighting power for future lighting improvements.

(a) The assumption about future lighting power used to calculate the Design Energy Consumption must be documented so that the future installed lighting systems may be in compliance with these standards. Documentation must be provided to enable future lighting systems to use either the Prescriptive method of section 3.4 or the Systems Performance method of section 3.5.

(b) Documentation for future lighting systems that use the Prescriptive method of section 3.4 shall be stated as a maximum adjusted lighting power for the tenant spaces. The adjusted lighting power allowance for tenant spaces shall account for the lighting power provided for the common areas of the building.

(c) Documentation for future lighting systems that use the System Performance method of section 3.5 shall be stated as a required lighting adjustment. The required lighting adjustment is the whole building lighting power assumed in order to calculate the Design Energy Consumption minus the ILPA value from Table 3.4–1 that was used to calculate the Energy Cost Budget. When the required lighting adjustment is less than zero, a complete lighting design must be developed for one or more representative tenant spaces, demonstrating acceptable lighting within the limits of the assumed lighting power allowance.

11.5.9.2 HVAC Systems and Equipment

11.5.9.2.1 If the HVAC system is not completely specified in the plans, the Design Energy Consumption shall be based on reasonable assumptions about the construction of future HVAC systems and equipment. These assumptions shall be documented so that future HVAC systems and equipment may be in compliance with these standards.

11.6 The Simulation Tool

11.6.1 Annual energy consumption shall be simulated with a multi-zone, 8760 hours per year building energy model. The model shall account for:

11.6.1.1 The dynamic heat transfer of the building envelope such as solar and internal gains;

11.6.1.2 Equipment efficiencies as a function of load and climate;

11.6.1.3 Lighting and HVAC system controls and distribution systems by simulating the whole building;

11.6.1.4 The operating schedule of the building including night setback during various times of the year; and

11.6.1.5 Energy consumption information at a level necessary to determine the Energy Cost Budget and Design Energy Cost through the appropriate utility rate schedules.

11.6.2 While the simulation tool should simulate an entire year on an hour by hour basis (8760 hours), programs that approximate this dynamic analysis procedure and provide equivalent results are acceptable.

11.6.3 Simulation tools shall be selected for their ability to simulate accurately the relevant features of the building in question, as shown in the tool's documentation. For example, a single zone model shall not be used to simulate a large, multi-zone building, and a steady-state model such as the degree-day method shall not be used to simulate buildings when equipment efficiency or performance is significantly affected by the dynamic patterns of weather, solar radiation, and occupancy. Relevant energy-related features shall be addressed by a model such as daylighting, atriums or sunspaces, night ventilation or thermal storage, chilled water storage or heat recovery, active or passive solar systems, zoning and controls of heating and cooling systems, and ground-coupled buildings. In addition, models shall be capable of translating the Design Energy Consumption into energy cost using actual utility rate schedules with the coincidental electrical demand of a building. Examples of public domain models capable of handling such complex building systems and energy cost translations available in the United States are DOE–2.1C and

BLAST 3.0 and in Canada, Energy Systems Analysis Series.

11.6.4 All simulation tools shall use scientifically justifiable documented techniques and procedures for modeling building loads, systems, and equipment. The algorithms used in the program shall have been verified by comparison with experimental measurements, loads, systems, and equipment.

TABLE 11-1

MULTI-FAMILY HIGH RISE RESIDENTIAL BUILDING SCHEDULES

(INTERNAL LOADS PER DWELLING UNIT Btu/h)

One-Zone Dwelling Unit

	OCCUPANTS		LIGHTS	EQUIPMENT	
HOUR	SENSIBLE	LATENT	SENSIBLE	SENSIBLE	LATENT
1	300	260	0	750	110
2	300	260	0	750	110
3	300	260	0	750	110
4	300	260	0	750	110
5	300	260	0	750	110
6	300	260	0	750	110
7	300	260	980	1250	190
8	210	200	840	2600	420
9	100	80	0	1170	180
10	100	80	0	1270	190
11	100	80	0	1270	190
12	100	80	0	2210	330
13	100	80	0	2210	330
14	100	80	0	1270	190
15	100	80	0	1270	190
16	100	80	0	1270	190
17	100	80	0	1270	190
18	300	260	0	3040	450
19	300	260	0	3360	500
20	300	260	960	1490	220
21	300	260	960	1490	220
22	300	260	960	1490	220
23	300	260	960	1060	160
24	300	260	960	1060	160

TABLE 11-1 (CONT.)
MULTI-FAMILY HIGH RISE RESIDENTIAL BUILDING SCHEDULES
(INTERNAL LOADS PER DWELLING UNIT Btu/h)

Two-Zone Dwelling Unit

HOUR	BEDROOMS & BATHROOMS						OTHER ROOMS					
	OCCUPANTS		LIGHTS	EQUIPMENT			OCCUPANTS		LIGHTS	EQUIPMENT		
	Sensible	Latent	Sensible	Sensible	Latent		Sensible	Latent	Sensible	Sensible	Latent	
1	300	260	0	100	20		0	0	0	650	90	
2	300	260	0	100	20		0	0	0	650	90	
3	300	260	0	100	20		0	0	0	650	90	
4	300	260	0	100	20		0	0	0	650	90	
5	300	260	0	100	20		0	0	0	650	90	
6	300	260	0	100	20		0	0	0	650	90	
7	200	180	680	200	40		100	80	300	1050	150	
8	110	120	240	200	40		100	80	600	2400	380	
9	0	0	0	100	20		100	80	0	1070	160	
10	0	0	0	100	20		100	80	0	1170	170	
11	0	0	0	100	20		100	80	0	1170	170	
12	0	0	0	100	20		100	80	0	2110	310	
13	0	0	0	100	20		100	80	0	2110	310	
14	0	0	0	100	20		100	80	0	1170	170	
15	0	0	0	100	20		100	80	0	1170	170	
16	0	0	0	100	20		100	80	0	1170	170	
17	0	0	0	100	20		100	80	0	1170	170	
18	0	0	0	100	20		300	260	0	2940	430	
19	0	0	0	100	20		300	260	0	3260	480	
20	100	80	320	300	60		200	180	640	1190	160	
21	100	80	320	300	60		200	180	640	1190	160	
22	150	130	480	700	90		150	130	480	790	130	
23	300	260	640	410	70		0	0	320	650	90	
24	300	260	640	410	70		0	0	320	650	90	

TABLE 11-2
OCCUPANCY DENSITY

BUILDING TYPE	CONDITIONED FLOOR AREA Ft^2/PERSON
Assembly	50
Office	275
Retail	300
Warehouse	15000
School	75
Hotel/Motel	250
Restaurant	100
Health/Institutional	200
Multi-family High Rise Residential	2 per unit[1]

Heat generation: Btu/h per person: 230 Btu/h per person sensible, and 190 Btu/h per person latent.

1. See Table 11-1

TABLE 11-3
BUILDING SCHEDULE PERCENTAGE MULTIPLIERS

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
ASSEMBLY	WEEKDAY:	0	0	0	0	0	0	0	0	20	20	20	20	80	80	80	80	80	80	20	20	20	20	10	0
OCCUPANCY	SATURDAY:	0	0	0	0	0	0	0	0	20	20	20	20	60	60	60	60	60	60	60	60	60	80	10	0
	SUNDAY:	0	0	0	0	0	0	0	0	10	10	10	10	10	70	70	70	70	70	70	70	70	70	20	0
ASSEMBLY	WEEKDAY:	0	0	0	0	0	0	40	40	40	75	75	75	75	75	75	75	75	75	75	75	75	75	25	0
LTNG & RECEP	SATURDAY:	0	0	0	0	0	0	0	30	30	50	50	50	50	50	50	50	50	50	50	50	50	50	0	0
	SUNDAY:	0	0	0	0	0	0	0	30	30	30	30	30	65	65	65	65	65	65	65	65	65	65	0	0
ASSEMBLY	WEEKDAY:	OFF	OFF	OFF	OFF	OFF	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	OFF
HVAC	SATURDAY:	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	OFF
	SUNDAY:	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	OFF
ASSEMBLY	WEEKDAY:	0	0	0	0	0	0	0	0	0	5	5	35	5	5	5	5	5	0	0	0	0	0	0	0
SWH	SATURDAY:	0	0	0	0	0	0	0	0	0	5	5	20	0	0	0	0	0	0	0	65	30	0	0	0
	SUNDAY:	0	0	0	0	0	0	0	0	0	5	5	10	0	0	0	0	0	0	0	65	30	0	0	0
OFFICE	WEEKDAY:	0	0	0	0	0	0	0	10	20	95	95	45	45	95	95	95	95	95	30	10	10	10	0	0
OCCUPANCY	SATURDAY:	0	0	0	0	0	0	0	10	10	30	30	30	30	10	10	10	10	10	0	0	0	0	0	0
	SUNDAY:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
OFFICE	WEEKDAY:	0	0	0	0	0	0	10	30	90	90	90	90	80	90	90	90	90	90	30	30	20	20	0	0
LTNG & RECEP	SATURDAY:	0	0	0	0	0	0	10	10	30	30	30	30	15	15	15	15	15	15	0	0	0	0	0	0
	SUNDAY:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
OFFICE	WEEKDAY:	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF
HVAC	SATURDAY:	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	ON	ON	ON	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
	SUNDAY:	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
OFFICE	WEEKDAY:	0	0	0	0	0	0	0	15	30	35	35	45	55	50	30	30	40	20	20	10	15	5	0	0
SWH	SATURDAY:	0	0	0	0	0	0	0	10	10	20	15	20	15	15	10	10	10	0	0	0	0	0	0	0
	SUNDAY:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

TABLE 11-3 (Continued)
BUILDING SCHEDULE PERCENTAGE MULTIPLIERS

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
RETAIL	WEEKDAY:	0	0	0	0	0	0	0	10	20	50	50	70	70	70	70	80	70	50	50	30	30	0	0	0
OCCUPANCY	SATURDAY:	0	0	0	0	0	0	0	10	20	50	60	80	80	80	80	80	80	60	20	20	20	10	0	0
	SUNDAY:	0	0	0	0	0	0	0	0	0	10	20	20	40	40	40	40	40	20	10	0	0	0	0	0
RETAIL	WEEKDAY:	0	0	0	0	0	0	0	20	50	90	90	90	90	90	90	90	90	90	60	60	50	0	0	0
LTNG & RECEPSATURDAY:		0	0	0	0	0	0	0	10	30	60	90	90	90	90	90	90	90	90	50	30	30	10	0	0
	SUNDAY:	0	0	0	0	0	0	0	0	0	10	40	40	60	60	60	60	60	40	20	0	0	0	0	0
RETAIL	WEEKDAY:	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	OFF	OFF	OFF
HVAC	SATURDAY:	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	OFF	OFF
	SUNDAY:	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	OFF	OFF	OFF	OFF	OFF
RETAIL	WEEKDAY:	0	0	0	0	0	0	0	10	20	30	40	55	60	60	45	40	45	45	40	30	30	0	0	0
SWH	SATURDAY:	0	0	0	0	0	0	0	15	20	25	40	50	55	55	45	45	45	45	40	35	25	20	0	0
	SUNDAY:	0	0	0	0	0	0	0	0	0	10	25	30	35	35	30	30	35	30	20	0	0	0	0	0
WAREHOUSE	WEEKDAY:	0	0	0	0	0	0	0	15	70	90	90	90	50	85	85	85	20	0	0	0	0	0	0	0
OCCUPANCY	SATURDAY:	0	0	0	0	0	0	0	0	20	20	20	20	10	10	10	10	0	0	0	0	0	0	0	0
	SUNDAY:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WAREHOUSE	WEEKDAY:	0	0	0	0	0	0	0	40	70	90	90	90	90	90	90	90	90	0	0	0	0	0	0	0
LTNG & RECEPSATURDAY:		0	0	0	0	0	0	0	0	10	25	25	25	10	10	10	10	0	0	0	0	0	0	0	0
	SUNDAY:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WAREHOUSE	WEEKDAY:	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF
HVAC	SATURDAY:	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	ON	ON	ON	ON	ON	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
	SUNDAY:	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
WAREHOUSE	WEEKDAY:	0	0	0	0	0	0	0	5	25	35	35	45	55	50	35	50	15	0	0	0	0	0	0	0
SWH	SATURDAY:	0	0	0	0	0	0	0	0	0	10	10	15	0	0	0	0	0	0	0	0	0	0	0	0
	SUNDAY:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

TABLE 11-3 (Continued)
BUILDING SCHEDULE PERCENTAGE MULTIPLIERS

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
SCHOOL	WEEKDAY:	0	0	0	0	0	0	0	5	75	90	90	80	80	80	80	45	15	5	15	20	20	10	0	0
OCCUPANCY	SATURDAY:	0	0	0	0	0	0	0	0	10	10	10	10	10	0	0	0	0	0	0	0	0	0	0	0
	SUNDAY:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SCHOOL	WEEKDAY:	0	0	0	0	0	0	0	30	85	95	95	95	80	80	80	70	50	50	35	35	35	30	0	0
LTNG & RECEP	SATURDAY:	0	0	0	0	0	0	0	0	15	15	15	15	15	0	0	0	0	0	0	0	0	0	0	0
	SUNDAY:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SCHOOL	WEEKDAY:	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON
HVAC	SATURDAY:	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	ON	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
	SUNDAY:	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
SCHOOL	WEEKDAY:	0	0	0	0	0	0	0	5	30	55	60	70	75	80	60	60	5	5	15	20	20	20	0	0
SWH	SATURDAY:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	SUNDAY:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
HOTEL/MOTEL	WEEKDAY:	90	90	90	90	90	90	70	40	40	20	20	20	20	20	20	30	50	50	50	70	70	80	90	90
OCCUPANCY	SATURDAY:	90	90	90	90	90	90	70	50	50	30	30	30	30	30	30	30	30	50	60	60	60	70	70	70
	SUNDAY:	70	70	70	70	70	70	70	70	50	50	50	30	30	20	20	20	30	40	40	60	60	80	80	80
HOTEL/MOTEL	WEEKDAY:	20	15	10	10	10	20	40	50	40	40	25	25	25	25	25	25	25	25	60	80	90	80	60	30
LTNG & RECEP	SATURDAY:	20	20	10	10	10	10	30	30	40	40	30	25	25	25	25	25	25	25	60	70	70	70	60	30
	SUNDAY:	30	30	20	20	20	20	30	40	40	30	30	30	30	20	20	20	20	20	50	70	80	60	50	30
HOTEL/MOTEL	WEEKDAY:	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON
HVAC	SATURDAY:	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON
	SUNDAY:	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON
HOTEL/MOTEL	WEEKDAY:	20	15	15	15	20	25	50	60	55	45	40	45	40	35	30	30	30	40	55	60	50	55	45	25
SWH	SATURDAY:	20	15	15	15	20	25	40	50	50	50	45	50	50	45	40	40	34	40	55	55	50	55	40	30
	SUNDAY:	25	20	20	20	20	30	50	50	50	55	50	50	40	40	30	30	30	40	50	50	40	50	40	20

TABLE 11-3 (Continued)
BUILDING SCHEDULE PERCENTAGE MULTIPLIERS

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
RESTAURANT	WEEKDAY:	15	15	5	0	0	0	0	5	5	5	20	50	80	70	40	20	25	50	80	80	80	50	35	20
OCCUPANCY	SATURDAY:	30	25	5	0	0	0	0	0	0	5	20	45	50	50	35	30	30	30	70	90	70	65	55	35
	SUNDAY:	20	20	5	0	0	0	0	0	0	0	0	20	25	25	15	20	25	35	55	65	70	35	20	20
RESTAURANT	WEEKDAY:	15	15	15	15	15	20	40	40	60	60	90	90	90	90	90	90	90	90	90	90	90	90	50	30
LTNG & RECEP	SATURDAY:	20	15	15	15	15	15	30	30	60	60	80	80	80	80	80	80	80	90	90	90	90	90	50	30
	SUNDAY:	20	15	15	15	15	15	30	30	50	70	70	70	70	70	70	70	60	60	60	60	60	60	50	30
RESTAURANT	WEEKDAY:	ON	ON	ON	OFF	OFF	OFF	OFF	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON
HVAC	SATURDAY:	ON	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON
	SUNDAY:	ON	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON
RESTAURANT	WEEKDAY:	20	15	15	0	0	0	0	60	55	45	40	45	40	35	30	30	30	40	55	60	50	55	45	25
SWH	SATURDAY:	20	15	15	0	0	0	0	0	0	50	45	50	50	45	40	40	35	40	55	55	50	55	40	30
	SUNDAY:	25	20	20	0	0	0	0	0	0	0	50	50	40	40	30	30	30	40	50	50	40	50	40	20
HEALTH	WEEKDAY:	0	0	0	0	0	0	0	10	50	80	80	80	80	80	80	80	80	50	30	30	20	20	0	0
OCCUPANCY	SATURDAY:	0	0	0	0	0	0	0	10	30	40	40	40	40	40	40	40	40	10	10	0	0	0	0	0
	SUNDAY:	0	0	0	0	0	0	0	0	5	5	5	5	5	5	5	5	5	0	0	0	0	0	0	0
HEALTH	WEEKDAY:	0	0	0	0	0	0	0	50	90	90	90	90	90	90	90	90	90	30	30	30	30	30	0	0
LTNG & RECEP	SATURDAY:	0	0	0	0	0	0	0	20	40	40	40	40	40	40	40	40	40	40	10	0	0	0	0	0
	SUNDAY:	0	0	0	0	0	0	0	0	10	10	10	10	10	10	10	10	0	0	0	0	0	0	0	0
HEALTH	WEEKDAY:	0	0	0	0	0	0	0	15	55	65	75	80	70	80	75	70	60	40	15	15	15	5	0	0
SWH	SATURDAY:	0	0	0	0	0	0	0	0	15	25	25	25	20	20	20	20	20	5	0	0	0	0	0	0
	SUNDAY:	0	0	0	0	0	0	0	0	0	15	15	15	15	15	15	0	0	0	0	0	0	0	0	0
HEALTH	WEEKDAY:	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON
HVAC	SATURDAY:	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON
	SUNDAY:	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON
MULTI-FAMILY	WEEKDAY:	0	0	0	5	5	5	80	70	50	40	20	20	25	25	50	50	70	70	35	20	15	15	5	0
SWH SYSTEM	SATURDAY:	0	0	0	0	0	0	20	45	50	50	35	30	30	30	70	90	70	65	55	35	30	25	5	0
	SUNDAY:	0	0	0	0	0	0	0	20	25	25	15	20	25	35	55	65	70	35	20	20	20	20	5	0

NOTES FOR TABLE 11-3

1 Reference: Recommendations for Energy Conservation Standards and Guidelines for New Commercial Buildings, Vol. III, App. A Pacific Northwest Laboratory, PNL-4870-8, 1983."

2 Table 11-3 contains multipliers for converting the nominal values for building occupancy (Table 11-2), receptacle power density (Table 11-4), service hot water (Table 11-6), and lighting energy (Section 3.4 or 3.5) into time series data for estimating building loads under the Standard Calculation Procedure.

For each standard building profile there are three series - one each for weekdays, Saturday and Sunday. There are 24 elements per series. These represent the multiplier that should be used to estimate building loads from 12 a.m. to 1 a.m. (series element #1) through 11 p.m. to 12 a.m. (series element #24). The estimated load for any hour is simply the multiplier from the appropriate standard profile multiplied by the appropriate value from the tables cited above.

3 The Building HVAC System Schedule listed in Table 11-3 lists the hours when the HVAC system shall be considered "on" or "off" in accordance with Section 11.5.5.2.

TABLE 11-4
RECEPTACLE POWER DENSITIES

BUILDING TYPE	W/ft^2 OF CONDTIONED FLOOR AREA
Assembly	0.25
Office	0.75
Retail	0.25
Warehouse	0.1
School	0.5
Hotel/Motel	0.25
Restaurant	0.1
Health	1.0
Multi-Family High Rise Residential	Included in Lights and Equipment portions of Table 11-1

TABLE 11-5
HVAC SYSTEMS OF PROTOTYPE AND REFERENCE BUILDINGS[1, 2]

BUILDING/SPACE OCCUPANCY	SYSTEM NO. (TABLE 11-7)	REMARKS (TABLE 11-7)
Assembly		
a. Churches (any size)	1	
b. ≤50,000 ft^2 or ≤3 floors	1 or 3	Note 1
c. >50,000 ft^2 or >3 floors	3	
Office		
a. ≤20,000 ft^2	1	
b. >20,000 ft^2 and either ≤3 floors or ≤75,000 ft^2	4	
c. >75,000 ft^2 or >3 floors	5	
Retail		
a. ≤50,000 ft^2	1 or 3	Note 1
b. >50,000 ft^2	4 or 5	Note 1
Warehouse	1	Note 1
Schools		
a. ≤75,000 ft^2 or ≤3 floors	1	
b. >75,000 ft^2 or >3 floors	3	
Hotel/Motel		
a. ≤3 stories	2 or 7	Note 5, 7
b. >3 stories	6	Note 6
Restaurant	1 or 3	Note 1
Health		
a. Nursing Home (any size)	2 or 7	Note 7
b. ≤15,000 ft^2	1	
c. >15,000 ft^2 and ≤50,000 ft^2	4	Note 2
d. >50,000 ft^2	5	Note 2, 3
Multi-Family High Rise Residential >3 stories	7	

[1] Space and Service Water Heating budget calculations shall be made using both electricity and natural gas. The Energy Cost Budget shall be the lower of these two calculations. If natural gas is not available at the rate, electricity and #2 fuel oil shall be used for the budget calculations.

[2] The systems and energy types presented in this Table are not intended as requirements or recommendations for the proposed design. Floor areas below are the total conditioned floor areas for the listed occupancy type in the building. The number of floors indicated below is the total number of occupied floors for the listed occupancy type.

TABLE 11-6
SERVICE HOT WATER QUANTITIES

Building Type	Btu/Person-hour[1]
1. Assembly	215
2. Office	175
3. Retail	135
4. Warehouse	225
5. School	215
6. Hotel/Motel	1110
7. Restaurant	390
8. Health	135
9. Multi-Family High Rise Residential	1700[2]

1. This value is the number to be multiplied by the percentage multipliers of the building profile schedules in Table 11-4. See Table 11-2 for occupancy levels.

2. Total hot water use per dwelling unit for each hour shall be 3400 Btu/h times the multi-family high rise residential building SWH system multiplier from Table 11-3.

TABLE 11-7
HVAC SYSTEM DESCRIPTION FOR PROTOTYPE AND REFERENCE BUILDINGS[1, 2]

HVAC COMPONENT	SYSTEM #1	SYSTEM #2	SYSTEM #3	SYSTEM #4
System Description	Packaged rooftop single zone, one unit per zone	Packaged terminal air conditioner with space heater or heatpump, one heating/ cooling unit per zone	Air handler per zone with central plant	Packaged rooftop VAV w/perimeter reheat
Fan System Design supply circulation rate	Note 9	Note 10	Note 9	Note 9
Supply fan total static pressure	1.3 in. W.C.	N/A	2.0 in. W.C.	3.0 in. W.C.
Combined supply fan, motor, and drive efficiency	40%	N/A	50%	45%
Supply fan control	Constant volume	Fan Cycles with call for heating or cooling	Constant volume	VAV w/forward curved centrifugal fan and variable inlet vanes
Return fan total static pressure	N/A	N/A	0.6 in. W.C.	0.6 in. W.C.
Combined return fan, motor, and drive efficiency	N/A	N/A	25%	25%
Return fan control	N/A	N/A	Constant volume	VAV w/forward curved centrifugal fan and discharge dampers
Cooling System	Direct expansion air cooled	Direct expansion air cooled	Chilled water (Note 11)	Direct expansion air cooled
Heating System	Furnace, heatpump, or electric resistance (Note 8)	Heatpump w/electric resistance auxiliary or air conditioner w/space heater (Note 8)	Hot water (Note 8, 12)	Hot water (Note 12) or electric resistance (Note 8)
Remarks	Drybulb economizer per Section 7.4.3 (barometric relief)	No economizer	Drybulb economizer per Section 7.4.3	Drybulb economizer per Section 7.4.3 Minimum VAV setting per 7.4.3 exception 1. Supply air reset by zone of greatest cooling demand.

Notes:

1. The systems and energy types presented in this Table are not intended as requirements or recommendations for the proposed design.

2. For numbered notes see end of Table 11-7.

TABLE 11-7, (Continued)
HVAC SYSTEM DESCRIPTION FOR PROTOTYPE AND REFERENCE BUILDINGS[1]

HVAC COMPONENT	SYSTEM #5	SYSTEM #6	SYSTEM #7
System Description	Built-up central VAV with perimeter reheat	Four-pipe fan coil per zone with central plant	Water source heat pump
Fan System Design supply circulation rate	Note 9	Note 9	Note 10
Supply fan total static pressure	4.0 in. W.C.	0.5 in. W.C.	0.5 in. W.C.
Combined supply fan, motor, and drive efficiency	55%	25%	25%
Supply fan control	VAV w/air-foil centrifugal fan and AC frequency variable speed drive	Fan cycles w/call for heating or cooling	Fan cycles w/call for heating or cooling
Return fan total static pressure	1.0 in. W.C.	N/A	N/A
Combined return fan, motor, and drive efficiency	30%	N/A	N/A
Return fan control	VAV with air-foil centrifugal fan and AC frequency variable speed drive	N/A	N/A
Cooling System	Chilled water (Note 11)	Chilled water (Note 11)	Closed circuit, centrifugal centrifugal blower type cooling tower sized per Note 11. Circulating pump sized for 2.7 GPM per ton.
Heating System	Hot water (Note 12) or electric resistance (Note 8)	Hot water (Note 12) or electric resistance (Note 8)	Electric or natural draft fossil fuel boiler (Note 8)
Remarks	Drybulb economizer per Section 7.4.3 Minimum VAV setting per Section 7.4.4.3 Supply air reset by zone of greatest cooling demand.	No economizer	Tower fans and boiler cycled to maintain circulating water temperature between 60 and design tower leaving water temperature.

TABLE 11-7
NUMBERED NOTES FOR TABLE 11-7
HVAC SYSTEM DESCRIPTIONS FOR PROTOTYPE AND REFERENCE BUILDINGS

NOTES:

1. For occupancies such as restaurants, assembly and retail which are part of a mixed use building which, according to Table 11-7, includes a central chilled water plant (systems 3, 5, or 6), chilled water system type 3 or 5, as indicated in the Table, shall be used.

2. Constant volume may be used in zones where pressurization relationships must be maintained by code. VAV shall be used in all other areas, in accordance with Section 7.4.4.3.

3. Provide run-around heat recovery systems for all fan systems with minimum outside air intake greater than 75%. Recovery effectiveness shall be 0.60.

4. If a warehouse is not intended to be mechanically cooled, both the Energy Cost Budgets and Design Energy Costs, may be calculated assuming no mechanical cooling.

5. The system listed is for guest rooms only. Areas such as public areas and back-of-house areas shall be served by system 4. Other areas such as offices and retail shall be served by the systems listed in Table 11-7 for these occupancy types.

6. The system listed is for guest rooms only. Areas such as public areas and back-of-house areas shall be served by system 5. Other areas such as offices and retail shall be served by systems listed in Table 11-7 for these occupancy types.

7. System 2 shall be used for the Energy Cost Budget calculation except in areas with design heating outside air temperatures less than 10 ^{o}F.

8. Prototype energy budget cost calculations shall be made using both electricity and natural gas. If natural gas is not available at the site, electricity and #2 fuel oil shall be used. The Energy Cost Budget shall be the lower of these results. Alternately, the Energy Cost Budget may be based on the fuel source that minimizes total operating, maintenance, equipment,

and installation costs for the prototype over the building lifetime. Equipment and installation cost estimates shall be prepared using professionally recognized cost estimating tools, guides, and techniques. The methods of analysis shall conform to those of Subpart A of 10 CFR 436. Energy costs shall be based on actual costs to the building as defined in this Section.

9. Design supply air circulation rate shall be based on a supply air to room air temperature difference of 20 °F. A higher supply air temperature may be used if required to maintain a minimum circulation rate of 4.5 air changes per hour or 15 cfm per person at design conditions to each zone served by the system. If return fans are specified, they shall be sized from the supply fan capacity less the required minimum ventilation with outside air, or 75% of the supply air capacity, whichever is larger. Except where noted, supply and return fans shall be operated continuously during occupied hours.

10. Fan Energy When included in the efficiency rating of the unit as defined in Section 7.4.4.3 need not be modeled explicitly for this system. The fan shall cycle with calls for heating or cooling.

11. Chilled water systems shall be modeled using a reciprocating chiller for systems with total cooling capacities less than 175 tons, and centrifugal chillers for systems with cooling capacities of 175 tons or greater. For systems with cooling of 600 tons or more, the Energy Cost Budget shall be calculated using two centrifugal chillers lead/lag controlled. Chilled water pumps shall be sized using a 12 °F temperature rise, from 44 °F to 56 °F, operating at 75 feet of head and and 65% combined impeller and motor efficiency. Condenser water pumps shall be sized using a 10 °F temperature rise, operating at 60 feet of head and 60% combined impeller and motor efficiency. The cooling tower shall be an open circuit, centrifugal blower type sized for the larger of 85 °F leaving water temperature or 10 °F approach to design wetbulb temperature. The tower shall be controlled to provide a 65 °F leaving water temperature whenever weather conditions permit, floating up to design leaving water temperature at design conditions. Chilled water supply temperature shall be reset in accordance with Section 7.4.6.2.

12. Hot water system shall include a natural draft fossil fuel or electric boiler per Note 8. The hot water pump shall be sized based on a 30 °F temperature drop, for 180 °F to 150 °F, operating at 60 feet of head and a combined impeller and motor efficiency of 60%. Hot water supply temperature shall be reset in accordance with Section 7.4.6.2.

TABLE 11-8
THERMOSTAT SETTINGS FOR MULTI-FAMILY HIGH-RISE BUILDINGS

TIME OF DAY	SINGLE ZONE DWELLING UNIT		TWO ZONE DWELLING UNIT			
			BEDROOMS/BATHROOMS		OTHER ROOMS	
	HEAT	COOL	HEAT	COOL	HEAT	COOL
Midnight - 6 a.m.	60	78	60	78	60	85
6 a.m. - 9 a.m.	70	78	70	78	70	78
9 a.m. - 5 p.m.	70	78	60	85	70	78
5 p.m. - 11 p.m.	70	78	70	78	70	78
11 p.m. - Midnight	60	78	60	78	60	78

§ 435.112 Building energy compliance alternative.

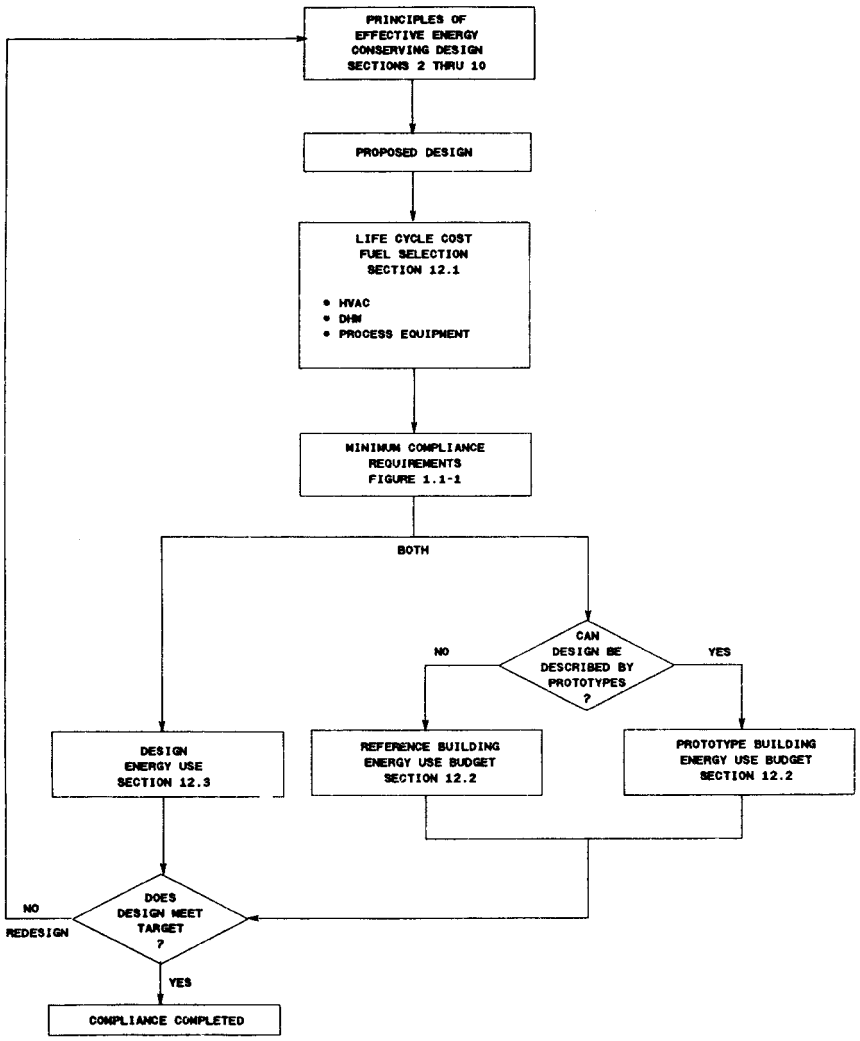
12.1 General

12.1 This section provides an alternative path for compliance with the standards that allow for greater flexibility in the design of energy efficient buildings using an annual energy target method. This path, as does the path used in section 11.0, provides an opportunity for the use of innovative designs, materials, and equipment such as daylighting, passive solar heating, heat recovery, and thermal storage as well as other applications of off-peak electrical energy where they cannot be adequately evaluated by the prescriptive or system performance methods found in sections 3.4, 3.5, 5.4, 5.5, 7.4., and 9.4.

12.1.2 The Building Energy Use Budget Target alternative may be used as an option to the Building Energy Cost Budget method in section 11.0 and is to be used in lieu of the prescriptive and system performance methods and in conjunction with sections 3.3, 4.3, 5.3, 6.3, 7.3, 8.3, 9.3 and 10.3.

12.1.3 Compliance under this section is demonstrated by showing that the calculated annual energy usage for the Proposed Design is less than or equal to a calculated Energy Use Budget. (See Figure 12–1). A life-cycle cost economic analysis is required to evaluate alternative fuel sources and energy reduction strategies. The procedures in this chapter are intended only for establishing design compliance, and are not intended to be used either to predict, document or verify annual energy consumption or annual energy costs.

Figure 12-1 Building Energy Compliance Alternative



12.1.4 Compliance under the Building Energy Use Budget method requires a detailed energy analysis, using a conventional simulation tool, of the Proposed Design. A life-cycle cost analysis shall be used to select the fuel source for the HVAC systems, service hot water, and process loads from available alternatives. The Annual Energy Consumption of the Proposed Design with the life-cycle cost-effective fuel selection is calculated to determine the modeled energy consumption, called the Design Energy Use.

12.1.5 The Design Energy Use is defined as the energy that is consumed within the five foot line of a proposed building per ft^2 over a 24 hour day, 365-day year period and specified operating hours. The calculated Design Energy

Use is then compared to a calculated Energy Use Budget.

12.1.6 *Compliance.* The Energy Use Budget is determined by calculating the annual energy usage for a Reference or Prototype Building that is configured to comply with the provisions of section 11.0 for such buildings, except that the fuel source(s) of the Prototype or Reference Building shall be the same life-cycle cost-effective source(s) selected for the Proposed Design. If the Design Energy Use is less than or equal to the Energy Use Budget then the proposed design complies with these standards.

12.1.7 This section provides instructions for determining the Design Energy Use and for calculating the Energy Use Budget. The Energy Use Budget is the highest allowable calculated annual energy consumption for a specified building design. Designers are encouraged to design buildings whose Design Energy Use is lower than the Energy Use Budget. Incorporated in this section is an optional life-cycle cost economic analysis procedure that may be used by the designer to examine the economic feasibility of all energy design alternatives and to produce a more optimum design.

12.2 Determination of the Annual Energy Budget

12.2.1 The Energy Use Budget shall be calculated for the appropriate Prototype or Reference Building in accordance with the procedures prescribed in section 11.2 with the following exceptions: The Energy Use Budget shall be stated in units of Btu/ft$^{2.}$ yr and the simulation tool shall segregate the calculated energy consumption by fuel type producing an Energy Use Budget for each fuel (the fuel selections having been made by a life cycle cost analysis in determining the proposed design).

12.2.2 The Energy Use Budget (EUB) is calculated similarly for the Reference or Prototype Building using the following equation:

$$EUB = EUB_1 \times f_1 + EUB_2 \times f_2 + \ldots\ldots + EUB_i \times f_i$$

Equation 12–1

Where EUB_1, EUB_2, . . . EUB_i are the calculated annual energy targets for each fuel used in the Reference or Prototype building and f_1, f_2, . . . f_i are the energy conversion factors given in Table 12–1. In lieu of case by case calculation of the Energy Use Budget, the designer may construct Energy Use Budget tables for the combinations of energy source(s) that may be considered in a set of project designs, such as electric heating, electric service water, and gas cooling or oil heating, gas service water and electric cooling. The values in such optional Energy Use Budget tables shall be equal to or less than the corresponding Energy Use Budgets calculated on a case by case basis according to this section. Energy Use Budget tables shall be constructed to correspond to the climatic regions and building types in accordance with provisions for Prototype or Reference Building models in section 11.0 of these standards.

TABLE 12-1
FUEL CONVERSION FACTORS FOR COMPUTING DESIGN ANNUAL ENERGY USES

FUELS	CONVERSION FACTOR
Electricity	3412 Btu/kilowatt hour
Fuel Oil	138,700 Btu/gallon
Natural Gas	1,031,000 Btu/1000 ft^3
Liquified Petroleum (including Propane and Butane)	95,500 Btu/gallon
Anthracite Coal	28,300,000 Btu/short ton
Bituminous Coal	24,580,000 Btu/short ton
Purchased Steam and Steam from Central Plants	1,000 Btu/Pound
High Temperature or Medium Temperature Water from Central Plants	Use the heat value based on the water actually delivered at the building five foot line

NOTE: At specific locations where the energy source Btu content varies significantly from the value presented above then the local fuel value may be used provided there is supporting documentation from the fuel source supplier stating this actual fuel energy value and verifying that this value will remain consistent for the foreseeable future. The fuel content for fuels not given above shall be determined from the best available source.

12.3 Determination of the Design Energy Use

12.3.1 The Design Energy Use shall be calculated by modeling the Proposed Design using the same methods, assumptions, climate data, and simulation tool as were used to establish the Energy Use Budget, but with the design features that will be used in the final building design. The simulation tool

used shall segregate the calculated energy consumption by fuel type giving an annual Design Energy Use for each fuel. The sum of the Design Energy Uses multiplied by the fuel conversion factors in Table 12–1 yields the Design Energy Use for the proposed design:

$$DEU = DEU_1 \times f_1 + DEU_2 \times f_2 + \ldots . + DEU_i \times f_i$$

Equation 12–2

Where f_1, f_2, . . . f_i are the fuel conversion factors in Table 12–1.

12.3.2 Required Life Cycle Cost Analysis for Fuel Selection

12.3.2.1 Fuel sources selected for the Proposed Design and Prototype or Reference buildings shall be determined by considering the energy cost and other costs and benefits that occur during the expected economic life of the alternative.

12.3.2.2 The designer shall use the procedures set forth in subpart A of 10 CFR part 436 to make this determination. The fuel selection life cycle cost analysis shall include the following steps:

12.3.2.2.1 Determine the feasible alternatives for energy sources of the Proposed Design's HVAC systems, service hot water, and process loads.

12.3.2.2.2 Model the Proposed Design including the alternative HVAC and service water systems and conduct an annual energy analysis for each fuel source alternative using the simulation tool specified in this section. The annual energy analysis shall be computed on a monthly basis in conformance with section 11.0 of these standards with the exception that all process loads shall be included in the calculation. Separate the output of the analysis by fuel type.

12.3.2.2.3 Determine the unit price of each fuel using information from the utility or other reliable local source. During rapid changes in fuel prices it is recommended that an average fuel price for the previous twelve months be used in lieu of the current price. Calculate the annual energy cost of each energy source alternative in accordance with procedures in section 11.0 for the Design Energy Cost. Estimate the initial cost of the HVAC and service water systems and other initial costs such as energy distribution lines and service connection fees associated with each fuel source alternative. Estimate other costs and benefits for each alternative including, but not necessarily limited to, annual maintenance and repair, periodic and one time major repairs and replacements and salvage of the energy and service water systems. Cost estimates shall be prepared using professionally recognized cost estimating tools, guides and techniques.

12.3.2.2.4 Perform a life cycle cost analysis using the procedure specified in section 12.3.2.

12.3.2.2.5 Compare the total life cycle cost of each energy source alternative. The alternative with the lowest total life-cycle cost shall be chosen as the energy source for the proposed design.

12.4 Compliance

12.4.1 Compliance with this section is demonstrated if the Design Energy Use is equal to or less than the Energy Use Budget.

$$DEU \leq EUB$$

Equation 12–3

12.4.2 The energy consumption shall be measured at the building five foot line for all fuels. Energy consumed from non-depletable energy sources and heat recovery systems shall not be included in the Design Energy Use calculations. The thermal efficiency of fixtures, equipment, systems or plants in the proposed design shall be simulated by the selected calculation tool.

12.5 Standard Calculation Procedure

12.5.1 The Standard Calculation Procedure consists of methods and assumptions for calculating the Energy Use Budgets for Prototype and Reference Buildings and the Design Energy Use for the Proposed Design. In order to maintain consistency between the Energy Use Budgets and the Design Energy Use, the input assumptions stated in section 11.5 are to be used.

12.5.2 The terms Energy Cost Budget and Design Energy Cost or Consumption used in section 11.0 correlate to Energy Use Budget and Design Energy Use, respectively, in section 12.0.

12.6 The Simulation Tool

12.6.1 The criteria established in section 11.0 for the selection of a simulation tool shall be followed when using the compliance path prescribed in section 12.0.

12.7 Life Cycle Cost Analysis Criteria

12.7.1 The following life cycle cost criteria applies to the fuel selection requirements of this chapter and to option life cycle cost analyses performed to evaluate energy conservation design alternatives. The fuel source(s) selection shall be made in accordance with the requirements of subpart A of 10 CFR part 436. The implementation calculations for the methodology of subpart A of 10 CFR part 436 is provided in *National Bureau of Standards Handbook 135* entitled ''Life Cycle Cost Manual for the Federal Energy Management Program.'' When performing life cycle cost analyses of optional energy conservation opportunities the designer may use the life cycle cost procedures of *subpart A of 10 CFR part 436 or OMB Circular A–94* or an equivalent procedure that meets the assumptions listed below:

12.7.1.1 The economic life of the Prototype Building and Proposed Design shall be 25 years. Anticipated replacements or renovations of energy related features and systems in the Prototype or Reference Building and Proposed Design during this period shall be included in their respective life cycle cost calculations.

12.7.1.2 The designer shall follow established professional cost estimating practices when determining the costs and benefits associated with the energy related features of the Prototype or Reference Building and Proposed Design.

12.7.1.3 All costs shall be expressed in current dollars. General inflation shall be disregarded. Differential escalation of prices (prices estimated to rise faster or slower than general inflation) for energy used in the life cycle cost calculations shall be those in effect at the time of the life cycle cost calculations as published by the Department of Energy's Energy Information Administration.

12.7.1.4 The economic effects of taxes, depreciation and other factors not consistent with the practices of *subpart A of 10 CFR part 436* shall not be included in the life cycle cost calculation.

Subpart B—Voluntary Performance Standards for New Non-Federal Residential Buildings [Reserved]

Subpart C—Mandatory Performance Standards for New Federal Residential Buildings

§ 435.300 Purpose.

(a) This subpart establishes voluntary energy conservation performance standards for new residential buildings. The voluntary energy conservation performance standards are designed to achieve the maximum practicable improvements in energy efficiency and increases in the use of non-depletable sources of energy.

(b) Voluntary energy conservation performance standards prescribed under this subpart shall be developed solely as guidelines for the purpose of providing technical assistance for the design of energy conserving buildings, and shall be mandatory only for the design of Federal buildings.

(c) The energy conservation performance standards will direct Federal policies and practices to ensure that cost-effective energy conservation features will be incorporated into the designs of all new residential buildings designed and constructed by and for Federal agencies.

§ 435.301 Scope.

(a) The energy conservation performance standards for new Federal residential buildings will apply to the design of all new residential buildings except multifamily buildings more than three stories above grade.

(b) The primary types of buildings built by or for the Federal agencies, to which the energy conservation performance standards will apply, are:

(1) Single-story single-family residences;

(2) Split-level single-family residences;

(3) Two-story single-family residences;
(4) End-unit townhouses;
(5) Middle-unit townhouses;
(6) End-units in multifamily buildings (of three stories above grade or less);
(7) Middle-units in multifamily buildings (of three stories above grade or less);
(8) Single-section mobile homes; and
(9) Multi-section mobile homes.

§ 435.302 Definitions.

(a) *ANSI* means American National Standards Institute.
(b) *ASHRAE Handbook* means American Society of Heating, Refrigerating and Air-Conditioning Engineeers, Inc., ASHRAE Handbook, 1985 Fundamentals. Volume, 1–P Edition.
(c) *ASTM* means American Society of Testing and Measurement.
(d) *British thermal unit (Btu)* means approximately the amount of heat required to raise the temperature of one pound of water from 59°F to 60°F.
(e) *Building* means any new residential structure:
(1) That includes or will include a heating or cooling system, or both, or a domestic hot water system, and
(2) For which a building design is created after the effective date of this rule.
(f) *Building design* means the development of plans and specifications for human living space.
(g) *Conservation Optimization Standard for Savings in Federal Residences* means the computerized calculation procedure that is used to establish an energy consumption goal for the design of Federal residential buildings.
(h) *COSTSAFR* means the Conservation Optimization Standard for Savings in Federal Residences.
(i) *DOE* means U.S. Department of Energy.
(j) *Domestic hot water (DHW)* means the supply of hot water for purposes other than space conditioning.
(k) *Energy conservation measure (ECM)* means a building material or component whose use will affect the energy consumed for space heating, space cooling, domestic hot water or refrigeration.
(l) *Energy performance standard* means an energy consumption goal or goals to be met without specification of the method, materials, and processes to be employed in achieving that goal or goals, but including statements of the requirements, criteria evaluation methods to be used, and any necessary commentary.
(m) *Federal agency* means any department, agency, corporation, or other entity or instrumentality of the executive branch of the Federal Government, including the United States Postal Service, the Federal National Mortgage Association, and the Federal Home Loan Mortgage Corporation.
(n) *Federal residential building* means any residential building to be constructed by or for the use of any Federal agency in the Continental U.S., Alaska, or Hawaii that is not legally subject to state or local building codes or similar requirements.
(o) *Life cycle cost* means the minimum life cycle cost calculated by using a methodology specified in subpart A of 10 CFR part 436.
(p) *Point system* means the tables that display the effect of the set of energy conservation measures on the design energy consumption and energy costs of a residential building for a particular location, building type and fuel type.
(q) *Practicable optimum life cycle energy cost* means the energy costs of the set of conservation measures that has the minimum life cycle cost to the Federal government incurred during a 25 year period and including the costs of construction, maintenance, operation, and replacement.
(r) *Project* means the group of one or more Federal residential buildings to be built at a specific geographic location that are included by a Federal agency in specifications issued or used by a Federal agency for design or construction of the buildings.
(s) *Prototype* means a fundamental house design based on typical construction assumptions. The nine prototypes in COSTSAFR are: single-section manufactured house, double-section manufactured house, ranch-style house, two-story house, split-level house, mid-unit apartment, end-unit apartment, mid-unit townhouse, end-unit townhouse.

(t) *Residential building* means a new building that is designed to be constructed and developed for residential occupancy.

(u) *Set of conservation options* means the combination of envelope design and equipment measures that influences the long term energy use in a building designed to maintain a minimum of ventilation level of 0.7 air changes per hour, including the heating and cooling equipment, domestic hot water equipment, glazing, insulation, refrigerators and air infiltration control measures.

(v) *Shading coefficient* means the ratio of the heat gains through windows, with or without integral shading devices, to that occurring through unshaded, ⅛-inch clear glass.

(w) *Total annual coil load* means the energy for space heating and/or cooling with no adjustment for HVAC equipment efficiency.

[56 FR 3772, Jan. 31, 1991]

§ 435.303 Requirements for the design of a Federal residential building.

(a) The head of each Federal agency responsible for the construction of Federal residential buildings shall establish an energy consumption goal for each building to be designed or constructed by or for the agency.

(b) The energy consumption goal for a Federal residential building shall be a total point score derived by using the micro-computer program and user manual entitled ''Conservation Optimization Standard for Savings in Federal Residences (COSTSAFR),'' unless the head of the Federal agency shall establish more stringent requirements for that agency.

(c) The head of each Federal agency shall adopt such procedures as may be necessary to ensure that the design of a Federal residential building is not less energy conserving than the energy consumption goal established for the building.

§ 435.304 The COSTSAFR Program.

(a) The COSTSAFR Program (Version 3.0) provides a computerized calculation procedure to determine the most effective set of energy conservation measures, selected from among the measures included within the Program that will produce the practicable optimum life cycle cost for a type of residential building in a specific geographic location. The most effective set of energy conservation measures is expressed as a total point score that serves as the energy consumption goal.

(b) The COSTSAFR Program (Version 3.0) also prints out a point system that identifies a wide array of different energy conservation measures indicating how many points various levels of each measure would contribute to reaching the total point score of the energy consumption goal. This enables a Federal agency to use the energy consumption goal and the point system in the design and procurement procedures so that designers and builders can pick and choose among different combinations of energy conservation measures to meet or exceed the total point score required to meet the energy consumption goal.

(c) The COSTSAFR Program (Version 3.0) operates on a micro-computer system that uses the MS DOS operating system and is equipped with an 8087 co-processor.

(d) The COSTSAFR Program (Version 3.0) may be obtained from:

National Technical Information Service; Department of Commerce; Springfield, Virginia 22161; (202) 487-4600

[53 FR 32545, Aug. 25, 1988, as amended at 56 FR 3772, Jan. 31, 1991]

§ 435.305 Alternative compliance procedure.

(a) If a proposed building design includes unusual or innovative energy conservation measures which are not covered by the COSTSAFR program, the Federal agency shall determine whether that design meets or exceeds the applicable energy consumption goal in compliance with the procedures set forth in this section.

(b) The Federal agency shall determine the estimated discounted energy cost for the COSTSAFR prototype building design, which is the most similar of the COSTSAFR prototypes to the proposed building design, by—

(1) Printing out the COSTSAFR compliance forms for the prototype showing the points attributable to levels of various energy conservation measures;

(2) Calculating the estimated unit energy cost on the compliance forms, on

the basis of selecting the optimum levels on the compliance forms or otherwise in the User's Manual for each energy conservation measure; and

(3) Multiplying the estimated unit energy cost by 100.

(c) The Federal agency shall determine the estimated discounted energy cost for the proposed building design by—

(1) Estimating the heating and cooling total annual coil loads of the proposed building design with the DOE 2.1C computer program on the basis of input assumptions including—

(i) Shading coefficients of 0.6 for summer and 0.8 for winter;

(ii) Thermostat setpoints of 78 degrees Fahrenheit for cooling, 70 degrees Fahrenheit for heating (6 am to 12 midnight), and 60 degrees Fahrenheit for Night Setback (12 midnight to 6 am, except for houses with heat pumps);

(iii) The infiltration rate measured in air changes per hour as calculated using appendix B of the COSTSAFR User's Manual;

(iv) Natural venting with a constant air change rate of 10 air changes per hour—

(A) When the outdoor temperature is lower than the indoor temperature, but not above 78 degrees Fahrenheit; and

(B) When the enthalpy of the outdoor air is lower than the indoor air.

(v) Internal gains in accordance with the following table for a house with 1540 square feet of floor area, adjusted by 0.35 Btu/ft^2/hr to account for changes in lighting as the floor area varies from 1540 square feet—

TABLE 1—INTERNAL GAIN SCHEDULE (BTU)

Hour of day	Sensible	Latent
1	1139	247
2	1139	247
3	1139	247
4	1139	247
5	1139	247
6	1903	412
7	2391	518
8	4782	1036
9	2790	604
10	1707	370
11	1707	370
12	2277	493
13	1707	370
14	1424	308
15	1480	321
16	1480	321
17	2164	469
18	2334	506
19	2505	543
20	3928	851
21	3928	851
22	4101	888
23	4101	888
24	3701	802

(vi) Thermal transmittances for building envelope materials measured in accordance with applicable ASTM procedures or from the ASHRAE Handbook;

(vii) Proposed heating and cooling equipment types included in COSTSAFR or having a certified seasonal efficiency rating;

(viii) Weather Year for Energy Calculations (WYEC) weather year data (WYEC data are on tapes available from ASHRAE, 1791 Tullie Circle, N.E., Atlanta, Georgia 30329), or if unavailable, Test Reference Year (TRY) weather data (obtainable from National Climatic Data Center, 1983 *Test Reference Year,* Tape Reference Manual, TD–9706, Asheville, North Carolina) relevant to project location.

(2) Estimating the discounted energy cost for the heating and cooling energy loads, respectively, according to the following equation—

$$\text{Discounted Energy Cost} = \frac{\text{Total Annual Coil Load} \times \text{Fuel Cost} \times \text{UPW*}}{\text{Equipment Efficiency}}$$

Where:

Total Annual Coil Load=the total heating or cooling annual coil load calculated under paragraph (c)(1);

Fuel Cost=the heating or cooling fuel cost calculated in accordance with sections 3.3.D and 3.3.E of the User's Manual;

UPW*=the uniform present worth discount factor; selected from the last page of the compliance forms.

Equipment Efficiency=the test seasonal efficiency rating of the heating and cooling equipment only (i.e., not including duct or distribution system losses).

(3) Estimating the discounted energy cost for water heating and refrigerator/freezer energy consumption—

(i) For equipment types covered by the COSTSAFR compliance forms, by multiplying the estimated unit energy cost by 100; or

(ii)For equipment types not covered by COSTSAFR—

$$\text{Discounted Energy Cost} = \frac{\text{Annual Energy Consumption} \times \text{Fuel Cost} \times \text{UPW*}}{\text{Energy Factor}}$$

Where:

Fuel Cost and UPW* are as defined in paragraph (c)(2) of this section; Annual Energy Consumption is as calculated in 10 CFR 430.22; and Energy Factor is the measure of energy efficiency as calculated under 10 CFR 430.22

(iii) [Reserved]

(4) Adding together the discounted energy costs calculated under paragraphs (c)(2) and (c)(3) of this section;

(d) If the discounted energy cost of the proposed building design calculated under paragraph (c)(4) of this section is equal to or less than the discounted energy cost of the COSTSAFR prototype building design calculated under paragraph (b) of this section, then the proposed building design is in compliance with the applicable energy consumption goal under this part.

[56 FR 3772, Jan. 31, 1991]

§ 435.306 Selecting a life cycle effective proposed building design.

In selecting between or among proposed building designs which comply with the applicable energy consumption goal under this part, each Federal agency shall select the design which, in comparison to the applicable COSTSAFR prototype, has the highest Net Savings or lowest total life cycle costs calculated in compliance with subpart A of 10 CFR part 436.

[56 FR 3773, Jan. 31, 1991]

PART 436—FEDERAL ENERGY MANAGEMENT AND PLANNING PROGRAMS

Sec.

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APPENDIX D TO PART 436—ENERGY PROGRAM CONSERVATION ELEMENTS

AUTHORITY: 42 U.S.C. §6361; 42 U.S.C. 8251–8263; 42 U.S.C. 8287–8287c.

SOURCE: 44 FR 60669, Oct. 19, 1979, unless otherwise noted.

§ 436.1 Scope.

This part sets forth the rules for Federal energy management and planning programs to reduce Federal energy consumption and to promote life cycle cost effective investments in building energy systems, building water systems and energy and water conservation measures for Federal buildings.

[61 FR 32649, June 25, 1996]

§ 436.2 General objectives.

The objectives of Federal energy management and planning programs are:

(a) To apply energy conservation measures to, and improve the design for construction of Federal buildings such that the energy consumption per gross square foot of Federal buildings in use during the fiscal year 1995 is at least 10 percent less than the energy consumption per gross square foot in 1985;

(b) To promote the methodology and procedures for conducting life cycle cost analyses of proposed investments in building energy systems, building water systems and energy and water conservation measures;

(c) To promote the use of energy savings performance contracts by Federal agencies for implementation of privately financed investment in building and facility energy conservation measures for existing Federally owned buildings; and

(d) To promote efficient use of energy in all agency operations through general operations plans.

[55 FR 48220, Nov. 20, 1990, as amended at 60 FR 18334, Apr. 10, 1995; 61 FR 32649, June 25, 1996]

Subpart A—Methodology and Procedures for Life Cycle Cost Analyses

SOURCE: 55 FR 48220, Nov. 20, 1990, unless otherwise noted.

§ 436.10 Purpose.

This subpart establishes a methodology and procedures for estimating and comparing the life cycle costs of Federal buildings, for determining the life cycle cost effectiveness of energy conservation measures and water conservation measures, and for rank ordering life cycle cost effective measures in order to design a new Federal building or to retrofit an existing Federal building. It also establishes the method by which efficiency shall be considered when entering into or renewing leases of Federal building space.

[61 FR 32649, June 25, 1996]

§ 436.11 Definitions.

As used in this subpart—

Base Year means the fiscal year in which a life cycle cost analysis is conducted.

Building energy system means an energy conservation measure or any portion of the structure of a building or any mechanical, electrical, or other functional system supporting the building, the nature or selection of which for a new building influences significantly the cost of energy consumed.

Building water system means a water conservation measure or any portion of the structure of a building or any mechanical, electrical, or other functional system supporting the building, the nature or selection of which for a new building influences significantly the cost of water consumed.

Component price means any variable sub-element of the total charge for a

fuel or energy or water, including but not limited to such charges as ''demand charges,'' ''off-peak charges'' and ''seasonal charges.''

Demand charge means that portion of the charge for electric service based upon the plant and equipment costs associated with supplying the electricity consumed.

DOE means Department of Energy.

Energy conservation measures means measures that are applied to an existing Federal building that improve energy efficiency and are life cycle cost effective and that involve energy conservation, cogeneration facilities, renewable energy sources, improvements in operation and maintenance efficiencies, or retrofit activities.

Federal agency means ''agency'' as defined by 5 U.S.C. 551(1).

Federal building means an energy or water conservation measure or any building, structure, or facility, or part thereof, including the associated energy and water consuming support systems, which is constructed, renovated, leased, or purchased in whole or in part for use by the Federal government. This term also means a collection of such buildings, structures, or facilities and the energy and water consuming support systems for such collection.

Investment costs means the initial costs of design, engineering, purchase, construction, and installation exclusive of sunk costs.

Life cycle cost means the total cost of owning, operating and maintaining a building over its useful life (including its fuel and water, energy, labor, and replacement components), determined on the basis of a systematic evaluation and comparison of alternative building systems, except that in the case of leased buildings, the life cycle cost shall be calculated over the effective remaining term of the lease.

Non-fuel operation and maintenance costs means material and labor cost for routine upkeep, repair and operation exclusive of energy cost.

Non-recurring costs means costs that are not uniformly incurred annually over the study period.

Non-water operation and maintenance costs mean material and labor cost for routine upkeep, repair and operation exclusive of water cost.

Recurring costs means future costs that are incurred uniformly and annually over the study period.

Replacement costs mean future cost to replace a building energy system or building water system, an energy or water conservation measure, or any component thereof.

Retrofit means installation of a building energy system or building water system alternative in an existing Federal building.

Salvage value means the value of any building energy system or building water system removed or replaced during the study period, or recovered through resale or remaining at the end of the study period.

Study period means the time period covered by a life cycle cost analysis.

Sunk costs means costs incurred prior to the time at which the life cycle cost analysis occurs.

Time-of-day rate means the charge for service during periods of the day based on the cost of supplying services during various times of the day.

Water conservation measures mean measures that are applied to an existing Federal building that improve the efficiency of water use, reduce the amount of water for sewage disposal and are life cycle cost effective and that involve water conservation, improvements in operation and maintenance efficiencies, or retrofit activities.

[55 FR 48220, Nov. 20, 1990, as amended at 61 FR 32649, June 25, 1996]

§ 436.12 Life cycle cost methodology.

The life cycle cost methodology for this part is a systematic analysis of relevant costs, excluding sunk costs, over a study period, relating initial costs to future costs by the technique of discounting future costs to present values.

§ 436.13 Presuming cost-effectiveness results.

(a) If the investment and other costs for an energy or water conservation measure considered for retrofit to an existing Federal building or a building energy system or building water system considered for incorporation into a new building design are insignificant, a Federal agency may presume that such

a system is life cycle cost-effective without further analysis.

(b) A Federal agency may presume that an investment in an energy or water conservation measure retrofit to an existing Federal building is not life cycle cost-effective for Federal investment if the Federal building is—

(1) Occupied under a short-term lease with a remaining term of one year or less, and without a renewal option or with a renewal option which is not likely to be exercised;

(2) Occupied under a lease which includes the cost of utilities in the rent and does not provide a pass-through of energy or water savings to the government; or

(3) Scheduled to be demolished or retired from service within one year or less.

[55 FR 48220, Nov. 20, 1990, as amended at 61 FR 32650, June 25, 1996]

§ 436.14 Methodological assumptions.

(a) Each Federal Agency shall discount to present values the future cash flows established in either current or constant dollars consistent with the nominal or real discount rate, and related tables, published in the annual supplement to the Life Cycle Costing Manual for the Federal Energy Management Program (NIST 85–3273) and determined annually by DOE as follows—

(1) The nominal discount rate shall be a 12 month average of the composite yields of all outstanding U.S. Treasury bonds neither due nor callable in less than ten years, as most recently reported by the Federal Reserve Board; and

(2) Subject to a ceiling of 10 percent and a floor of three percent the real discount rate shall be a 12 month average of the composite yields of all outstanding U.S. Treasury bonds neither due nor callable in less than ten years, as most recently reported by the Federal Reserve Board, adjusted to exclude estimated increases in the general level of prices consistent with projections of inflation in the most recent Economic Report of the President's Council of Economic Advisors.

(b) Each Federal agency shall assume that energy prices will change at rates projected by DOE's Energy Information Administration and published by NIST annually no later than the beginning of the fiscal year in the Annual Supplement to the Life Cycle Costing Manual for the Federal Energy Management Program, in tables consistent with the discount rate determined by DOE under paragraph (a) of this section, except that—

(1) If the Federal agency is using component prices under § 436.14(c), that agency may use corresponding component escalation rates provided by the energy or water supplier.

(2) For Federal buildings in foreign countries, the Federal agency may use a ''reasonable'' escalation rate.

(c) Each Federal agency shall assume that the price of energy or water in the base year is the actual price charged for energy or water delivered to the Federal building and may use actual component prices as provided by the energy or water supplier.

(d) Each Federal agency shall assume that the appropriate study period is as follows:

(1) For evaluating and ranking alternative retrofits for an existing Federal building, the study period is the expected life of the retrofit, or 25 years from the beginning of beneficial use, whichever is shorter.

(2) For determining the life cycle costs or net savings of mutually exclusive alternatives for a given building energy system or building water system (e.g., alternative designs for a particular system or size of a new or retrofit building energy system or building water system), a uniform study period for all alternatives shall be assumed which is equal to—

(i) The estimated life of the mutually exclusive alternative having the longest life, not to exceed 25 years from the beginning of beneficial use with appropriate replacement and salvage values for each of the other alternatives; or

(ii) The lowest common multiple of the expected lives of the alternative, not to exceed 25 from the beginning of beneficial use with appropriate replacement and salvage values for each alternative.

(3) For evaluating alternative designs for a new Federal building, the study period extends from the base year

through the expected life of the building or 25 years from the beginning of beneficial use, whichever is shorter.

(e) Each Federal agency shall assume that the expected life of any building energy system or building water system is the period of service without major renewal or overhaul, as estimated by a qualified engineer or architect, as appropriate, or any other reliable source except that the period of service of a building energy or water system shall not be deemed to exceed the expected life of the owned building, or the effective remaining term of the leased building (taking into account renewal options likely to be exercised).

(f) Each Federal agency may assume that investment costs are a lump sum occurring at the beginning of the base year, or may discount future investment costs to present value using the appropriate present worth factors under paragraph (a) of this section.

(g) Each Federal agency may assume that energy or water costs and non-fuel or non-water operation and maintenance costs begin to accrue at the beginning of the base year or when actually projected to occur.

(h) Each Federal agency may assume that costs occur in a lump sum at any time within the year in which they are incurred.

(i) This section shall not apply to calculations of estimated simple payback time under § 436.22 of this part.

[55 FR 48220, Nov. 20, 1990, as amended at 61 FR 32650, June 25, 1996]

§ 436.15 Formatting cost data.

In establishing cost data under §§ 436.16 and 436.17 and measuring cost effectiveness by the modes of analysis described by § 436.19 through § 436.22, a format for accomplishing the analysis which includes all required input data and assumptions shall be used. Subject to § 436.18(b), Federal agencies are encouraged to use worksheets or computer software referenced in the Life Cycle Cost Manual for the Federal Energy Management Program.

§ 436.16 Establishing non-fuel and non-water cost categories.

(a) The relevant non-fuel cost categories are—

(1) Investment costs;

(2) Non-fuel operation and maintenance cost;

(3) Replacement cost; and

(4) Salvage value.

(b) The relevant non-water cost categories are—

(1) Investment costs;

(2) Non-water operation and maintenance cost;

(3) Replacement cost; and

(4) Salvage value.

(c) The present value of recurring costs is the product of the base year value of recurring costs as multiplied by the appropriate uniform present worth factor under § 436.14, or as calculated by computer software indicated in § 436.18(b) and used with the official discount rate and escalation rate assumptions under § 436.14. When recurring costs begin to accrue at a later time, subtract the present value of recurring costs over the delay, calculated using the appropriate uniform present worth factor for the period of the delay, from the present value of recurring costs over the study period or, if using computer software, indicate a delayed beneficial occupancy date.

(d) The present value of non-recurring cost under § 436.16(a) is the product of the non-recurring costs as multiplied by appropriate single present worth factors under § 436.14 for the respective years in which the costs are expected to be incurred, or as calculated by computer software provided or approved by DOE and used with the official discount rate and escalation rate assumptions under § 436.14.

[55 FR 48220, Nov. 20, 1990, as amended at 61 FR 32650, June 25, 1996]

§ 436.17 Establishing energy or water cost data.

(a) Each Federal agency shall establish energy costs in the base year by multiplying the total units of energy used in the base year by the price per unit of energy in the base year as determined in accordance with § 436.14(c).

(b) When energy costs begin to accrue in the base year, the present value of energy costs over the study period is the product of energy costs in the base year as established under § 436.17(a), multiplied by the appropriate modified uniform present worth factor adjusted

for energy price escalation for the applicable region, sector, fuel type, and study period consistent with § 436.14, or as calculated by computer software provided or approved by DOE and used with the official discount rate and escalation rate assumptions under § 436.14. When energy costs begin to accrue at a later time, subtract the present value of energy costs over the delay, calculated using the adjusted, modified uniform present worth factor for the period of delay, from the present value of energy costs over the study period or, if using computer software, indicate a delayed beneficial occupancy date.

(c) Each Federal agency shall establish water costs in the base year by multiplying the total units of water used in the base year by the price per unit of water in the base year as determined in accordance with § 436.14(c).

(d) When water costs begin to accrue in the base year, the present value of water costs over the study period is the product of water costs in the base year as established under § 436.17(a), or as calculated by computer software provided or approved by DOE and used with the official discount rate and assumptions under § 436.14. When water costs begin to accrue at a later time, subtract the present value of water costs over the delay, calculated using the uniform present worth factor for the period of delay, from the present value of water costs over the study period or, if using computer software, indicate a delayed beneficial occupancy date.

[55 FR 48220, Nov. 20, 1990, as amended at 61 FR 32650, June 25, 1996]

§ 436.18 Measuring cost-effectiveness.

(a) In accordance with this section, each Federal agency shall measure cost-effectiveness by combining cost data established under §§ 436.16 and 436.17 in the appropriate mode of analysis as described in § 436.19 through § 436.22.

(b) Federal agencies performing LCC analysis on computers shall use either the Federal Buildings Life Cycle Costing (FBLCC) software provided by DOE or software consistent with this subpart.

(c) Replacement of a building energy or water system with an energy or water conservation measure by retrofit to an existing Federal building or by substitution in the design for a new Federal building shall be deemed cost-effective if—

(1) Life cycle costs, as described by § 436.19, are estimated to be lower; or

(2) Net savings, as described by § 436.20, are estimated to be positive; or

(3) The savings-to-investment ratio, as described by § 436.21, is estimated to be greater than one; or

(4) The adjusted internal rate of return, as described by § 436.22, is estimated to be greater than the discount rate as set by DOE.

(d) As a rough measure, each Federal agency may determine estimated simple payback time under § 436.23, which indicates whether a retrofit is likely to be cost effective under one of the four calculation methods referenced in § 436.18(c). An energy or water conservation measure alternative is likely to be cost-effective if estimated payback time is significantly less than the useful life of that system, and of the Federal building in which it is to be installed.

(e) Mutually exclusive alternatives for a given building energy or water system, considered in determining such matters as the optimal size of a solar energy system, the optimal thickness of insulation, or the best choice of double-glazing or triple-glazing for windows, shall be compared and evaluated on the basis of life cycle costs or net savings over equivalent study periods. The alternative which is estimated to result in the lowest life cycle costs or the highest net savings shall be deemed the most cost-effective because it tends to minimize the life cycle cost of Federal building.

(f) When available appropriations will not permit all cost-effective energy or water conservation measures to be undertaken, they shall be ranked in descending order of their savings-to-investment ratios, or their adjusted internal rate of return, to establish priority. If available appropriations cannot be fully exhausted for a fiscal year by taking all budgeted energy or water conservation measures according to their rank, the set of energy or water

conservation measures that will maximize net savings for available appropriations should be selected.

(g) Alternative building designs for new Federal buildings shall be evaluated on the basis of life cycle costs. The alternative design which results in the lowest life cycle costs for a given new building shall be deemed the most cost-effective.

[55 FR 48220, Nov. 20, 1990, as amended at 61 FR 32650, June 25, 1996]

§ 436.19 Life cycle costs.

Life cycle costs are the sum of the present values of—

(a) Investment costs, less salvage values at the end of the study period;

(b) Non-fuel operation and maintenance costs:

(c) Replacement costs less salvage costs of replaced building systems; and

(d) Energy and/or water costs.

[55 FR 48220, Nov. 20, 1990, as amended at 61 FR 32651, June 25, 1996]

§ 436.20 Net savings.

For a retrofit project, net savings may be found by subtracting life cycle costs based on the proposed project from life cycle costs based on not having it. For a new building design, net savings is the difference between the life cycle costs of an alternative design and the life cycle costs of the basic design.

§ 436.21 Savings-to-investment ratio.

The savings-to-investment ratio is the ratio of the present value savings to the present value costs of an energy or water conservation measure. The numerator of the ratio is the present value of net savings in energy or water and non-fuel or non-water operation and maintenance costs attributable to the proposed energy or water conservation measure. The denominator of the ratio is the present value of the net increase in investment and replacement costs less salvage value attributable to the proposed energy or water conservation measure.

[61 FR 32651, June 25, 1996]

§ 436.22 Adjusted internal rate of return.

The adjusted internal rate of return is the overall rate of return on an energy or water conservation measure. It is calculated by subtracting 1 from the nth root of the ratio of the terminal value of savings to the present value of costs, where n is the number of years in the study period. The numerator of the ratio is calculated by using the discount rate to compound forward to the end of the study period the yearly net savings in energy or water and non-fuel or non-water operation and maintenance costs attributable to the proposed energy or water conservation measure. The denominator of the ratio is the present value of the net increase in investment and replacement costs less salvage value attributable to the proposed energy or water conservation measure.

[61 FR 32651, June 25, 1996]

§ 436.23 Estimated simple payback time.

The estimated simple payback time is the number of years required for the cumulative value of energy or water cost savings less future non-fuel or non-water costs to equal the investment costs of the building energy or water system, without consideration of discount rates.

[61 FR 32651, June 25, 1996]

§ 436.24 Uncertainty analyses.

If particular items of cost data or timing of cash flows are uncertain and are not fixed under § 436.14, Federal agencies may examine the impact of uncertainty on the calculation of life cycle cost effectiveness or the assignment of rank order by conducting additional analyses using any standard engineering economics method such as sensitivity and probabilistic analysis. If additional analysis casts substantial doubt on the life cycle cost analysis results, a Federal agency should consider obtaining more reliable data or eliminating the building energy or water system alternative.

[55 FR 48220, Nov. 20, 1990, as amended at 61 FR 32651, June 25, 1996]

Subpart B—Methods and Procedures for Energy Savings Performance Contracting

SOURCE: 60 FR 18334, Apr. 10, 1995, unless otherwise noted.

§ 436.30 Purpose and scope.

(a) *General.* This subpart provides procedures and methods which apply to Federal agencies with regard to the award and administration of energy savings performance contracts awarded within five years of April 10, 1995. This subpart applies in addition to the Federal Acquisition Regulation at Title 48 of the CFR and related Federal agency regulations. The provisions of this subpart are controlling with regard to energy savings performance contracts notwithstanding any conflicting provisions of the Federal Acquisition Regulation and related Federal agency regulations.

(b) *Utility incentive programs.* Nothing in this subpart shall preclude a Federal agency from—

(1) Participating in programs to increase energy efficiency, conserve water, or manage electricity demand conducted by gas, water, or electric utilities and generally available to customers of such utilities;

(2) Accepting financial incentives, goods, or services generally available from any such utility to increase energy efficiency or to conserve water or manage electricity demand; or

(3) Entering into negotiations with electric, water, and gas utilities to design cost-effective demand management and conservation incentive programs to address the unique needs of each Federal agency.

(c) *Promoting competition.* To the extent allowed by law, Federal agencies should encourage utilities to select contractors for the conduct of utility incentive programs in a competitive manner to the maximum extent practicable.

(d) *Interpretations.* The permissive provisions of this subpart shall be liberally construed to effectuate the objectives of Title VIII of the National Energy Conservation Policy Act, 42 U.S.C. 8287–8287c.

[60 FR 18334, Apr. 10, 1995, as amended at 60 FR 19343, Apr. 18, 1995]

§ 436.31 Definitions.

As used in this subpart—

Act means Title VIII of the National Energy Conservation Policy Act.

Annual energy audit means a procedure including, but not limited to, verification of the achievement of energy cost savings and energy unit savings guaranteed resulting from implementation of energy conservation measures and determination of whether an adjustment to the energy baseline is justified by conditions beyond the contractor's control.

Building means any closed structure primarily intended for human occupancy in which energy is consumed, produced, or distributed.

Detailed energy survey means a procedure which may include, but is not limited to, a detailed analysis of energy cost savings and energy unit savings potential, building conditions, energy consuming equipment, and hours of use or occupancy for the purpose of confirming or revising technical and price proposals based on the preliminary energy survey.

DOE means Department of Energy.

Energy baseline means the amount of energy that would be consumed annually without implementation of energy conservation measures based on historical metered data, engineering calculations, submetering of buildings or energy consuming systems, building load simulation models, statistical regression analysis, or some combination of these methods.

Energy conservation measures means measures that are applied to an existing Federally owned building or facility that improves energy efficiency, are life-cycle cost-effective under subpart A of this part, and involve energy conservation, cogeneration facilities, renewable energy sources, improvements in operation and maintenance efficiencies, or retrofit activities.

Energy cost savings means a reduction in the cost of energy and related operation and maintenance expenses, from a base cost established through a methodology set forth in an energy savings

performance contract, utilized in an existing federally owned building or buildings or other federally owned facilities as a result of—

(1) The lease or purchase of operating equipment, improvements, altered operation and maintenance, or technical services; or

(2) The increased efficient use of existing energy sources by cogeneration or heat recovery, excluding any cogeneration process for other than a federally owned building or buildings or other federally owned facilities.

Energy savings performance contract means a contract which provides for the performance of services for the design, acquisition, installation, testing, operation, and, where appropriate, maintenance and repair of an identified energy conservation measure or series of measures at one or more locations.

Energy unit savings means the determination, in electrical or thermal units (e.g., kilowatt hour (kwh), kilowatt (kw), or British thermal units (Btu)), of the reduction in energy use or demand by comparing consumption or demand, after completion of contractor-installed energy conservation measures, to an energy baseline established in the contract.

Facility means any structure not primarily intended for human occupancy, or any contiguous group of structures and related systems, either of which produces, distributes, or consumes energy.

Federal agency has the meaning given such term in section 551(1) of Title 5, United States Code.

Preliminary energy survey means a procedure which may include, but is not limited to, an evaluation of energy cost savings and energy unit savings potential, building conditions, energy consuming equipment, and hours of use or occupancy, for the purpose of developing technical and price proposals prior to selection.

Secretary means the Secretary of Energy.

§ 436.32 Qualified contractors lists.

(a) DOE shall prepare a list, to be updated annually, or more often as necessary, of firms qualified to provide energy cost savings performance services and grouped by technology. The list shall be prepared from statements of qualifications by or about firms engaged in providing energy savings performance contract services on questionnaires obtained from DOE. Such statements shall, at a minimum, include prior experience and capabilities of firms to perform the proposed energy cost savings services by technology and financial and performance information. DOE shall issue a notice annually, for publication in the Commerce Business Daily, inviting submission of new statements of qualifications and requiring listed firms to update their statements of qualifications for changes in the information previously provided.

(b) On the basis of statements of qualifications received under paragraph (a) of this section and any other relevant information, DOE shall select a firm for inclusion on the qualified list if—

(1) It has provided energy savings performance contract services or services that save energy or reduce utility costs for not less than two clients, and the firm possesses the appropriate project experience to successfully implement the technologies which it proposes to provide;

(2) Previous project clients provide ratings which are ''fair'' or better;

(3) The firm or any principal of the firm has neither been insolvent nor declared bankruptcy within the last five years;

(4) The firm or any principal of the firm is not on the list of parties excluded from procurement programs under 48 CFR part 9, subpart 9.4; and

(5) There is no other adverse information which warrants the conclusion that the firm is not qualified to perform energy savings performance contracts.

(c) DOE may remove a firm from DOE's list of qualified contractors after notice and an opportunity for comment if—

(1) There is a failure to update its statement of qualifications;

(2) There is credible information warranting disqualification; or

(3) There is other good cause.

(d) A Federal agency shall use DOE's list unless it elects to develop its own list of qualified firms consistent with

the procedures in paragraphs (a) and (b) of this section.

(e) A firm not designated by DOE or a Federal agency pursuant to the procedures in paragraphs (a) and (b) of this section as qualified to provide energy cost savings performance services shall receive a written decision and may request a debriefing.

(f) Any firm receiving an adverse final decision under this section shall apply to the Board of Contract Appeals of the General Services Administration in order to exhaust administrative remedies.

§ 436.33 Procedures and methods for contractor selection.

(a) *Competitive selection.* Competitive selections based on solicitation of firms are subject to the following procedures—

(1) With respect to a particular proposed energy cost savings performance project, Federal agencies shall publish a Commerce Business Daily notice which synopsizes the proposed contract action.

(2) Each competitive solicitation—

(i) Shall request technical and price proposals and the text of any third-party financing agreement from interested firms;

(ii) Shall consider DOE model solicitations and should use them to the maximum extent practicable;

(iii) May provide for a two-step selection process which allows Federal agencies to make an initial selection based, in part, on proposals containing estimated energy cost savings and energy unit savings, with contract award conditioned on confirmation through a detailed energy survey that the guaranteed energy cost savings are within a certain percentage (specified in the solicitation) of the estimated amount; and

(iv) May state that if the Federal agency requires a detailed energy survey which identifies life cycle cost effective energy conservation measures not in the initial proposal, the contract may include such measures.

(3) Based on its evaluation of the technical and price proposals submitted, any applicable financing agreement (including lease-acquisitions, if any), statements of qualifications submitted under § 436.32 of this subpart, and any other information determines to be relevant, the Federal agency may select a firm on a qualified list to conduct the project.

(4) If a proposed energy cost savings project involves a large facility with too many contiguously related buildings and other structures at one site for proposing firms to assume the costs of a preliminary energy survey of all such structures, the Federal agency—

(i) May request technical and price proposals for a representative sample of buildings and other structures and may select a firm to conduct the proposed project; and

(ii) After selection of a firm, but prior to award of an energy savings performance contract, may request the selected firm to submit technical and price proposals for all or some of the remaining buildings and other structures at the site and may include in the award for all or some of the remaining buildings and other structures.

(5) After selection under paragraph (a)(3) or (a)(4) of this section, but prior to award, a Federal agency may require the selectee to conduct a detailed energy survey to confirm that guaranteed energy cost savings are within a certain percentage (specified in the solicitation) of estimated energy cost savings in the selectee's proposal. If the detailed energy survey does not confirm that guaranteed energy savings are within the fixed percentage of estimated savings, the Federal agency may select another firm from those within the competitive range.

(b) *Unsolicited proposals.* Federal agencies may—

(1) Consider unsolicited energy savings performance contract proposals from firms on a qualified contractor list under this subpart which include technical and price proposals and the text of any financing agreement (including a lease-acquisition) without regard to the requirements of 48 CFR 15.503 (a) and (c); 48 CFR 15.506–2(a)(1); and 48 CFR 15.507(a), (b)(2), (b)(3), (b)(4) and (b)(5).

(2) Reject an unsolicited proposal that is too narrow because it does not

address the potential for significant energy conservation measures from other than those measures in the proposal.

(3) After requiring a detailed energy survey, if appropriate, and determining that technical and price proposals are adequate, award a contract to a firm on a qualified contractor list under this subpart on the basis of an unsolicited proposal, provided that the Federal agency complies with the following procedures—

(i) An award may not be made to the firm submitting the unsolicited proposal unless the Federal agency first publishes a notice in the Commerce Business Daily acknowledging receipt of the proposal and inviting other firms on the qualified list to submit competing proposals.

(ii) Except for unsolicited proposals submitted in response to a published general statement of agency needs, no award based on such an unsolicited proposal may be made in instances in which the Federal agency is planning the acquisition of an energy conservation measure through an energy savings performance contract.

(c) *Certified cost or pricing data.*

(1) Energy savings performance contracts under this part are firm fixed-price contracts.

(2) Pursuant to the authority provided under section 304A(b)(1)(B) of the Federal Property and Administrative Services Act of 1049, the heads of procuring activities shall waive the requirement for submission of certified cost or pricing data. However, this does not exempt offerors from submitting information (including pricing information) required by the Federal agency to ensure the impartial and comprehensive evaluation of proposals.

§ 436.34 Multiyear contracts.

(a) Subject to paragraph (b) of this section, Federal agencies may enter into a multiyear energy savings performance contract for a period not to exceed 25 years, as authorized by 42 U.S.C. 8287, without funding of cancellation charges, if:

(1) The multiyear energy savings performance contract was awarded in a competitive manner using the procedures and methods established by this subpart;

(2) Funds are available and adequate for payment of the scheduled energy cost for the first fiscal year of the multiyear energy savings performance contract;

(3) Thirty days before the award of any multiyear energy savings performance contract that contains a clause setting forth a cancellation ceiling in excess of $750,000, the head of the awarding Federal agency gives written notification of the proposed contract and the proposed cancellation ceiling for the contract to the appropriate authorizing and appropriating committees of the Congress; and

(4) Except as otherwise provided in this section, the multiyear energy savings performance contract is subject to 48 CFR part 17, subpart 17.1, including the requirement that the contracting officer establish a cancellation ceiling.

(b) Neither this subpart nor any provision of the Act requires, prior to contract award or as a condition of a contract award, that a Federal agency have appropriated funds available and adequate to pay for the total costs of an energy savings performance contract for the term of such contract.

§ 436.35 Standard terms and conditions.

(a) *Mandatory requirements.* In addition to contractual provisions otherwise required by the Act or this subpart, any energy savings performance contract shall contain clauses—

(1) Authorizing modification, replacement, or changes of equipment, at no cost to the Federal agency, with the prior approval of the contracting officer who shall consider the expected level of performance after such modification, replacement or change;

(2) Providing for the disposition of title to systems and equipment;

(3) Requiring prior approval by the contracting officer of any financing agreements (including lease-acquisitions) and amendments to such an agreement entered into after contract award for the purpose of financing the acquisition of energy conservation measures;

(4) Providing for an annual energy audit and identifying who shall conduct such an audit, consistent with § 436.37 of this subpart; and

(5) Providing for a guarantee of energy cost savings to the Federal agency, and establishing payment schedules reflecting such guarantee.

(b) *Third party financing.* If there is third party financing, then an energy savings performance contract may contain a clause:

(1) Permitting the financing source to perfect a security interest in the installed energy conservation measures, subject to and subordinate to the rights of the Federal agency; and

(2) Protecting the interests of a Federal agency and a financing source, by authorizing a contracting officer in appropriate circumstances to require a contractor who defaults on an energy savings performance contract or who does not cure the failure to make timely payments, to assign to the financing source, if willing and able, the contractor's rights and responsibilities under an energy savings performance contract;

§ 436.36 Conditions of payment.

(a) Any amount paid by a Federal agency pursuant to any energy savings performance contract entered into under this subpart may be paid only from funds appropriated or otherwise made available to the agency for the payment of energy expenses and related operation and maintenance expenses which would have been incurred without an energy savings performance contract. The amount the agency would have paid is equal to:

(1) The energy baseline under the energy savings performance contract (adjusted if appropriate under § 436.37), multiplied by the unit energy cost; and

(2) Any related operations and maintenance cost prior to implementation of energy conservation measures, adjusted for increases in labor and material price indices.

(b) Federal agencies may incur obligations pursuant to energy savings performance contracts to finance energy conservation measures provided guaranteed energy cost savings exceed the contractor's debt service requirements.

§ 436.37 Annual energy audits.

(a) After contractor implementation of energy conservation measures and annually thereafter during the contract term, an annual energy audit shall be conducted by the Federal agency or the contractor as determined by the contract. The annual energy audit shall verify the achievement of annual energy cost savings performance guarantees provided by the contractor.

(b) The energy baseline is subject to adjustment due to changes beyond the contractor's control, such as—

(1) Physical changes to building;

(2) Hours of use or occupancy;

(3) Area of conditioned space;

(4) Addition or removal of energy consuming equipment or systems;

(5) Energy consuming equipment operating conditions;

(6) Weather (i.e., cooling and heating degree days); and

(7) Utility rates.

(c) In the solicitation or in the contract, Federal agencies shall specify requirements for annual energy audits, the energy baseline, and baseline adjustment procedures.

§ 436.38 Terminating contracts.

(a) Except as otherwise provided by this subpart, termination of energy savings performance contracts shall be subject to the termination procedures of the Federal Acquisition Regulation in 48 CFR part 49.

(b) In the event an energy savings performance contract is terminated for the convenience of a Federal agency, the termination liability of the Federal agency shall not exceed the cancellation ceiling set forth in the contract, for the year in which the contract is terminated.

Subparts C—E [Reserved]

Subpart F—Guidelines for General Operations Plans

AUTHORITY: Energy Policy and Conservation Act, as amended, 42 U.S.C. 6361; Executive Order 11912, as amended, 42 FR 37523 (July 20, 1977); National Energy Conservation Policy Act, title V, part 3, 42 U.S.C. 8251 *et seq.*; Department of Energy Organization Act, 42 U.S.C. 7254.

SOURCE: 45 FR 44561, July 1, 1980, unless otherwise noted.

§ 436.100 Purpose and scope.

(a) *Purpose.* The purpose of this subpart is to provide guidelines for use by Federal agencies in their development of overall 10-year energy management plans to establish energy conservation goals, to reduce the rate of energy consumption, to promote the efficient use of energy, to promote switching for petroleum-based fuels and natural gas to coal and other energy sources, to provide a methodology for reporting their progress in meeting the goals of those plans, and to promote emergency energy conservation planning to assuage the impact of a sudden disruption in the supply of oil-based fuels, natural gas or electricity. The plan is intended to provide the cornerstone for a program to conserve energy in the general operations of an agency.

(b) *Scope.* This subpart applies to all general operations of Federal agencies and is applicable to management of all energy used by Federal agencies that is excluded from coverage pursuant to section 543(a)(2) of part 3 of title V of the National Energy Conservation Policy Act, as amended (42 U.S.C. 8251–8261).

[45 FR 44561, July 1, 1980, as amended at 55 FR 48223, Nov. 20, 1990]

§ 436.101 Definitions.

As used in this subpart—

Automotive gasoline means all grades of gasoline for use in internal combustion engines except aviation gasoline. Does not include diesel fuel.

Aviation gasoline (AVGAS) means all special grades of gasoline for use in aviation reciprocating engines.

Btu means British thermal unit; the quantity of heat required to raise the temperature of one pound of water one degree Fahrenheit.

Cogeneration means the utilization of surplus energy, e.g., steam, heat or hot water produced as a by-product of the manufacture of some other form of energy, such as electricity. Thus, diesel generators are converted to cogeneration sets when they are equipped with boilers that make steam and hot water (usable as energy) from the heat of the exhaust and the water that cools the generator.

Diesel and petroleum distillate fuels means the lighter fuel oils distilled-off during the refining process. Included are heating oils, fuels, and fuel oil. The major uses of distillate fuel oils include heating, fuel for on- and off-highway diesel engines, marine diesel engines and railroad diesel fuel.

DOE means the Department of Energy.

Emergency conservation plan means a set of instructions designed to specify actions to be taken in response to a serious interruption of energy supply.

Energy efficiency goal means the ratio of production achieved to energy used.

Energy use avoidance means the amount of energy resources, e.g., gasoline, not used because of initiatives related to conservation. It is the difference between the baseline without a plan and actual consumption.

Facility means any structure or group of closely located structures, comprising a manufacturing plant, laboratory, office or service center, plus equipment.

Federal agency means any Executive agency under 5 U.S.C. 105 and the United States Postal Service, each entity specified in 5 U.S.C. 5721(1) (B) through (H) and, except that for purposes of this subpart, the Department of Defense shall be separated into four reporting organizations: the Departments of the Army, Navy and Air Force and the collective DOD agencies, with each responsible for complying with the requirements of this subpart.

Fiscal year or *FY* means, for a given year, October 1 of the prior year through September 30 of the given year.

Fuel types means purchased electricity, fuel oil, natural gas, liquefied petroleum gas, coal, purchased steam, automotive gasoline, diesel and petroleum distillate fuels, aviation gasoline, jet fuel, Navy special, and other identified fuels.

General operations means world-wide Federal agency operations, other than building operations, and includes services; production and industrial activities; operation of aircraft, ships, and land vehicles; and operation of Government-owned, contractor-operated plants.

General transportation means the use of vehicles for over-the-road driving as opposed to vehicles designed for off-road conditions, and the use of aircraft and vessels. This category does not include special purpose vehicles such as combat aircraft, construction equipment or mail delivery vehicles.

Goal means a specific statement of an intended energy conservation result which will occur within a prescribed time period. The intended result must be time-phased and must reflect expected energy use assuming planned conservation programs are implemented.

Guidelines means a set of instructions designed to prescribe, direct and regulate a course of action.

Industrial or production means the operation of facilities including buildings and plants which normally use large amounts of capital equipment, e.g., GOCO plants, to produce goods (hardware).

Jet fuel means fuels for use, generally in aircraft turbine engines.

Life cycle cost means the total cost of acquiring, operating and maintaining equipment over its economic life, including its fuel costs, determined on the basis of a systematic evaluation and comparison of alternative investments in programs, as defined in subpart A of this part.

Liquefied petroleum gas means propane, propylene-butanes, butylene, propane-butane mixtures, and isobutane that are produced at a refinery, a natural gas processing plant, or a field facility.

Maintenance means activities undertaken to assure that equipment and energy-using systems operate effectively and efficiently.

Measures means actions, procedures, devices or other means for effecting energy efficient changes in general operations which can be applied by Federal agencies.

Measure of performance means a scale against which the fulfillment of a requirement can be measured.

Navy special means a heavy fuel oil that is similar to ASTM grade No. 6 oil or Bunker C oil. It is used to power U.S. Navy ships.

Non-renewable energy source means fuel oil, natural gas, liquefied petroleum gas, synthetic fuels, and purchased steam or electricity, or other such energy sources.

Operational training and readiness means those activities which are necessary to establish or maintain an agency's capability to perform its primary mission. Included are major activities to provide essential personnel strengths, skills, equipment/supply inventory and equipment condition. General administrative and housekeeping activities are not included.

Overall plan means the comprehensive agency plan for conserving fuel and energy in all operations, to include both the Buildings Plan developed pursuant to subpart C of this part and the General Operations Plan.

Plan means those actions which an agency envisions it must undertake to assure attainment of energy consumption and efficiency goals without an unacceptably adverse impact on primary missions.

Program means the organized set of activities and allocation of resources directed toward a common purpose, objective, or goal undertaken or proposed by an agency in order to carry out the responsibilities assigned to it.

Renewable energy sources means sunlight, wind, geothermal, biomass, solid wastes, or other such sources of energy.

Secretary means the Secretary of the Department of Energy.

Services means the provision of administrative assistance or something of benefit to the public.

Specific Functional Category means those Federal agency activities which consume energy, or which are directly linked to energy consuming activities and which fall into one of the following groups: Services, General Transportation, Industrial or Production, Operational Training and Readiness, and Others.

Standard means an energy conservation measure determined by DOE to be applicable to a particular agency or agencies. Once established as a standard, any variance or decision not to adopt the measure requires a waiver.

Under Secretary means the Under Secretary of the Department of Energy.

Variance means the difference between actual consumption and goal.

656 Committee means the Interagency Federal Energy Policy Committee, the group designated in section 656 of the DOE Organization Act to provide general oversight for interdepartmental FEMP matters. It is chaired by the Under Secretary of DOE and includes the designated Assistant Secretaries or Assistant Administrator of the Department of Defense, Commerce, Housing and Urban Development, Transportation, Agriculture, Interior and the U.S. Postal Service and General Services Administration, along with similar level representatives of the National Aeronautics and Space Administration and the Veterans Administration.

§ 436.102 General operations plan format and content.

(a) Each Federal agency shall prepare and submit to the Under Secretary, DOE, within six months from the effective date of these guidelines, a general operations 10-year plan which shall consist of two parts, an executive summary and a text. Subsequent agency revisions to plans shall be included in each agency's annual report on progress which shall be forwarded to DOE by July 1 annually.

(b) The following information shall be included in each Federal agency general operations 10-year plan for the period of fiscal years 1980–1990:

(1) An Executive Summary which includes—

(i) A brief description of agency missions, and applicable functional categories pursuant to § 436.106(a)(2);

(ii) A Goals and Objectives Section which summarizes what energy savings or avoidance will be achieved during the plan period, and what actions will be taken to achieve those savings, and the costs and benefits of measures planned for reducing energy consumption, increasing energy efficiencies, and shifting to a more favorable fuel mix. Assumptions of environmental, safety and health effects of the goals should be included;

(iii) A chart depicting the agency organizational structure for energy management, showing energy management program organization for headquarters and for major subordinate elements of the agency;

(iv) A schedule for completion of requirements directed in this subpart, including phase-out of any procedures made obsolete by these guidelines; and

(v) Identification of any significant problem which may impede the agency from meeting its energy management goals.

(2) A Text which includes—

(i) A Goals and Objectives Section developed pursuant to § 436.103 describing agency conservation goals; these goals will be related to primary mission goals;

(ii) An Investment Section describing the agency planned investment program by fiscal year, pursuant to appendix B of this subpart, all measures selected pursuant to § 436.104, and the estimated costs and benefits of the measures planned for reducing energy consumption and increasing energy efficiencies;

(iii) An Organization Section which includes: (A) Designation of the principal energy conservation officer, such as an Assistant Secretary or Assistant Administrator, who is responsible for supervising the preparation, updating and execution of the Plan, for planning and implementation of agency energy conservation programs, and for coordination with DOE with respect to energy matters; (B) designation of a middle-level staff member as a point of contact to interface with the DOE Federal Programs Office at the staff level; and (C) designation of key staff members within the agency who are responsible for technical inputs to the plan or monitoring progress toward meeting the goals of the plan;

(iv) An Issues Section addressing problems, alternative courses of action for resolution, and agency recommendations that justify any decisions not to plan for or implement measures contained in appendix C of this subpart, and identifying any special projects, programs, or administrative procedures which may be beneficial to other Federal agency energy management programs:

(v) An implementing Instructions Section which includes a summary of implementing instructions issued by agency headquarters, and attachments of appropriate documents such as:

(A) Specific tasking resulting from development of the Plan;

(B) Guidance for the development of emergency conservation plans;

(C) Task milestones;

(D) Listing of responsible sub-agencies and individuals at both agency headquarters and subordinate units;

(E) Reporting and administrative procedures for headquarters and subordinate organizations;

(F) Report schedules pursuant to § 436.106(c);

(G) Schedules for feedback in order to facilitate plan updating, to include reviews of emergency conservation plans developed pursuant to § 436.105;

(H) Schedules for preparing and submitting the annual report on energy management pursuant to § 436.106(a);

(I) Schedules of plan preparation and publication;

(J) Communication, implementation, and control measures such as inspections, audits, and others; and

(vi) An Emergency Conservation Plan Summary Section pursuant to the requirements of § 436.105(d).

(3) Appendices which are needed to discuss and evaluate any innovative energy conserving technologies or methods, not included in this part, which the agency has identified for inclusion in its plan.

(c) Each plan must be approved and signed by the principal energy conservation officer designated pursuant to paragraph (b)(2) of this section.

§ 436.103 Program goal setting.

(a) In developing and revising plans for a projected 10-year plan each agency shall establish and maintain energy conservation goals in accordance with the requirements of this section.

(b) Agencies shall establish three types of conservation goals:

(1) Energy consumption goals, by fuel type by functional category (see appendix B).

(2) Energy efficiency goals by fuel type by functional category (see appendix B).

(3) Fuel switching goals for shifting energy use from oil and natural gas to other fuels in more plentiful supply from domestic sources (see appendix B).

(c) General operations energy conservation goals shall be established by each Federal agency with the broad purpose of achieving reductions in total energy consumption and increased efficiency without serious mission degradation or unmitigated negative environmental impacts. Within the broad framework, each agency should seek first to reduce energy consumption per unit of output in each applicable functional category. In evaluating energy efficiency, each agency should select and use standards of measurement which are consistent throughout the planning period. Particular attention should be given to increased energy use efficiency in nonrenewable fuel consumption. The second focus of attention should be on initiatives which shift energy use from oil and natural gas to other fuels in more plentiful supply from domestic sources.

§ 436.104 Energy conservation measures and standards.

(a) Each agency shall consider for inclusion in its plan the measures identified in appendix C of this subpart.

(b) The following questions should be considered in the evaluation of each measure:

(1) Does this measure provide an incentive or disincentive?

(2) What is the estimate of savings by fuel type?

(3) What are the direct and indirect impacts of this measure?

(4) Is this measure to be mandatory throughout the agency?

(5) If not mandatory, under what circumstances will it be implemented, and who will be responsible for determining specific applicability?

(6) Who will be the direct participants in the implementation of this measure?

(7) What incentives (if any) are to be provided for the participants?

(8) When will this measure be implemented?

(9) Will this measure be implemented in a single step or will it be phased in? If it will be phased in, over what period of time?

(10) Will performance of the measure be evaluated and reported?

(11) By what criterion will performance be determined?

(12) Who will prepare performance reports?

(13) What is the reporting chain?

(14) What is the reporting period?

(c) Each agency will take all necessary steps to implement the energy conservation standards for general operations listed in appendix A (reserved).

§ 436.105 Emergency conservation plan.

(a) Each agency shall establish an emergency conservation plan, a summary of which shall be included in the general operations plan, for assuaging the impact of a sudden disruption in the supply of oil-based fuels, natural gas or electricity. Priorities for temporarily reducing missions, production, services, and other programmatic or functional activities shall be developed in accordance with paragraph (b) of this section. Planning for emergencies is to address both buildings and general operations. Provisions shall be made for testing emergency actions to ascertain that they are effective.

(b) Federal agencies shall prepare emergency conservation plans for 10 percent, fifteen percent, and 20 percent reduction compared to the previous fiscal year in gasoline, other oil-based fuels, natural gas, or electricity for periods of up to 12 months. In developing these plans, agencies shall consider the potential for emergency reductions in energy use in buildings and facilities which the agency owns, leases, or has under contract and by employees through increased use of car and van pooling, preferential parking for multipassenger vehicles, and greater use of mass transit. Agencies may formulate whatever additional scenarios they consider necessary to plan for various energy emergencies.

(c) In general, Federal agencies' priorities shall go to those activities which directly support the agencies' primary missions. Secondary mission activities which must be curtailed or deferred will be reported to DOE as mission impacts. The description of mission impacts shall include estimates of the associated resources and time required to mitigate the effects of the reduction in energy. Other factors or assumptions to be used in energy conservation emergency planning are as follows:

(1) Agencies will be given 15–30 days notice to implement any given plan.

(2) Substitution of fuels in plentiful supply for fuels in short supply is authorized, if the substitution can be completed within a 3-month period and the cost is within the approval authority of the executive branch.

(3) All costs and increases in manpower or other resources associated with activities or projects to assuage mission impacts will be clearly defined in respective agency plans. One-time costs will be identified separately.

(4) Confronting the emergency situation will be considered a priority effort and all projects and increases in operating budgets within the approval authority of the executive branch will be expeditiously considered and approved if justified.

(d) Summary plans for agency-wide emergency conservation management shall be provided to DOE pursuant to § 436.102(b)(2)(vi). Such summaries shall include:

(1) Agency-wide impacts of energy reductions as determined in accordance with paragraph (b) of this section.

(2) Actions to be taken agency-wide to alleviate the energy shortfalls as they occur.

(3) An assessment of agency services or production that may need to be curtailed or limited after corrective actions have been taken.

(4) A summation of control and feedback mechanisms for managing an energy emergency situation.

§ 436.106 Reporting requirements.

(a) By July 1 of each year each Federal agency shall submit an ''Annual Report on Energy Management'' based on fiscal year data to the Secretary of DOE. The general operations portion of this report will encompass all agency energy use not reported in the buildings portion and shall include:

(1) A summary evaluation of progress toward the achievement of energy consumption, energy efficiency, and fuel switching goals established by the agency in its plans;

(2) Energy consumption reported by functional categories. Reports must include General Transportation and one

or more of the following functional categories: industrial or production, services, operational training and readiness, and other. Agencies may report in subcategories of their own choosing. The following information is to be reported for the usage of each fuel type in physical units for each selected functional category:

(i) Total energy consumption goal;

(ii) Total energy consumed;

(iii) Total energy use avoidance;

(iv) Variance between actual consumption and consumption goal;

(v) Cost saved;

(vi) Status of planned investments, and if different from the investment program upon which existing goals are based, the expected impact on meeting goals; and

(vii) Summary of any other benefits realized.

(3) The energy efficiencies as calculated in accordance with appendix B of this subpart, or by an equivalent method, for the appropriate functional categories identified in paragraph (a)(2) of this section. The following information is to be reported for the energy efficiency for each fuel type by functional category:

(i) Energy efficiency goal;

(ii) Efficiency for the reporting period;

(iii) Summary of any other benefits realized.

(4) A summary of fuel switching progress including:

(i) Description and cost of investments in fuel switching;

(ii) Avoidance in use of oil-based fuels and natural gas;

(iii) Increased use of solar, wood, gasohol and other renewable energy sources;

(iv) Increased use of coal and coal derivatives, and

(v) Use of all other alternative fuels.

(b) Each agency's annual report shall be developed in accordance with a format to be provided by DOE and will include agency revisions to 10-year plans.

(c) Agencies whose annual total energy consumption exceeds one hundred billion Btu's, shall, in addition to the annual report required under paragraph (a) of this section, submit quarterly reports of the energy usage information specified in paragraph (a)(2) of this section.

(d) Agencies who consume energy in operations in foreign countries will include data on foreign operations if foreign consumption is greater than 10% of that consumed by the agency in the United States, its territories and possessions. If an agency's estimated foreign consumption is less than 10% of its total domestic energy use, reporting of foreign consumption is optional. Reports should be annotated if foreign consumption is not included.

[45 FR 44561, July 1, 1980, as amended at 51 FR 4586, Feb. 6, 1986]

§ 436.107 Review of plan.

(a) Each plan or revision of a plan shall be submitted to DOE and DOE will evaluate the sufficiency of the plan in accordance with the requirements of this subpart. Written notification of the adequacy of the plan including a critique, will be made by DOE and sent to the agency submitting the plan or revision within 60 days of submission. Agencies shall be afforded an opportunity to modify and return the plan within an appropriate period of time for review by DOE.

(b) A general operations plan under the guidelines will be evaluated with respect to:

(1) Adequacy of information or plan content required to be included by § 436.102;

(2) Adequacy of goal setting methodology or baseline justification as stated in § 436.103;

(3) Adequacy of a well-justified investment program which considers all measures included in appendix C of this subpart; and

(4) Other factors as appropriate.

(c) After reviewing agency plans or revisions of plans, the Under Secretary of DOE, may submit to the ''656'' Committee for its recommendation, major problem areas or common deficiencies.

(d) Status of the plan review, the Under Secretary's decisions, and ''656'' Committee recommendations, will be published as appropriate in the DOE annual report to the President, titled ''Energy Management in the Federal Government.''

§ 436.108 Waivers.

(a) Any Federal agency may submit a written request to the Under Secretary for a waiver from the procedures and requirements of this subpart. The request for a waiver must identify the specific requirements and procedures of this subpart from which a waiver is sought and provide a detailed explanation, including appropriate information or documentation, as to why a waiver should be granted.

(b) A request for a waiver under this section must be submitted at least 60 days prior to the due date for the required submission.

(c) A written response to a request for a waiver will be issued by the Under Secretary no later than 30 days from receipt of the request. Such a response will either (1) grant the request with any conditions determined to be necessary to further the purposes of this subpart, (2) deny the request based on a determination that the reasons given in the request for a waiver do not establish a need that takes precedence over the futherance of the purposes of this subpart, or (3) deny the request based on the failure to submit adequate information upon which to grant a waiver.

(d) A requested waiver may be submitted by the Under Secretary to the ''656'' Committee for its review and recommendation. The agency official that submitted the request may attend any scheduled meeting of the ''656'' Committee at which the request is planned to be discussed. The determination to approve or disapprove a request for a waiver shall be made by the Under Secretary.

(e) Status of the requests for a waiver, the Under Secretary's decisions, and ''656'' Committee recommendations, will be published, as appropriate, in the DOE annual report to the President, entitled ''Energy Management in the Federal Government.''

APPENDIX A TO PART 436—ENERGY CONSERVATION STANDARDS FOR GENERAL OPERATIONS [RESERVED]

APPENDIX B TO PART 436—GOAL SETTING METHODOLOGY

In establishing and updating agency goals for energy conservation, the following methodology or an equivalent method should be utilized:

(a) For overall energy consumption—

(1) An analysis shall be made to determine what factors have the most significant impact upon the amount of each fuel type used by the agency in performing functions in support of its overall mission. Consideration is to be given, but not limited to, the following factors: Number of people using energy; number of vehicles using gasoline; amounts of other equipment using energy; tempo of operations (one, two, or three shifts); the type of operations (degree of equipment or labor intensity); equipment fuel limitations; environmental conditions (tropical versus arctic, etc.); budget levels for fuel, operations, maintenance, and equipment acquisition; and phase-out schedule (of older equipment or plants which may be inefficient). After identifying these factors, a further analysis shall be made to identify any projected workload changes in the quality or quantity of these factors on a yearly basis up to 1990.

(2) Based upon the analysis in (a)(1) and an evaluation of available information on past energy usage, a baseline of energy use by fuel type by functional category shall be established beginning with FY 1975. In addition to ''General Transportation,'' other functional categories should be selected to enhance energy management. Total fuel use for a particular activity may be allocated to the functional category for which the preponderance of fuel is used. Figure B–1 is an example of one such baseline.

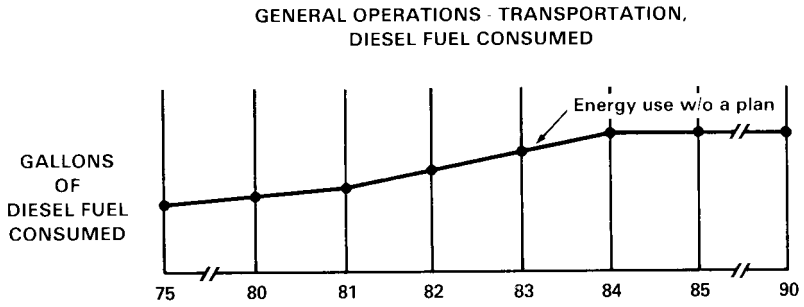

FIGURE B-1: GENERAL OPERATIONS - TRANSPORTATION, DIESEL FUEL CONSUMED

This example shows an increase in energy use, for a specific fuel type, during the period 1975–1981, with a further increase from 1981 to 1984 and a leveling off and no growth from 1984–1990. A justification, based on factors as discussed above, shall accompany each baseline.

(3) Thereafter, analyses should be made of the measures available for reducing the energy consumption profiles without adverse impact on mission accomplishment. Finding viable opportunities for reducing energy use, increasing energy efficiency and switching energy sources, will require consultation with specialists in the fields of operations, maintenance, engineering, design, and economics, and consideration of the measures identified in Appendix C. The DOE Federal Energy Management Programs Office can, upon request, provide information on where such resources can be located. Once these measures are identified, they are to be incorporated into a time-phased investment program, (using where appropriate, the life cycle costing factors and methodology in subpart A of this part). If investment and other costs for implementing a measure are insignificant, a Federal agency may presume that a measure is cost-effective without further analysis. An estimate must then be made as to the lead time required to implement the program and realize energy reductions.

Figure B–2 shows a summarized investment program, which should be accompanied by a detailed description of the measures, projects, and programs making up the total planned investments for each year. This summary need not be by function or fuel type.

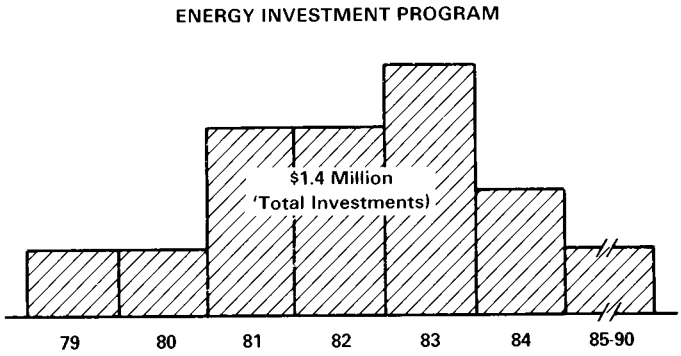

FIGURE B-2: ENERGY INVESTMENT PROGRAM

These analyses should enable the agency to project an energy consumption goal, with the assumption that funds for executing the planned projects will be approved. Figure B–3 shows a new energy use profile, with planned initiatives and related investments taken into consideration, and the resulting goal entitled ''Energy Use With A Plan'' superimposed on Figure B–1. Included are the anticipated effects on consumption cause by improvements in energy efficiency and fuel switching.

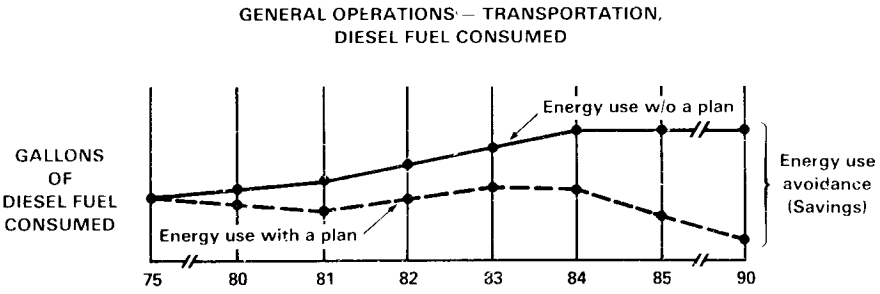

FIGURE B-3: GENERAL OPERATIONS — TRANSPORTATION, DIESEL FUEL CONSUMED

A comparison of these projections will show the energy use avoidance resulting from the investment program as depicted in Figure B–2. Using the prices of fuel contained in Appendix C to Subpart A, the dollars saved can be projected against the dollars invested. Life cycle costing methodology pursuant to subpart A, will be used to determine priorities for submitting individual initiatives into the appropriate budget year.

(b) For energy efficiencies—Energy efficiency baselines and goals for each fuel type shall be calculated using the same consumption factors and similar methodology to that outlined in paragraph (a). Energy consumption by fuel type shall be linked to mission through the functional categories listed in §436.106(a)(2). This will identify a rate which will indicate energy efficiency trends. This linkage may be accomplished through the following algorithm:

Step 1: Determine functional categories from section 436.106(a)(2) which best describe the Agency overall mission.

Step 2: Determine types of fuels used to support the functions selected in Step 1.

Step 3: Determine quantities of fuel consumed or planned for consumption over a specific period of time.

Step 4: Determine quantity of output of function for same period of time used in Step 3. Quantify output in a standard measure which best describes functional category.

Step 5: Determine the energy efficiency ratio by dividing quantity from Step 4 by quantity from Step 3.

This ratio of fuel consumed to a unit measure of output will be used to develop a projection of a baseline and goals through 1990, and used in reporting variance. Examples of ratios that should be considered are:

- Production or industrial process type operations

Ton of product

Cu. ft. of natural gas

- Services, such as postal delivery

Customers served or
pounds delivered

Gallons of automotive
gasoline

- General transportation

Passenger miles

Gallons of automotive gasoline

- Training

Persons trained
or in training

Gallons of navy special

Agencies shall select one or more of these ratios, which shall be used throughout the planning period, or use more appropriate energy efficiency ratios, to describe their overall functions. Figure B–4 illustrates the planning baseline and goal resulting from this type of analysis.

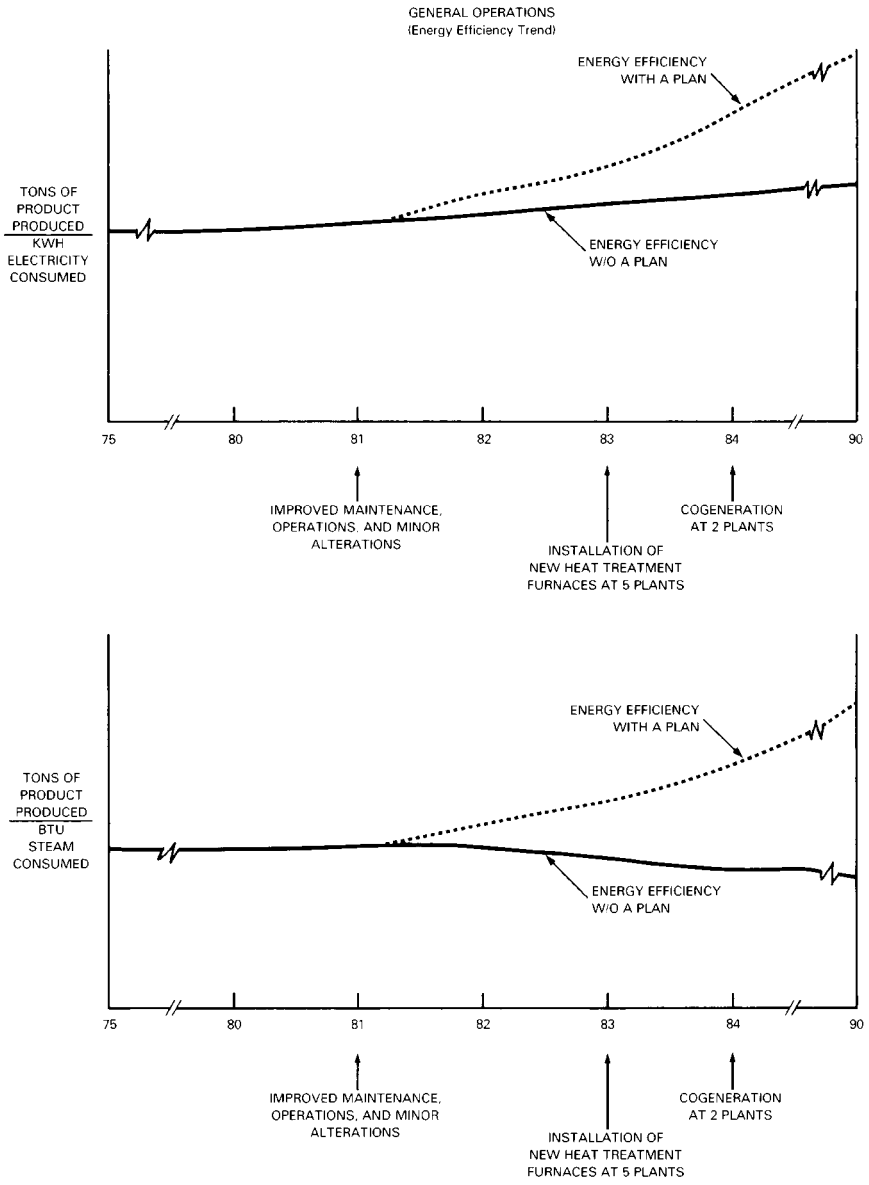

FIGURE B-4: GENERAL OPERATIONS, ELECTRICITY, STEAM CONSUMED.

(c) For fuel switching—Fuel switching goals for gasoline other oil-based fuel and natural gas may be calculated as follows:

Step 1: For each fiscal year, identify investments, where appropriate, in fuel switching

from gasoline, other oil-based fuel and natural gas to alternate renewable or nonrenewable fuel sources.

Step 2: Project for each fiscal year, the avoidance in the use of gasoline, other oil-based fuel and natural gas resulting from previous fuel switching investments.

Completion of these steps will permit the formulation of charts such as that shown in Figure B–5.

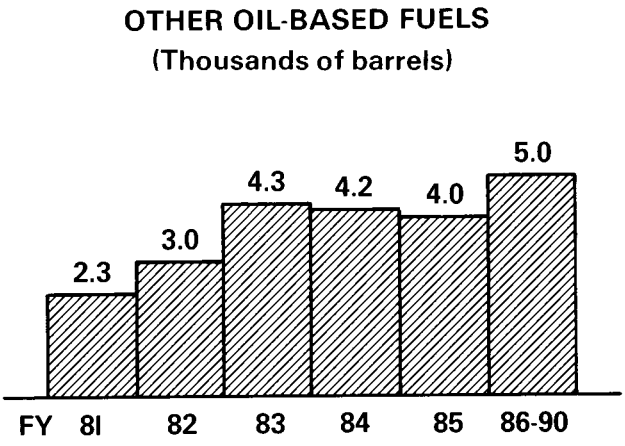

FIGURE B-5
FUEL SWITCHING GOALS

APPENDIX C TO PART 436—GENERAL OPERATIONS ENERGY CONSERVATION MEASURES

(a) The following individual measures or set of measures must be considered for inclusion in each agency 10-year energy management plan:

(1) Federal Employee Ridesharing Programs—Includes the use of vanpooling and carpooling and complies with existing orders and regulations governing parking for vanpools and carpools.

(2) Fleet Profile Change—Includes energy considerations in equipment selection and assignment.

(3) Fleet Mileage Efficiency—Includes agency plans to implement existing orders, goals, and laws related to vehicle fuel economy.

(4) Driver Training—Includes development of appropriate programs for training operators of U.S. Government vehicles in energy conservation.

(5) Maintenance Procedures Improvement—Includes activities to insure proper vehicle maintenance to optimize energy conservation.

(6) Operating Procedures Improvement—Includes use of cooperative passenger shuttle and courier services on an interagency or other basis within each metropolitan area.

(7) Mass Transit—Includes employee use of existing services for business-related activities and commuting.

(8) Public Education to Promote Vanpooling and Carpooling—Includes activities to support the EPCA requirement to establish ''responsible public education programs to promote vanpooling and carpooling arrangements'' through their employee awareness programs.

(9) Elimination of Free or Subsidized Employee Parking—Includes elimination of free or subsidized employee parking on Federal installations in accordance with OMB Cir. A–118, August 13, 1979.

(10) Two-Wheeled Vehicle Programs—Includes activities to encourage the substitution of bicycles, mopeds, etc. for automobiles for commuting and operational purposes. These may include the establishment of weather-protected secure storage facilities, shower and locker facilities, and restricted routes for these vehicles on Federal property. Cooperative programs with local civil authorities may also be included.

(11) Consolidation of Facilities and Process Activities—Includes such measures as physical consolidation of operations to minimize intra-operational travel and may include facility closure or conversion. Alternative work patterns, availability of transportation, energy source availability, and technical and financial feasibility are among the considerations that should be evaluated.

(12) Agency Procurement Programs—Includes activities to ensure that energy conservation opportunities are fully exploited with respect to the agency's procurement programs including procurements relating to operations and maintenance activities; e.g., (a) giving preference to fuel-efficient products whenever practicable, and (b) ensuring that agency's contractors having a preponderance of cost-type contracts pursue a comprehensive energy conservation program.

(13) Energy Conservation Awareness Programs—Includes programs aimed toward gaining and perpetuating employee awareness and participation in energy conservation measures on the job and in their personal activities.

(14) Communication—Includes substitution of communications for physical travel.

(15) Dress Code—Includes measures to allow employees greater freedom in their choice of wearing apparel to promote greater participation in conservation.

(16) Land Use—Includes energy considerations to be employed in new site selection, such as colocation.

(17) Automatic Data Processing (ADP)—Includes all energy aspects of ADP operation and equipment selection.

(18) Aircraft Operations—Includes energy-conserving measures developed for both military and Federal administrative and research and development aircraft operations.

(19) GOCO Facilities and Industrial Plants Operated by Federal Employees—Includes development of energy conservation plans at these facilities and plants which contain measures such as energy efficient periodic maintenance.

(20) Energy Conserving Capital Plant and Equipment Modification—Includes development of energy conservation and life cycle cost parameter measures for replacement of capital plant and equipment.

(21) Process Improvements—Includes measures to improve energy conservation in industrial process operations. These may include consideration of equipment replacement or modification, as well as scheduling and other operational changes.

(22) Improved Steam Maintenance and Management—Includes measures to improve energy efficiency of steam systems. These may include improved maintenance, installation of energy-conserving devices, and the operational use of substitutes for live steam where feasible.

(23) Improvements in Waste Heat Recovery—Includes measures utilizing waste heat for other purposes.

(24) Improvement in Boiler Operations—Includes energy-conserving retrofit measures for boiler operations.

(25) Improved Insulation—Includes measures addressing the addition or replacement of insulation on pipes, storage tanks, and in other appropriate areas.

(26) Scheduling by Major Electric Power Users—Includes measures to shift major electrical power demands to non-peak hours, to the maximum extent possible.

(27) Alternative Fuels—Includes measures to alter equipment such as generators to use lower quality fuels and to fill new requirements with those that use alternative fuels. The use of gasohol in stationary gasoline-powered equipment should be considered, in particular.

(28) Cogeneration—Includes measures to make full use of cogeneration in preference to single-power generation.

(29) Mobility Training and Operational Readiness—Includes measures which can reduce energy demands through the use of simulators, communications, computers for planning, etc.

(30) Energy Conservation Inspection or Instruction Teams—Includes measures which formulate and perpetuate the review of energy conservation through inspections to determine where specific improvements can be made and then followed by an instruction and training program.

(31) Intra-agency and Interagency Information Exchange Program—Includes measures providing a free exchange of energy conservation ideas and experiences between elements of an agency and between other agencies in the same geographic area.

(32) Recycled Waste—Includes measures to recycle waste materials such as paper products, glass, aluminum, concrete and brick, garbage, asphalt road materials or any material which requires a petroleum base.

(33) Fuel Conversion—Includes measures to accomplish conversion from petroleum based fuels and natural gas to coal and other alternative fuels for appropriate equipment.

(34) Operational Lighting—Includes measures to reduce energy consumption for lighting in operational areas and GOCO plants by: switching off by means of automatic controls; maximizing the use of daylight by floor planning; keeping window and light fixtures clean and replacing fixtures when they begin to deteriorate, rather than when they fail altogether; providing automatic dimmer controls to reduce lighting when daylight increases; and cleaning the work area during daylight, if possible, rather than at night.

(35) Lighting Fixtures—Includes measures to increase energy efficiency of lighting. The following reveals the relative efficiencies of common lamp types.

Lamp type	Lumens watt	Improvement over tungsten
Tungsten lamp	12	X1
Modern fluorescent lamp	85	X7
Mercury halide lamp	100	X8
High pressure sodium lamp	110	X9
Low pressure sodium lamp	180	X15

(36) Industrial Buildings Heating—Includes measures to improve the energy conservation of industrial buildings such as: fixing holes in roofs, walls and windows; fitting flexible doors, fitting controls to heating systems; use of ''economizer units'' which circulate hot air back down from roof level to ground level; use of controlled ventilation; insulation of walls and roof; use of ''optimisers'' or optimum start controls in heating systems, so that the heating switch-on is dictated by actual temperature conditions rather than simply by time.

(37) Hull Cleaning and Antifouling Coating—Includes measures to reduce energy consumption through periodic cleaning of hulls and propellers or through the use of antifouling coatings.

(38) [Reserved]

(39) Building Temperature Restrictions on Thermostat Setting for Heating, Cooling and Hot Water—Includes enforcement of suggested restriction levels: 65 degrees for heating, 78 degrees for cooling, and 105 degrees or ban for hot water.

(40) Such other measures as DOE may from time-to-time add to this appendix, or as the Federal agency concerned may find to be energy-saving or efficient.

APPENDIX D TO PART 436—ENERGY PROGRAM CONSERVATION ELEMENTS

(a) In all successful energy conservation programs, certain key elements need to be present. The elements listed below must be incorporated into each agency conservation program and must be reflected in the 10-year plan prescribed in §436.102. Those organizations that have already developed programs should review them to determine whether the present management systems incorporate these elements.

(1) *Top Management Control.* Top management must have a personal and sustained commitment to the program, provide active direction and motivation, and require regular review of overall energy usage at senior staff meetings.

(2) *Line Management Accountability.* Line managers must be accountable for the energy conservation performance of their organizations and should participate in establishing realistic goals and developing strategies and budgets to meet these goals.

(3) *Formal Planning.* An overall 10-year plan for the period 1980–1990 must be developed and formalized which sets forth performance-oriented conservation goals, including the categorized reduction in rates of energy consumption that the program is expected to realize. The plan will be supplemented by guidelines enumerating specific conservation procedures that will be followed. These procedures and initiatives must be life cycle cost-effective as well as energy efficient.

(4) *Goals.* Goals must be established in a measurable manner to answer questions of ''Where are we?'' ''Where do we want to go?'' ''Are we getting there?'' and ''Are our initiatives for getting there life cycle cost-effective?''

(5) *Monitoring.* Progress must be reviewed periodically both at the agency headquarters and at local facility levels to identify program weakness or additional areas for conservation actions. Progress toward achievement of goals should be assessed, and explanations should be required for non-achievement or unusual variations in energy use. Monitoring should include personal inspections and staff visits, management information reporting and audits.

(6) *Using Technical Expertise.* Personnel with adequate technical background and knowledge of programmatic objectives should be used to help management set technical goals and parameters for efficient planning and implementation of energy conservation programs. These technicians should work in conjunction with the line managers who are accountable for both mission accomplishment and energy conservation.

(7) *Employee Awareness.* Employees must gain an awareness of energy conservation through formal training and employee information programs. They should be invited to participate in the process of developing an energy conservation program, and to submit definitive suggestions for conservation of energy.

(8) *Energy Emergency Planning.* Every energy management plan must provide for programs to respond to contingencies that may occur at the local, state or National level. Programs must be developed for potential energy emergency situations calling for reductions of 10 percent, 15 percent and 20 percent for up to 12 months. Emergency plans must be tested to ascertain their effectiveness.

(9) *Budgetary and Fiscal Support.* Resources necessary for the energy conservation program must be planned and provided for, and the fiscal systems adjusted to support energy management investments and information reporting.

(10) *Environmental Considerations.* Each agency shall fulfill its obligations under the National Environmental Policy Act in developing its plan.

PART 440—WEATHERIZATION ASSISTANCE FOR LOW-INCOME PERSONS

Sec.
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APPENDIX A TO PART 440—STANDARDS FOR WEATHERIZATION MATERIALS

AUTHORITY: 42 U.S.C. 6861–6871; 42 U.S.C. 7191.

SOURCE: 49 FR 3629, Jan. 27, 1984, unless otherwise noted.

§ 440.1 Purpose and scope.

This part contains the regulations adopted by the Department of Energy to carry out a program of weatherization assistance for low-income persons established by the Energy Conservation in Existing Buildings Act of 1976, 42 U.S.C. 6861 *et seq.*, enacted as Title IV, Part A, of the Energy Conservation and Production Act, Pub.L. 94–385, 90 Stat. 1150 *et seq.*, and amended by Title II, Part 2, of the National Energy Conservation Policy Act, Pub.L. 95–619, 92 Stat. 3206 *et seq.*, by the Energy Security Act, Pub. L. 96–294, 94 Stat. 611 *et seq.*, and the State Energy Efficiency Programs Improvement Act, Pub. L. 101–440, 104 Stat. 1006 *et seq.* It is the purpose of this part to implement a weatherization assistance program to increase the energy efficiency of dwellings owned or occupied by low-income persons, reduce their total residential energy expenditures, and improve their health and safety, especially low-income persons who are particularly vulnerable such as the elderly, the handicapped, and children.

[58 FR 12525, Mar. 4, 1993]

§ 440.2 Administration of grants.

Grant awards under this part shall comply with applicable law including, without limitation, the requirements of:

(a) Executive Order 12372 entitled ''Intergovernmental Review of Federal Programs'', 48 FR 3130, and the DOE Regulation implementing this Executive Order entitled ''Intergovernmental Review of Department of Energy Programs and Activities'' (10 CFR part 1005);

(b) Office of Management and Budget Circular A–97, entitled ''Rules and Regulations Permitting Federal Agencies to Provide Specialized or Technical Services to State and Local Units of Government under Title III of the Inter-Governmental Coordination Act of 1968;''

(c) Unless in conflict with provisions of this part, the DOE Financial Assistance Rule (10 CFR part 600); and

(d) Such other procedures applicable to this part as DOE may from time to time prescribe for the administration of financial assistance.

§ 440.3 Definitions.

As used in this part:

Act means the Energy Conservation in Existing Buildings Act of 1976, as amended, 42 U.S.C. 6851 *et seq.*

Assistant Secretary means the Assistant Secretary for Conservation and Renewable Energy or official to whom the Assistant Secretary's functions may be redelegated by the Secretary.

Base Allocation means the fixed amount of funds for each State as set forth in § 440.10(b)(1).

CAA means a Community Action Agency.

Capital-Intensive furnace or cooling efficiency modifications means those major heating and cooling modifications which require a substantial amount of funds, including replacement and major repairs, but excluding such items as tune-ups, minor repairs, and filters.

Children means dependents not exceeding 19 years or a lesser age set forth in the State plan.

Community Action Agency means a private corporation or public agency established pursuant to the Economic Opportunity Act of 1964, Pub. L. 88–452, which is authorized to administer funds received from Federal, State, local, or private funding entities to assess, design, operate, finance, and oversee antipoverty programs.

Cooling Degree Days means a population-weighted annual average of the climatological cooling degree days for each weather station within a State, as determined by DOE.

Deputy Assistant Secretary means the Deputy Assistant Secretary for Technical and Financial Assistance or any official to whom the Deputy Assistant Secretary's functions may be redelegated by the Assistant Secretary.

DOE means the Department of Energy.

Dwelling Unit means a house, including a stationary mobile home, an apartment, a group of rooms, or a single room occupied as separate living quarters.

Elderly Person means a person who is 60 years of age or older.

Family Unit means all persons living together in a dwelling unit.

Formula Allocation means the amount of funds for each State as calculated based on the formula in § 440.10(b)(3).

Formula Share means the percentage of the total formula allocation provided to each State as calculated in § 440.10 (b)(3).

Governor means the chief executive officer of a State, including the Mayor of the District of Columbia.

Grantee means the State or other entity named in the Notification of Grant Award as the recipient.

Handicapped Person means any individual (1) who is a handicapped individual as defined in section 7(6) of the Rehabilitation Act of 1973, (2) who is under a disability as defined in section 1614(a)(3)(A) or 223(d)(1) of the Social Security Act or in section 102(7) of the Developmental Disabilities Services and Facilities Construction Act, or (3) who is receiving benefits under chapter 11 or 15 of title 38, U.S.C.

Heating Degree Days means a population-weighted seasonal average of the climatological heating degree days for each weather station within a State, as determined by DOE.

Incidental Repairs means those repairs necessary for the effective performance or preservation of weatherization materials. Such repairs include, but are not limited to, framing or repairing windows and doors which could not otherwise be caulked or weatherstripped and providing protective materials, such as paint, used to seal materials installed under this program.

Indian Tribe means any tribe, band, nation, or other organized group or community of Native Americans, including any Alaskan native village, or regional or village corporation as defined in or established pursuant to the Alaska Native Claims Settlement Act, Pub. L. 92–203, 85 Stat. 688, which (1) is recognized as eligible for the special programs and services provided by the United States to Native Americans because of their status as Native Americans, or (2) is located on, or in proximity to, a Federal or State reservation or rancheria.

JTPA means the Job Training Partnership Act, 29 U.S.C. 1501 *et seq.*

Local Applicant means a CAA or other public or non profit entity unit of general purpose local government.

Low Income means that income in relation to family size which:

(1) Is at or below 125 percent of the poverty level determined in accordance with criteria established by the Director of the Office of Management and Budget, except that the Secretary may establish a higher level if the Secretary, after consulting with the Secretary of Agriculture and the Secretary of Health and Human Services, determines that such a higher level is necessary to carry out the purposes of this part and is consistent with the eligibility criteria established for the weatherization program under section 222(a)(12) of the Economic Opportunity Act of 1964;

(2) Is the basis on which cash assistance payments have been paid during the preceding twelve month-period under titles IV and XVI of the Social Security Act or applicable State or local law; or

(3) If a State elects, is the basis for eligibility for assistance under the Low Income Home Energy Assistance Act of 1981, provided that such basis is at least 125 percent of the poverty level determined in accordance with criteria established by the Director of the Office of Management and Budget.

Native American means a person who is a member of an Indian tribe.

Program Allocation means the base allocation plus formula allocation for each State.

Relevant Reporting Period means the Federal fiscal year beginning on October 1 and running through September 30 of the following calendar year.

Rental Dwelling Unit means a dwelling unit occupied by a person who pays rent for the use of the dwelling unit.

Residential Energy Expenditures means the average annual cost of purchased residential energy, including the cost of renewable energy resources.

Secretary means the Secretary of the Department of Energy.

Separate Living Quarters means living quarters in which the occupants do not live and eat with any other persons in the structure and which have either direct access from the outside of the building or through a common hall or complete kitchen facilities for the exclusive use of the occupants. The occupants may be a single family, one person living alone, two or more families living together, or any other group of related or unrelated persons who share living arrangements, and includes shelters for homeless persons.

Shelter means a dwelling unit or units whose principal purpose is to house on a temporary basis individuals who may or may not be related to one another and who are not living in nursing homes, prisons, or similar institutional care facilities.

Single-Family Dwelling Unit means a structure containing no more than one dwelling unit.

Skirting means material used to border the bottom of a dwelling unit to prevent infiltration.

State means each of the States and the District of Columbia.

Subgrantee means an entity managing a weatherization project which receives a grant of funds awarded under this part from a grantee.

Support Office Director means the Director of the DOE Field Support Office with the responsibility for grant administration or any official to whom that function may be redelegated by the Assistant Secretary.

Total Program Allocations means the annual appropriation less funds reserved for training and technical assistance.

Tribal Organization means the recognized governing body of any Indian tribe or any legally established organization of Native Americans which is controlled, sanctioned, or chartered by such governing body.

Unit of General Purpose Local Government means any city, county, town, parish, village, or other general purpose political subdivision of a State.

Vestibule means an enclosure built around a primary entry to a dwelling unit.

Weatherization Materials mean:

(1) Caulking and weatherstripping of doors and windows;

(2) Furnace efficiency modifications including, but not limited to—

(i) Replacement burners, furnaces, or boilers or any combination thereof;

(ii) Devices for minimizing energy loss through heating system, chimney, or venting devices; and

(iii) Electrical or mechanical furnace ignition systems which replace standing gas pilot lights;

(3) Cooling efficiency modifications including, but not limited to—

(i) Replacement air conditioners;

(ii) Ventilation equipment;

(iii) Screening and window films; and

(iv) Shading devices.

Weatherization Project means a project conducted in a single geographical area which undertakes to weatherize dwelling units that are energy inefficient.

[49 FR 3629, Jan. 27, 1984, as amended at 50 FR 712, Jan. 4, 1985; 50 FR 49917, Dec. 5, 1985; 55 FR 41325, Oct. 10, 1990; 58 FR 12525, Mar. 4, 1993; 60 FR 29480, June 5, 1995]

§ 440.10 Allocation of funds.

(a) DOE shall allocate financial assistance for each State from sums appropriated for any fiscal year, upon annual application.

(b) Based on total program allocations at or above the amount of total

program allocations under Pub. L. 103–332, DOE shall determine the program allocation for each State from available funds as follows:

(1) Allocate to each State a ''Base Allocation'' as listed in Table 1.

TABLE 1

Alabama	1,636,000
Alaska	1,425,000
Arkansas	1,417,000
Arizona	760,000
California	4,404,000
Colorado	4,574,000
Connecticut	1,887,000
Delaware	409,000
District of Columbia	487,000
Florida	761,000
Georgia	1,844,000
Hawaii	120,000
Idaho	1,618,000
Illinois	10,717,000
Indiana	5,156,000
Iowa	4,032,000
Kansas	1,925,000
Kentucky	3,615,000
Louisiana	912,000
Maine	2,493,000
Maryland	1,963,000
Massachusetts	5,111,000
Michigan	12,346,000
Minnesota	8,342,000
Mississippi	1,094,000
Missouri	4,615,000
Montana	2,123,000
Nebraska	2,013,000
Nevada	586,000
New Hampshire	1,193,000
New Jersey	3,775,000
New Mexico	1,519,000
New York	15,302,000
North Carolina	2,853,000
North Dakota	2,105,000
Ohio	10,665,000
Oklahoma	1,846,000
Oregon	2,320,000
Pennsylvania	11,457,000
Rhode Island	878,000
South Carolina	1,130,000
South Dakota	1,561,000
Tennessee	3,218,000
Texas	2,999,000
Utah	1,692,000
Vermont	1,014,000
Virginia	2,970,000
Washington	3,775,000
West Virginia	2,573,000
Wisconsin	7,061,000
Wyoming	967,000
Total	171,258,000

(2) Subtract 171,258,000 from total program allocations.

(3) Calculate each State's formula share as follows:

(i) Divide the number of ''Low Income'' households in each State by the number of ''Low Income'' households in the United States and multiply by 100.

(ii) Divide the number of ''Heating Degree Days'' for each State by the median ''Heating Degree Days'' for all States.

(iii) Divide the number of ''Cooling Degree Days'' for each State by the median ''Cooling Degree Days'' for all States, then multiply by 0.1.

(iv) Calculate the sum of the two numbers from paragraph (b)(3)(ii) and (iii) of this section.

(v) Divide the residential energy expenditures for each State by the number of households in the State.

(vi) Divide the sum of the residential energy expenditures for the States in each Census division by the sum of the households for the States in that division.

(vii) Divide the quotient from paragraph (b)(3)(v) of this section by the quotient from paragraph (b)(3)(vi) of this section.

(viii) Multiply the quotient from paragraph (b)(3)(vii) of this section for each State by the residential energy expenditures per low-income household for its respective Census division.

(ix) Divide the product from paragraph (b)(3)(viii) of this section for each State by the median of the products of all States.

(x) Multiply the results for paragraph (b)(3)(i), (iv) and (ix) of this section for each State.

(xi) Divide the product in paragraph (b)(3)(x) of this section for each State by the sum of the products in paragraph (b)(3)(x) of this section for all States.

(4) Calculate each State's program allocation as follows:

(i) Multiply the remaining funds calculated in paragraph (b)(2) of this section by the formula share calculated in paragraph (b)(3)(xi) of this section,

(ii) Add the base allocation from paragraph (b)(1) of this section to the product of paragraph (b)(4)(i) of this section.

(c) Should total program allocations for any fiscal year fall below the total program allocations under Pub. L. 103-

332, then each State's program allocation shall be reduced from its allocated amount under Pub. L. 103–332 by the same percentage as total program allocations for the fiscal year fall below the total program allocations under Pub. L. 103–332.

(d) All data sources used in the development of the formula are publicly available. The relevant data is available from the Bureau of the Census, the Department of Energy's Energy Information Administration and the National Oceanic and Atmospheric Administration.

(e) Should updates to the data used in the formula become available in any fiscal year, these changes would be implemented in the formula in the following program year.

(f) DOE may reduce the program allocation for a State by the amount DOE determines cannot be reasonably expended by a grantee to weatherize dwelling units during the budget period for which financial assistance is to be awarded. In reaching this determination, DOE will consider the amount of unexpended financial assistance currently available to a grantee under this part and the number of dwelling units which remains to be weatherized with the unexpended financial assistance.

(g) DOE may increase the program allocation of a State by the amount DOE determines the grantee can expend to weatherize additional dwelling units during the budget period for which financial assistance is to be awarded.

(h) The Support Office Director shall notify each State of the program allocation for which that State is eligible to apply.

[60 FR 29480, June 5, 1995]

§ 440.11 Native Americans.

(a) Notwithstanding any other provision of this part, the Support Office Director may determine, after taking into account the amount of funds made available to a State to carry out the purposes of this part, that:

(1) The low-income members of an Indian tribe are not receiving benefits under this part equivalent to the assistance provided to other low-income persons in the State under this part and

(2) The low-income members of such tribe would be better served by means of a grant made directly to provide such assistance.

(b) In any State for which the Support Office Director shall have made the determination referred to in paragraph (a) of this section, the Support Office Director shall reserve from the sums that would otherwise be allocated to the State under this part not less than 100 percent, or more than 150 percent, of an amount which bears the same ratio to the State's allocation for the fiscal year involved as the population of all low-income Native Americans for whom a determination under paragraph (a) of this section has been made bears to the population of all low-income persons in the State.

(c) The Support Office Director shall make the determination prescribed in paragraph (a) of this section in the event a State:

(1) Does not apply within the sixty-day time period prescribed in §440.12(a);

(2) Recommends that direct grants be made for low-income members of an Indian tribe as provided in §440.12(b)(5);

(3) Files an application which DOE determines, in accordance with the procedures in §440.30, not to make adequate provision for the low-income members of an Indian tribe residing in the State; or

(4) Has received grant funds and DOE determines, in accordance with the procedures in §440.30, that the State has failed to implement the procedures required by §440.16(6).

(d) Any sums reserved by the Support Office Director pursuant to paragraph (b) of this section shall be granted to the tribal organization serving the individuals for whom the determination has been made, or where there is no tribal organization, to such other entity as the Support Office Director determines is able to provide adequate weatherization assistance pursuant to this part. Where the Support Office Director intends to make a grant to an organization to perform services benefiting more than one Indian tribe, the approval of each Indian tribe shall be a prerequisite for the issuance of a notice of grant award.

(e) Within 30 days after the Support Office Director has reserved funds pursuant to paragraph (b) of this section, the Support Office Director shall give written notice to the tribal organization or other qualified entity of the amount of funds reserved and its eligibility to apply therefor.

(f) Such tribal organization or other qualified entity shall thereafter be treated as a unit of general purpose local government eligible to apply for funds hereunder, pursuant to the provisions of § 440.13.

[49 FR 3629, Jan. 27, 1984, as amended at 58 FR 12529, Mar. 4, 1993]

§ 440.12 State application.

(a) To be eligible for financial assistance under this part, a State shall submit an application to DOE in conformity with the requirements of this part not later than 60 days after the date of notice to apply is received from the Support Office Director. After receipt of an application for financial assistance or for approval of an amendment to a State plan, the Support Office Director may request the State to submit within a reasonable period of time any revisions necessary to make the application complete or to bring the application into compliance with the requirements of this part. The Support Office Director shall attempt to resolve any dispute over the application informally and to seek voluntary compliance. If a State fails to submit timely appropriate revisions to complete the application, the Support Office Director may reject the application as incomplete in a written decision, including a statement of reasons, which shall be subject to administrative review under § 440.30 of this part.

(b) Each application shall include:

(1) The name and address of the State agency or office responsible for administering the program;

(2) A copy of the final State plan prepared after notice and a public hearing in accordance with § 440.14(a), except that an application by a local applicant need not include a copy of the final State plan;

(3) The budget for total funds applied for under the Act, which shall include a justification and explanation of any amounts requested for expenditure pursuant to § 440.18(d) for State administration;

(4) The total number of dwelling units proposed to be weatherized with grant funds during the budget period for which assistance is to be awarded—

(i) With financial assistance previously obligated under this part, and

(ii) With the program allocation to the State;

(5) A recommendation that a tribal organization be treated as a local applicant eligible to submit an application pursuant to § 440.13(b), if such a recommendation is to be made;

(6) A monitoring plan which shall indicate the method used by the State to insure the quality of work and adequate financial management control at the subgrantee level;

(7) A training and technical assistance plan which shall indicate how funds for training and technical assistance will be used; and

(8) Any further information which the Secretary finds necessary to determine whether an application meets the requirements of this part.

(c) On or before 60 days from the date that a timely filed application is complete, the Support Office Director shall decide whether DOE shall approve the application. The Support Office Director may—

(1) Approve the application in whole or in part to the extent that the application conforms to the requirements of this part;

(2) Approve the application in whole or in part subject to special conditions designed to ensure compliance with the requirements of this part; or

(3) Disapprove the application if it does not conform to the requirements of this part.

(Approved by the Office of Management and Budget under control number 1904–0047)

[49 FR 3629, Jan. 27, 1984, as amended at 50 FR 712, Jan. 4, 1985; 55 FR 41325, Oct. 10, 1990; 58 FR 12529, Mar. 4, 1993; 60 FR 29481, June 5, 1995]

§ 440.13 Local applications.

(a) The Support Office Director shall give written notice to all local applicants throughout a State of their eligibility to apply for financial assistance under this part in the event:

(1) A State, within which a local applicant is situated, fails to submit an application within 60 days after notice in accordance with § 440.12(a) or

(2) The Support Office Director finally disapproves the application of a State, and, under § 440.30, either no appeal is filed or the Support Office Director's decision is affirmed.

(b) To be eligible for financial assistance, a local applicant shall submit an application pursuant to § 440.12(b) to the Support Office Director within 30 days after receiving the notice referred to in paragraph (a) of this section.

(c) In the event one or more local applicants submits an application for financial assistance to carry out projects in the same geographical area, the Support Office Director shall hold a public hearing with the same procedures that apply under section § 440.14(a).

(d) Based on the information provided by a local applicant and developed in any hearing held under paragraph (c) of this section, the Support Office Director shall determine in writing whether to award a grant to carry out one or more weatherization projects.

(e) If there is an adverse decision in whole or in part under paragraph (d) of this section, that decision is subject to administrative review under § 440.30 of this part.

(f) If, after a State application has been finally disapproved by DOE and the Support Office Director approves local applications under this section, the Support Office Director may reject a new State application in whole or in part as disruptive and untimely without prejudice to submission of an application for the next program year.

(Approved by the Office of Management and Budget under control number 1904–0047)

[49 FR 3629, Jan. 27, 1984, as amended at 58 FR 12525, 12529, Mar. 4, 1993]

§ 440.14 State plans.

(a) Before submitting an application, a State shall give not less than 10 days notice of hearing, reasonably calculated to inform prospective subgrantees, and shall conduct one or more public hearing for the purpose of receiving comments on a proposed State plan. The proposed State plan shall identify and describe proposed weatherization projects, including a statement of proposed subgrantees and the amount each will receive; shall address the other items contained in paragraph (b) of this section; and shall be made available throughout the State prior to the hearing. The notice for the hearing shall specify that copies of the plan are available and how they may be obtained. A transcript of the hearings shall be prepared and written submission of views and data shall be accepted for the record.

(b) Subsequent to the hearing, the State shall prepare a final State plan which shall identify and describe:

(1) The production schedule for the State, which shall indicate projected expenditures and the number of dwelling units which are expected to be weatherized each quarter during the program year;

(2) An estimate of the number of dwelling units expected to be weatherized during the program year by category to include:

(i) Single-family and multi-family residences;

(ii) Elderly persons' residences;

(iii) Handicapped persons' residences;

(iv) Renters' residences;

(v) If Native Americans do not receive direct grants under § 440.11, Native American residences; and

(vi) Children's residences, if the State selects this category as a priority with paragraphs (b)(2)(ii) and (b)(2)(iii) of this section.

(3) The climatic conditions within the State;

(4) The type of weatherization work to be done;

(5) An estimate of the amount of energy to be conserved;

(6) An estimate of the number of eligible dwelling units in which the elderly reside;

(7) An estimate of the number of eligible dwelling units in which the handicapped reside;

(8) Each area to be served by a weatherization project within the State, and shall include for each area:

(i) The tentative allocation;

(ii) The number of dwelling units expected to be weatherized during the program year, and the number of previously weatherized units expected to be weatherized;

(iii) The estimated number of rental dwelling units to be weatherized; and

(iv) Sources of labor.

(9) The manner in which the State plan is to be implemented, and shall include:

(i) An analysis of the existence and effectiveness of any weatherization project being carried out by a subgrantee;

(ii) An explanation of the method used to select each area to be served by a weatherization project;

(iii) The extent to which priority will be given to the weatherization of single-family or other high energy consuming dwelling units;

(iv) The amount of non-Federal resources to be applied to the program;

(v) The amount of Federal resources, other than DOE weatherization grant funds, to be applied to the program;

(vi) The amount of weatherization grant funds allocated to the State under this part;

(vii) The expected average cost per dwelling to be weatherized, taking into account the total number of dwellings to be weatherized and the total amount of funds, Federal and non-Federal, expected to be applied to the program;

(viii) The average amount of the DOE funds specified in § 440.18(c) (1) through (11) to be applied to any dwelling unit;

(ix) The average amount of DOE funds to be applied to any dwelling unit for weatherization materials as specified in § 440.18(c)(1);

(x) The procedures used by the State for providing additional administrative funds to qualified subgrantees as specified in § 440.18(d).

(xi) Procedures for determining the most cost-effective measures in a dwelling unit or a statement that Project Retro-Tech or another DOE-approved audit will be used;

(xii) The definition of ''low income'' which the State has chosen for use statewide for determining eligibility under § 440.22(a).

(xiii) The definition of ''children'' which the State has chosen consistent with § 440.3.

(xiv) The amount of Federal funds to be used, and an explanation of how they will be used, to increase the amount of weatherization assistance that the State obtains from non-Federal sources, including private sources, and the expected leveraging effect to be accomplished.

(Approved by the Office of Management and Budget under control number 1904–0047)

[49 FR 3629, Jan. 27, 1984, as amended at 50 FR 712, Jan. 4, 1985; 58 FR 12526, Mar. 4, 1993; 60 FR 29481, June 5, 1995]

§ 440.15 Subgrantees.

(a) The grantee shall ensure that:

(1) Each subgrantee is a CAA or other public or nonprofit entity;

(2) Each subgrantee is selected on the basis of public comment received during a public hearing conducted pursuant to § 440.14(a) and other appropriate findings regarding:

(i) The subgrantee's experience and performance in weatherization or housing renovation activities;

(ii) The subgrantee's experience in assisting low-income persons in the area to be served; and

(iii) The subgrantee's capacity to undertake a timely and effective weatherization program.

(3) In selecting a subgrantee, preference is given to any CAA or other public or nonprofit entity which has, or is currently administering, an effective program under this part or under title II of the Economic Opportunity Act of 1964, with program effectiveness evaluated by consideration of factors including, but not necessarily limited to, the following:

(i) The extent to which the past or current program achieved or is achieving weatherization goals in a timely fashion;

(ii) The quality of work performed by the subgrantee;

(iii) The number, qualifications, and experience of the staff members of the subgrantee; and

(iv) The ability of the subgrantee to secure volunteers, training participants, and public service employment workers pursuant to JTPA.

(b) The grantee shall ensure that the funds received under this part will be allocated to the entities selected in accordance with paragraph (a) of this section, such that funds will be allocated to areas on the basis of the relative need for a weatherization project by low-income persons.

(c) If DOE finds that a subgrantee selected to undertake weatherization activities under this part has failed to comply substantially with the provisions of the Act or this part and should be replaced, such finding shall be treated as a finding under § 440.30(i) for purposes of § 440.30.

(d) Any new or additional subgrantee shall be selected at a hearing in accordance with § 440.14(a) and upon the basis of the criteria in paragraph (a) of this section.

(e) A State may terminate financial assistance under a subgrant agreement for a grant period only in accordance with established State procedures that provide to the subgrantee appropriate notice of the State's reasons for termination and afford the subgrantee an adequate opportunity to be heard.

[49 FR 3629, Jan. 27, 1984, as amended at 55 FR 41326, Oct. 10, 1990; 58 FR 12526, Mar. 4, 1993]

§ 440.16 Minimum program requirements.

Prior to the expenditure of any grant funds each grantee shall develop, publish, and implement procedures to ensure that:

(a) No dwelling unit may be weatherized without documentation that the dwelling unit is an eligible dwelling unit as provided in § 440.22;

(b) Priority is given to identifying and providing weatherization assistance to elderly and handicapped low-income persons and such priority as the applicant determines is appropriate is given to dwelling units containing children and to single-family or other high-energy-consuming dwelling units;

(c) Financial assistance provided under this part will be used to supplement, and not supplant, State or local funds, and, to the maximum extent practicable as determined by DOE, to increase the amounts of these funds that would be made available in the absence of Federal funds provided under this part;

(d) To the maximum extent practicable, the grantee will secure the services of volunteers when such personnel are generally available, training participants and public service employment workers, pursuant to JTPA, to work under the supervision of qualified supervisors and foremen;

(e) To the maximum extent practicable, the use of weatherization assistance shall be coordinated with other Federal, State, local, or privately funded programs in order to improve energy efficiency and to conserve energy;

(f) The low-income members of an Indian tribe shall receive benefits equivalent to the assistance provided to other low-income persons within a State unless the grantee has made the recommendation provided in § 440.12(b)(5);

(g) No dwelling unit may be reported to DOE as completed until all weatherization materials have been installed and the subgrantee, or its authorized representative, has performed a final inspection(s) including any mechanical work performed and certified that the work has been completed in a workmanlike manner and in accordance with the priority determined by the audit procedures required by § 440.21; and

(h) Subgrantees limit expenditure of funds under this part for installation of materials (other than weatherization materials) to abate energy-related health and safety hazards, to a list of types of such hazards, permissible abatement materials and their costs which is submitted, and updated as necessary at the same time as an annual application under § 440.12 of this part and which DOE shall approve if—

(1) Elimination of such hazards are necessary before, or as a result of, installation of weatherization materials; and

(2) The grantee sets forth a limitation on the percent of average dwelling unit costs which may be used to abate such hazards which is reasonable in light of the primary energy conservation purpose of this part;

(i) The benefits of weatherization to occupants of rental units are protected in accordance with § 440.22(b)(3) of this part.

(Approved by the Office of Management and Budget under control number 1904–0047)

[49 FR 3629, Jan. 27, 1984, as amended at 58 FR 12526, Mar. 4, 1993]

§ 440.17 Policy Advisory Council.

(a) Prior to the expenditure of any grant funds, a State policy advisory council shall be established by a State or by the Support Office Director if a State does not participate in the program which:

(1) Has special qualifications and sensitivity with respect to solving the problems of low-income persons, including the weatherization and energy conservation problems of these persons;

(2) Is broadly representative of organizations and agencies, including consumer groups that represent low-income persons, particularly elderly and handicapped low-income persons and low-income Native Americans, in the State or geographical area in question; and

(3) Has responsibility for advising the appropriate official or agency administering the allocation of financial assistance in the State or area with respect to the development and implementation of a weatherization assistance program.

[49 FR 3629, Jan. 27, 1984, as amended at 58 FR 12529, Mar. 4, 1993]

§ 440.18 Allowable expenditures.

(a) An average of at least 40 percent of the funds provided in a State under this part for weatherization materials, labor, and related matters included in paragraphs (c)(1) through (9) of this section shall be spent for weatherization materials, except if DOE approves a State's application to waive the 40 percent requirement under § 440.21(h).

(b) The expenditure of financial assistance provided under this part for labor, weatherization materials, and related matters included in paragraphs (c)(1) through (9) and (c)(15) of this section shall not exceed an average of $1,600 per dwelling unit weatherized in the State, except as adjusted as follows:

(1) The $1,600 average will be adjusted annually by DOE beginning in calendar year 1991 by increasing the limitation by an amount equal to:

(i) The limitation amount for the previous year, multiplied by

(ii) The lesser of:

(A) The percentage increase in the Consumer Price Index (all items, United States city average) for the most recent calendar year completed before the beginning of the year for which the determination is being made, or

(B) Three percent.

(2) In addition to the average per-dwelling-unit limitation applicable in a State under this section, DOE shall, upon application by a State, establish a separate average per-dwelling-unit limitation for dwelling units in such States which conform to program requirements and, in addition to any other weatherization modifications, have capital-intensive furnace or cooling efficiency modifications as defined in § 440.3 made under this part. The average per-dwelling-unit limitation applicable in a State which meets these requirements shall not exceed an amount equal to:

(i) The amount permitted for the expenditure of financial assistance for labor, weatherization materials, and related matters for dwelling units in such State in paragraphs (c) (1) through (9) and (c)(15) of this section plus

(ii) An amount determined by the State to be the average amount that is appropriate for capital-intensive furnace or cooling efficiency modifications of dwelling units of the type assisted under this part in such State and approved by DOE.

(c) Allowable expenditures under this part include only:

(1) The cost of purchase and delivery of weatherization materials;

(2) Labor costs, in accordance with § 440.19;

(3) Transportation of weatherization materials, tools, equipment, and work crews to a storage site and to the site of weatherization work;

(4) Maintenance, operation, and insurance of vehicles used to transport weatherization materials;

(5) Maintenance of tools and equipment;

(6) Purchase or annual lease of tools, equipment, and vehicles, except that any purchase of vehicles shall be referred to DOE for prior approval in every instance;

(7) Employment of on-site supervisory personnel;

(8) Storage of weatherization materials, tools, and equipment;

(9) The cost of incidental repairs if such repairs are necessary to make the installation of weatherization materials effective;

(10) The cost of liability insurance for weatherization projects for personal injury and for property damage;

(11) The cost of carrying out low-cost/no-cost weatherization activities in accordance with § 440.20;

(12) The cost of weatherization program financial audits as required by § 440.23(d);

(13) Allowable administrative expenses under paragraph (d) of this section; and

(14) Funds used for leveraging activities in accordance with § 440.14(b)(9)(xiv); and

(15) The cost of eliminating health and safety hazards elimination of which is necessary before, or because of, installation of weatherization materials.

(d) Not more than 10 percent of any grant made to a State may be used by the grantee and subgrantees for administrative purposes in carrying out duties under this part, except that not more than 5 percent may be used by the State for such purposes, and not less than 5 percent must be made available to subgrantees by States. A State may provide in its annual plan for recipients of grants of less than $350,000 to use up to an additional 5 percent of such grants for administration if the State has determined that such recipient requires such additional amount to implement effectively the administrative requirements established by DOE pursuant to this part.

(e) No grant funds awarded under this part shall be used for any of the following purposes:

(1) To weatherize a dwelling unit which is designated for acquisition or clearance by a Federal, State, or local program within 12 months from the date weatherization of the dwelling unit would be scheduled to be completed; or

(2) To install or otherwise provide weatherization materials for a dwelling unit weatherized previously with grant funds under this part, except:

(i) As provided under § 440.20;

(ii) If such dwelling unit has been damaged by fire, flood, or act of God and repair of the damage to weatherization materials is not paid for by insurance; or

(iii) That dwelling units partially weatherized under this part or under other Federal programs during the period September 30, 1975, through September 30, 1985, may receive further financial assistance for weatherization under this part. While DOE will continue to require these homes to be reported separately, States may count these homes as completions for the purposes of compliance with the per-home expenditure limit in § 440.18. Each dwelling unit must receive a new energy audit which takes into account any previous energy conservation improvements to the dwelling.

[58 FR 12526, Mar. 4, 1993]

§ 440.19 Labor.

(a) Payments for labor costs under § 440.18(c)(2) shall consist of:

(1) Payments permitted by the Department of Labor to supplement wages paid to training participants and public service employment workers pursuant to JTPA and

(2) Payments to employ labor (particularly persons eligible for training under JTPA) or to engage a contractor (particularly a nonprofit organization or a business owned by disadvantaged individuals which performs weatherization services), provided a grantee has determined an adequate number of volunteers, training participants, and public service employment workers, assisted pursuant to JTPA, are not available to weatherize dwelling units for a subgrantee under the supervision of qualified supervisors.

[49 FR 3629, Jan. 27, 1984, as amended at 50 FR 713, Jan. 4, 1985; 58 FR 12527, Mar. 4, 1993]

§ 440.20 Low-cost/no-cost weatherization activities.

(a) An eligible dwelling unit may be weatherized without regard to the limitations contained in § 440.18 (e)(2) or § 440.21(b) from funds designated by the grantee for carrying out low-cost/no-

cost weatherization activities provided:

(1) Inexpensive weatherization materials are used, such as water flow controllers, furnace or cooling filters, or items which are primarily directed toward reducing infiltration, including weatherstripping, caulking, glass patching, and insulation for plugging and

(2) No labor paid with funds provided under this part is used to install weatherization materials referred to in paragraph (a)(1) of this section.

(b) A maximum of 10 percent of the amount allocated to a subgrantee, not to exceed $50 in materials costs per dwelling unit, may be expended to carry out low-cost/no-cost weatherization activities, unless the Support Office Director approves a higher expenditure per dwelling unit.

[49 FR 3629, Jan. 27, 1984, as amended at 50 FR 713, Jan. 4, 1985; 58 FR 12529, Mar. 4, 1993]

§ 440.21 Standards and techniques for weatherization.

(a) Paragraphs (b) through (g) of this section set forth the energy audit procedures which apply to the grantees and subgrantees who are subject to the 40 percent material cost requirement in § 440.18(a) of this part. Paragraphs (b), (d), (e), and (h) through (k) of this section set forth the requirements for the energy audit procedures which, if satisfied in the State plan, warrant approval of a State's application to waive the 40 percent material cost requirement in § 440.18(a) of this part.

(b) Only weatherization materials which are listed in appendix A and which meet or exceed standards prescribed in appendix A to this part shall be purchased with funds provided under this part, except that DOE may approve an unlisted material upon application from any State.

(c) The most cost-effective weatherization materials for each dwelling unit shall be determined by audit procedures using the following formula:

(1) The cost of fuel saved per year by installing a weatherization material in a dwelling unit;

(2) Multiplied by the appropriate lifetime of the weatherization material; and

(3) Divided by the cost of the weatherization material and the cost of the installation of the weatherization material.

(d) The computation of the cost of fuel saved per year must take into account the number of heating or cooling degree days in the area of which the computation is being made and must otherwise use reasonable methods and assumptions.

(e) The figures used for the lifetime of the materials and for the costs of materials and cost of the installation of the materials must be generally accepted in the relevant trade.

(f) The weatherization materials which shall be installed first are those which are determined to be the most cost effective using the formula in paragraph (c) of this section.

(g) The audit procedures used in Project Retro-Tech to determine the most cost-effective weatherization materials comply with this section. The grantee or subgrantee may use other audit procedures to determine the most cost-effective weatherization materials, provided that these procedures comply with this section and are approved by the Support Office Director prior to their use. A grantee or subgrantee may use results obtained from audits conducted under the Residential Conservation Service Program as part of the audit procedures which have been approved by the Support Office Director.

(h) The energy audit procedures must—

(1) Consider the rate of energy use;

(2) Address significant heating and cooling needs;

(3) Make provision for use of advanced diagnostic and assessment techniques which DOE has determined are consistent with sound engineering practices;

(4) Determine energy use from actual energy bills or by generally accepted engineering calculations;

(5) Consistent with paragraphs (d) and (e) of this section, determine that each weatherization material is cost effective by ensuring that the net fuel cost savings over the lifetime of such weatherization material, discounted to present value in accordance with paragraph (i) of this section, to the costs to

be claimed as allowable under § 440.18(c)(1), (2), and (7), and any other significant, related cost required to be included by a State, is greater than or equal to one;

(6) Assign priorities among weatherization materials in descending order of their cost effectiveness ratios calculated under paragraph (h)(5) of this section;

(i) After adjusting those ratios for interaction between architectural and mechanical weatherization materials by decreasing the estimated fuel cost savings for a lower priority weatherization material in light of fuel cost savings for a related higher priority weatherization material; and

(ii) Eliminating any weatherization material if its cost effectiveness ratio, as adjusted under paragraph (h)(6) of this section, is less than one;

(7) Determine that the total conservation investment has a positive rate of return by ensuring that the ratio of the cumulative net fuel cost savings of all weatherization materials, adjusted for interaction between architectural and mechanical weatherization materials if any, to the cumulative costs included under paragraph (h)(5) of this section and the costs to be claimed as allowable under § 440.18(c)(9), is greater than or equal to one;

(8) Identify health and safety hazards to be abated with DOE funds in compliance with the State's DOE-approved health and safety procedures under § 440.16(h); and

(9) Treat the dwelling unit as a whole system by examining its heating and cooling system, its air exchange system and it occupants' living habits and needs, and making necessary adjustments to the priority of weatherization materials with adequate documentation of the reasons for such an adjustment.

(i) The energy audit must provide for use of the annually adjusted discount rate provided by DOE except that a State may keep that rate constant up to 5 years or may use a reasonable higher real discount rate. Subject to a ceiling of 10 percent and floor of 3 percent and subject to adjustment by DOE region for a rate of fuel cost escalation predicted by the DOE Energy Information Administration, DOE shall calculate annually the adjusted discount rate, for use under paragraph (h) of this section as a 12-month average of the composite yields of all outstanding U.S. Treasury bonds neither due nor callable in less than 10 years, as most recently reported by the Federal Reserve, adjusted to exclude estimated increases in the general level of prices consistent with projections of inflation in the most recent Economic Report of the President's Council of Economic Advisers.

(j) For typical dwelling units without unusual energy consuming characteristics which significantly alter typical energy usage, energy audits may be accomplished by using a priority list developed by conducting, in compliance with paragraph (h) of this section, site-specific energy audits of a representative sample of typical dwelling units for each major dwelling type covered by the State's weatherization program. Priority lists developed in accordance with this paragraph must be revalidated by conducting a representative sample of site-specific energy audits every 5 years.

(k) Subject to DOE approval, a State may use as a part of an energy audit, a list of presumptively cost effective general heat waste reduction weatherization materials and the circumstance under which such materials may be presumed cost effective without need for further audit justification if those materials are shown to be cost effective in typical dwelling units for major dwelling unit types in the State based on documentation of a representative number of site-specific energy audits.

[58 FR 12527, Mar. 4, 1993]

§ 440.22 Eligible dwelling units.

(a) A dwelling unit shall be eligible for weatherization assistance under this part if it is occupied by a family unit:

(1) Whose income is at or below 125 percent of the poverty level determined in accordance with criteria established by the Director of the Office of Management and Budget;

(2) Which contains a member who has received cash assistance payments under Title IV or XVI of the Social Security Act or applicable State or local

law at any time during the 12-month period preceding the determination of eligibility for weatherization assistance; or

(3) If the State elects, is eligible for assistance under the Low-Income Home Energy Assistance Act of 1981, provided that such basis is at least 125 percent of the poverty level determined in accordance with criteria established by the Director of the Office of Management and Budget.

(b) A subgrantee may weatherize a building containing rental dwelling units using financial assistance for dwelling units eligible for weatherization assistance under paragraph (a) of this section, where:

(1) The subgrantee has obtained the written permission of the owner or his agent;

(2) Not less than 66 percent (50 percent for duplexes and four-unit buildings) of the dwelling units in the building:

(i) Are eligible dwelling units, or

(ii) Will become eligible dwelling units within 180 days under a Federal, State, or local government program for rehabilitating the building or making similar improvements to the building; and

(3) The grantee has established procedures for dwellings which consist of a rental unit or rental units to ensure that:

(i) The benefits of weatherization assistance in connection with such rental units, including units where the tenants pay for their energy through their rent, will accrue primarily to the low-income tenants residing in such units;

(ii) For a reasonable period of time after weatherization work has been completed on a dwelling containing a unit occupied by an eligible household, the tenants in that unit (including households paying for their energy through their rent) will not be subjected to rent increases unless those increases are demonstrably related to matters other than the weatherization work performed;

(iii) The enforcement of paragraph (b)(3)(ii) of this section is provided through procedures established by the State by which tenants may file complaints, and owners, in response to such complaints, shall demonstrate that the rent increase concerned is related to matters other than the weatherization work performed; and

(iv) No undue or excessive enhancement shall occur to the value of the dwelling units.

(c) In order to secure the Federal investment made under this part and address the issues of eviction from and sale of property receiving weatherization materials under this part, States may seek landlord agreement to placement of a lien or to other contractual restrictions;

(d) As a condition of having assistance provided under this part with respect to multifamily buildings, a State may require financial participation, when feasible, from the owners of such buildings. Such financial participation shall not be reported as program income, nor will it be treated as if it were appropriated funds. The funds contributed by the landlord shall be expended in accordance with the agreement between the landlord and the weatherization agency.

(e) In devising procedures under paragraph (b)(3)(iii) of this section, States should consider requiring use of alternative dispute resolution procedures including arbitration.

(f) A State may weatherize shelters. For the purpose of determining how many dwelling units exist in a shelter, a grantee may count each 800 square feet of the shelter as a dwelling unit or it may count each floor of the shelter as a dwelling unit.

[58 FR 12528, Mar. 4, 1993]

§ 440.23 Oversight, training, and technical assistance.

(a) The Secretary and the appropriate Support Office Director, in coordination with the Secretary of Health and Human Services, shall monitor and evaluate the operation of projects carried out by CAA's receiving financial assistance under this part through on-site inspections, or through other means, in order to ensure the effective provision of weatherization assistance for the dwelling units of low-income persons.

(b) DOE shall also carry out periodic evaluations of a program and weatherization projects that are not carried

out by a CAA and that are receiving financial assistance under this part.

(c) The Secretary and the appropriate Support Office Director, the Comptroller General of the United States, and for a weatherization project carried out by a CAA, the Secretary of Health and Human Services or any of their duly authorized representatives, shall have access to any books, documents, papers, information, and records of any weatherization project receiving financial assistance under the Act for the purpose of audit and examination.

(d) Each grantee shall ensure that audits by or on behalf of subgrantees are conducted with reasonable frequency, on a continuing basis, or at scheduled intervals, usually annually, but not less frequently than every two years, in accordance with 10 CFR part 600, and OMB Circular 110, Attachment F, as applicable.

(e) The Secretary may reserve from the funds appropriated for any fiscal year an amount not to exceed 10 percent to provide, directly or indirectly, training and technical assistance to any grantee or subgrantee. Such training and technical assistance may include providing information concerning conservation practices to occupants of eligible dwelling units.

[49 FR 3629, Jan. 27, 1984, as amended at 58 FR 12529, Mar. 4, 1993]

§ 440.24 Recordkeeping.

Each grantee or subgrantee receiving Federal financial assistance under this part shall keep such records as DOE shall require, including records which fully disclose the amount and disposition by each grantee and subgrantee of the funds received, the total cost of a weatherization project or the total expenditure to implement the State plan for which assistance was given or used, the source and amount of funds for such project or program not supplied by DOE, the average costs incurred in weatherization of individual dwelling units, the average size of the dwelling being weatherized, the average income of households receiving assistance under this part, and such other records as DOE deems necessary for an effective audit and performance evaluation. Such recordkeeping shall be in accordance with the DOE Financial Assistance Rule, 10 CFR part 600, and any further requirements of this part.

[58 FR 12529, Mar. 4, 1993]

§ 440.25 Reports.

DOE may require any recipient of financial assistance under this part to provide, in such form as may be prescribed, such reports or answers in writing to specific questions, surveys, or questionnaires as DOE determines to be necessary to carry out its responsibilities or the responsibilities of the Secretary of Health and Human Services under this part.

(Approved by the Office of Management and Budget under control number 1901–0127)

§§ 440.26–440.29 [Reserved]

§ 440.30 Administrative review.

(a) An applicant shall have 20 days from the date of receipt of a decision under § 440.12 or § 440.13 to file a notice requesting administrative review. If an applicant does not timely file such a notice, the decision under § 440.12 or § 440.13 shall become final for DOE.

(b) A notice requesting administrative review shall be filed with the Support Office Director and shall be accompanied by a written statement containing supporting arguments and requesting, if desired, the opportunity for a public hearing.

(c) A notice or any other document shall be deemed filed under this section upon receipt.

(d) On or before 15 days from receipt of a notice requesting administrative review which is timely filed, the Support Office Director shall forward to the Deputy Assistant Secretary, the notice requesting administrative review, the decision under § 440.12 or § 440.13 as to which administrative review is sought, a draft recommended final decision for the concurrence of the Deputy Assistant Secretary, and any other relevant material.

(e) If the applicant requests a public hearing, the Deputy Assistant Secretary, within 15 days, shall give actual notice to the State and FEDERAL REGISTER notice of the date, place, time, and procedures which shall apply to the public hearing. Any public hearing

under this section shall be informal and legislative in nature.

(f) On or before 45 days from receipt of documents under paragraph (d) of this section or the conclusion of the public hearing, whichever is later, the Deputy Assistant Secretary shall concur in, concur in as modified, or issue a substitute for the recommended decision of the Support Office Director.

(g) On or before 15 days from the date of receipt of the determination under paragraph (f) of this section, the Governor may file an application, with a supporting statement of reasons, for discretionary review by the Assistant Secretary. On or before 15 days from filing, the Assistant Secretary shall send a notice to the Governor stating whether the Deputy Assistant Secretary's determination will be reviewed. If the Assistant Secretary grants review, a decision shall be issued no later than 60 days from the date review is granted. The Assistant Secretary may not issue a notice or decision under this paragraph without the concurrence of the DOE Office of General Counsel.

(h) A decision under paragraph (f) of this section shall be final for DOE if there is no review under paragraph (g) of this section. If there is review under paragraph (g) of this section, the decision thereunder shall be final for DOE, and no appeal shall lie elsewhere in DOE.

(i) Prior to the effective date of the termination of eligibility for further participation in the program because of failure to comply substantially with the requirements of the Act or of this part, a grantee shall have the right to written notice of the basis for the enforcement action and the opportunity for a public hearing notwithstanding any provisions to contrary of 10 CFR 600.26, 600.28(b), 600.29, 600.121(c), and 600.443. A notice under this paragraph shall be mailed by the Support Office Director by registered mail, return-receipt requested, to the State, local grantee, and other interested parties. To obtain a public hearing, the grantee must request an evidentiary hearing, with prior FEDERAL REGISTER notice, in the election letter submitted under Rule 2 of 10 CFR 1024.4 and the request shall be granted notwithstanding any provisions of Rule 2 to the contrary.

[55 FR 41326, Oct. 10, 1990, as amended at 58 FR 12529, Mar. 4, 1993]

APPENDIX A—STANDARDS FOR WEATHERIZATION MATERIALS

The following Government standards are produced by the Consumer Product Safety Commission and are published in title 16, Code of Federal Regulations:

Thermal Insulating Materials for Building Elements Including Walls, Floors, Ceilings, Attics, and Roofs Insulation—organic fiber—conformance to Interim Safety Standard in 16 CFR part 1209;

Fire Safety Requirements for Thermal Insulating Materials According to Insulation Use—Attic Floor—insulation materials intended for exposed use in attic floors shall be capable of meeting the same flammability requirements given for cellulose insulation in 16 CFR part 1209;

Enclosed spaces—insulation materials intended for use within enclosed stud or joist spaces shall be capable of meeting the smoldering combustion requirements in 16 CFR part 1209.

The following standards which are not otherwise set forth in part 440 are incorporated by reference and made a part of part 440. The following standards have been approved for incorporation by reference by the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR part 51. These materials are incorporated as they exist on April 5, 1993 and a notice of any change in these materials will be published in the FEDERAL REGISTER. The standards incorporated by reference are available for inspection at the Office of the Federal Register Information Center, 800 North Capitol Street, suite 700, Washington, DC.

The standards incorporated by reference in part 440 can be obtained from the following sources:

Air Conditioning and Refrigeration Institute, 1501 Wilson Blvd., Arlington, VA 22209; (703) 524–8800.

American Gas Association, 1515 Wilson Blvd., Arlington, VA 22209; (703) 841–8400.

American National Standards Institute, Inc., 1430 Broadway, New York, NY 10018; (212) 642–4900.

American Society of Mechanical Engineers, United Engineering Center, 345 East 47th Street, New York, NY 10017; (212) 705–7800.

American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103; (215) 299–5400.

American Architectural Manufacturers Association, 1540 East Dundee Road, Palatine, IL 60067; (708) 202–1350.

Federal Specifications, General Services Administration, Specifications Section,

Room 6654, 7th and D Streets, SW, Washington, DC 20407; (202) 708–5082.
Gas Appliance Manufacturers Association, 1901 Moore St., Arlington, VA 22209; (703) 525–9565.
National Electrical Manufacturers Association, 2101 L Street, NW, Suite 300, Washington, DC 20037; (202) 457–8400.
National Fire Protection Association, Batterymarch Park, P.O. Box 9101, Quincy, MA 02269; (617) 770–3000.
National Standards Association, 1200 Quince Orchard Blvd., Gaithersburg, MD 20878; (301) 590–2300. (NSA is a local contact for materials from ASTM).
National Wood Window and Door Association, 1400 East Touhy Avenue, Des Plaines, IL 60018; (708) 299–5200.
Sheet Metal and Air Conditioning Contractors Association, P.O. Box 221230, Chantilly, VA 22022–1230; (703) 803–2980.
Steel Door Institute, 712 Lakewood Center North, 14600 Detroit Avenue, Cleveland, OH 44107; (216) 899–0100.
Steel Window Institute, 1230 Keith Building, Cleveland, OH 44115; (216) 241–7333.
Tubular Exchanger Manufacturers Association, 25 North Broadway, Tarrytown, NY 10591; (914) 332–0040.
Underwriters Laboratories, Inc., P.O. Box 75530, Chicago, IL 60675–5330; (708) 272–8800.

More information regarding the standards in this reference can be obtained from the following sources:

Environmental Protection Agency, 401 M Street, NW, Washington, DC 20006; (202) 554–1080.
National Institute of Standards and Technology, U.S. Department of Commerce, Gaithersburg, MD 20899, (301) 975–2000
Weatherization Assistance Programs Division, Conservation and Renewable Energy, Mail Stop 5G–023, Forrestal Bldg, 1000 Independence Ave, SW, Washington, DC 20585; (202) 586–2207.

THERMAL INSULATING MATERIALS FOR BUILDING ELEMENTS INCLUDING WALLS, FLOORS, CEILINGS, ATTICS, AND ROOFS

[Standards for conformance]

Insulation—mineral fiber:	
Blanket insulation	ASTM[1] C665–88.
Roof insulation board	ASTM C726–88.
Loose-fill insulation	ASTM C764–88.
Insulation—mineral cellular:	
Vermiculite loose-fill insulation.	ASTM C516–80 (1990).
Perlite loose-fill insulation	ASTM C549–81 (1986).
Cellular glass insulation block.	ASTM C552–88.
Perlite insulation board	ASTM C728–89a.
Insulation—organic fiber:	
Cellulosic fiber insulating board.	ASTM C208–72 (1982).

THERMAL INSULATING MATERIALS FOR BUILDING ELEMENTS INCLUDING WALLS, FLOORS, CEILINGS, ATTICS, AND ROOFS—Continued

[Standards for conformance]

Cellulose loose-fill insulation	ASTM C739–88.
Insulation-organic cellular:	
Preformed block-type polystyrene insulation.	ASTM C578–87a.
Rigid preformed polyurethane insulation board.	ASTM C591–85.
Polyurethane or polyisocyanurate insulation board faced with aluminum foil on both sides.	FS[2] HH-I–1972/1 (1981).
Polyurethane or polyisocyanurate insulation board faced with felt on both sides.	FS HH-I–1972/2 (1981). And Amendment 1, October 3, 1985.
Insulation—composite boards:	
Mineral fiber and rigid cellular polyurethane composite roof insulation board.	ASTM C726–88.
Perlite board and rigid cellular polyurethane composite roof insulation.	ASTM C984–83.
Gypsum board and polyurethane or polisocyanurate composite board.	FS HH–I–1972/4 (1981).
Materials used as a patch to reduce infiltration through the building envelope.	Commercially available.

[1] ASTM indicates American Society for Testing and Materials.
[2] FS indicates Federal Specifications.

THERMAL INSULATING MATERIALS FOR PIPES, DUCTS, AND EQUIPMENT SUCH AS BOILERS AND FURNACES

[Standards for conformance]

Insulation—mineral fiber:	
Preformed pipe insulation	ASTM[1] C547–77.
Blanket and felt insulation (industrial type).	ASTM C553–70 (1977).
Blanket insulation and blanket type pipe insulation (metal-mesh covered) (industrial type).	ASTM C592–80.
Block and board insulation	ASTM C612–83.
Spray applied fibrous insulation for elevated temperature.	ASTM C720–89.
High-temperature fiber blanket insulation.	ASTM C892–89.
Duct work insulation	Selected and applied according to ASTM C971–82.
Insulation—mineral cellular:	
Diatomaceous earth block and pipe insulation.	ASTM C517–71 (1979)

THERMAL INSULATING MATERIALS FOR PIPES, DUCTS, AND EQUIPMENT SUCH AS BOILERS AND FURNACES—Continued

[Standards for conformance]

Calcium silicate block and pipe insulation.	ASTM C533–85 (1990).
Cellular glass insulation	ASTM C552–88.
Expanded perlite block and pipe insulation.	ASTM C610–85.
Insulation—Organic Cellular:	
Preformed flexible elastomeric cellular insulation in sheet and tubular form.	ASTM C534–88.
Unfaced preformed rigid cellular polyurethane insulation.	ASTM C591–85.
Insulation skirting	Commercially available.

[1] ASTM indicates American Society for Testing and Materials.

FIRE SAFETY REQUIREMENTS FOR INSULATING MATERIALS ACCORDING TO INSULATION USE

[Standards for conformance]

Attic floor	Insulation materials intended for exposed use in attic floors shall be capable of meeting the same smoldering combustion requirements given for cellulose insulation in ASTM [1] C739–88.
Enclosed space.	Insulation materials intended for use within enclosed stud or joist spaces shall be capable of meeting the smoldering combustion requirements in ASTM C739–88.
Exposed interior walls and ceilings.	Insulation materials, including those with combustible facings, which remain exposed and serve as wall or ceiling interior finish, shall have a flame spread classification not to exceed 150 (per ASTM E84–89a).
Exterior envelope walls and roofs.	Exterior envelope walls and roofs containing thermal insulations shall meet applicable local government building code requirements for the complete wall or roof assembly.
Pipes, ducts, and equipment.	Insulation materials intended for use on pipes, ducts and equipment shall be capable of meeting a flame spread classification not to exceed 150 (per ASTM E84–89a).

[1] ASTM indicates American Society for Testing and Materials.

STORM WINDOWS

[Standards for conformance]

Storm windows:	
Aluminum insulating storm windows.	ANSI/AAMA [1] 1002.10–83.
Aluminum frame storm windows.	ANSI/AAMA 1002.10–83.
Wood frame storm windows.	ANSI/NWWDA [2] I.S. 2–87. (Section 3)
Rigid vinyl frame storm windows.	ASTM [3] D4099–89.
Frameless plastic glazing storm.	Required minimum thickness windows is 6 mil (.006 inches).
Movable insulation systems for windows.	Commercially available.

[1] ANSI/AAMA indicates American National Standards Institute/American Architectural Manufacturers Association.
[2] ANSI/NWWDA indicates American National Standards Institute/National Wood Window & Door Association.
[3] ASTM indicates American Society for Testing and Materials.

STORM DOORS

[Standards for conformance]

Storm doors—Aluminum:	
Storm Doors	ANSI/AAMA [1] 1102.7–89.
Sliding glass storm doors.	ANSI/AAMA 1002.10–83.
Wood storm doors	ANSI/NWWDA [2] I.S. 6–86.
Rigid vinyl storm doors ...	ASTM [3] D3678–88.
Vestibules:	
Materials to construct vestibules.	Commercially available.
Replacement windows:	
Aluminum frame windows.	ANSI/AAMA 101–88.
Steel frame windows ...	Steel Window Institute recommended specifications for steel windows, 1990.
Wood frame windows ..	ANSI/NWWDA I.S. 2–87.
Rigid vinyl frame windows.	ASTM D4099–89.

[1] ANSI/AAMA indicates American National Standards Institute/American Architectural Manufacturers Association.
[2] ANSI/NWWDA indicates American National Standards Institute/National Wood Window & Door Association.
[3] ASTM indicates American Society for Testing and Materials.

REPLACEMENT DOORS

[Standards for conformance]

Replacement doors—	
Hinged doors:	
Steel doors	ANSI/SDI [1] 100–1985.
Wood doors:	
Flush doors	ANSI/NWWDA [2] I.S. 1–87. (exterior door provisions)
Pine, fir, hemlock and spruce doors.	ANSI/NWWDA I.S. 6–86.
Sliding patio doors:	
Aluminum doors	ANSI/AAMA [3] 101–88.

REPLACEMENT DOORS—Continued

[Standards for conformance]

Wood doors	NWWDA I.S. 3–83.

[1] ANSI/SDI indicates American National Standards Institute/Steel Door Institute.
[2] ANSI/NWWDA indicates American National Standards Institute/National Wood Window & Door Association.
[3] ANSI/AAMA indicates American National Standards Institute/American Architectural Manufacturers Association.

CAULKS AND SEALANTS:

[Standards for conformance]

Caulks and sealants:	
Putty	FS[1] TT–P–00791B, October 16, 1969 and Amendment 2, March 23, 1971.
Glazing compounds for metal sash.	ASTM[2] C669–75 (1989).
Oil and resin base caulks.	ASTM C570–72 (1989).
Acrylic (solvent types) sealants.	FS TT–S–00230C, February 2, 1970 and Amendment 2, October 9, 1970.
Butyl rubber sealants ..	FS TT–S–001657, October 8, 1970.
Chlorosulfonated polyethylene sealants.	FS TT–S–00230C, February 2, 1970 and Amendment 2, October 9, 1970.
Latex sealing compounds.	ASTM C834–76 (1986).
Elastomeric joint sealants (normally considered to include polysulfide, polyurethane, and silicone).	ASTM C920–87.
Preformed gaskets and sealing materials.	ASTM C509–84.

[1] FS indicates Federal Specifications.
[2] ASTM indicates American Society for Testing and Materials.

WEATHERSTRIPPING

[Standards for conformance]

Weatherstripping	Commercially available.
Vapor retarders	Selected according to the provisions cited in ASTM[1] C755–85 (1990). Permeance not greater than 1 perm when determined according to the desiccant method described in ASTM E96–90.
Items to improve attic ventilation.	Commercially available.
Clock thermostats	NEMA[2] DC 3–1989.

[1] ASTM indicates American Society for Testing and Materials.
[2] NEMA indicates National Electrical Manufacturers Association.

HEAT EXCHANGERS

[Standards for conformance]

Heat exchangers, water-to-water and steam-to-water.	ASME[1] Boiler and Pressure Vessel Code, 1992, Sections II, V, VIII, IX, and X, as applicable to pressure vessels. Standards of Tubular Exchanger Manufacturers Association, Seventh Edition, 1988.
Heat exchangers with gas-fired appliances[2].	Conformance to AGA[3] Requirements for Heat Reclaimer Devices for Use with Gas-Fired Appliances No. 1–80, June 1, 1980. AGA Laboratories Certification Seal.
Heat pump water heating heat recovery systems.	Electrical components to be listed by UL.[4]

[1] ASME indicates American Society of Mechanical Engineers.
[2] The heat reclaimer is for installation in a section of the vent connector from appliances equipped with draft hoods or appliances equipped with powered burners or induced draft and not equipped with a draft hood.
[3] AGA indicates American Gas Association.
[4] UL indicates Underwriters Laboratories.

BOILER/FURNACE CONTROL SYSTEMS

[Standards for conformance]

Automatic set back thermostats.	Listed by UL.[1] Conformance to NEMA[2] DC 3–1989.
Line voltage or low voltage room thermostats.	NEMA DC 3–1989.
Automatic gas ignition systems.	ANSI[3] Z21.21–1987 and Z21.21a-1989. AGA[4] Laboratories Certification Seal.
Energy management systems.	Listed by UL.
Hydronic boiler controls ..	Listed by UL.
Other burner controls	Listed by UL.

[1] UL indicates Underwriters Laboratories.
[2] NEMA indicates National Electrical Manufacturers Association.
[3] ANSI indicates American National Standards Institute.
[4] AGA indicates American Gas Association.

WATER HEATER MODIFICATIONS

[Standards for conformance]

Insulate tank and distribution piping.	(See insulation section of this appendix).
Install heat traps on inlet and outlet piping.	Applicable local plumbing code.
Install/replace water heater heating elements.	Listed by UL[1].
Electric, freeze-prevention tape for pipes.	Listed by UL.

WATER HEATER MODIFICATIONS—Continued

[Standards for conformance]

Reduce thermostat settings.	State or local recommendations.
Install stack damper, gas-fueled.	ANS1[2] Z21.66–1988, including Exhibits A&B, and ANSI Z223.1–1988.
Install stack damper, oil-fueled.	UL 17, November 28, 1988, and NFPA[3] 31–1987.
Install water flow modifiers.	Commercially available.

[1] UL indicates Underwriters Laboratories.
[2] ANSI indicates American National Standards Institute.
[3] NFPA indicates National Fire Prevention Association.

WASTE HEAT RECOVERY DEVICES

[Standards for conformance]

Desuperheater/water heaters.	ARI[1] 470–1987.
Condensing heat exchangers.	Commercially available components and in new heating furnace systems to manufacturers' specifications.
Condensing heat exchangers.	Commercially available (Commercial, multi-story building, with teflon-lined tubes institutional) to manufacturers' specifications.
Energy recovery equipment.	Energy Recovery Equipment and Systems Air-to-Air (1978) Sheet Metal and Air-Conditioning Contractors National Association (SMACNA).[2]

[1] ARI indicates Air Conditioning and Refrigeration Institute.
[2] SMACNA denotes Sheet Metal and Air Conditioning Contractors' National Association.

BOILER REPAIR AND MODIFICATIONS/EFFICIENCY IMPROVEMENTS

[Standards for conformance]

Install gas conversion burners.	ANSI[1] Z21.8–1984, (for gas or oil-fired systems) ANSI Z21.17–1984, ANSI Z21.17a-1990, and ANSI Z223.1–1988. AGA[2] Laboratories Certification seal.
Replace oil burner	UL[3] 296, February 28, 1989 Revision and NFPA[4] 31–1987.
Install burners (oil/gas)	ANSI Z223.1–1988 for gas equipment and NFPA 31–1987 for oil equipment.
Re-adjust boiler water temperature or install automatic boiler temperature reset control.	ASME[5] CSD–1–1988, ASME CSD–1a-1989, ANSI Z223.1–1988, and NFPA 31–1987.

BOILER REPAIR AND MODIFICATIONS/EFFICIENCY IMPROVEMENTS—Continued

[Standards for conformance]

Replace/modify boilers	ASME Boiler and Pressure Vessel Code, 1992, Sections II, IV, V, VI, VIII, IX, and X. Boilers must be Institute of Boilers and Radiation Manufacturers (IBR) equipment.
Clean heat exchanger, adjust burner air shutter(s), check smoke no. on oil-fueled equipment. Check operation of pump(s) and replacement filters.	Per manufacturers' instructions.
Repair combustion chambers.	Refractory linings may be required for conversions.
Replace heat exchangers, tubes.	Protection from flame contact with conversion burners by refractory shield.
Install/replace thermostatic radiator valves.	Commercially available. One pipe steam systems require air vents on each radiator; see manufacturers' requirements.
Install boiler duty cycle control system.	Commercially available. NFPA 70, National Electrical Code (NEC) 1993 and local electrical codes provisions for wiring.

[1] ANSI indicates American National Standards Institute.
[2] AGA indicates American Gas Association.
[3] UL indicates Underwriters Laboratories.
[4] NFPA indicates National Fire Prevention Association.
[5] ANSI/ASME indicates American National Standards Institute/American Society of Mechanical Engineers.

HEATING AND COOLING SYSTEM REPAIRS AND TUNE-UPS/EFFICIENCY IMPROVEMENTS

[Standards for conformance]

Install duct insulation	FS[1] HH-I–558C, January 7, 1992 (see insulation sections of this appendix).
Reduce input of burner; derate gas-fueled equipment.	Local utility company and procedures if applicable for gas-fueled furnaces and ANSI[2] Z223.1–1988 (NFPA[3] 54–1988) including Appendix H.
Repair/replace oil-fired equipment.	NFPA 31–1987.
Replace combustion chamber in oil-fired furnaces or boilers.	NFPA 31–1987.

HEATING AND COOLING SYSTEM REPAIRS AND TUNE-UPS/EFFICIENCY IMPROVEMENTS—Continued

[Standards for conformance]

Clean heat exchanger and adjust burner: adjust air shutter and check CO_2 and stack temperature. Clean or replace air filter on forced air furnace.	ANSI Z223.1–1988 (NFPA 54–1988) including Appendix H.
Install vent dampers for gas-fueled heating systems.	Applicable sections of ANSI Z223.1–1988 (NFPA 54–1988) including Appendices H, I, J, and K. ANSI Z21.66–1988 and Exhibits A & B for electrically operated dampers.
Install vent dampers for oil-fueled heating systems.	Applicable sections of NFPA 31–1987 for installation and in conformance with UL[4] 17, November 28, 1988.
Reduce excess combustion air:	
A: Reduce vent connector size of gas-fueled appliances.	ANSI Z223.1–1988 (NFPA 54–1988) Part 9 and Appendices G & H.
B: Adjust barometric draft regulator for oil fuels.	NFPA 31–1987 and per manufacturers' (furnace or boiler) instructions.
Replace constant burning pilot with electric ignition device on gas-fueled furnaces or boilers.	ANSI Z21.71–1981, Z21.71a-1985, and Z21.71b-1989.
Readjust fan switch on forced air gas or oil-fueled furnaces.	Applicable sections and Appendix H of ANSI Z223.1–1988 (NFPA 54–1988) for gas furnaces and NFPA 31–1987 for oil furnaces.
Replace burners	See power burners (oil/gas).
Install/replace duct furnaces (gas).	ANSI Z223.1–1988 (NFPA 54–1988).
Install/replace heat pumps.	Listed by UL.
Replace air diffusers, intakes, registers, and grilles.	Commercially available.
Install/replace warm air heating metal ducts.	Commercially available.
Filter alarm units	Commercially available.

[1] FS indicates Federal Specifications.
[2] ANSI indicates American National Standards Institute.
[3] NFPA indicates National Fire Prevention Association.
[4] UL indicates Underwriters Laboratories.

REPLACEMENT FURNACES, BOILERS, AND WOOD STOVES

[Standards for conformance]

Chimneys, fireplaces, vents and solid fuel burning appliances.	NFPA[1] 211–1988.
Gas-fired furnaces	ANS1[2] Z21.47–1987, Z21.47a–1988, and Z21.47b–1989. ANSI Z223.1–1988 (NFPA 54–1988).
Oil-fired furnaces	UL[3] 727, August 27, 1991 Revision and NFPA 31–1987.
Liquified petroleum gas storage.	NFPA 58–1989.
Ventilation fans:	
Including electric attic, ceiling, and whole house fans.	UL 507, August 23, 1990 Revision.

[1] NFPA indicates National Fire Prevention Association.
[2] ANSI indicates American National Standards Institute.
[3] UL indicates Underwriters Laboratories.

AIR CONDITIONERS AND COOLING EQUIPMENT

[Standards for conformance]

Air conditioners:	
Central air conditioners	ARI[1] 210/240–1989.
Room size units	ANSI/AHAM[2] RAC–1–1982.
Other cooling equipment:	
Including evaporative coolers, heat pumps and other equipment.	UL[3] 1995, November 30, 1990.[4]

[1] ARI indicates Air Conditioning and Refrigeration Institute.
[2] AHAM/ANSI indicates American Home Appliance Manufacturers/American National Standards Institute.
[3] UL indicates Underwriters Laboratories.
[4] This standard is a general standard covering many different types of heating and cooling equipment.

SCREENS, WINDOW FILMS, AND REFLECTIVE MATERIALS

[Standards for conformance]

Insect screens	Commercially available.
Window films	Commercially available.
Shade screens:	
Fiberglass shade screens	Commercially available.
Polyester shade screens	Commercially available.
Rigid awnings:	
Wood rigid awnings	Commercially available.
Metal rigid awnings	Commercially available.
Louver systems:	
Wood louver systems	Commercially available.
Metal louver systems	Commercially available.

SCREENS, WINDOW FILMS, AND REFLECTIVE MATERIALS—Continued

[Standards for conformance]

Industrial-grade white paint used as a heat-reflective measure on awnings, window louvers, doors, and exterior duct work (exposed).	Commercially available.

[58 FR 12529, Mar. 4, 1993]

PART 445 [RESERVED]

PART 451—RENEWABLE ENERGY PRODUCTION INCENTIVES

Sec.
451.1 Purpose and scope.
451.2 Definitions.
451.3 Who may apply.
451.4 What is a qualified renewable energy facility.
451.5 Where and when to apply.
451.6 Duration of incentive payments.
451.7 Metering requirements.
451.8 Application content requirements.
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451.10 Administrative appeals.

AUTHORITY: 42 U.S.C. §7254; 42 U.S.C. §13317.

SOURCE: 60 FR 36964, July 19, 1995, unless otherwise noted.

§451.1 Purpose and scope.

(a) The provisions of this part cover the policies and procedures applicable to the determinations by the Department of Energy (DOE) to make incentive payments for electric energy generated and sold by a qualified renewable energy facility owned by a State or nonprofit electric cooperative under the authority of 42 U.S.C. 13317.

(b) Determinations to make incentive payments under this part are not subject to the provisions of 10 CFR part 600 and such payments shall not be construed to be financial assistance.

§451.2 Definitions.

As used in this part—

Closed-loop biomass means any organic material from a plant which is planted exclusively for purposes of being used at a qualified renewable energy facility to generate electricity or from a second harvesting of such a plant if planted before October 1, 1993.

Deciding Official means the Assistant Secretary for Energy Efficiency and Renewable Energy (or any DOE official to whom the authority of the Assistant Secretary may be redelegated by the Secretary of Energy).

DOE means the Department of Energy.

Finance Office means the DOE Office of the Chief Financial Officer (or any office to which that Office's authority may be redelegated by the Secretary of Energy).

Fiscal year means the Federal fiscal year beginning October 1 and ending on September 30 of the following calendar year.

Net electric energy means the metered kilowatt-hours (kWh) generated and sold, and excludes electric energy used within the renewable energy facility to power equipment such as pumps, motors, controls, lighting, heating, cooling, and other systems needed to operate the facility.

Nonprofit electrical cooperative means a cooperative association that is legally obligated to operate on a nonprofit basis and is organized under the laws of any State for the purpose of providing electric service to its members.

Renewable energy facility means a single module or unit, or an aggregation of such units, that generates electric energy which is independently metered and which results from the utilization of a renewable energy source.

Renewable energy source means solar heat, solar light, wind, geothermal energy, and biomass, except for—

(1) Heat from the burning of municipal solid waste; or

(2) Heat from a dry steam geothermal reservoir which—

(i) Has no mobile liquid in its natural state;

(ii) Is a fluid composed of at least 95 percent water vapor; and

(iii) Has an enthalpy for the total produced fluid greater than or equal to 2.791 megajoules per kilogram (1200 British thermal units per pound).

State means the District of Columbia, Puerto Rico, and any of the States, territories, and possessions of the United States.

§ 451.3 Who may apply.

Any owner, or operator with the written consent of the owner, but not both, of a qualified renewable energy facility, may apply for incentive payments for net electric energy generated from a renewable energy source and sold.

§ 451.4 What is a qualified renewable energy facility.

In order to qualify for an incentive payment under this part, a renewable energy facility must meet the following qualifications—

(a) *Owner qualifications.* The owner must be—

(1) A State or a political subdivision of a State (or agency, authority, or instrumentality thereof);

(2) A corporation or association wholly owned, directly or indirectly, by a State or a political subdivision of a State; or

(3) A nonprofit electrical cooperative.

(b) *What constitutes ownership.* The owner must have all rights to the beneficial use of the renewable energy facility, and legal title must be held by, or for the benefit of, the owner.

(c) *Sales affecting interstate commerce.* The net electric energy generated by the renewable energy facility must be sold to another entity for consideration.

(d) *Type of renewable energy sources.* The source of the electric energy for which an incentive payment is sought must be a renewable energy source, as defined in § 451.2.

(e) *Time of first use.* The date of the first use of a newly constructed renewable energy facility, or a facility covered by paragraph (f) of this section, must occur during the inclusive period beginning October 1, 1993, and ending on September 30, 2003.

(f) *Conversion of non-qualified facilities.* Existing non-qualified facilities that are converted must meet either of the following criteria—

(1) A facility employing solar, wind, geothermal or biomass sources must be refurbished during the allowed time of first use such that the fair market value of any previously used property does not exceed 20% of the facility's total value.

(2) A facility not employing solar, wind, geothermal or biomass sources must be converted in part or in whole to a qualified facility during the allowed time of first use.

(g) *Location.* The qualified renewable energy facility must be located in a State.

§ 451.5 Where and when to apply.

(a) *Pre-application and notification.* (1) An applicant may submit at any time a pre-application, containing the information described in § 451.8 (a) through (e), to obtain a preliminary and conditional determination of eligibility.

(2) To assist DOE in its budget planning, the owner or operator of a qualified renewable energy facility is requested to provide notification at least 6 months in advance of when a facility is expected to be first used, providing projected information specified in § 451.8 (a) through (e).

(b) *Application.* (1) Except as provided by paragraph (b)(2) of this section, an application for an incentive payment for electric energy generated and sold in a fiscal year must be filed during the first quarter (October 1 through December 31) of the next fiscal year.

(2) For energy generated and sold in fiscal year 1994, an application for incentive payment must be filed on or before September 5, 1995.

(3) Failure to file an application in any fiscal year for payment for energy generated in the preceding fiscal year shall disqualify the owner or operator from eligibility for any incentive payment for energy generated in that preceding fiscal year.

(c) *Where.* Applications and notifications to the Department shall be submitted to the Renewable Energy Production Incentive Program, U.S. Department of Energy, Golden Field Office, 1617 Cole Boulevard, Golden, CO, 80401.

§ 451.6 Duration of incentive payments.

Subject to the availability of appropriated funds, DOE shall make incentive payments under this part with respect to a qualified renewable energy facility for 10 fiscal years. Such period shall begin with the fiscal year in

which application for payment for electricity generated by the facility is first made and the facility is determined by DOE to be eligible for receipt of an incentive payment. The period for payment under this program ends with fiscal year 2013.

§451.7 Metering requirements.

The net electric energy generated and sold (kilowatt-hours) by the owner or operator of a qualified renewable energy facility must be measured by a standard metering device that—

(a) Meets generally accepted industry standards;

(b) Is maintained in proper working order according to the instructions of its manufacturer; and

(c) Is calibrated according to generally accepted industry standards.

§451.8 Application content requirements.

An application for an incentive payment under this part must be signed by an authorized executive official and shall provide the following information—

(a) A statement indicating that the applicant is the owner, of the facility or is the operator of the facility and has the written consent of an authorized executive official of the owner to file an application;

(b) The name of the facility or other official designation;

(c) The location and address of the facility and type of renewable energy source;

(d) The name, address, and telephone number of a point of contact to respond to questions or requests for additional information;

(e) A clear statement of how the application satisfies each and every part of the eligibility criteria under §451.4;

(f) A statement of the annual and monthly metered net electric energy generated and sold during the prior fiscal year by the qualified renewable energy facility, measured in kilowatt-hours, for which an incentive payment is requested;

(g) In the case of a qualified renewable energy facility which generates electric energy using a fossil fuel, nuclear energy, or other non-qualified energy source in addition to using a renewable energy source, a statement of the net electric energy generated, measured in kilowatt-hours, attributable to the renewable energy source, including a calculation showing the total monthly and annual kilowatt-hours generated and sold during the fiscal year multiplied by a fraction consisting of the heat input, as measured in appropriate energy units, received by the working fluid from the renewable energy sources divided by the heat input, as measured in the same energy units, received by the working fluid from all energy sources;

(h) the amounts of accrued electric energy, by sources and by year, in kilowatt-hours, for which the applicant previously applied and DOE did not make an incentive payment because of insufficient appropriations;

(i) The total amount of electric energy for which payment is requested, including the net electric energy generated in the prior fiscal year, as determined according to paragraph (f) or (g) of this section, and the accrued energy as determined according to paragraph (h) of this section;

(j) Preferred method of payment (check or wire transfer) and instructions;

(k) A statement agreeing to retain records for a period of three (3) years which substantiate the annual and monthly metered number of kilowatt-hours generated and sold, and to provide access to, or copies of, such records within 30 days of a written request by DOE; and

(l) A statement signed by an authorized executive official certifying that the information contained in the application is accurate.

(m) If a nonprofit electric cooperative, a statement certifying that no claim for tax credit has been made for the same electricity for which incentive payments are requested.

§451.9 Procedures for processing applications.

(a) *Supplemental information.* DOE may request supplementary information relating to the application.

(b) *Audits.* DOE may require the applicant to conduct at its own expense and submit an independent audit, or DOE may conduct an audit, to verify

the number of kilowatt-hours claimed to have been generated and sold by the qualified renewable energy facility and for which an incentive payment has been requested or made.

(c) *DOE determinations.* Upon evaluating the application and any other relevant information, DOE shall determine:

(1) Eligibility of the applicant for receipt of an incentive payment, based on the criteria for eligibility specified in this part; and

(2) The number of kilowatt-hours to be used in calculating the incentive payment, based on the sum of net electric energy generated from a qualified renewable energy source at the qualified renewable energy facility and sold during the prior fiscal year, and any accrued energy.

(d) *Calculating payments.* Subject to the provisions of paragraph (e) of this section, incentive payments under this part shall be determined by multiplying the number of kilowatt-hours determined under §451.9(c)(2) by 1.5 cents per kilowatt-hour, and adjusting that product for inflation for each fiscal year beginning after calendar year 1993 in the same manner as provided in section 29(d)(2)(B) of the Internal Revenue Code of 1986, except that in applying such provisions calendar year 1993 shall be substituted for calendar year 1979.

(e) *Insufficient Funds.* The Assistant Secretary for Energy Efficiency and Renewable Energy shall determine the extent to which appropriated funds are available to be obligated under this program for each fiscal year. If funds determined to be available under the preceding sentence are not sufficient to make full incentive payments for all approved applications, DOE shall—

(1) Make incentive payments first, and if necessary on a pro rata basis, to owners or operators of qualified renewable energy facilities using solar, wind, geothermal, and closed-loop biomass technologies;

(2) Make incentive payments second, and if necessary on a pro rata basis, to owners or operators of all other qualified renewable energy facilities.

(3) Treat the number of kilowatt-hours for which an incentive payment is not made as a result of insufficient appropriations as accrued energy for which subsequent application for incentive payment may be made.

(f) *Notice to applicant.* After calculating the amount of the incentive payment under paragraphs (e) through (g) of this section, the DOE Deciding Official shall then issue a written notice of the determination to the applicant—

(1) Approving the application as eligible for payment and forwarding a copy to the DOE Finance Office with a request to pay;

(2) Setting forth the calculation of the approved amount of the incentive payment; and

(3) Stating the amount of accrued energy, measured in kilowatt-hours, for each qualified renewable energy facility, if any, and the energy source for same.

(g) *Disqualification.* If the application does not meet the requirements of this part or some of the kilowatt-hours claimed in the application are disallowed as unqualified, the Deciding Official shall issue a written notice denying the application in whole or in part with an explanation of the basis for denial.

§ 451.10 Administrative appeals.

(a) In order to exhaust administrative remedies, an applicant who receives a notice denying an application in whole or in part shall appeal, on or before 45 days from date of the notice issued by the DOE Deciding Official, to the Office of Hearings and Appeals, 1000 Independence Avenue, S.W., Washington, D.C. 20585, in accordance with the procedures set forth in subpart C of 10 CFR part 1003.

(b) If an applicant does not appeal under paragraph (a) of this section, the determination of the DOE Deciding Official shall become final for DOE and judicially unreviewable.

(c) If an applicant appeals on a timely basis under paragraph (a) of this section, the decision and order of the Office of Hearings and Appeals shall be final for DOE.

(d) If the Office of Hearings and Appeals orders an incentive payment, the DOE Deciding Official shall send a copy of such order to the DOE Finance Office with a request to pay.

PART 455—GRANT PROGRAMS FOR SCHOOLS AND HOSPITALS AND BUILDINGS OWNED BY UNITS OF LOCAL GOVERNMENT AND PUBLIC CARE INSTITUTIONS

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AUTHORITY: 42 U.S.C. 6371 *et seq.*, and 42 U.S.C. 7101 *et seq.*

SOURCE: 58 FR 9438, Feb. 19, 1993, unless otherwise noted.

Subpart A—General Provisions

§ 455.1 Purpose and scope.

(a) This part establishes programs of financial assistance pursuant to Title III of the Energy Policy and Conservation Act, as amended, 42 U.S.C. 6371 *et seq.*

(b) This part authorizes grants to States or to public or non-profit schools and hospitals to assist them in conducting preliminary energy audits and energy audits, in identifying and implementing energy conservation maintenance and operating procedures, and in evaluating, acquiring, and installing energy conservation measures, including renewable resource measures, to reduce the energy use and anticipated energy costs of buildings owned by schools and hospitals.

(c) This part also authorizes grants to States or units of local government and public care institutions to assist them in conducting preliminary energy audits and energy audits, in identifying and implementing energy conservation maintenance and operating procedures, and in evaluating energy conservation measures, including renewable resource measures, to reduce the energy use and anticipated energy costs of buildings owned by units of local government and public care institutions.

§ 455.2 Definitions.

Act, as used in this part, means the Energy Policy and Conservation Act, Public Law 94–163, 89 Stat. 871 (42 U.S.C. 6201, *et seq.*), as amended by title III of the National Energy Conservation Policy Act, Public Law 95–619, 92 Stat. 3238 (42 U.S.C. 6371), and the State Energy Efficiency Programs Improvement Act of 1990, Public Law 101–440, 104 Stat. 1011.

Assistant Secretary means the Assistant Secretary for Conservation and Renewable Energy or any official to whom the Assistant Secretary's functions may be redelegated by the Secretary.

Auditor means any person who is qualified in accordance with 10 CFR 450.44 and with State requirements pursuant to §455.20(k), to conduct an energy audit.

Building means any structure, including a group of closely situated structural units that are centrally metered or served by a central utility plant, or an eligible portion thereof, the construction of which was completed on or before May 1, 1989, which includes a heating or cooling system, or both.

Civil rights requirements means civil rights responsibilities of applicants and grantees pursuant to the Nondiscrimination in Federally Assisted Programs regulation of the Department of Energy (10 CFR part 1040).

Complex means a closely situated group of buildings on a contiguous site such as a school or college campus or multibuilding hospital.

Construction completion means the date of issuance of an occupancy permit for a building or the date the building is ready for occupancy as determined by DOE.

Cooling degree days means the annual sum of the number of Fahrenheit degrees of each day's mean temperature above 65° for a given locality.

Coordinating agency means a State or any public or nonprofit organization legally constituted within a State which provides either administrative control or services for a group of institutions within a State and which acts on behalf of such institutions with respect to their participation in the program.

Deputy Assistant Secretary means the Deputy Assistant Secretary for Technical and Financial Assistance or any official to whom the Deputy Assistant Secretary's functions may be redelegated by the Assistant Secretary.

DOE means the Department of Energy.

Energy audit means a determination of the energy consumption characteristics of a building which:

(1) Identifies the type, size, and rate of energy consumption of such building and the major energy-using systems of such building;

(2) Determines appropriate energy conservation maintenance and operating procedures;

(3) Indicates the need, if any, for the acquisition and installation of energy conservation measures; and

(4) If paid for with financial assistance under this part, complies with 10 CFR 450.43.

Energy conservation maintenance and operating procedures means modifications in the maintenance and operations of a building and any installation therein which are designed to reduce the energy consumption in such building and which require no significant expenditure of funds, including, but not limited to:

(1) Effective operation and maintenance of ventilation systems and control of infiltration conditions, including:

(i) Repair of caulking or weatherstripping around windows and doors;

(ii) Reduction of outside air intake, shutting down ventilation systems in unoccupied areas, and shutting down ventilation systems when the building is not occupied; and

(iii) Assuring central or unitary ventilation controls, or both, are operating properly;

(2) Changes in the operation and maintenance of heating or cooling systems through:

(i) Lowering or raising indoor temperatures;

(ii) Locking thermostats;

(iii) Adjusting supply or heat transfer medium temperatures; and

(iv) Reducing or eliminating heating or cooling at night or at times when a building or complex is unoccupied;

(3) Changes in the operation and maintenance of lighting systems through:

(i) Reducing illumination levels;

(ii) Maximizing use of daylight;

(iii) Using higher efficiency lamps; and

(iv) Reducing or eliminating evening cleaning of buildings;

(4) Changes in the operation and maintenance of water systems through:

(i) Repairing leaks;

(ii) Reducing the quantity of water used, e.g., using flow restrictors;

(iii) Lowering settings for hot water temperatures; and

(iv) Raising settings for chilled water temperatures;

(5) Changes in the maintenance and operating procedures of the building's mechanical systems through:

(i) Cleaning equipment;

(ii) Adjusting air/fuel ratio;

(iii) Monitoring combustion;

(iv) Adjusting fan, motor, or belt drive systems;

(v) Maintaining steam traps; and

(vi) Repairing distribution pipe insulation; and

(6) Such other actions relating to operations and maintenance procedures as the State may determine useful or necessary. In general, energy conservation maintenance and operating procedures involve cleaning, repairing or adjusting existing equipment rather than acquiring new equipment.

Energy conservation measure means an installation or modification of an installation in a building which is primarily intended to maintain (in the case of load management systems) or reduce energy consumption and reduce energy costs, or allow the use of an alternative energy source, including, but not limited to:

(1) Insulation of the building structure and systems within the building;

(2) Storm windows and doors, multiglazed windows and doors, heat- absorbing or heat-reflective glazed and coated windows and door systems, additional glazing, reductions in glass area, and other window and door systems modifications;

(3) Automatic energy control systems which would reduce energy consumption;

(4) Load management systems which would shift demand for energy from peak hours to hours of low demand and lower cost;

(5) Equipment required to operate variable steam, hydraulic, and ventilating systems adjusted by automatic energy control systems;

(6) Active or passive solar space heating or cooling systems, solar electric generating systems, or any combination thereof;

(7) Active or passive solar water heating systems;

(8) Furnace or utility plant and distribution system modifications including:

(i) Replacement burners, furnaces, boilers, or any combination thereof which substantially increase the energy efficiency of the heating system;

(ii) Devices for modifying flue openings which will increase the energy efficiency of the heating system;

(iii) Electrical or mechanical furnace ignition systems which replace standing gas pilot lights; and

(iv) Utility plant system conversion measures including conversion of existing oil- and gas-fired boiler installations to alternative energy sources;

(9) Addition of caulking and weatherstripping;

(10) Replacement or modification of lighting fixtures (including exterior light fixtures which are physically attached to, or connected to, the building) to increase the energy efficiency of the lighting system without increasing the overall illumination of a facility, unless such increase in illumination is necessary to conform to any applicable State or local building code or, if no such code applies, the increase is considered appropriate by DOE;

(11) Energy recovery systems;

(12) Cogeneration systems which produce steam or forms of energy such as heat as well as electricity for use primarily within a building or a complex of buildings owned by an eligible institution and which meet such fuel efficiency requirements as DOE may by rule prescribe;

(13) Such other measures as DOE identifies by rule for purposes of this part as set forth in subpart D of 10 CFR part 450; and

(14) Such other measures as a grant applicant shows will save a substantial amount of energy and as are identified in an energy audit or energy use evaluation in accordance with § 455.20(k) or a technical assistance report in accordance with § 455.62.

Energy use evaluation means a determination of:

(1) Whether the building is a school facility, hospital facility, or a building owned and primarily occupied and used throughout the year by a unit of local government or by a public care institution.

(2) The name and address of the owner of record, indicating whether owned by a public institution, private nonprofit institution, or an Indian tribe;

(3) The building's potential suitability for renewable resource applications;

(4) Major changes in functional use or mode of operation planned in the next 15 years, such as demolition, disposal, rehabilitation, or conversion from office to warehouse;

(5) Appropriate energy conservation maintenance and operating procedures which have been implemented for the building;

(6) The need, if any, for the acquisition and installation of energy conservation measures including an assessment of the estimated costs and energy and cost savings likely to result from the purchase and installation of one or more energy conservation measures and an evaluation of the need and potential for retrofit based on consideration of one or more of the following:

(i) An energy use index or indices, for example, Btu's per gross square foot per year;

(ii) An energy cost index or indices, for example, annual energy costs per gross square foot; or

(iii) The physical characteristics of the building envelope and major energy-using systems; and

(7) Such other information as the State has determined useful or necessary, in accordance with § 455.20(k).

Fuel means any commercial source of energy used within the building or complex being surveyed such as natural gas, fuel oil, electricity, or coal.

Governor means the chief executive officer of a State including the Mayor of the District of Columbia or a person duly designated in writing by the Governor to act on her or his behalf.

Grant program cycle means the period of time specified by DOE which relates to the fiscal year or years for which monies are appropriated for grants under this part, during which one complete cycle of DOE grant activity occurs including fund allocations to the States; applications receipt, review, approval, or disapproval; and award of grants by DOE but which does not include the grantee's performance period.

Grantee means the entity or organization named in the Notice of Financial Assistance Award as the recipient of the grant.

Gross square feet means the sum of all heated or cooled floor areas enclosed in a building, calculated from the outside dimensions or from the centerline of common walls.

Heating or cooling system means any mechanical system for heating, cooling, or ventilating areas of a building including a system of through-the-wall air conditioning units.

Heating degree days means the annual sum of the number of Fahrenheit degrees for each day's mean temperature below 65° for a given locality.

Hospital means a public or nonprofit institution which is a general hospital, tuberculosis hospital, or any other type of hospital other than a hospital furnishing primarily domiciliary care and which is duly authorized to provide hospital services under the laws of the State in which it is situated.

Hospital facilities means buildings housing a hospital and related facilities including laboratories, laundries, outpatient departments, nurses' residence and training facilities, and central service facilities operated in connection with a hospital; it also includes buildings containing education or training facilities for health profession personnel operated as an integral part of a hospital.

Indian tribe means any tribe, band, nation, or other organized group or community of Indians including any Alaska native village or regional or village corporation, as defined in or established pursuant to, the Alaska Native Claims Settlement Act, Public Law 92–203; 85 Stat. 688, which (a) is recognized as eligible for the special programs and services provided by the United States to Indians because of their status as Indians; or (b) is located on, or in proximity to, a Federal or State reservation or rancheria.

Load management system means a device or devices which are designed to shift energy use to hours of low demand in order to reduce energy costs and which do not cause more energy to be used than was used before their installation.

Local educational agency means a public board of education or other public authority or a nonprofit institution legally constituted within, or otherwise recognized by, a State either for administrative control or direction of, or to perform administrative services for, a group of schools within a State.

Maintenance means activities undertaken in a building to assure that equipment and energy-using systems operate effectively and efficiently.

Marketing means a program or activity managed or performed by the State including but not limited to:

(1) Obtaining non-Federal funds to finance energy conservation measures consistent with this part;

(2) Making site visits to school and hospital officials to review program opportunities;

(3) Giving presentations to groups such as school or hospital board officials and personnel; and

(4) Preparing and disseminating articles in publications directed to school and hospital personnel.

Native American means a person who is a member of an Indian tribe.

Non-Federal funds means financing sources obtained or arranged for by a State as a result of the State program(s) pursuant to §455.20(j), to be used to pay for energy conservation measures for institutions eligible under this part, and includes petroleum violation escrow funds except for those funds required to be treated as if they were Federal funds by statute, court order, or settlement agreement.

Operating means the operation of equipment and energy-using systems in

a building to achieve or maintain specified levels of environmental conditions of service.

Owned or *owns* means property interest including without limitation a leasehold interest which is or shall become a fee simple title in a building or complex.

Preliminary energy audit means a determination of the energy consumption characteristics of a building including the size, type, rate of energy consumption, and major energy-using systems of such building which if paid for with financial assistance under this part, complies with 10 CFR 450.42.

Primarily occupied means that in excess of 50 percent of a building's square footage or time of occupancy is occupied by a public care institution or an office or agency of a unit of local government.

Program assistance means a program or activity managed or performed by the State and designed to provide support to eligible institutions to help ensure the effectiveness of energy conservation programs carried out consistent with this part including such relevant activities as:

(1) Evaluating the services and reports of consulting engineers;

(2) Training school or hospital personnel to perform energy accounting and to identify and implement energy conservation maintenance and operating procedures;

(3) Monitoring the implementation and operation of energy conservation measures; and

(4) Aiding in the procurement of energy-efficient equipment.

Public care institution means a public or nonprofit institution which owns:

(1) A facility for long-term care, rehabilitation facility, or public health center, as described in section 1624 of the Public Health Service Act (42 U.S.C. 300s–3; 88 Stat. 2270); or

(2) A residential child care center which is an institution, other than a foster home, operated by a public or nonprofit institution. It is primarily intended to provide full-time residential care, with an average length of stay of at least 30 days, for at least 10 minor persons who are in the care of such institution as a result of a finding of abandonment or neglect or of being persons in need of treatment or supervision.

Public or nonprofit institution means an institution owned and operated by:

(1) A State, a political subdivision of a State, or an agency or instrumentality of either; or

(2) A school or hospital which is, or would be in the case of such entities situated in American Samoa, Guam, the Commonwealth of Puerto Rico, the Commonwealth of the Northern Mariana Islands, and the U.S. Virgin Islands, exempt from income tax under section 501(c)(3) of the Internal Revenue Code of 1954; or

(3) A unit of local government or public care institution which is, or would be in the case of such entities situated in American Samoa, Guam, the Commonwealth of Puerto Rico, the Commonwealth of the Northern Mariana Islands, and the U.S. Virgin Islands, exempt from income tax under section 501(c)(3) or 501(c)(4) of the Internal Revenue Code of 1954.

Renewable resource energy conservation measure means an energy conservation measure which produces at least 50 percent of its Btu's from a non-depletable energy source.

School means a public or nonprofit institution which:

(1) Provides, and is legally authorized to provide, elementary education or secondary education, or both, on a day or residential basis;

(2) Provides, and is legally authorized to provide, a program of education beyond secondary education, on a day or residential basis and:

(i) Admits as students only persons having a certificate of graduation from a school providing secondary education, or the recognized equivalent of such certificate;

(ii) Is accredited by a nationally recognized accrediting agency or association; and

(iii) Provides an educational program for which it awards a bachelor's degree or higher degree or provides not less than a 2-year program which is acceptable for full credit toward such a degree at any institution which meets the preceding requirements and which provides such a program;

(3) Provides not less than a 1-year program of training to prepare students for gainful employment in a recognized occupation and which meets the provisions cited in paragraph (2), and subparagraphs (2)(i), and (2)(ii) of this definition; or

(4) Is a local educational agency.

School facilities means buildings housing classrooms, laboratories, dormitories, administrative facilities, athletic facilities, or related facilities operated in connection with a school.

Secretary means the Secretary of the Department of Energy or his/her designee.

State means, in addition to the several States of the Union, the District of Columbia, the Commonwealth of Puerto Rico, Guam, American Samoa, the Commonwealth of the Northern Mariana Islands, and the U.S. Virgin Islands.

State energy agency means the State agency responsible for developing State energy conservation plans pursuant to section 362 of the Energy Policy and Conservation Act (42 U.S.C. 6322) or, if no such agency exists, a State agency designated by the Governor of such State to prepare and submit the State Plan required under section 394 of the Energy Policy and Conservation Act.

State hospital facilities agency means an existing agency which is broadly representative of the public hospitals and the nonprofit hospitals or, if no such agency exists, an agency designated by the Governor of such State which conforms to the requirements of this definition.

State school facilities agency means an existing agency which is broadly representative of public institutions of higher education, nonprofit institutions of higher education, public elementary and secondary schools, nonprofit elementary and secondary schools, public vocational education institutions, nonprofit vocational education institutions, and the interests of handicapped persons in a State or, if no such agency exists, an agency which is designated by the Governor of such State which conforms to the requirements of this definition.

Support office director means the Director of the DOE field support office with the responsibility for grant administration or any official to whom that function may be redelegated.

Technical assistance means: (1) The conduct of specialized studies to identify and specify energy savings or energy cost savings that are likely to be realized as a result of the modification of maintenance and operating procedures in a building, the acquisition and installation of one or more specified energy conservation measures in a building, or both; and

(2) The planning or administration of such specialized studies. For schools and hospitals which are eligible to receive grants to carry out energy conservation measures, the term also means the planning or administration of specific remodeling, renovation, repair, replacement, or insulation projects related to the installation of energy conservation or renewable resource measures in a building.

Technical assistance program update means a brief revision to an existing technical assistance program report designed to provide current information such as that relating to energy use, equipment costs, and other data needed to substantiate an application for an energy conservation measure grant. Such an update shall be limited to the particular measures included in the related grant application together with any relevant data regarding interactions or relationships to previously installed energy conservation measures.

Unit of local government means the government of a county, municipality, parish, borough, or township which is a unit of general purpose government below the State (determined on the basis of the same principles as are used by the Bureau of the Census for general statistical purposes) and the District of Columbia. Such term also means the recognized governing body of an Indian tribe which governing body performs substantial governmental functions and includes libraries which serve all residents of a political subdivision below the State level (such as a community, district, or region) free of charge and which derive at least 40 percent of their operating funds from tax revenues of a taxing authority below the State level.

§ 455.3 Administration of grants.

Grants provided under this part shall comply with applicable law, regulation, or procedure including, without limitation, the requirements of:

(a) The DOE Financial Assistance Rules (10 CFR part 600 as amended) except as otherwise provided in this rule;

(b) Executive Order 12372 entitled ''Intergovernmental Review of Federal Programs'' (48 FR 3130, January 24, 1983; 3 CFR, 1982 Comp., p. 197) and the DOE regulation implementing this Executive Order entitled ''Intergovernmental Review of Department of Energy Programs and Activities'' (10 CFR part 1005);

(c) Office of Management and Budget Circular A–97 entitled ''Rules and Regulations Permitting Federal Agencies to Provide Specified or Technical Services to State and Local Units of Government under title III of the Inter-Governmental Coordination Act of 1968'' available from the Office of Management and Budget, Office of Publication Services, 725 17th Street, NW., Washington, DC 20503;

(d) DOE regulation entitled ''Nondiscrimination in Federally Assisted Programs'' (10 CFR part 1040) which implements the following public laws: Title VI of the Civil Rights Act of 1964; section 16 of the Federal Energy Administration Act of 1974; section 401 of the Energy Reorganization Act of 1974; title IX of the Education Amendments of 1972; The Age Discrimination Act of 1975; and section 504 of the Rehabilitation Act of 1973; and

(e) Such other procedures applicable to this part as DOE may from time to time prescribe for the administration of financial assistance.

§ 455.4 Recordkeeping.

Each State or other entity within a State receiving financial assistance under this part shall make and retain records required and specified by the DOE Financial Assistance Rules, 10 CFR part 600, and this part.

§ 455.5 Suspension and termination of grants.

Suspension and termination procedures shall be as set forth in the DOE Financial Assistance Rules, 10 CFR part 600.

Subpart B—State Plan Development and Approval

§ 455.20 Contents of State Plan.

Each State shall develop and submit to DOE a State Plan for technical assistance programs and energy conservation measures, including renewable resource measures and, to the extent appropriate, program assistance, and/or marketing. The State Plan shall include:

(a) A statement setting forth the procedures by which the views of eligible institutions or coordinating agencies representing such institutions, or both, were solicited and considered during development of the State Plan and any amendment to a State Plan;

(b) The procedures the State will follow to notify eligible institutions and coordinating agencies of the content of the approved State Plan or any approved amendment to a State Plan;

(c) The procedures the State will follow to notify eligible institutions and coordinating agencies of the availability (each funding cycle) of funding under this program and related funding available from non-Federal sources to fund technical assistance programs and energy conservation measures consistent with this part;

(d) The procedures for submittal of grant applications to the State;

(e) The procedures to be used by the State for evaluating and ranking technical assistance and energy conservation measure grant applications pursuant to § 455.130 and § 455.131, including the weights assigned to each criterion set forth in §§ 455.131 (c)(1), (c)(2), (c)(3), (c)(4) and (c)(5). In addition, the State shall determine the order of priority given to fuel types that include oil, natural gas, and electricity, under § 455.131(c)(2);

(f) The procedures that the State will follow to insure that funds will be allocated equitably among eligible applicants within the State including procedures to insure that funds will not be allocated on the basis of size or type of institution, but rather on the basis of relative need, taking into account such factors as cost, energy consumption, and energy savings, in accordance with § 455.131;

(g) The procedures that the States will follow for identifying schools and hospitals experiencing severe hardship and for apportioning the funds that are available for schools and hospitals in a case of severe hardship. Such policies and procedures shall be in accordance with § 455.132;

(h) A statement setting forth the extent to which, and by which methods, the State will encourage utilization of solar space heating, cooling and electric systems, and solar water heating systems;

(i) The procedures to assure that all financial assistance under this part will be expended in compliance with the requirements of the State Plan, in compliance with the requirements of this part, and in coordination with other State and Federal energy conservation programs;

(j) If a State is eligible and elects to use up to 100 percent of the funds provided by DOE under this part for any fiscal year for program and technical assistance and/or up to 50 percent of such funds for marketing:

(1) A description of each activity the State proposes, including the procedures for program operation, monitoring, and evaluation;

(2) The level of funding to be used for each program and the source of those funds;

(3) The amount of the State's allocated funds that the State proposes to use for each;

(4) A description of the non-Federal financing mechanisms to be used to fund energy conservation measures in the State during the fiscal year;

(5) A description of the evaluation/selection criteria to be used by the State in determining which institutions receive funding for energy conservation measures;

(6) The procedures for assuring that all segments of the State's eligible institutions, including religiously affiliated institutions receive an equitable share of the assistance provided both for program and technical assistance, marketing, and energy conservation measures;

(7) A description of how the State will track: the amount of total available funds by source; the amount of funds obligated against those funds; and any limits on types of institutions eligible for particular funding sources; and

(8) The procedures for assisting institutions which initially receive program, technical, or marketing assistance (as part of the State's special program(s)) in later participating in the State's program(s) to provide energy conservation measure funding;

(k) The requirements for an energy audit or an energy use evaluation, and the requirements for qualifications for auditors or persons who will conduct energy use evaluations in the State;

(l) With regard to energy conservation maintenance and operating procedures:

(1) The procedures to insure implementation of energy conservation maintenance and operating procedures in those buildings for which financial assistance is requested under this part;

(2) A provision that all maintenance and operating procedure changes recommended in an energy audit pursuant to § 455.20(k), or in a technical assistance report under § 455.62, or a combination of these are implemented as provided under this part; or

(3) An assurance that the maintenance and operating procedures will be implemented in the future, or a reasonable justification for not implementing such procedures, as appropriate;

(m) The procedures to assure that financial assistance under this part will be used to supplement, and not to supplant, State, local or other funds, including at least:

(1) The screening of applicants for eligibility for available State funds;

(2) The identification of applicants which are seeking or have obtained private sector funds; and,

(3) Limiting or excluding (at the option of the State) the availability of financial assistance under this part for funding particular measures for which funding is being provided by other sources in the State (such as utility rebates) together with any requirements for potential applicants to first seek other sources of funding and document the results of that attempt before seeking financial assistance under this part and a description of the State's plan to

assist potential applicants in identifying and obtaining other sources of funding;

(n) The procedures for determining that technical assistance programs performed without the use of Federal funds and used as the basis for energy conservation measure grant applications have been performed in compliance with the requirements of §455.62, for the purposes of satisfying the eligibility requirements contained in §455.71(a)(3);

(o) The State's policy regarding reasonable selection of energy conservation measures for study in a technical assistance program including any restrictions based on category of building or on groups of structures where measures may, or may not, be appropriate for all the structures and any additional State requirements for the conduct of such a program;

(p) The procedures for State management, monitoring, and evaluation of technical assistance programs and energy conservation measures receiving financial assistance under this part. This includes any State requirements for hospital certifications from a State agency with descriptions of the review procedures and coordination process applicable in such cases. If there is no school facilities agency in the State, or if the existing agency does not certify all types of schools, it also includes any State requirements for an alternative review and certification process for schools;

(q) The circumstances under which the State requires an updated technical assistance program report to accompany an application for an energy conservation measure grant and the scope and contents of such an update;

(r) A description of the State's policies for establishing and insuring compliance with qualifications for technical assistance analysts. Such policies shall require that technical assistance analysts be free from financial interests which may conflict with the proper performance of their duties and have experience in energy conservation and:

(1) Be a registered professional engineer licensed under the regulatory authority of the State;

(2) Be an architect-engineer team, the principal members of which are licensed under the regulatory authority of the State; or

(3) Be otherwise qualified in accordance with such criteria as the State may prescribe in its State Plan to insure that individuals conducting technical assistance programs possess the appropriate training and experience in building energy systems;

(s) The circumstances under which the State will or will not consider accepting applications for technical assistance programs or energy conservation measures which were included in earlier approved grant awards but which were not implemented and for which no funds were expended after the original grant award;

(t) A statement setting forth:

(1) An estimate of energy savings which may result from the modification of maintenance and operating procedures and installation of energy conservation measures;

(2) A recommendation as to the types of energy conservation measures considered appropriate within the State; and

(3) An estimate of the costs of carrying out technical assistance and energy conservation measure programs;

(u) For purposes of the technical assistance program pursuant to §455.62:

(1) A statement setting forth uniform conversion factors to be used by all grant applicants in the technical assistance analysis for conversion of fuels to Btu equivalents. For the conversion of kilowatt hours to Btus, the State may use 3,413, representing consumption at the consumer's end, or 11,600, representing consumption at the producer's end, or may assign 3,413 to some types of energy conservation measures and 11,600 to other types of measures in which case the State shall specify the conversion factor to be used for each type of measure, providing a rationale and citing the sources used in making this decision, and the State shall always apply the specified factor consistently to all ECMs of a particular type;

(2) A statement setting forth the cost-effectiveness testing approach to be used to evaluate energy conservation measures pursuant to §455.63. States may select either the simple payback approach or the life-cycle

costing approach. Only one approach may be used for all technical assistance programs in the State. If the State elects to use the life-cycle costing approach, it must specify, consistent with § 455.64(g), whether it will use DOE-provided or its own energy cost escalation rate or annual discount rate, together with any other procedures required to be used (in addition to those specified in § 455.64); and

(3) A statement setting forth that 50 percent (or a higher percent) of total cost savings (used in calculating cost effectiveness pursuant to § 455.63(a)(1) for simple payback, or § 455.64(c) for life-cycle costing) must be from the cost of the energy to be saved.

(v) For any coordinating agency, a description of how it will operate including but not limited to:

(1) Name and address;

(2) Type of institutions covered;

(3) Application processing procedures;

(4) Whether TA applications, ECM applications, or both are covered;

(5) Intended schedule for soliciting and processing applications;

(6) Any special provisions for religiously affiliated institutions;

(7) Nature of subagreement to be used with institutions;

(8) Whether TA or ECM contractors selected by the coordinating agency will be offered incident to, or as a condition in, subagreements; and

(9) Other significant policies and procedures;

(w) If a State elects to allow credit toward the cost share for an energy conservation measure for the costs of technical assistance programs, technical assistance program updates, or energy conservation measures previously incurred and wholly paid for with non-Federal funds, the policies regarding such credit, including any time limits for the age of the earlier-funded work being proposed for credit; and

(x) The limit to the Federal share to be provided to applicants in the State if a State elects to provide less than a 50 percent Federal share to its applicants that do not qualify for severe hardship.

§ 455.21 Submission and approval of State Plans and State Plan amendments.

(a) Proposed State Plans or Plan amendments necessitated by a change in regulations shall be submitted to DOE within 90 days of the effective date of this subpart or any amended regulations. Upon request by a State, and for good cause shown, DOE may grant an extension of time.

(b) The Support Office Director shall, within 60 days of receipt of a proposed State Plan, review each plan and, if it is reasonable and found to conform to the requirements of this part, approve the State Plan. If the Support Office Director does not disapprove a State Plan within the 60-day period, the State Plan will be deemed to have been approved.

(c) If the Support Office Director determines that a proposed State Plan fails to comply with the requirements of this part or is not reasonable, DOE shall return the plan to the State with a statement setting forth the reasons for disapproval.

(d) Except for State Plan amendments covered by paragraph (a) of this section, if a State wishes to deviate from its approved State Plan, the State must submit and obtain DOE approval of the State Plan amendment.

(e) The Support Office Director shall, within 60 days or less of receipt of a proposed State Plan amendment review each amendment and, if it is found to conform to the requirements of this part, approve the amendment. If the Support Office Director determines that a proposed State Plan amendment fails to comply with the requirements of this part, or is not reasonable, DOE shall return the amendment to the State with a statement setting forth the reasons for disapproval.

Subpart C—Allocation of Appropriations Among the States

§ 455.30 Allocation of funds.

(a) DOE will allocate available funds among the States for two purposes: to award grants to schools, hospitals, units of local government, and public care institutions and coordinating agencies representing them to implement technical assistance and energy

conservation measures grant programs and to award grants to eligible States for administrative expenses, technical assistance programs, program assistance, and marketing expenses in accordance with this part.

(b) DOE shall notify each Governor of the total amount allocated for grants within the State for any grant program cycle:

(1) For schools and hospitals, the allocation amount shall be for technical assistance programs, subject to any limitation placed on technical assistance, and energy conservation measures;

(2) For States that are eligible pursuant to § 455.91, up to 100 percent of the funds allocated to the State by DOE may be used for technical assistance programs and/or for program assistance and up to 50 percent of the funds allocated to the State by DOE may be used for marketing as defined in § 455.2;

(3) For States eligible under § 455.81, a portion of the allocation may be used for a grant to the State for administrative expenses as described in § 455.120;

(4) For unit of local government and public care institutions, the allocation amount shall be solely for technical assistance programs; and

(5) For coordinating agencies, the allocation amount shall be for either technical assistance programs subject to any limitation placed on technical assistance, or energy conservation measures, or both depending on how the coordinating agency elects to operate.

(c) DOE shall notify each Governor of the period for which funds allocated for a grant program cycle will be made available for grants within the State.

(d) Each State shall make available up to 10 percent of its allocation for schools and hospitals in each grant program cycle to provide financial assistance, not to exceed a 90 percent Federal share, for technical assistance programs and energy conservation measures for schools and hospitals determined to be in a class of severe hardship. Such determinations shall be made in accordance with § 455.132.

§ 455.31 Allocation formulas.

(a) Financial assistance for conducting technical assistance programs for units of local government and public care institutions shall be allocated among the States by multiplying the sum available by the allocation factor set forth in paragraph (c) of this section.

(b) Financial assistance for conducting technical assistance programs and acquiring and installing energy conservation measures, including renewable resource measures, for schools and hospitals, shall be allocated among the States by multiplying the sum available by the allocation factor set forth in paragraph (c) of this section.

(c) The allocation factor (K) shall be determined by the formula:

$$K = \frac{0.07}{N} + 0.1\frac{(Sfc)}{(Nfc)} + 0.83\frac{(SP)(SC)}{(NPC)}$$

where, as determined by DOE:

(1) Sfc is the projected average retail cost per million Btu's of energy consumed within the region in which the State is located as contained in current regional energy cost projections obtained from DOE.

(2) Nfc is the summation of the Sfc numerators for all States;

(3) N is the total number of eligible States;

(4) SP is the population of the State;

(5) SC is the sum of the State's heating and cooling degree days; and

(6) NPC is the summation of the (SP)(SC) numerators for all States.

(d) Except for the District of Columbia, Puerto Rico, Guam, American Samoa, the Commonwealth of the Northern Mariana Islands, and the U.S. Virgin Islands, no allocation available to any State may be less than 0.5 percent of all amounts allocated in any grant program cycle. No State will be allocated more than 10 percent of the funds allocated in any grant program cycle.

§ 455.32 Reallocation of funds.

(a) If a State Plan has not been approved and implemented by a State by the close of the period for which allocated funds are available as set forth in the notice issued by DOE pursuant to § 455.30(c), funds allocated to that State for technical assistance and energy

conservation measures will be reallocated among all States for the next grant program cycle, if available.

(b) Funds which have been allocated to States in a grant program cycle but which have not been obligated to eligible State, school, or hospital grant applicants by the end of that cycle shall be reallocated by DOE among all States in the next grant program cycle.

(c) Funds which become available due to deobligations resulting from funds returned by grantees due to cost underruns or scope-of-work reductions on completed projects shall be reallocated by DOE among all States in the next grant program cycle.

(d) Funds which become available because of declined grants to schools and hospitals within a State may be reobligated to other eligible applicants in the State until the December 31 following the close of the cycle for which the funds were allocated to the State. Such funds which have not been reobligated by that deadline shall be reallocated by DOE among all States in the next grant program cycle.

(e) Funds which become available because of declined or deobligated financial assistance provided through coordinating agencies to schools and hospitals within a State may be reobligated to other eligible applicants in the State until the December 31 following the close of the cycle for which the funds were allocated to the coordinating agency. Such funds which have not been reobligated by that deadline shall be reallocated by DOE among all States in the next grant program cycle.

(f) Funds granted to States for technical assistance, program assistance, and marketing pursuant to §455.144 are subject to reallocation by DOE among all the States in the next program cycle if such funds are not committed by the State to their intended purposes by means of grants, contracts, or other legally binding obligations, or redirected to schools and hospitals grant applications pursuant to §455.144(d), by the December 31 following the close of the cycle for which the funds were allocated to the State.

Subpart D—Preliminary Energy Audit and Energy Audit Grants [Reserved]

Subpart E—Technical Assistance Programs for Schools, Hospitals, Units of Local Government, and Public Care Institutions

§ 455.60 Purpose.

This subpart specifies what constitutes a technical assistance program eligible for financial assistance under this part and sets forth the eligibility criteria for schools, hospitals, units of local government, and public care institutions to receive grants for technical assistance to be performed in buildings owned by such institutions.

§ 455.61 Eligibility.

To be eligible to receive financial assistance for a technical assistance program, an applicant must:

(a) Be a school, hospital, unit of local government, public care institution, or coordinating agency representing them except that financial assistance for units of local government and public care institutions will be provided only for buildings which are owned and primarily occupied by offices or agencies of a unit of local government or public care institution and which are not intended for seasonal use and not utilized primarily as a school or hospital eligible for assistance under this program;

(b) Be located in a State which has an approved State Plan as described in subpart B of this part;

(c) Have conducted an energy audit or an energy use evaluation required pursuant to §455.20(k) and adequate to estimate energy conservation potential for the building for which financial assistance is to be requested, subsequent to the most recent construction, reconfiguration, or utilization change which significantly modified energy use within the building;

(d) If an energy audit has been performed, give assurance that it has implemented all energy conservation maintenance and operating procedures required pursuant to §455.20(k) or provide a written justification for not implementing them pursuant to §455.20(l)(3); and

(e) Submit an application in accordance with the provisions of this part and the approved State Plan.

§ 455.62 Contents of a technical assistance program.

(a) The purpose of a technical assistance program is to provide a report based on an on-site analysis of the building which meets the requirements of this section and the State's procedures for implementing this section.

(b) A technical assistance program shall be designed to identify and document energy conservation maintenance and operating procedure changes and energy conservation measures in sufficient detail to support possible application for an energy conservation measure grant and to provide reviewers and decision makers handling such applications sufficient information upon which to base a judgment as to their reasonableness and a decision whether to pursue any or all of the recommended improvements.

(c) A technical assistance program shall be conducted by a technical assistance analyst who has the qualifications established in the State Plan in accordance with § 455.20(r).

(d) At the conclusion of a technical assistance program, the technical assistance analyst shall prepare a report which shall include:

(1) A description of building characteristics and energy data including:

(i) The results of the energy audit or energy use evaluation of the building together with a statement as to the accuracy and completeness of the energy audit or energy use evaluation data and recommendations;

(ii) The operation characteristics of energy-using systems; and

(iii) The estimated remaining useful life of the building;

(2) An analysis of the estimated energy consumption of the building, by fuel type in total Btus and Btu/sq.ft./yr., using conversion factors prescribed by the State in the State Plan, at optimum efficiency (assuming implementation of all energy conservation maintenance and operating procedures);

(3) A description and analysis of all identified energy conservation maintenance and operating procedure changes, if any, and energy conservation measures selected in accordance with the State Plan, including renewable resource measures, setting forth:

(i) A description of each energy conservation maintenance and operating procedure change and an estimate of the costs of adopting such energy conservation maintenance and operating procedure changes;

(ii) An estimate of the cost of design, acquisition and installation of each energy conservation measure, discussing pertinent assumptions as necessary;

(iii) Estimated useful life of each energy conservation measure;

(iv) An estimate of any increases or decreases in maintenance and operating costs that would result from each conservation measure, if relevant to the cost effectiveness test applicable under this part;

(v) An estimate of any significant salvage value or disposal cost of each energy conservation measure at the end of its useful life if relevant to the cost effectiveness test applicable under this part;

(vi) An estimate, supported by all data and assumptions used in arriving at the estimate, of the annual energy savings, the annual cost of energy to be saved, and total annual cost savings using current energy prices including demand charges expected from each energy conservation maintenance and operating procedure change and the acquisition and installation of each energy conservation measure. In calculating the potential annual energy savings, annual cost of energy to be saved, or total annual cost savings of each energy conservation measure, including renewable resource measures, the technical assistance analyst shall:

(A) Assume that all energy savings obtained from energy conservation maintenance and operating procedures have been realized;

(B) Calculate the total annual energy savings, annual cost of energy to be saved, and total annual cost savings, by fuel type, expected to result from the acquisition and installation of the energy conservation measures, taking into account the interaction among the various measures;

(C) Calculate that portion of the total annual energy savings, annual cost of energy to be saved, and total annual cost savings, as determined in paragraph (d)(3)(vi)(B) of this section,

attributable to each individual energy conservation measure; and

(D) Consider climate and other variables;

(vii) An analysis of the cost effectiveness of each energy conservation measure consistent with §455.63 and, if applicable, §455.64 of this part;

(viii) The estimated cost of the measure, which shall be the total cost for design and other professional service (excluding the cost of a technical assistance program), if any, and acquisition and installation costs. If required by the State in its State Plan, or if requested by the applicant, the technical assistance report shall provide a life-cycle cost analysis which is consistent with §455.64 and states the discount and energy cost escalation rates that were used;

(ix) The simple payback period of each energy conservation measure, calculated pursuant to §455.63(a);

(4) Energy use and cost data, actual or estimated, for each fuel type used for the prior 12-month period, by month, if possible;

(5) Documentation of demand charges paid by the institution for the prior 12-month period, by month if possible, when demand charges are included in current energy prices or when the technical assistance report recommends an energy conservation measure that shifts energy usage to periods of lower demand and cost; and

(6) A signed and dated certification that the technical assistance program has been conducted in accordance with the requirements of this section and that the data presented is accurate to the best of the technical assistance analyst's knowledge.

§455.63 Cost-effectiveness testing.

(a) This paragraph applies to calculation of the simple payback period of energy conservation measures.

(1) The simple payback period of each energy conservation measure (except measures to shift demand, or renewable resource measures) shall be calculated, taking into account the interactions among the various measures, by dividing the estimated total cost of the measure, as determined pursuant to §455.62(d)(3)(ii), by the estimated annual cost savings accruing from the measure (adjusted for demand charges), as determined pursuant to §455.62(d)(3)(vi), provided that:

(i) At least 50 percent of the annual cost savings used in this calculation shall be from the cost of the energy to be saved or a higher percent if required by a State in its State Plan pursuant to §455.20(u)(3); and

(ii) No more than 50 percent of the annual cost savings used in this calculation shall be from other cost savings, such as those resulting from energy conservation maintenance and operating procedures related to particular energy conservation measures, or from changes in type of fuel used, or a lower percent if required by a State in its State Plan pursuant to §455.20(u)(3).

(2) The simple payback period of each renewable resource energy conservation measure shall be calculated, taking into account the interactions among the various measures, by dividing the estimated total cost of the measure, as determined pursuant to §455.62(d)(3)(ii), by the estimated annual cost savings accruing from the measure taking into account at least the annual cost of the non-renewable fuels displaced less the annual cost of the renewable fuel, if any, and the annual cost of any backup non-renewable fuel needed to operate the system, adjusted for demand charges, as determined pursuant to §455.62(d)(3)(vi).

(3) The simple payback period of each energy conservation measure designed to shift demand to a period of lower demand and lower cost shall be calculated, taking into account the interactions among the various measures, by dividing the estimated total cost of the measure, as determined pursuant to §455.62(d)(3)(ii), by the estimated annual cost savings accruing from the measure taking into account at least the annual cost of the energy used before the measure is installed less the estimated annual cost of the energy to be used after the measure is installed, adjusted for demand charges, as determined pursuant to §455.62(d)(3)(vi).

(b) This paragraph applies, in addition to paragraph (a) of this section, if the State plan requires the cost effectiveness of an energy conservation measure to be determined by life-cycle

cost analysis or if the applicant requests such an analysis.

(1) A life-cycle cost analysis, showing a savings-to-investment ratio greater than or equal to one over the useful life of the energy conservation measure or 15 years, whichever is less, shall be conducted in accordance with the requirements set forth in the State Plan pursuant to §§ 455.20(u)(2), 455.20(u)(3) and § 455.64.

(2) The resulting savings-to-investment ratio shall be used for the purpose of ranking applications.

§ 455.64 Life-cycle cost methodology.

(a) The life-cycle cost methodology under § 455.63(b) of this part is a systematic comparison of the relevant significant cost savings and costs associated with an energy conservation measure over its expected useful life, or other appropriate study period with future cost savings and costs discounted to present value. The format for displaying life-cycle costs shall be a savings-to-investment ratio.

(b) An energy conservation measure must be cost effective, and its savings-to-investment ratio must be greater than or equal to one no earlier than the end of the second year of the study period.

(c) A savings-to-investment ratio is the ratio of the present value of net cost savings attributable to an energy conservation measure to the present value of the net increase in investment, maintenance and operating, and replacement costs less salvage value or disposal cost attributable to that measure over a study period.

(d) Except for energy conservation measures to shift demand or to use renewable energy resources, the numerator of the savings-to-investment ratio shall include net cost savings, appropriately discounted and adjusted for energy cost escalation consistent with paragraph (g) of this section, subject to the limitation that the cost of the energy to be saved shall constitute at least 50 percent of the net cost savings unless the State specifies a higher percent in its State plan pursuant to § 455.20(u)(3).

(e) With respect to energy conservation measures to shift demand or to use renewable energy resources, the numerator of the savings-to-investment ratio shall be net cost savings appropriately discounted and adjusted for energy cost escalation consistent with paragraph (g) of this section.

(f) The study period for a life-cycle cost analysis, which may not exceed 15 years, shall be the useful life of the energy conservation measure or of the energy conservation measure with the longest life (for purposes of ranking buildings with multiple energy conservation measures).

(g) The discount rate must equal or exceed the discount rate annually provided by DOE under 10 CFR part 436. The energy cost escalation rates must not exceed those annually provided by DOE under 10 CFR part 436.

(h) Investment costs may be assumed to be a lump sum occurring at the beginning of the base year, or to the extent that there are future investment costs, discounted to present value.

(i) The cost of energy and maintenance and operating costs may be assumed to begin to accrue at the beginning of the base year or when they are actually projected to occur.

(j) It may be assumed that costs occur in a lump sum at any time within the year in which they are incurred.

Subpart F—Energy Conservation Measures for Schools and Hospitals

§ 455.70 Purpose.

This subpart sets forth the eligibility criteria for schools and hospitals to receive grants for energy conservation measures, including renewable resource measures, and the elements of an energy conservation measure program.

§ 455.71 Eligibility.

(a) To be eligible to receive financial assistance for an energy conservation measure, including renewable resource measures, an applicant must:

(1) Be a school, hospital, or coordinating agency representing them as defined in § 455.2;

(2) Be located in a State which has an approved State Plan as described in subpart B of this part;

(3) Have completed a technical assistance program consistent with § 455.62,

as determined by the State in accordance with the State Plan, for the building for which financial assistance is to be requested subsequent to the most recent construction, reconfiguration, or utilization change to the building which significantly modified energy use within the building;

(4) Have completed an updated technical assistance program if required in the State Plan as specified in § 455.20(q);

(5) Have implemented all energy conservation maintenance and operating procedures which are identified as the result of a technical assistance program or have provided pursuant to the State plan a satisfactory written justification for not implementing any specific maintenance and operating procedures so identified;

(6) Have met any requirements set forth in the State Plan pursuant to § 455.20(m) regarding the avoidance of supplanting other funds in the financing of energy conservation measures under this part;

(7) Have no plan or intention at the time of application to close or otherwise dispose of the building for which financial assistance is to be requested within the simple payback period or useful life (depending on the State's requirement for determining cost effectiveness) of any energy conservation measure recommended for that building; and

(8) Submit an application in accordance with the provisions of this part and the approved State Plan;

(b) To be eligible for financial assistance:

(1) In States where simple payback has been selected as the cost-effectiveness test pursuant to § 455.20(u)(2), the simple payback period of each energy conservation measure for which financial assistance is requested shall not be less than 2 years nor greater than 10 years, and the estimated useful life of the measure shall be greater than its simple payback period; or

(2) In States where life-cycle costing has been selected as the cost-effectiveness test pursuant to § 455.20(u)(2), the savings-to-investment ratio of each energy conservation measure must be greater than or equal to one under § 455.63(b)(1), over a period for analysis which does not exceed 15 years, and the useful life of the energy conservation measure must be at least 2 years.

(c) Leased equipment is not eligible for financial assistance under this part. Equipment which becomes the property of the grantee at the conclusion of a long-term purchase agreement without any additional payment is eligible.

§ 455.72 Scope of the grant.

Financial assistance awarded under this subpart may be expended for the design (excluding design costs funded under the technical assistance program), acquisition, and installation of energy conservation measures to reduce energy consumption or measures to allow the use of renewable resources in schools and hospitals or to shift energy usage to periods of low demand and cost. Such measures include, but are not necessarily limited to, those included in the definition of ''energy conservation measure'' in § 455.2.

Subpart G—State Administrative Expenses

§ 455.80 Purpose.

This subpart describes what constitutes a State administrative expense that may receive financial assistance under this part and sets forth the eligibility criteria for States to receive grants for administrative expenses.

§ 455.81 Eligibility.

To be eligible to receive financial assistance for administrative expenses, a State must:

(a) Have in place a State Plan approved by DOE pursuant to § 455.21 and

(b) Be operating a program to provide technical assistance and energy conservation measure grants, or technical assistance, program assistance, and marketing (where energy conservation measures are funded non-Federally) to eligible institutions pursuant to this part.

§ 455.82 Scope of the grant.

A State's administrative expenses shall be limited to those directly related to administration of technical assistance programs, program assistance and marketing programs, and energy

conservation measures including costs associated with:

(a) Personnel whose time is expended directly in support of such administration;

(b) Supplies and services expended directly in support of such administration;

(c) Equipment purchased or acquired solely for and utilized directly in support of such administration, subject to 10 CFR 600.436;

(d) Printing, directly in support of such administration; and

(e) Travel, directly related to such administration.

Subpart H—State Grants for Technical Assistance, Program Assistance, and Marketing

§ 455.90 Purpose.

This subpart describes what constitutes a State program for technical assistance, program assistance, and marketing that may receive financial assistance under this part and sets forth the eligibility criteria for States to receive grants for technical assistance, program assistance, and marketing.

§ 455.91 Eligibility.

To be eligible to receive financial assistance for technical assistance, program assistance, and marketing, a State must:

(a) Have in place a State Plan approved by DOE which includes a description of the State's program or programs to provide technical assistance, program assistance, and marketing, pursuant to § 455.20(j)(1);

(b) Have established a program consistent with this part to fund, from non-Federal sources, energy conservation measures for eligible institutions; and

(c) Provide to DOE a certification pursuant to § 455.122.

§ 455.92 State technical assistance awards.

Technical assistance awards by States under this subpart are subject to all requirements of this part which apply to DOE-awarded technical assistance program grants except that States:

(a) Are not required to award the funds in grant instruments;

(b) May award the funds throughout the fiscal year subject to § 455.144(a)(3); and

(c) Are not required to rank applications under § 455.131(b) of this part.

Subpart I—Cost Sharing

§ 455.100 Limits to Federal share.

Amounts made available under this part, together with any other amounts made available from other Federal sources, may not be used to pay more than 50 percent of the costs of technical assistance programs and energy conservation measures unless the grantee qualifies for the exceptions specified in §§ 455.141(a), 455.142(a), 455.142(b), or for severe hardship assistance specified in § 455.142(c). In cases of severe hardship, the Federal share of the cost cannot exceed 90 percent.

§ 455.101 Borrowing the non-Federal share/title to equipment.

The non-Federal share of the costs of acquiring and installing energy conservation measures may be provided by using financing or other forms of borrowed funds, such as those provided by loans and performance contracts, even if such financing does not provide for the grantee to receive clear title to the equipment being financed until after the grant is closed out. However, grantees in such cases must otherwise meet all the requirements of this part, and financing and loan agreements and performance contracts under this section are subject to the requirements of 10 CFR Part 600 and the certification requirements under § 455.111(e). Grantees must receive clear title to the equipment when the loan is paid off.

§ 455.102 Energy conservation measure cost-share credit.

To the extent a State provides in its State Plan, DOE may wholly or partially credit the costs of the following, with respect to a building, toward the required cost-share for an energy conservation measure grant in that building:

(a) A non-Federally funded technical assistance program;

(b) A non-Federally funded technical assistance program update to comply with §455.20(q); and

(c) The non-Federally funded implementation of one or more energy conservation measures, which complies with the eligibility criteria set forth in §455.71.

§455.103 Requirements for applications for credit.

(a) If a State has provided for credit in its State Plan pursuant to §455.20(w), applications for credit will be considered only when the technical assistance programs or updates and the energy conservation measure projects for which credit is sought meet the applicable program requirements, such as those specified in §455.61, §455.62, §455.71, and the relevant sections of 10 CFR part 600, except that the project need not comply with the Davis-Bacon Act regarding labor standards or wage rates.

(b) Credit for energy conservation measures will be considered only when supported by a technical assistance analysis that meets the requirements of §455.62 and that was performed prior to the installation of the energy conservation measures.

§455.104 Rebates from utilities and other entities.

(a) Grantees which receive rebates or other monetary considerations from utilities or other entities for installing the energy conservation measures funded by a grant under this part may use such funds to meet their cost- sharing obligations pursuant to §455.100.

(b) Where the rebate or monetary consideration does not exceed the non-Federal share of the cost of the measures applied for in a grant application, grantees are not required to deduct the amount of the rebate or monetary consideration from the cost of the measures, and DOE does not consider such rebates or monetary considerations to be program income which would have to be remitted to DOE upon receipt by the grantee.

(c) Where the rebate or monetary consideration does exceed the non-Federal share of the cost of the measures applied for in a grant application, grantees may use the excess to fund additional measures if such measures have been recommended in the technical assistance report. If it is not possible to use the excess funding in this way, the grantee must reduce the cost—and DOE will reduce the Federal share—by the amount of the excess above the non-Federal share.

Subpart J—Applicant Responsibilities—Grants to Institutions and Coordinating Agencies

§455.110 Grant application submittals for technical assistance and energy conservation measures.

(a) Each eligible applicant desiring to receive financial assistance (either from DOE directly, through a State serving as a coordinating agency, or through another organization serving as a coordinating agency) shall file an application in accordance with the provisions of this subpart and the approved State Plan of the State in which such building is located. The application, which may be amended in accordance with applicable State procedures at any time prior to the State's final determination thereon, shall be filed with the State energy agency designated in the State Plan. Coordinating agencies shall file a single application with DOE which includes all of the information required below for each building for which assistance has been requested and to which is attached a copy of each application from each building owner.

(b) Applications from schools, hospitals, units of local government, public care institutions, and coordinating agencies for financial assistance for technical assistance programs shall include the certifications contained in §455.111 and:

(1) The applicant's name and mailing address;

(2) The energy audit or energy use evaluation required by the State pursuant to §455.20(k) for each building for which financial assistance is requested;

(3) A project budget, by building, which stipulates the intended use of all Federal and non-Federal funds, including in-kind contributions (valued in accordance with the guidelines in 10 CFR part 600), to be used to meet the cost-

sharing requirements described in subpart I of this part;

(4) A brief description, by building, of the proposed technical assistance program, including a schedule, with appropriate milestone dates, for completing the technical assistance program;

(5) Additional information required by the applicable State Plan and any other information which the applicant desires to have considered, such as information to support an application from a school or hospital for financial assistance in excess of the 50 percent Federal share on the basis of severe hardship or an application which proposes the use of Federal funds, paid under and authorized by another Federal agreement to meet cost sharing requirements.

(c) Applications from schools and hospitals and coordinating agencies for financial assistance for energy conservation measures, including renewable resource measures, shall include the certifications contained in §455.111 and:

(1) The applicant's name and mailing address;

(2) A description of each building for which financial assistance is requested sufficient to determine the building's eligibility, ownership, use, and size in gross square feet;

(3) A project budget, by measure or building, as provided in the State Plan which stipulates the intended use of all Federal and non-Federal funds and identifies the sources and amounts of non-Federal funds, including in-kind contributions (valued in accordance with the guidelines in 10 CFR part 600) to be used to meet the cost-sharing requirements described in subpart I of this part;

(4) A schedule, including appropriate milestone dates, for the completion of the design, acquisition, and installation of the proposed energy conservation measures for each building;

(5) For each energy conservation measure proposed for funding, the projected cost, the projected simple payback period, and if appropriate, the life-cycle cost savings-to-investment ratio calculated under §455.64. Applications with more than one energy conservation measure per building shall include projected costs and paybacks, and if appropriate, the savings-to-investment ratios for each measure and the average simple payback period or overall savings-to-investment ratio for all measures proposed for the building;

(6) The report of the technical assistance analyst (unless waived by DOE because the report is already in its possession). This report must have been completed since the most recent construction, reconfiguration, or utilization change to the building which significantly modified energy use, for each building;

(7) An update of the technical assistance program report if required by the State in its State Plan and as specified in §455.20(q);

(8) If the applicant is aware of any adverse environmental impact which may arise from adoption of any energy conservation measure, an analysis of that impact and the applicant's plan to minimize or avoid such impact; and

(9) Additional information required by the applicable State Plan, and any additional information which the applicant desires to have considered, such as information to support an application for financial assistance in excess of the non-Federal share set forth in the State plan on the basis of severe hardship, or an application which proposes the use of Federal funds paid under and authorized by another Federal agreement to meet cost sharing requirements.

§455.111 Applicant certifications for technical assistance and energy conservation measure grants to institutions and coordinating agencies.

Applications for financial assistance for technical assistance programs and energy conservation measures, including renewable resource measures, shall include certification that the applicant:

(a) Is eligible under §455.61 for technical assistance or §455.71 for energy conservation measures;

(b) Has satisfied the requirements set forth in §455.110;

(c) For applications for technical assistance, has implemented all energy conservation maintenance and operating procedures recommended in the energy audit pursuant to §455.20(k), if done, and for applications for energy

conservation measures, those recommended in the report obtained under a technical assistance program pursuant to § 455.62. If any such procedure has not been implemented, the application shall contain a satisfactory written justification consistent with the State plan for not implementing that procedure;

(d) Will obtain from the technical assistance analyst, before the analyst performs any work in connection with a technical assistance program or energy conservation measure, a signed statement certifying that the technical assistance analyst has no conflicting financial interest and is otherwise qualified to perform the duties of technical assistance analyst in accordance with the standards and criteria established in the approved State Plan;

(e) When using borrowed funds for the non-Federal share of an energy conservation project where a lien is placed by the lender on equipment funded under the grant, will obtain clauses in the financing contract:

(1) Stating the percent of DOE interest in the equipment (i.e., the percent of the total cost provided by the grant); and

(2) Requiring lender notification, with certified return receipt requested, to the applicable Support Office Director of the filing of a lawsuit seeking a remedy for a default; and

(f) Will comply with all reporting requirements contained in § 455.113.

§ 455.112 Davis-Bacon wage rate requirement.

When an energy conservation measure or group of measures in a building, funded under this part, has a total estimated cost for acquisition and installation of more than $5,000, any construction contract or subcontract in excess of $2,000, using any grant funds awarded under this part must include:

(a) Those contract labor standards provisions set forth in 29 CFR 5.5 and

(b) A provision for payment of laborers and mechanics at the minimum wage rates determined by the Secretary of Labor in accordance with the Davis-Bacon Act (40 U.S.C. 276a) as set forth in 29 CFR part 1.

§ 455.113 Grantee records and reports for technical assistance and energy conservation measure grants to institutions and coordinating agencies.

(a) Each unit of local government or public care institution which receives a grant for a technical assistance program and each school, hospital, and coordinating agency which receives a grant for a technical assistance program or an energy conservation measure, including renewable resource measures, shall keep all the records required by § 455.4 in accordance with this part and the DOE Financial Assistance Rules.

(b) Each grantee shall submit reports as follows:

(1) For technical assistance programs, two copies of a final report of the analysis completed on each building for which financial assistance was provided shall be submitted, either both to the State energy agency, or one to the State energy agency, and one to DOE as agreed upon between the State and the DOE Support Office no later than 90 days following completion of the analysis. These reports shall contain:

(i) The report submitted to the institution by the technical assistance analyst, and

(ii) The institution's plan to implement energy conservation maintenance and operating procedures;

(2) For energy conservation measure projects:

(i) Semi-annual progress reports. Two copies shall be submitted, either both to the State energy agency or one to the State energy agency and one to DOE, as agreed upon between the State and the DOE Support Office, no later than the end of July (for the period January 1 through June 30), and January (for the period July 1 through December 31) and shall detail and discuss milestones accomplished, those not accomplished, status of in-progress activities, and remedial actions if needed to achieve project objectives. Reports of coordinating agency grantees shall include financial assistance which an institution declines or does not use as a result of a change in scope. A final report may be submitted in lieu of the last semi-annual report if it satisfies

the semi-annual progress report and final report designated time frames;

(ii) A final report. Two copies shall be submitted, either both to the State energy agency or one to the State energy agency and one to DOE, as agreed upon between the State and the DOE Support Office, within 90 days of the completion of the project and shall list and describe the energy conservation measures acquired and installed, contain a final actual cost and a final estimated simple payback period for each measure and the project as a whole, or a final savings-to-investment ratio for each measure and the project as a whole (depending on the State requirement), and include a statement that the completed energy conservation measures conform to the approved grant application;

(iii) Annual energy use reports from a representative sample to be selected by the State which will reflect the grantee's actual post-retrofit energy use experiences for 3 years after project completion. Two copies of these reports shall be submitted, either both to the State energy agency or one to the State energy agency and one to DOE, as agreed upon between the State and the DOE Support Office within 60 days after the end of each 12-month period covered in the reports and shall identify each building and provide data on energy use for that building for the relevant 12-month period. To the extent feasible, energy consumption data in each annual report should be the monthly usage data by fuel or energy type, and the reports should include brief descriptions of any changes in building usage, equipment, or structure occurring during the reporting period.

(3) Each copy of any technical assistance or energy conservation measure report shall be accompanied by a financial status report completed in accordance with the documents listed in §455.3;

(4) In cases where both copies of the grantee technical assistance, energy conservation measure, and financial status reports are submitted to the State, as agreed upon between the State and the DOE Support Office, the State shall in turn submit copies to DOE on a mutually agreed-upon schedule; and

(5) Such other information as DOE may from time to time request.

Subpart K—Applicant Responsibilities—Grants to States

§455.120 Grant applications for State administrative expenses.

Each State desiring to receive grants to help defray State administrative expenses shall file an application in accordance with the provisions of this section.

(a) Where a State is operating a program solely to provide grants to schools and hospitals, the maximum amount of administrative expenses the State may apply for is $50,000 or 5 percent of the Federal share of its schools and hospitals grant awards, whichever is greater.

(1) At any time after notice by DOE of the amounts allocated to each State for a grant program cycle, each State may apply to DOE for an amount for administrative expenses not exceeding $50,000.

(2) After making a submittal to DOE as required under §455.133, each State may apply for a further grant not exceeding 5 percent of the total Federal share of all grant awards for technical assistance and energy conservation measures within the State, less the $50,000 provided for in paragraph (a)(l) of this section if that was previously awarded to the State for administrative expenses in the same grant program cycle.

(b) Where a State is eligible and elects to apply to use its appropriated allocation for grants for technical assistance, program assistance, and/or marketing pursuant to §455.121, the maximum amount of administrative expenses the State may apply for is $50,000 or 5 percent of the total amount obligated or legally committed to eligible recipients in the State pursuant to the State's program under this part, whichever is greater.

(1) At any time after notice by DOE of amounts allocated to each State for a grant program cycle, each State may apply to DOE for an amount for administrative expenses not exceeding $50,000.

(2) Once the total amount obligated or legally committed to the program in

the cycle is known, a State may subsequently apply for a further grant, not exceeding 5 percent of the total amount (less the $50,000 provided for in paragraph (b)(1) of this section if that was previously awarded to the State for administrative expenses in the same fiscal year) obligated or legally committed to eligible recipients in the State during the fiscal year for technical assistance, program assistance, and marketing, and for energy conservation measures which are funded with non-Federal funds but which meet the certification and other requirements of this part for such energy conservation measures.

(3) The aggregate amount applied for to cover State administrative expenses, technical assistance, program assistance, and marketing cannot exceed the State's allocation for the fiscal year.

(c) In the event that a State cannot, or decides not to use the amount available to it for an administrative grant under this section for administrative purposes, these funds may, at the discretion of the State, be used for technical assistance and energy conservation measure grants to eligible institutions within that State in accordance with this part.

(d) Applications for financial assistance to defray State administrative expenses shall include:

(1) The name and address of the person designated by the State to be responsible for the State's functions under this part;

(2) An identification of intended use of all Federal and non-Federal funds to be used for the State administrative expenses listed in § 455.82; and

(3) Any other information required by DOE.

§ 455.121 Grant applications for State technical assistance, program assistance, and marketing programs.

(a) A State may apply for up to 100 percent of the amount allocated to it for a grant program cycle to fund administrative expenses under § 455.120 and technical assistance and program assistance programs, or for up to 50 percent of the amount allocated to it for a grant program cycle to fund marketing programs provided that:

(1) The State has established a program to fund technical assistance, program assistance, or marketing programs, and has described its program or programs in its State Plan, as specified in § 455.20(j);

(2) The State has a program or programs established consistent with this part of that fund, from non-Federal sources, energy conservation measures eligible under this part;

(3) Not more than 15 percent of the aggregate amount of Federal and non-Federal funds legally committed or obligated to eligible recipients in the State to provide program assistance, marketing and technical assistance programs, implement energy conservation measures consistent with this part, and otherwise carry out a program pursuant to this part for the fiscal year concerned are expended for program assistance, technical assistance and marketing costs for such program;

(4) The energy conservation measures funded from non-Federal sources under this section would be eligible for funding under § 455.71; and

(5) The institutions undertaking the non-Federally funded energy conservation measures do so in accordance with all applicable Federal, State, and local laws and regulations with particular attention paid to applicable Federal and State non-discrimination laws and regulations.

(b) Applications for financial assistance to defray State technical assistance, program assistance, or marketing expenses shall include:

(1) The name and address of the person designated by the State to be responsible for the State's functions under this part;

(2) An identification of intended use of all Federal and non-Federal funds for the State administrative expenses listed in § 455.82, or the technical assistance, program assistance, or marketing programs pursuant to this section;

(3) Descriptions of the activities to be implemented together with a description of the State's program to provide non-Federal sources of funding to carry out the State's program(s) for energy conservation measures consistent with this part;

(4) A certification that the 15 percent limit specified in subparagraph (a)(3) of this section will not be exceeded; and

(5) Any other information required by DOE.

§ 455.122 Applicant certifications for State grants for technical assistance, program assistance, and marketing.

Applications from States for financial assistance for technical assistance programs, program assistance, and marketing shall include certifications that the State:

(a) Has established a program or programs to fund, from non-Federal sources, energy conservation measures for eligible buildings consistent with this part;

(b) Will not expend, for technical assistance, program assistance, and marketing, more than 15 percent of the aggregate amount of Federal and non-Federal funds legally obligated or committed to eligible recipients in the State to provide technical assistance, program assistance, marketing programs, implement energy conservation measures consistent with this part, and otherwise carry out a program pursuant to this part for the fiscal year concerned; and

(c) Has provided for regular DOE-funded grants to eligible religiously affiliated institutions if the State has a State constitutional or other legal prohibition on providing State assistance to such institutions and if such institutions would be ineligible to apply for the non-Federally funded energy conservation measures or State-funded technical assistance.

§ 455.123 Grantee records and reports for State grants for administrative expenses, technical assistance, program assistance, and marketing.

(a) Each State which receives a grant for administrative expenses, or a grant for technical assistance programs, program assistance, or marketing shall keep all the records required by § 455.4 in accordance with this part and the DOE Financial Assistance Rules.

(b) Each State shall submit a semi-annual program performance report to DOE by the close of each February and August, including, but not limited to:

(1) A discussion of administrative activities pursuant to § 455.82, if a State has received a grant to fund such activities, and a discussion of milestones accomplished, those not accomplished, status of in-progress activities, problems encountered, and remedial actions, if any, planned pursuant to § 455.135(f);

(2) A discussion of technical assistance, program assistance, and/or marketing programs pursuant to § 455.121, if the State has received grants to fund such activities, including a discussion of the results of the State's program to non-Federally fund energy conservation measures consistent with this part pursuant to § 455.121, with a list of buildings receiving assistance for technical assistance programs and a list of buildings which obtained energy conservation measures using non-Federal funds, including the name and address of each building, the amount and type of funding provided to each, and for energy conservation measures, the types of measures funded in each building together with each measure's total estimated cost and estimated annual cost savings, annual energy savings, and the annual cost of the energy to be saved (determined pursuant to § 455.62(d)) consistent with the data currently provided to DOE on all ICP grants;

(3) A summary of grantee reports received by the State during the report period pursuant to §§ 455.113(b)(1) and (b)(2);

(4) For the report due to be submitted to DOE by the close of each August, an estimate of annual energy use reductions in the State, by energy source, attributable to implementation of energy conservation maintenance and operating procedures and installation of energy conservation measures under this part. Such estimates shall be based upon a sampling of institutions participating in the technical assistance phase of this program and upon the energy use reports submitted to the State pursuant to § 455.113(b)(2)(iii); and

(5) Such other information as DOE may from time to time request.

(c) Each copy of any report covering grants for State administrative, technical assistance, program assistance,

or marketing expenses shall be accompanied by a financial status report completed in accordance with the documents listed in §455.3. In addition, States shall file quarterly financial status reports for the quarters which occur between the semi-annual report periods covered in their program performance reports. These quarterly reports are due within 30 days following the end of the applicable quarters.

Subpart L—State Responsibilities

§455.130 State evaluation of grant applications.

(a) If an application received by a State is reviewed and evaluated by that State and determined to be in compliance with subparts E, F, and J of this part, §455.130(b), any additional requirements of the approved State Plan, State environmental laws, and other applicable laws and regulations, then such application will be eligible for financial assistance.

(b) Concurrent with its evaluation and ranking of grant applications pursuant to §455.131, the State will forward applications for technical assistance or for energy conservation measures for schools to the State school facilities agency for review and certification that each school application is consistent with related State programs for educational facilities. For hospitals the certification requirement applies only if there is a State requirement for it in which case the procedure should be described in the State Plan.

§455.131 State ranking of grant applications.

(a) Except as provided by §455.92 of this part, all eligible applications received by the State will be ranked by the State in accordance with its approved State Plan.

(b) For technical assistance programs, buildings shall be ranked in descending priority based upon the energy conservation potential, on a savings percentage basis, of the building as determined in the energy audit or energy use evaluation pursuant to §455.20(k). Each State shall develop separate rankings for all buildings covered by eligible applications for:

(1) Technical assistance programs for units of local government and public care institutions and

(2) Technical assistance programs for schools and hospitals.

(c) All eligible applications for energy conservation measures received will be ranked by the State on building-by-building or a measure-by-measure basis. If a State ranks on a building-by-building basis, several buildings may be ranked as a single building if the application proposes a single energy conservation measure which is physically connected to all of the buildings. If a State ranks on a measure-by-measure basis, a measure that is physically connected to a number of buildings may be ranked as a single measure. Buildings or measures shall be ranked in accordance with the procedures established by the State Plan on the basis of the information developed during a technical assistance program (or its equivalent) for the building and the criteria for ranking applications. The criterion set forth in paragraph (1) of this subsection shall receive at least 50 percent of the weight given to the criteria used to rank applications. Each State may assign weights to the other criteria as set forth in the State Plan pursuant to §455.20(e). The criteria for ranking applications are:

(1) Simple payback or a life-cycle cost analysis, calculated in accordance with §455.63 and §455.64, as applicable;

(2) The types and quantities of energy to be saved, including oil, natural gas, or electricity, in a priority as established in the approved State Plan;

(3) The types of energy sources to which conversion is proposed, including renewable energy;

(4) The quality of the technical assistance program report; and

(5) Other factors as determined by the State.

(d) A State is exempt from the ranking requirements of this section when:

(1) The total amount requested by all applications for schools and hospitals for technical assistance and energy conservation measures in a given grant program cycle for grants up to 50 percent is less than or equal to the funds available to the State for such grants and the total amount recommended for

hardship funding is less than or equal to the amounts available to the State for such grants and

(2) The total amount requested by all applications for buildings owned by units of local government and public care institutions in a given grant program cycle is less than or equal to the total amount allocated to the State for technical assistance program grants in the State;

(e) If a State elects to permit applications for credit pursuant to §455.102, such applications for completed or partially completed energy conservation measures shall reflect both the work done and the work to be done and will be reviewed and ranked on the basis of the cost of all of the measures in the project. The credit shall not exceed the non-Federal share of the proposed additional energy conservation measures (and the Federal share shall not exceed the cost of the work remaining to be done).

(f) Within the rankings of school and hospital buildings for technical assistance and energy conservation measures including renewable resource measures to the extent that approvable applications are submitted, a State shall initially assure that:

(1) Schools receive at least 30 percent of the total funds allocated for schools and hospitals to the State in any grant program cycle and

(2) Hospitals receive at least 30 percent of the total funds allocated for schools and hospitals to the State in any grant program cycle.

(g) If there are insufficient applications from schools or hospitals to cover the respective 30 percent requirements specified in paragraph (f) of this section, then the State may recommend use of the remaining funds in those allocations for other qualified applicants.

§455.132 State evaluation of requests for severe hardship assistance.

(a) To the extent provided in §455.30(d), financial assistance will be initially available for schools and hospitals experiencing severe hardship based upon an applicant's inability to provide the non-Federal share as specified in the State plan pursuant to §455.20(g). This financial assistance will be available only to the extent necessary to enable such institutions to participate in the program.

(b) The State shall recommend funds for severe hardship applications wholly or partially from the funds reserved in accordance with §455.30(d) and as stated in an approved State Plan.

(c) Applications for Federal funding in excess of the non-Federal share in the State plan pursuant to §455.20(x) based on claims of severe hardship shall be given an additional evaluation by the State to assess on a quantifiable basis to the maximum extent practicable the relative need among eligible institutions. The minimum amount of additional Federal funding necessary for the applicant to participate in the program will be determined by the State in accordance with the procedures established in the State Plan. The primary consideration shall be the institution's inability to provide the non-Federal share of the project cost as specified in the State plan pursuant to §455.20(x). Secondary criteria such as climate, fuel cost and fuel availability, borrowing capacity, median family income in the area, and other relevant factors as determined by the State may be addressed in the State Plan as specified in §455.20(g).

(d) A State shall indicate, for those schools and hospitals with the highest rankings, determined pursuant to §455.131(b) and (c):

(1) The amount of additional hardship funding requested by each eligible applicant for each building determined to be in a class of severe hardship and

(2) The amount of hardship funding recommended by the State based upon relative need, as determined in accordance with the State Plan, to the limit of the hardship funds available. The State must decide on a case-by-case basis whether, and to what extent, it will recommend hardship funding.

(e) If there are insufficient applications from hardship applicants to cover the 10 percent allocation provided for in §455.30(d), then the State may recommend use of the remaining funds for other qualified applicants. The total amount recommended for hardship grants cannot exceed the 10 percent limit.

§ 455.133 Forwarding of applications from institutions and coordinating agencies for technical assistance and energy conservation measure grants.

(a) Except as provided by § 455.92 of this part, each State shall forward all applications recommended for funding within its allocation to DOE once each program cycle along with a listing of buildings or measures covered by eligible applications for schools, hospitals, units of local government, and public care institutions ranked by the State if necessary pursuant to the provisions of § 455.131. If ranking has been employed, the list shall include the standings of buildings or measures.

(1) Measure-by-measure rankings will be recombined for the respective buildings with more than one recommended measure and

(2) Buildings will be consolidated under one grantee application.

(b) The State shall indicate the amount of financial assistance requested by the applicant for each eligible building and, for those buildings recommended for funding within the limits of the State's allocation, the amount recommended for funding. If the amount recommended is less than the amount requested by the applicant, the list shall also indicate the reason for that recommendation.

(c) The State shall indicate that it has reviewed and evaluated all of the submitted applications and that those applications meet the relevant requirements of the program, and shall certify that applications submitted are eligible pursuant to § 455.130(a).

§ 455.134 Forwarding of applications for State grants for technical assistance, program assistance, and marketing.

A State eligible to apply for grants for technical assistance, program assistance, or marketing, as described in § 455.121, may submit such an application to DOE any time after the allocations have been announced as part of, or in lieu of, an application for a grant for State administrative expenses. Such applications shall provide separate narrative descriptions, budgets and appropriate milestone dates, covering each activity or program, that are sufficiently detailed to enable DOE to reasonably evaluate the application.

§ 455.135 State liaison, monitoring, and reporting.

Each State shall be responsible for:

(a) Consulting with eligible institutions and coordinating agencies representing such institutions in the development of its State Plan;

(b) Notifying eligible institutions and coordinating agencies of the content of the approved State Plan and any amendment to a State Plan;

(c) Notifying each applicant how the applicant's building or measure ranked among other applications, and whether and to what extent its application will be recommended for funding or if not to be recommended for funding, the specific reasons(s) therefor;

(d) Certifying that each institution has given its assurance that it is willing and able to participate on the basis of any changes in amounts recommended for that institution in the State ranking pursuant to § 455.131;

(e) Reporting requirements pursuant to § 455.113; and

(f) Direct program oversight and monitoring of the activities for which grants are awarded as defined in the State Plan. States shall immediately notify DOE of any noncompliance or indication thereof.

Subpart M—Grant Awards

§ 455.140 Approval of applications from institutions and coordinating agencies for technical assistance and energy conservation measures.

(a) DOE shall review and approve applications submitted by a State in accordance with § 455.133 if DOE determines that the applications meet the objectives of the Act, and comply with the applicable State Plan and the requirements of this part. DOE may disapprove all or any portion of an application to the extent funds are not available to carry out a program or measure (or portion thereof) contained in the application, or for such other reason as DOE may deem appropriate.

(b) DOE shall notify a State and the applicant of the final approval or disapproval of an application at the earliest practicable date after the DOE receipt of the application, and, in the event of disapproval, shall include a statement of the reasons therefor.

(c) An application which has been disapproved for reasons other than lack of funds may be amended to correct the cause of its disapproval and resubmitted in the same manner as the original application at any time within the same grant program cycle. Such an application will be considered to the extent funds have not already been designated for applicants by the ranking process at the time of resubmittal. However, nothing in this provision shall obligate either the State or DOE to take final action regarding a resubmitted application within the grant program cycle. An application not acted upon may be resubmitted in a subsequent grant program cycle.

(d) DOE shall not provide supplemental funds to cover cost overruns or other additional costs beyond those provided for in the original grant award for technical assistance projects and shall fund only one technical assistance project per building.

(e) DOE shall not provide supplemental funds to cover cost overruns or other additional costs beyond those provided for in the original grant award for energy conservation measures funded under a grant in a given grant program cycle. DOE shall not provide funds to cover energy conservation measures intended to replace energy conservation measures funded in an earlier grant cycle unless the State has funds remaining after all applications for new energy conservation measures have been evaluated and submitted to DOE for funding.

(f) If provided for in the State Plan, an applicant may reapply for a technical assistance program or an energy conservation measure grant which was included in a prior grant application but which was not implemented and for which no funds were expended.

(g) An applicant may apply for, and DOE may make, grant awards in another grant program cycle for additional energy conservation measures which relate to a building which previously received grants for other energy conservation measures.

(h) Funds which become available to a grantee after the installation of all approved measures, due to cost underruns in the installed measures, may be used by the grantee for additional measures if such measures are approved in writing by the State and DOE.

(i) DOE may fund costs incurred by an applicant for technical assistance and energy conservation measure projects after the date of the grant application, so long as that date is no earlier than the close of the preceding grant program cycle. Such costs may be funded when, in the judgment of DOE, the applicant has complied with program requirements and the costs incurred are allowable under applicable cost principles and the approved project budget. The applicant bears the responsibility for the entire project cost unless the application is approved by DOE in accordance with this part.

(j) In addition to the prior approval requirements for project changes as specified in the DOE Financial Assistance Rules (10 CFR part 600), a grantee shall request prior written approval from DOE before:

(1) Transferring DOE or matching amounts between buildings included in an approved application when the State ranks applications on a building-by-building basis or

(2) Transferring DOE or matching amounts between energy conservation measures included in an approved application when the State ranks on a measure-by-measure basis.

§ 455.141 Grant awards for units of local government, public care institutions, and coordinating agencies.

(a) DOE may make grants to units of local government, public care institutions, and coordinating agencies representing them for up to 50 percent of the costs of performing technical assistance programs for buildings covered by an application approved in accordance with § 455.140 except that in the case of units of local government and public care institutions a majority of whose operating and capital funds are provided by the Government of the U.S. Virgin Islands, Guam, American

Samoa, or the Commonwealth of the Northern Mariana Islands, a grant may be made for up to 100 percent of such costs.

(b) Total grant awards within any State to units of local government and public care institutions are limited to funds allocated to each State in accordance with § 455.30.

(c) Units of local government and public care institutions are not eligible for financial assistance for severe hardship.

§ 455.142 Grant awards for schools, hospitals, and coordinating agencies.

(a) DOE may make grants to schools, hospitals, and coordinating agencies for up to 50 percent of the costs of performing technical assistance programs for buildings covered by an application approved in accordance with § 455.140; except that in the case of schools and hospitals a majority of whose operating and capital funds are provided by the Government of the U.S. Virgin Islands, Guam, American Samoa, or the Commonwealth of the Northern Mariana Islands a grant may be made for up to 100 percent of such costs. Grant awards for technical assistance programs in any State within any grant program cycle shall be limited to a portion of the total allocation as specified in § 455.30(b)(1).

(b) DOE may make grants to schools, hospitals and coordinating agencies for up to 50 percent of the costs of acquiring and installing energy conservation measures, including renewable resource measures, for buildings covered by an application approved in accordance with § 455.140, except that in the case of schools and hospitals a majority of whose operating and capital funds are provided by the Government of the U.S. Virgin Islands, Guam, American Samoa, or the Commonwealth of the Northern Mariana Islands, a grant may be made for up to 100 percent of such costs.

(c) DOE may award up to 10 percent of the total amount allocated to a State for schools and hospitals in cases of severe hardship, ascertained by the State in accordance with the State Plan, for buildings recommended and in amounts determined by the State pursuant to § 455.132(d)(2).

§ 455.143 Grant awards for State administrative expenses.

(a) For the purpose of defraying State expenses in the administration of technical assistance programs in accordance with subpart E and energy conservation measures in accordance with subpart F or energy conservation measures non-Federally funded pursuant to § 455.121, DOE may make grant awards to a State:

(1) Immediately following public notice of the amounts allocated to a State for the grant program cycle, and upon approval of the application for administrative costs, in an amount not exceeding $50,000;

(2) Concurrent with grant awards for approved applications for technical assistance or energy conservation measures for institutions in that State and upon approval of an application for administrative costs, in an amount not exceeding the difference between the amount granted pursuant to paragraph (a)(1) of this section and 5 percent of the Federal share of the total amount of grants awarded within the State for technical assistance programs and energy conservation measures in the applicable grant program cycle; or

(3) Upon receipt by DOE of documentation from the State demonstrating that sufficient non-Federal funding has been obligated or legally committed to schools and hospitals for energy conservation measures pursuant to § 455.121(a) and § 455.123(b)(2), and upon approval of an application for administrative costs, in an amount not exceeding the difference between the amount granted pursuant to paragraph (a)(1) of this section and 5 percent of the aggregate Federal and non-Federal funds obligated or legally committed to eligible recipients in the State to provide technical assistance, program assistance, and marketing programs and implement energy conservation measures consistent with this part, for the fiscal year concerned.

(b) Grants for such purposes may be made for up to 100 percent of the projected administrative expenses, not to exceed the State's allocation or the

$50,000 or 5 percent limit, as approved by DOE.

(c) The total of all grants for State administrative costs, technical assistance programs, and energy conservation measures (or for State administrative costs, technical assistance, program assistance, and marketing, if the State elects and is eligible to apply for such grants) in that State shall not exceed the total amount allocated for that State for any grant program cycle.

(d) In the event that a State cannot or decides not to use the amount available to it for an administrative grant under this section for administrative purposes, these funds may, at the discretion of the State, be used for technical assistance and energy conservation grants to eligible institutions within that State in accordance with this part.

§ 455.144 Grant awards for State programs to provide technical assistance, program assistance, and marketing.

(a) For the purpose of defraying State expenses in the administration of special programs to provide technical assistance and program assistance pursuant to § 455.121, DOE may make a grant award to a State for up to 100 percent of the funds allocated to the State for the grant program cycle, provided that the State meets the requirements described in § 455.121(b). In addition:

(1) Funds for individual technical assistance programs provided by the State pursuant to this section shall not exceed 50 percent of the cost of the technical assistance program;

(2) Grants for program assistance may be made for up to 100 percent of a State's projected program assistance expenses; and

(3) Grants for State technical assistance, and program assistance programs may be awarded by DOE upon approval of an application from the State.

(b) For the purpose of defraying State expenses in the administration of a marketing program pursuant to § 455.121, DOE may make a grant award to a State for up to 50 percent of the funds allocated to the State for the grant program cycle, provided that the State meets the requirements described in § 455.121(b). In addition:

(1) Grants for marketing may be made for up to 100 percent of a State's projected marketing expenses; and

(2) Such grants may be awarded by DOE upon approval of an application from the State.

(c) If a State provides a certification under section 455.121(b) and is unable to document that the required non-Federal funding levels for energy conservation measures were achieved substantially for the previous fiscal year for which a similar certification was submitted, DOE may deny the application, accept it after the percentage of allocated funds is reduced in light of past performance, or take other appropriate action.

(d) In the event that a State, after receiving a grant under this section, cannot or decides not to use all or part of the amount available to it for technical assistance, program assistance, and marketing, these funds may, at the discretion of the State and after appropriate application to and approval of DOE, be used for technical assistance and energy conservation grants to eligible institutions within that State in accordance with this part.

Subpart N—Administrative Review

§ 455.150 Right to administrative review.

(a) A State shall have a right to file a notice requesting administrative review of a decision under § 455.143 by a Support Office Director to disapprove an application for a grant award for State administrative expenses subject to special conditions or a decision under § 455.21 of this part by a Support Office Director to disapprove a State Plan or an amendment to a State Plan.

(b) A State shall have a right to file a notice requesting administrative review of a decision under § 455.144 by a Support Office Director to disapprove an application for a grant award for State technical assistance, program assistance, or marketing programs.

(c) A school, hospital, coordinating agency, or State acting as an institution's duly authorized agent shall have a right to file a notice requesting administrative review of a decision under

§ 455.140 by a Support Office Director to disapprove an application for a grant award to perform technical assistance programs or to acquire and install an energy conservation measure if the disapproval is based on a determination that:

(1) The applicant is ineligible, under § 455.61 or § 455.71 or for any other reason; or

(2) An energy use evaluation submitted in lieu of an energy audit is unacceptable under the State Plan; or

(3) A technical assistance program equivalent performed without the use of Federal funds does not comply with the requirements of § 455.62 for purposes of satisfying the eligibility requirements of § 455.71(a)(3).

§ 455.151 Notice requesting administrative review.

(a) Any applicant shall have 20 days from the date of receipt of a decision subject to administrative review under § 455.150 to disapprove its application for a grant award to file a notice requesting administrative review. If an applicant does not timely file such a notice, the decision to disapprove shall become final for DOE.

(b) A notice requesting administrative review shall be filed with the Support Office Director and shall be accompanied by a written statement containing supporting arguments.

(c) If the applicant is a State appealing pursuant to paragraph (a) of § 455.150, the State shall have the right to a public hearing. To exercise that right, the State must request such a hearing in the notice filed under paragraph (b) of this section. A public hearing under this section shall be informal and legislative in nature.

(d) A notice or any other document shall be deemed filed under this subpart upon receipt.

§ 455.152 Transmittal of record on review.

On or before 15 days from receipt of a notice requesting administrative review which is timely filed, the Support Office Director shall forward to the Deputy Assistant Secretary the notice requesting administrative review, the decision to disapprove as to which administrative review is sought, a draft recommended final decision for concurrence, and any other relevant material.

§ 455.153 Review by the Deputy Assistant Secretary.

(a) If a State requests a public hearing pursuant to paragraph (a) of § 455.150, the Deputy Assistant Secretary, within 15 days, shall give actual notice to the State and FEDERAL REGISTER notice of the date, place, time, and procedures which shall apply to the public hearing. Any public hearing under this section shall be informal and legislative in nature.

(b) The Deputy Assistant Secretary shall concur in, concur in as modified, or issue a substitute for the recommended decision of the Support Office Director:

(1) With respect to a notice filed pursuant to paragraph (a) of § 455.150, on or before 60 days from receipt of documents under § 455.152 or the conclusion of a public hearing, whichever is later; or

(2) With respect to a notice filed pursuant to paragraph (b) of § 455.150, on or before 30 days from receipt of documents under § 455.152.

§ 455.154 Discretionary review by the Assistant Secretary.

On or before 15 days from the date of the determination under § 455.153(b), the applicant for a grant award may file an application, with a supporting statement of reasons, for discretionary review by the Assistant Secretary. If administrative review is sought pursuant to paragraph (a) of § 455.150, the Assistant Secretary shall send a notice granting or denying discretionary review within 15 days and upon granting such review, shall issue a decision no later that 60 days from the date discretionary review is granted. If administrative review is sought pursuant to paragraph (b) of § 455.150, the Assistant Secretary shall send a notice granting or denying discretionary review within 15 days and upon granting such review shall issue a decision no later than 30 days from the date discretionary review is granted. The Assistant Secretary may not issue a notice or decision under this paragraph without the concurrence of the DOE Office of General Counsel.

§ 455.155 Finality of decision.

A decision under § 455.153 shall be final for DOE if there is no review sought under § 455.154. If there is review under § 455.154, the decision thereunder shall be final for DOE, and no appeal shall lie elsewhere in DOE.

PART 456 [RESERVED]

PART 470—APPROPRIATE TECHNOLOGY SMALL GRANTS PROGRAM

Sec.
470.1 Purpose and scope.
470.2 Definitions.
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470.11 Eligibility requirements.
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AUTHORITY: Energy Research and Development Administration Appropriation Authorization of 1977, Pub. L. 95–39; Energy Reorganization Act of 1974, Pub. L. 93–438; Department of Energy Organization Act, Pub. L. 95–91.

SOURCE: 45 FR 8928, Feb. 8, 1980, unless otherwise noted.

EDITORIAL NOTE: The recordkeeping requirements contained in this part have been approved by the Office of Management and Budget under control number 1904–0036.

§ 470.1 Purpose and scope.

This part contains guidelines for the implementation of the appropriate technology small grants program required to be prescribed by section 112 of the Act.

§ 470.2 Definitions.

As used in this part—

Act means the Energy Research and Development Administration Appropriation Authorization of 1977, Pub. L. 95–39, 91 Stat. 180, 42 U.S.C. 5907a.

Affiliate means a concern which, either directly or indirectly, controls or has the power to control another concern, is controlled by or is within the power to control of another concern or, together with another concern, is controlled by or is within the power to control of a third party, taking into consideration all appropriate factors, including common ownership, common management and contractual relationships.

Concern means any business entity organized for profit (even if its ownership is in the hands of a nonprofit entity) with its principal place of business located in the United States. ''Concern'' includes, but is not limited to, an individual, partnership, corporation, joint venture, association or cooperative. For the purpose of making affiliation findings, any business entity, whether organized for profit or not, and any foreign business entity (i.e., any entity located outside the United States), shall be included.

DOE means the Department of Energy.

DOE–AR means the Department of Energy Assistance Regulations (10 CFR part 600).

DOE–PR means the Department of Energy Procurement Regulations (41 CFR part 9).

Indian tribe means any tribe band, nation, or other organized group or community of Indians (including any Alaska native village or regional or village corporation as defined in or established pursuant to the Alaska Native Claims Settlement Act, Pub. L. 92–203, 85 Stat. 688, which (1) is recognized as eligible for the special programs and services provided by the United States to Indians because of their status as Indians; or (2) is located on, or in proximity to, a Federal or State reservation or rancheria, acting through its tribal organization.

Local agency means an agency or instrumentality of a local government.

Local government means a local unit of government including specifically a county, municipality, city, town, township, local public authority, special district, intrastate district, council of governments, sponsor group representative organization, and other regional or intrastate government entity.

Local nonprofit organization or institution means any corporation trust, foundation, trade association, or other institution (1) which is entitled to exemption under section 501(c)(3) of the

Internal Revenue Code or (2) which is not organized for profit and no part of the net earnings of which insure to the benefit of any private shareholder or individual.

Program means the appropriate technology small grants program.

Small business means a concern, including its affiliates, which is organized for profit, is independently owned and operated, is not dominant in the field of operation in which it is submitting a proposal to DOE, and has 100 employees or less.

Standard Federal regions means the 10 standard Federal regions established by Office of Management and Budget Circular A–105, entitled ''Standard Federal Regions.''

State means any of the several States of the United States, the District of Columbia, the Commonwealth of Puerto Rico, and any territory or possession of the United States.

State agency means an agency or instrumentality of a State government.

State government means the government of a State, or an interstate organization.

Support means financial support or award under the program by grants, cooperative agreements or contracts.

Tribal organization means the recognized governing body of an Indian tribe, or any legally established organization of Native Americans which is controlled, sanctioned, or chartered by such governing body.

§ 470.10 Establishment of program.

There is established, under direction of the Assistant Secretary for Conservation and Solar Energy of DOE, an appropriate technology small grants program for the purpose of encouraging development and demonstration of, and the dissemination of information with respect to, energy-related systems and supporting technologies appropriate to—

(a) The needs of local communities and the enhancement of community self-reliance through the use of available resources;

(b) The use of renewable resources and the conservation of non-renewable resources;

(c) The use of existing technologies applied to novel situations and uses;

(d) Applications which are energy conserving, environmentally sound, small scale and low cost; and

(e) Applications which demonstrate simplicity of installation, operation and maintenance.

§ 470.11 Eligibility requirements.

(a) Support under this part may be made to individuals, local non-profit organizations and institutions. State and local agencies, Indian tribes and small businesses.

(b) The aggregate amount of support made available to any participant in the program, including affiliates, shall not exceed $50,000 during any 2-year period. This limitation applies only to support for projects and not to funds received by participants from DOE for other purposes, such as performance of services.

(c) Projects which shall be considered for support are those which carry out the purposes of the program as expressed in § 470.10 and which are within the following categories—

(1) Idea development, i.e., the development of an idea or concept or an investigative finding in areas ranging from development of new concepts of energy sources to the utilization of old procedures or systems for a new application;

(2) Device development, i.e., the systematic use and practical application of investigative findings and theories of a scientific or technical nature toward the production of, or improvements in, useful products to meet specific performance requirements but exclusive of manufacturing and production engineering. The dominant characteristic is that the effort be pointed toward specific energy problem areas to develop and evaluate the feasibility and practicability of proposed solutions and determine their parameters. Device development includes studies, investigations, initial hardware development and ultimately development of hardware, systems, or other means for experimental or operational test; or

(3) Demonstration, i.e., the testing of a system or technique under operation conditions to show that commercial application is technically, economically and environmentally feasible.

(d) Support for each category in paragraph (c) of this section shall not, for a single participant in the program, including affiliates, exceed the following limits for any project—

(1) For idea development, $10,000;

(2) For device development, $50,000; and

(3) For demonstration, $50,000.

(4) A participant may receive under a subsequent program solicitation—

(i) Additional support for a funded project or;

(ii) Initial support for a new project, subject to the support limits set forth in paragraphs (b) and (d) of this section.

§ 470.12 Management.

(a) The program shall be managed by a National Program Director within the Office of the Assistant Secretary for Conservation and Solar Energy of DOE.

(b) The program shall be implemented regionally, based on the 10 standard Federal regions or combinations thereof, to insure substantial consideration of the needs, resources, and special circumstances of local communities. Regions may be combined provided the requirements of Office of Management and Budget Circular A–106 entitled ''Standard Federal Regulations'' are met. Regional Program Managers shall design and manage the regional programs as directed by the National Program Director and shall consult, as appropriate, with State and local officials, the appropriate technology community and other interested parties.

§ 470.13 Program solicitation.

(a) The Regional Program Managers shall be responsible for the preparation of program solicitations which solicit proposals for support under the program pursuant to simplified application procedures. Projects may be supported under the program only if they have successfully completed under a program solicitation.

(b) Each program solicitation shall include—

(1) A description of the program;

(2) The eligibility requirements;

(3) A time schedule for submission of, and action on, proposals;

(4) A simple application form for submitting a proposal for support under the program, together with instructions for completing the application form;

(5) Evaluation criteria, along with a narrative description of their relative importance;

(6) An explanation of the evaluation and selection procedures, including a notice to proposers that if the proposer expressly indicates that only Government evaluation is authorized, DOE may be unable to give full consideration to the proposal.

(7) Other applicable information, terms and conditions, including the desired budget format;

(8) Place for, and manner of, submission;

(9) A unique number for identification purposes;

(10) A statement notifying potential proposers that an announcement does not commit DOE to pay any proposal perparation costs and that DOE reserves the right to select for support any, all, or none of the proposals received in response to a solicitation;

(11) A late proposal provision;

(12) A statement notifying proposers how to identify information in the proposal which the proposer does not want disclosed for purposes other than the evaluation of the proposal.

(13) A statement notifying proposers that all information contained in the proposal will be handled in accordance with the policies and procedures set forth in DOE–AR and DOE–PR, as applicable, and disclosed, if appropriate, in accordance with 10 CFR part 1004 entitled ''Freedom of Information.''

(14) A statement notifying proposers of their right to request a debriefing pursuant to the procedures set forth in § 470.18; and

(15) A statement notifying proposers of their right to request a waiver of DOE's title to inventions made under the program.

(c) Each program solicitation shall be synopsized in the *Commerce Business Daily* prior to or concurrent with release. The program solicitation also shall be announced to appropriate newspapers, trade and technical publications, and State and local governments, and shall be circulated directly

to interested individuals, entities, and associations thereof, to the maximum extent feasible.

§ 470.14 Evaluation and selection.

(a) Prior to making a comprehensive evaluation of a proposal, the receiving office shall determine that it contains sufficient technical, cost, and other information to enable comprehensive evaluation and that it has been properly signed. If the proposal does not meet these requirements, a prompt reply shall be sent to the proposer, indicating the reason(s) for the proposal not being selected for support under the program solicitation. A proposer may correct any minor informality or irregularity or apparent clerical mistake prior to the entering into of grants, contracts, or cooperative agreements. A minor informality or irregularity is one which is merely a matter of form and not of substance or pertains to some immaterial or inconsequential defect or variation from the exact requirements of the program announcement.

(b)(1) The Regional Program Manager shall select a number of technical evaluation reviewers representing several disciplines to ensure adequate technical review of proposals.

(2) After receiving nominations from each State or combinations of States within the Region, the Program Manager shall select a number of State reviewers for each State or combinations of States, respectively. The nominations and selections of State reviewers shall take into consideration representation by persons from a variety of backgrounds, in order that the reviewers are able to evaluate proposals of potential merit in various fields and from various types of proposers.

(3) The Regional Program Manager or designee shall provide proposals to the technical evaluation and State reviewers and shall provide their findings and comments to the selection panel established pursuant to paragraph (3) of this section.

(4) In carrying out the responsibilities set forth in paragraphs (b) (1), (2) and (3) of this section, the Regional Program Manager (i) shall determine the number of technical evaluation and State reviewers who shall review each proposal; (ii) shall determine the sequence of the technical and State review; (iii) may designate a person to serve as both a technical and State reviewer, if appropriate to the needs of the program in the Region. A decription of the Program Manager's determinations under this paragraph shall be included in the Program Solicitation pursuant to § 470.13(b)(6).

(c) Each technical evaluation reviewer shall evaluate those proposals which he or she receives from the Regional Program Manager or designee and shall provide his or her findings to the Regional Program Manager or designee. In addition to the general criteria underlying the establishment of the program as set forth in § 470.10, the major criteria to be considered by each technical evaluation reviewer shall include—

(1) Whether the proposal is technically feasible, including a determination as to whether the proposed energy savings or energy production can be technically achieved;

(2) Whether the results being proposed are capable of being measured;

(3) Whether the proposal has any potential environmental, health and safety impacts; and

(4) From a technical standpoint, whether the proposal can be carried out within the funds being requested.

(d) Each State reviewer shall evaluate those proposals which he or she receives from the Program Manager or designee and shall provide his or her findings and comments to the Program Manager or designee. In addition to the general criteria underlying establishment of the program as set forth in § 470.10, the criteria to be considered by each State reviewer shall include—

(1) The potential impact of the proposal on the energy needs and requirements of the community or region;

(2) The energy resource involved and its importance or availability to the community or region;

(3) The expected energy savings or production that will result from the proposal and the significance of those savings or production to the energy requirements of the community or region;

(4) The institutional barriers that may substantially affect the proposal

and the potential of the proposal to deal with those barriers;

(5) The likelihood of commercialization or utilization of the technology, process, or items within the proposal and extent of such commercialization/utilization;

(6) The innovative nature of the proposal;

(7) Any potential environmental, health and safety impacts of the proposal upon the community or region;

(8) The extent to which work beyond the funded project period might be required;

(9) The extent to which local resources, material, and manpower will be utilized; and

(10) The adequacy of the business aspects of the proposal, including the reasonableness of the proposer's budget for carrying out the proposal.

(e) A selection panel composed of DOE personnel appointed by the Regional Program Manager shall, taking into account the findings and comments of the technical evaluation and State reviewers, evaluate and rank the proposals in accordance with the criteria stated in the program solicitation.

(f) For each Region, a DOE selection official shall select proposals for support from the ranking established by the selection panel, taking into account the following program policy factors in order to determine the mix of proposed projects which will best further specific program goals—

(1) Regional distribution, including geography, population, and climate;

(2) Project type distribution, including a diversity of methods, approaches, and technologies;

(3) Diversity of participants; and

(4) The best overall use of the funds available.

§ 470.15 Allocation of funds.

(a) DOE shall annually allocate fiscal year funds available for support among the 10 standard Federal Regions, according to the following formula;

(1) Two-thirds to be allocated according to population; and

(2) One-third to be allocated according to the number of proposals received, per hundred thousand of population of the Region, which meet the requirements set forth in § 470.14(a).

(b) The minimum annual level of support for projects for each State within a Region shall be 10 percent of the fiscal year funds allocated to the Region, divided by the number of States in the Region.

(c) For the purposes of this section, population shall be determined by the most current complete national series, as published by the United States Bureau of the Census in *Current Population Reports*, P–25, P–26, or related series, except where data from the decennial census conducted by the Bureau of the Census is more current.

§ 470.16 Cost sharing and funds from other sources.

Proposers are encouraged to offer to share in the costs of their proposed projects or to arrange that other entities provide cost sharing on their behalf. Regional Program Managers, with the consent of the proposer, may work with States, local governments or other entities to obtain supplemental funding.

§ 470.17 General requirements.

(a) Except where this part provides otherwise, the submission, evaluation and selection for support of proposals under the program and the entering into and administration of grants, cooperative agreements, and contracts under the program, shall be governed by the provisions of DOE–AR and DOE–PR are applicable, such other procedures applicable to grants, cooperative agreements, and contracts under the program as DOE may from time to time prescribe, and any Federal requirements applicable to grants, cooperative agreements, and contracts under the program.

(b) Each grant, cooperative agreement or contract under this part shall require that a recipient of support under the program shall submit a full written report of activities supported in whole or in part by Federal funds made available under the program and shall contain any additional report provisions and other provisions dealing with records, allowable expenses, accounting practices, publication and

publicity, copyrights, patents, discrimination, conflict of interest, insurance, safety, changes, resolution of disputes and other standard and/or relevant support agreements requirements required by, or appropriate to, the needs of the program.

§ 470.18 Debriefing.

Upon written request, unsuccessful proposers will be accorded debriefings. Such debriefings must be requested within 30 working days of notification of elimination from consideration. Debriefings will be provided at the earliest feasible time as determined by the Regional Program Manager.

§ 470.20 Dissemination of information.

DOE shall disseminate to the public, in an appropriate manner, information of the nature, usage and availability of the energy-related systems and supporting technologies developed or demonstrated under the program. In addition, DOE shall maintain and make available to recipients of support under the program current information on public and private sources of possible assistance for the further development and commercialization of their projects.

PART 473—AUTOMOTIVE PROPULSION RESEARCH AND DEVELOPMENT

REVIEW AND CERTIFICATION OF GRANTS, COOPERATIVE AGREEMENTS, CONTRACTS, AND PROJECTS

Sec.

473.1 Purpose and scope.
473.2 Definitions.
473.10 Required information from applicant.
473.11 Submission of applicant's information.
473.20 Public notice and opportunity to object.
473.21 Supplemental information and rebuttal.
473.22 Initial review by manager.
473.23 Interagency review panel.
473.24 Final action and certification by manager.
473.25 Reviewability of certification.
473.30 Standards and criteria.

AUTHORITY: Federal Energy Administration Act of 1978—Civilian Applications, Pub. L. 95–238; Department of Energy Organization Act, Pub. L. 95–91.

SOURCE: 43 FR 55230, Nov. 24, 1978, unless otherwise noted.

REVIEW AND CERTIFICATION OF GRANTS, COOPERATIVE AGREEMENTS, CONTRACTS, AND PROJECTS

§ 473.1 Purpose and scope.

These regulations implement section 304(f) of the Federal Energy Administration Act of 1978—Civilian Applications, and apply to each new contract, grant, cooperative agreement, Department of Energy project, or other agency project funded or to be funded under the authority of that Act. 15 U.S.C. 2703(f) (1970). These regulations do not apply to subcontractors, or to contracts, grants, cooperative agreements, Department of Energy projects, or other agency projects entered into, made, or formally approved and initiated prior to February 25, 1978, or with respect to any renewal or extension thereof. Insofar as grants, cooperative agreements, and contracts are concerned, these regulations provide procedures and requirements that are in addition to those generally applicable under the assistance and procurement regulations of the Federal agency funding research and development under the Act.

§ 473.2 Definitions.

For purpose of these regulations—

Act means the Federal Energy Administration Act of 1978—Civilian Applications. Pub. L. 95–238, 92 Stat. 47.

Advanced automobile propulsion system means an energy conversion system, including engine and drivetrain, which utilizes advanced technology and is suitable for use in an advanced automobile.

Agency project means research and development under the Act by employees of a Federal agency furnishing assistance at the request of the DOE.

Annual funding period means the Federal fiscal year during which a grant, cooperative agreement, or contract is funded by an appropriation under the Act.

Applicant means any private laboratory, university, nonprofit organization, industrial organization, private agency, institution, organization, corporation, partnership, individual, or

public agency other than a Federal agency.

DOE project means research and development under the Act by employees of the DOE.

Federal agency means an executive agency as defined by 5 U.S.C. 105 (1970).

Manager means the Federal program official who requests grant agreements, cooperative agreements, or contracts to be negotiated or who authorizes a DOE or agency project to begin.

Notice of availability means a notice published in the Commerce Business Daily advertising the availability of a formal solicitation document to be issued for the purpose of inviting and setting guidelines for submission of proposals for research and development grants, cooperative agreements, or contracts.

Research and development means activities constituting a project to create an advanced automobile propulsion system and does not mean activities involving technology transfer to mass production, evaluative testing, preliminary planning for a DOE or an agency project, or program administration and managment.

Solicitation means a formal, written request for proposals to perform research and development under a grant, cooperative agreement, or contract, typically including evaluation criteria and a statement of the work to be done.

§ 473.10 Required information from applicant.

In accordance with applicable procedures of §473.11 any applicant for a grant, cooperative agreement, or contract under the Act to support research and development activities of an advanced automobile propulsion system shall—

(a) State whether the activities will initiate or continue research and development of an advanced automobile propulsion system;

(b) State, insofar as the applicant has information, whether and to what extent the activities to be supported are technically the same as activities conducted previously or to be conducted during the annual funding period by any person for research and development of a substantially similar advanced automobile propulsion system;

(c) Justify research and development activities on an advanced automobile propulsion system abandoned by any person because of a lack of mass production potential by presenting information showing a significant intervening technological advance, promising conceptual innovation, or other special consideration;

(d) Provide—

(1) An assurance that the amount of funds to be expended for research and development of advanced automobile propulsion systems during the initial annual funding period will exceed the amount of funds expended, if any, during the previous year for the same purpose by at least the amount of the grant, cooperative agreement, or contract being sought; and

(2) An assurance that the level of research and development effort on advanced automobile propulsion systems in the initial annual funding period will not be decreased in future annual funding periods.

(e) Provide to the extent possible—

(1) An assurance that the time period for completing research and development of the advanced automobile propulsion is likely to be shorter as a result of a grant, cooperative agreement, or contract; and

(2) The estimated delay, if any, which is likely to occur if the application for a grant, cooperative agreement, or contract is denied.

§ 473.11 Submission of applicant's information.

(a) An applicant submitting an unsolicited proposal to conduct research and development to be funded by a grant, cooperative agreement, or contract under the Act shall include the information required under §473.10 in the unsolicited proposal document filed under the assistance or procurement regulations of the DOE or other Federal agency which funds the proposed research and development under the Act.

(b) In responding to a solicitation for a proposal to conduct research and development funded by a grant, cooperative agreement, or contract under the

Act, the applicant shall include the information required under § 473.10 in the proposal.

(c) Information submitted under § 473.10 of these regulations shall be certified in writing as complete and accurate by the applicant, and if the applicant is not an individual, the chief executive officer of the applicant or his authorized designee shall sign the certification.

§ 473.20 Public notice and opportunity to object.

(a) In compliance with paragraph (b) of this section and unless provisions of paragraph (c) of this section apply, the manager shall cause to be published in the Commerce Business Daily a statement describing the unsolicited proposal, solicitation, DOE project, or agency project, as appropriate, inviting any interested person to submit a written objection, with supporting information at an appropriate address on or before 30 days from the date of publication, if the person believes that the research and development to be performed does not comply with standards and criteria of § 473.30.

(b) Except as paragraph (c) of this section applies, the manager shall comply with the requirements of paragraph (a) of this section—

(1) Upon receipt of an unsolicited proposal from an applicant;

(2) In any notice of availability of a solicitation;

(3) Prior to beginning a DOE project; or

(4) Prior to beginning an agency project.

(c) Without publishing a notice under paragraph (a) of this section, the manager may reject an unsolicited proposal that does not comply with these regulations or any other generally applicable requirements.

§ 473.21 Supplemental information and rebuttal.

The manager may request additional information from an applicant or any interested person who files an objection under § 473.20.

§ 473.22 Initial review by manager.

(a) Upon expiration of the time for filing information under these regulations, the manager shall—

(1) Review the proposed research and development to be performed under grant, under cooperative agreement, under contract, as a DOE project, or as an agency project and any other pertinent information received under these regulations or otherwise available; and

(2) Initially determine whether the research and development reviewed under paragraph (a)(1) of this section complies with the standards and criteria of § 473.30.

(b) A manager who makes a negative determination under paragraph (a)(2) of this section shall inform the applicant and any interested person who objected of the decision in writing with a brief statement of supporting reasons.

(c) A manager who initially determines that research and development reviewed under this section complies with the standards and criteria of § 473.30 shall cause an interagency review panel to be convened under § 473.23.

§ 473.23 Interagency review panel.

(a) The interagency review panel shall consist of—

(1) A head designated by the Federal agency that employs the manager;

(2) A representative of the DOE if the manager is not an employee of the DOE; and

(3) A representative of any other Federal agency deemed appropriate by the Federal agency that employs the manager.

(b) The interagency review panel shall—

(1) Review the research and development to be performed and consider the information presented by the applicant, in the case of a grant, cooperative agreement, or contract, and by any interested person who filed a statement of objection;

(2) Make a recommendation with a supporting statement of findings to the manager as to whether the research and development to be performed complies with the standards and criteria of § 473.30; and

(3) Operate by majority vote with the head of the panel casting the decisive vote in the event of a tie.

§ 473.24 Final action and certification by manager.

(a) Upon consideration of the recommendation of the interagency review panel and other pertinent information, the manager—

(1) Shall determine whether the research and development to be performed complies with the standards and criteria of § 473.30;

(2) Shall obtain the concurrence of the DOE if the manager is not an employee of the DOE;

(3) Shall, in the event of a negative determination under this section, advise the applicant, in the case of a grant, cooperative agreement, or contract, and any interested person who filed a statement of objection; and

(4) Shall, in the event of an affirmative determination under this section, prepare a certification—

(i) Explaining the determination;

(ii) Discussing any allegedly related or comparable industrial research and development considered and deemed to be an inadequate basis for not certifying the grant or contract;

(iii) Discussing issues regarding cost sharing and patent rights related to the standards and criteria of § 473.30 of these regulations; and

(iv) Discussing any other relevant issue.

(b) After complying with paragraph (a) of this section, the manager shall sign the certification and distribute copies to the applicant, if any, and any interested person who filed a statement of objections—

(1) Immediately in the case of a DOE or agency project; and

(2) After the agreement has been negotiated in the case of a grant, cooperative agreement, or contract.

§ 473.25 Reviewability of certification.

Any certification issued under these rules is—

(a) Subject to disclosure under 5 U.S.C. 552 (1970) and section 17 of the Federal Nonnuclear Energy Research and Development Act of 1974, as amended, 42 U.S.C. 5918 (1970);

(b) Subject neither to judicial review nor to the provisions of 5 U.S.C. 551–559 (1970), except as provided under paragraph (a) of this section; and

(c) Available to the Committee on Science and Technology of the House of Representatives and the Committee on Energy and Natural Resources of the Senate.

§ 473.30 Standards and criteria.

Research and development to be performed under a grant, under a cooperative agreement, under a contract, as a DOE project, or as an agency project under the Act may be certified under these regulations only if the research and development to be conducted—

(a) Supplements the automotive propulsion system research and development efforts of industry or any other private researcher;

(b) Is not duplicative of efforts previously abandoned by private researchers unless there has been an intervening technological advance, promising conceptual innovation, or justified by other special consideration;

(c) Would not be performed during the annual funding period but for the availability of the Federal funding being sought;

(d) Is likely to produce an advanced automobile propulsion system suitable for steps toward technology transfer to mass production in a shorter time period than would otherwise occur;

(e) Is not technologically the same as efforts by any person conducted previously or to be conducted during the annual funding period regarding a substantially similar advanced automobile propulsion system; and

(f) Is not likely to result in a decrease in the level of private resources expended on advanced automotive research and development by substituting Federal funds without justification.

PART 474—ELECTRIC AND HYBRID VEHICLE RESEARCH, DEVELOPMENT AND DEMONSTRATION PROGRAM; EQUIVALENT PETROLEUM-BASED FUEL ECONOMY CALCULATION

Sec.
474.1 Purpose and scope.
474.2 Definitions.
474.3 Test procedures.
474.4 Equivalent petroleum-based fuel economy calculation.

AUTHORITY: Sec. 503(a)(3), Motor Vehicle Information and Cost Savings Act, Pub. L. 94–163 (15 U.S.C. 2003(a)(3)), as added by sec. 18, Chrysler Corporation Loan Guarantee Act of 1979, Pub. L. 96–185; Department of Energy Organization Act, Pub. L. 95–91.

SOURCE: 46 FR 22753, Apr. 21, 1981, unless otherwise noted.

§474.1 Purpose and scope.

This part contains procedures for calculating the equivalent petroleum-based fuel economy value of electric vehicles, as required to be prescribed by the Secretary of Energy under section 503(a)(3) of the Motor Vehicle Information and Cost Savings Act (15 U.S.C. 2003(a)(3)), as added by section 18 of the Chrysler Corporation Loan Guarantee Act of 1979. The equivalent petroleum-based fuel economy value is intended to be used in calculating corporate average fuel economy pursuant to regulations promulgated by the Environmental Protection Agency at 40 CFR Part 600—Fuel Economy of Motor Vehicles.

§474.2 Definitions.

For purposes of this part, the term—

Electric vehicle means a vehicle that is powered by an electric motor drawing current from rechargeable storage batteries or other portable energy storage devices. Recharge energy shall be drawn primarily from a source off the vehicle, such as residential electric service.

Electrical efficiency value means the weighted average of the stop-and-go and steady-speed electrical efficiency values, as determined in accordance with §474.4(b).

Energy equivalent fuel economy value means the electrical efficiency value converted into units of miles per gallon, as determined in accordance with §474.4(c).

Equivalent petroleum-based fuel economy value means a number, determined in accordance with §474.4, which represents the average number of miles travelled by an electric vehicle per gallon of gasoline.

Model type means the term defined by the Environmental Protection Agency in its regulations at 40 CFR 600.002–81(19).

Model year means the term defined by the Environmental Protection Agency in its regulations at 40 CFR 600.002–81(6).

Petroleum equivalency factor means a number which represents the parameters listed in section 503(a)(3)(ii) through (iv) of the Motor Vehicle Information and Cost Savings Act (15 U.S.C. 2003(a)(3)) for purposes of calculating equivalent petroleum-based fuel economy in accordance with §474.4.

Petroleum-powered accessory means a heater/defroster system or an air conditioner system which uses fuel, as defined in section 501(5) of the Motor Vehicle Information and Cost Savings Act (15 U.S.C. 2001) as its primary energy source.

Production volume means the term defined by the Environmental Protection Agency in its regulations at 40 CFR 600.002–81(32).

Steady-speed electrical efficiency value means the average number of kilowatt-hours of electrical energy required for an electric vehicle to travel 1 mile, as determined in accordance with §474.3(c).

Stop-and-go electrical efficiency value means the average number of kilowatt-hours of electrical energy required for an electric vehicle to travel 1 mile, as determined in accordance with §474.3(b).

[46 FR 22753, Apr. 21, 1981, as amended at 48 FR 28432, June 22, 1983]

§474.3 Test procedures.

(a) The conditions and equipment in the Electric Vehicle Test Procedure—SAE J227a of the Society of Automotive Engineers shall be used for conducting the test procedures set forth in this section.

(b) The test procedures prescribed in SAE procedure J227a, Vehicle Energy

Economy, using Vehicle Test Cycle C for the driving cycle, shall be used for generation of the stop-and-go electrical efficiency value.

(c) The test procedures prescribed in SAE procedure J227a, Vehicle Energy Economy, using a driving cycle consisting of a maximum cruise speed of 54 mph, as prescribed in the SAE procedure for Range at Steady Speed, shall be used for generation of the steady-speed electrical value. For an electric vehicle model type that is incapable of maintaining a maximum cruise speed of 54 mph, this test procedure shall be conducted at the maximum cruise speed as defined in section 2.8 of the SAE procedure J227a.

§ 474.4 Equivalent petroleum-based fuel economy calculation.

(a) Calculate the equivalent petroleum-based fuel economy of an electric vehicle as follows:

(1) Determine the stop-and-go electrical efficiency value, according to § 474.3(b).

(2) Determine the steady-speed electrical efficiency value, according to § 474.3(c).

(b) Calculate the electrical efficiency value by:

(1) Multiplying the stop-and-go electrical efficiency value by 0.91;

(2) Multiplying the steady-speed electrical efficiency value by 0.09; and

(3) Adding the resulting two figures, rounding to the nearest 0.01 kWh/mile.

(c) Calculate the energy equivalent fuel economy value by dividing the electrical efficiency value into 36.66.

(d) For purposes of paragraph (e) of this section, use the appropriate Petroleum Equivalency Factor as follows:

(1) If no more than 33 percent of the production volume of the electric vehicle model type is to be equipped with any petroleum-powered accessories, use the first number listed under paragraph (e) of this section for the applicable model year.

(2) If more than 33 percent of the production volume of the electric vehicle model type is to be equipped with only one petroleum-powered accessory, use the second number under paragraph (e) of this section of the applicable model year.

(3) If more than 33 percent of the production volume of the electric vehicle model type is to be equipped with two petroleum-powered accessories, use the third number under § 474.4(e) for the applicable model year.

(e) Calculate the equivalent petroleum-based fuel economy value in miles per gallon by multiplying the energy equivalent fuel economy value by the appropriate petroleum equivalency factor for the model year in which the electric vehicle is manufactured.

(1) For model year 1981, the petroleum equivalency factor is:
(i) 1.9,
(ii) 1.7, or
(iii) 1.6;

(2) For model year 1982, the petroleum equivalency factor is:
(i) 2.0,
(ii) 1.8, or
(iii) 1.6;

(3) For model year 1983, the petroleum equivalency factor is:
(i) 2.0,
(ii) 1.8, or
(iii) 1.6;

(4) For model year 1984, the petroleum equivalency factor is:
(i) 2.1,
(ii) 1.9, or
(iii) 1.7;

(5) For model year 1985, the petroleum equivalency factor is:
(i) 2.3,
(ii) 2.0, or
(iii) 1.8;

(6) For model year 1986, the petroleum equivalency factor is:
(i) 2.2,
(ii) 2.0, or
(iii) 1.8; and

(7) For model year 1987, the petroleum equivalency factor is:
(i) 2.2,
(ii) 2.0, or
(iii) 1.8.

PART 490—ALTERNATIVE FUEL TRANSPORTATION PROGRAM

Subpart A—General Provisions

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490.705 Use of credits.
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490.708 Violations.

AUTHORITY: 42 U.S.C. 7191, 13211–13212, 13235, 13251, 13257, 12260–12263.

SOURCE: 61 FR 10653, Mar. 14, 1996, unless otherwise noted.

Subpart A—General Provisions

§490.1 Purpose and Scope.

(a) The provisions of this part implement the alternative fuel transportation program under titles III, IV, V, and VI of the Energy Policy Act of 1992. (Pub. L. 102–486)

(b) The provisions of this subpart cover the definitions applicable throughout this part and procedures to obtain an interpretive ruling and to petition for a generally applicable rule to amend this part.

§490.2 Definitions.

The following definitions apply to this part—

Acquire means to take into possession or control.

Act means the Energy Policy Act of 1992 (Pub. L. 102–486) and any amendments thereof.

After-Market Converted Vehicle means an Original Equipment Manufacturer vehicle that is reconfigured by a conversion company, which is not under contract to the Original Equipment Manufacturer, to operate on an alternative fuel and whose conversion kit components are under warranty of the conversion company.

Alternative Fuel means methanol, denatured ethanol, and other alcohols; mixtures containing 85 percent or more by volume of methanol, denatured ethanol, and other alcohols with gasoline or other fuels; natural gas; liquefied petroleum gas; hydrogen; coal-derived liquid fuels; fuels (other than alcohol)

derived from biological materials (including neat biodiesel); three P-series fuels (specifically known as Pure Regular, Pure Premium and Pure Cold Weather) as described by United States Patent number 5,697,987, dated December 16, 1997, and containing at least 60 percent non-petroleum energy content derived from methyltetrahydrofuran, which must be manufactured solely from biological materials, and ethanol, which must be manufactured solely from biological materials; and electricity (including electricity from solar energy).

Alternative Fueled Vehicle means a dedicated vehicle or a dual fueled vehicle (including a flexible fuel vehicle as defined by this section).

Assistant Secretary means the Assistant Secretary for Energy Efficiency and Renewable Energy or any other DOE official to whom the Assistant Secretary's duties under this part may be redelegated by the Secretary.

Automobile means a 4-wheeled vehicle propelled by conventional fuel, or by alternative fuel, manufactured primarily for use on public streets, roads, and highways (except a vehicle operated only on a rail line), and rated at

(1) Not more than 6,000 pounds gross vehicle weight; or

(2) More than 6,000, but less than 10,000 pounds gross vehicle weight, if the Secretary of Transportation has decided, by rule, that the vehicle meets the criteria in section 501(1) of the Motor Vehicle Information and Cost Savings Act, as amended, 49 U.S.C. 32901(a)(3).

Capable of Being Centrally Fueled means a vehicle can be refueled at least 75 percent of its time at the location that is owned, operated, or controlled by the fleet or covered person, or is under contract with the fleet or covered person for refueling purposes.

Centrally Fueled means that a vehicle is fueled at least 75 percent of the time at a location that is owned, operated, or controlled by the fleet or covered person, or is under contract with the fleet or covered person for refueling purposes.

Control—

(1) When it is used to determine whether one person controls another or whether two persons are under common control, means any one or a combination of the following:

(i) A third person or firm has equity ownership of 51 percent or more in each of two firms; or

(ii) Two or more firms have common corporate officers, in whole or in substantial part, who are responsible for the day-to-day operation of the companies; or

(iii) One person or firm leases, operates, or supervises 51 percent or more of the equipment and/or facilities of another person or firm; owns 51 percent or more of the equipment and/or facilities of another person or firm; or has equity ownership of 51 percent or more of another person or firm.

(2) When it is used to refer to the management of vehicles, means a person has the authority to decide who can operate a particular vehicle, and the purposes for which the vehicle can be operated.

Covered Person means a person that owns, operates, leases, or otherwise controls—

(1) A fleet, as defined by this section, that contains at least 20 light duty motor vehicles that are centrally fueled or capable of being centrally fueled, and are used primarily within a metropolitan statistical area or a consolidated metropolitan statistical area, as established by the Bureau of the Census, with a 1980 population of 250,000 or more (as set forth in Appendix A to this subpart) or in a FEDERAL REGISTER notice; and

(2) At least 50 light duty motor vehicles within the United States.

Dealer Demonstration Vehicle means any vehicle that is operated by a motor vehicle dealer solely for the purpose of promoting motor vehicle sales, either on the sales lot or through other marketing or sales promotions, or for permitting potential purchasers to drive the vehicle for pre-purchase or prelease evaluation.

Dedicated Vehicle means—

(1) An automobile that operates solely on alternative fuel; or

(2) A motor vehicle, other than an automobile, that operates solely on alternative fuel.

DOE means the Department of Energy.

Dual Fueled Vehicle means—

(1) An automobile that meets the criteria for a dual fueled automobile as that term is defined in section 513(h)(1)(C) of the Motor Vehicle Information and Cost Savings Act, 49 U.S.C. 32901(a)(8); or

(2) A motor vehicle, other than an automobile, that is capable of operating on alternative fuel and on gasoline or diesel fuel; or

(3) A flexible fuel vehicle.

Electric-hybrid Vehicle means a vehicle primarily powered by an electric motor that draws current from rechargeable storage batteries, fuel cells or other sources of electric current and also relies on a non-electric source of power.

Electric Motor Vehicle means a motor vehicle primarily powered by an electric motor that draws current from rechargeable storage batteries, fuel cells, photovoltaic arrays, or other sources of electric current and may include an electric-hybrid vehicle.

Emergency Motor Vehicle means any vehicle that is legally authorized by a government authority to exceed the speed limit to transport people and equipment to and from situations in which speed is required to save lives or property, such as a rescue vehicle, fire truck or ambulance.

Fleet means a group of 20 or more light duty motor vehicles, excluding certain categories of vehicles as provided by section 490.3, used primarily in a metropolitan statistical area or consolidated metropolitan statistical area, as established by the Bureau of the Census as of December 31, 1992, with a 1980 Census population of more than 250,000 (listed in Appendix A to this Subpart), that are centrally fueled or capable of being centrally fueled, and are owned, operated, leased, or otherwise controlled—

(1) By a person who owns, operates, leases, or otherwise controls 50 or more light duty motor vehicles within the United States and its possessions and territories;

(2) By any person who controls such person;

(3) By any person controlled by such person; and

(4) By any person under common control with such person.

Flexible Fuel Vehicle means any motor vehicle engineered and designed to be operated on any mixture of two or more different fuels.

Law Enforcement Motor Vehicle means any vehicle which is primarily operated by a civilian or military police officer or sheriff, or by personnel of the Federal Bureau of Investigation, the Drug Enforcement Administration, or other enforcement agencies of the Federal government, or by State highway patrols, municipal law enforcement, or other similar enforcement agencies, and which is used for the purpose of law enforcement activities including, but not limited to, chase, apprehension, and surveillance of people engaged in or potentially engaged in unlawful activities.

Lease means the use and control of a motor vehicle for transportation purposes pursuant to a rental contract or similar arrangement with a term of 120 days or more.

Light Duty Motor Vehicle means a light duty truck or light duty vehicle, as such terms are defined under section 216(7) of the Clean Air Act (42 U.S.C. §7550(7)), having a gross vehicle weight rating of 8,500 pounds or less, before any after-market conversion to alternative fuel operation.

Model Year means the period from September 1 of the previous calendar year through August 31.

Motor Vehicle means a self-propelled vehicle, other than a non-road vehicle, designed for transporting persons or property on a street or highway.

Non-road Vehicle means a vehicle not licensed for on-road use, including such vehicles used principally for industrial, farming or commercial use, for rail transportation, at an airport, or for marine purposes.

Original Equipment Manufacturer means a manufacturer that provides the original design and materials for assembly and manufacture of its product.

Original Equipment Manufacturer Vehicle means a vehicle engineered, designed, produced and warranted by an Original Equipment Manufacturer.

Person means any individual, partnership, corporation, voluntary association, joint stock company, business trust, Governmental entity, or other

legal entity in the United States except United States Government entities.

State means any of the 50 States, the District of Columbia, the Commonwealth of Puerto Rico, and any other territory or possession of the United States.

Used Primarily, as utilized in the definition of ''fleet,'' means that a majority of a vehicle's total annual miles are accumulated within a covered metropolitan or consolidated metropolitan statistical area.

[61 FR 10653, Mar. 14, 1996, as amended at 64 FR 26829, May 17, 1999]

§ 490.3 Excluded vehicles.

When counting light duty motor vehicles to determine under this part whether a person has a fleet or to calculate alternative fueled vehicle acquisition requirements, the following vehicles are excluded—

(a) Motor vehicles held for lease or rental to the general public, including vehicles that are owned or controlled primarily for the purpose of short-term rental or extended-term leasing, without a driver, pursuant to a contract;

(b) Motor vehicles held for sale by motor vehicle dealers, including demonstration motor vehicles;

(c) Motor vehicles used for motor vehicle manufacturer product evaluations or tests, including but not limited to, light duty motor vehicles owned or held by a university research department, independent testing laboratory, or other such evaluation facility, solely for the purpose of evaluating the performance of such vehicle for engineering, research and development or quality control reasons;

(d) Law enforcement vehicles;

(e) Emergency motor vehicles;

(f) Motor vehicles acquired and used for purposes that the Secretary of Defense has certified to DOE must be exempt for national security reasons;

(g) Nonroad vehicles; and

(h) Motor vehicles which, when not in use, are normally parked at the personal residences of the individuals that usually operate them, rather than at a central refueling, maintenance, or business location.

§ 490.4 General information inquiries.

DOE responses to inquiries with regard to the provisions of this part that are not filed in compliance with §§ 490.5 or 490.6 of this part constitute general information and the responses provided shall not be binding on DOE.

§ 490.5 Requests for an interpretive ruling.

(a) *Right to file.* Any person who is or may be subject to this part shall have the right to file a request for an interpretive ruling on a question with regard to how the regulations apply to particular facts and circumstances.

(b) *How to file.* A request for an interpretive ruling shall be filed—

(1) With the Assistant Secretary;

(2) In an envelope labeled ''Request for Interpretive Ruling under 10 CFR Part 490;'' and

(3) By messenger or mail at the Office of Energy Efficiency and Renewable Energy, EE–33, U.S. Department of Energy, 1000 Independence Avenue, S.W., Washington, D.C. 20585 or at such other address as DOE may provide by notice in the FEDERAL REGISTER.

(c) *Content of request for interpretive ruling.* At a minimum, a request under this section shall—

(1) Be in writing;

(2) Be labeled ''Request for Interpretive Ruling Under 10 CFR Part 490;''

(3) Identify the name, address, telephone number, and any designated representative of the person requesting the interpretive ruling;

(4) State the facts and circumstances relevant to the request;

(5) Be accompanied by copies of relevant supporting documents, if any;

(6) Specifically identify the pertinent regulations and the related question on which an interpretive ruling is sought with regard to the relevant facts and circumstances; and

(7) Contain any arguments in support of the terms of an interpretation the requester is seeking.

(d) *Public comment.* DOE may give public notice of any request for an interpretive ruling and invite public comment.

(e) *Opportunity to respond to public comment.* DOE may provide an opportunity for any person who requested an

interpretive ruling to respond to public comments.

(f) *Other sources of information.* DOE may—

(1) Conduct an investigation of any statement in a request;

(2) Consider any other source of information in evaluating a request for an interpretive ruling; and

(3) Rely on previously issued interpretive rulings dealing with the same or a related issue.

(g) *Informal conference.* DOE, on its own initiative, may convene an informal conference with the person requesting an interpretive ruling.

(h) *Effect of an interpretive ruling.* The authority of an interpretive ruling shall be limited to the person requesting such ruling and shall depend on the accuracy and completeness of the facts and circumstances on which the interpretive ruling is based. An interpretive ruling by the Assistant Secretary shall be final for DOE.

(i) *Reliance on an interpretive ruling.* No person who obtains an interpretive ruling under this section shall be subject to an enforcement action for civil penalties or criminal fines for actions reasonably taken in reliance thereon, but a person may not act in reliance on an interpretive ruling that is administratively rescinded or modified, judicially invalidated, or its prospective effect is overruled by statute or regulation.

(j) *Denials of requests for an interpretive ruling.* DOE shall deny a request for an interpretive ruling if DOE determines that—

(1) There is insufficient information upon which to base an interpretive ruling;

(2) The questions posed should be treated in a general notice of proposed rulemaking under 42 U.S.C. 7191 and 5 U.S.C. 553;

(3) There is an adequate procedure elsewhere in this part for addressing the question posed such as a petition for exemption; or

(4) For other good cause.

(k) *Public file.* DOE may file a copy of an interpretive ruling in a public file labeled ''Interpretive Rulings Under 10 CFR Part 490'' which shall be available during normal business hours for public inspection at the DOE Freedom of Information Reading Room at 1000 Independence Avenue, SW, Washington, DC 20585, or at such other addresses as DOE may announce in a FEDERAL REGISTER notice.

§ 490.6 Petitions for generally applicable rulemaking.

(a) *Right to file.* Pursuant to 42 U.S.C. 7191 and 5 U.S.C. 553(e), any person may file a petition for generally applicable rulemaking under titles III, IV, and V of the Act with the DOE General Counsel.

(b) *How to file.* A petition for generally applicable rulemaking under this section shall be filed by mail or messenger in an envelope addressed to the Office of General Counsel, GC–1, U.S. Department of Energy, 1000 Independence Avenue, SW., Washington, DC 20585.

(c) *Content of rulemaking petitions.* A petition under this section must—

(1) Be labeled ''Petition for Rulemaking Under 10 CFR Part 490'';

(2) Describe with particularity the terms of the rule being sought;

(3) Identify the provisions of law that direct, authorize, or affect the issuance of the rules being sought; and

(4) Explain why DOE should not choose to make policy by precedent through interpretive rulings, petitions for exemption, or other adjudications.

(d) *Determination upon rulemaking petitions.* After considering the petition and other information deemed to be appropriate, DOE may grant the petition and issue an appropriate rulemaking notice, or deny the petition because the rule being sought—

(1) Would be inconsistent with statutory law;

(2) Would establish a generally applicable policy in an area that should be left to case-by-case determinations;

(3) Would establish a policy inconsistent with the underlying statutory purposes; or

(4) For other good cause.

§ 490.7 Relationship to other law.

(a) Nothing in this part shall be construed to require or authorize sale of, or conversion to, light duty alternative fueled motor vehicles in violation of applicable regulations of any Federal, State or local government agency.

(b) Nothing in this part shall be construed to require or authorize the use of a motor fuel in violation of applicable regulations of any Federal, State, or local government agency.

APPENDIX A TO SUBPART A OF PART 490

Metropolitan Statistical Areas/Consolidated Metropolitan Statistical Areas With 1980 Populations of 250,000 or more

Albany-Schenectady-Troy MSA NY
Albuquerque MSA NM
Allentown-Bethlehem-Easton MSA PA
Appleton-Oshkosh-Neenah MSA WI
Atlanta MSA GA
Augusta-Aiken MSA GA-SC
Austin-San Marcos MSA TX
Bakersfield MSA CA
Baton Rouge MSA LA
Beaumont-Port Arthur MSA TX
Binghamton MSA NY
Birmingham MSA AL
Boise City MSA ID
Boston-Worcester-Lawrence CMSA MA-NH-ME-CT
Buffalo-Niagara Falls MSA NY
Canton-Massillon MSA OH
Charleston MSA SC
Charleston MSA WV
Charlotte-Gastonia-Rock Hill MSA NC–SC
Chattanooga MSA TN–GA
Chicago-Gary-Kenosha CMSA IL–IN–WI
Cincinnati-Hamilton CMSA OH–KY–IN
Cleveland-Akron CMSA OH
Colorado Springs MSA CO
Columbia MSA SC
Columbus MSA OH
Columbus MSA GA–AL
Corpus Christi MSA TX
Dallas-Fort Worth CMSA TX
Davenport-Moline-Rock Island MSA IA–IL
Dayton-Springfield MSA OH
Daytona Beach MSA FL
Denver-Boulder-Greeley CMSA CO
Des Moines MSA IA
Detroit-Ann Arbor-Flint CMSA MI
Duluth MSA MN–WI
El Paso MSA TX
Erie MSA PA
Eugene-Springfield MSA OR
Evansville-Henderson MSA IN–KY
Fort Wayne MSA IN
Fresno MSA CA
Grand Rapids-Muskegon-Holland MSA MI
Greensboro-Winston Salem-High Point MSA NC
Greenville-Spartanburg-Anderson MSA SC
Harrisburg-Lebanon-Carlisle MSA PA
Hartford MSA CT
Hickory-Morganton MSA NC
Honolulu MSA HI
Houston-Galveston-Brazoria CMSA TX
Huntington-Ashland MSA WV–KY–OH
Indianapolis MSA IN
Jackson MSA MS
Jacksonville MSA FL
Johnson City-Kingsport-Bristol MSA TN–VA
Johnstown MSA PA
Kalamazoo-Battle Creek MSA MI
Kansas City MSA MO–KS
Knoxville MSA TN
Lakeland-Winter Haven MSA FL
Lancaster MSA PA
Lansing-East Lansing MSA MI
Las Vegas MSA NV–AZ
Lexington MSA KY
Little Rock-N. Little Rock MSA AR
Los Angeles-Riverside-Orange County CMSA CA
Louisville MSA KY–IN
Macon MSA GA
Madison MSA WI
McAllen-Edinburg-Mission MSA TX
Melbourne-Titusville-Palm Bay MSA FL
Memphis MSA TN–AR–MS
Miami-Fort Lauderdale CMSA FL
Milwaukee-Racine CMSA WI
Minneapolis-St. Paul MSA MN–WI
Mobile MSA AL
Modesto MSA CA
Montgomery MSA AL
Nashville MSA TN
New London-Norwich MSA CT–RI
New Orleans MSA LA
New York-N. New Jersey-Long Island CMSA NY–NJ–CT–PA
Norfolk-Virginia Beach-Newport News MSA VA–NC
Oklahoma City MSA OK
Omaha MSA NE–IA
Orlando MSA FL
Pensacola MSA FL
Peoria-Pekin MSA IL
Philadelphia-Wilmington-Atlantic City CMSA PA–NJ DE–MD
Phoenix-Mesa MSA AZ
Pittsburgh MSA PA
Portland-Salem CMSA OR–WA
Providence-Fall River-Warwick MSA RI–MA
Raleigh-Durham-Chapel Hill MSA NC
Reading MSA PA
Richmond-Petersburg MSA VA
Rochester MSA NY
Rockford MSA IL
Sacramento-Yolo CMSA CA
Saginaw-Bay City-Midland MSA MI
St. Louis MSA MO–IL
Salinas MSA CA
Salt Lake City-Ogden MSA UT
San Antonio MSA TX
San Diego MSA CA
San Francisco-Oakland-San Jose CMSA CA
San Juan MSA PR
Santa Barbara-Santa Maria-Lompoc MSA CA
Scranton-Wilkes Barre-Hazleton MSA PA
Seattle-Tacoma-Bremerton CMSA WA
Shreveport-Bossier City MSA LA
Spokane MSA WA
Springfield MSA MA
Stockton-Lodi MSA CA
Syracuse MSA NY

Tampa-St. Petersburg-Clearwater MSA FL
Toledo MSA OH
Tucson MSA AZ
Tulsa MSA OK
Utica-Rome MSA NY
Washington-Baltimore CMSA DC–MD–VA–WV
West Palm Beach-Boca Raton MSA FL
Wichita MSA KS
York MSA PA
Youngstown-Warren MSA OH

Subpart B [Reserved]

Subpart C—Mandatory State Fleet Program

§ 490.200 Purpose and scope.

This subpart sets forth rules implementing the provisions of Section 507(o) of the Act which requires, subject to some exemptions, that certain percentages of new light duty motor vehicles acquired for State fleets be alternative fueled vehicles.

§ 490.201 Alternative fueled vehicle acquisition mandate schedule.

(a) Except as otherwise provided in this part, of the new light duty motor vehicles acquired annually for State government fleets, including agencies thereof but excluding municipal fleets, the following percentages shall be alternative fueled vehicles for the following model years;

(1) 10 percent for model year 1997;
(2) 15 percent for model year 1998;
(3) 25 percent for model year 1999;
(4) 50 percent for model year 2000; and
(5) 75 percent for model year 2001 and thereafter.

(b) Each State shall calculate its alternative fueled vehicle acquisition requirements for the State government fleets, including agencies thereof, by applying the alternative fueled vehicle acquisition percentages for each model year to the total number of new light duty motor vehicles to be acquired during that model year for those fleets.

(c) If the calculation performed under paragraph (b) of this section produces a number that requires the acquisition of a partial vehicle, an adjustment to the acquisition number will be made by rounding the number of vehicles down the next whole number if the fraction is less than one half and by rounding the number of vehicles up to the next whole number if the fraction is equal to or greater than one half.

(d) A State fleet that first becomes subject to this part after model year 1997 shall acquire alternative fueled vehicles in the next model year at the percentage applicable to that model year according to the schedule in paragraph (a) of this section, unless the State is granted an exemption or reduction of the acquisition percentage pursuant to the procedures and criteria in section 490.204.

§ 490.202 Acquisitions satisfying the mandate.

The following actions within a model year qualify as acquisitions for the purpose of compliance with the requirements of section 490.201 of this part:

(a) The purchase or lease of an Original Equipment Manufacturer light duty vehicle (regardless of the model year of manufacture), capable of operating on alternative fuels that was not previously under control of the State or State agency;

(b) The purchase or lease of an aftermarket converted light duty vehicle (regardless of model year of manufacture), that was not previously under control of the State or State agency;

(c) The conversion of a newly purchased or leased light duty vehicle to operate on alternative fuels within four months after the vehicle is acquired for a State fleet; and

(d) The application of alternative fueled vehicle credits allocated under subpart F of this part.

§ 490.203 Light Duty Alternative Fueled Vehicle Plan.

(a) *General Provisions.* (1) In lieu of meeting its requirements under section 490.201 exclusively with acquisitions for State fleets, a State may follow a Light Duty Alternative Fueled Vehicle Plan that has been approved by DOE under this section.

(2) Any Light Duty Alternative Fueled Vehicle Plan must provide for voluntary acquisitions or conversions, or combinations thereof, by State, local, and private fleets that equal or exceed the State's alternative fuel vehicle acquisition requirement under section 490.201.

(3) Any acquisitions of light duty alternative fueled vehicles by participants in the State plan may be included for purposes of compliance, irrespective of whether the vehicles are in excluded categories set forth in section 490.3 of this part.

(4) Except as provided in paragraph (h) of this section or except for a fleet exempt under section 490.204, a State that does not have an approved plan in effect under this section is subject to the State fleet acquisition percentage requirements of section 490.201.

(5) If a significant commitment under an approved plan is not met by a participant of a plan, the State shall meet its percentage requirements under section 490.201 or submit to DOE an amendment to the plan for DOE approval.

(b) *Required elements of a plan.* Each plan must include the following elements:

(1) Certification by the Governor, or the Governor's designee, that the plan meets the requirements of this subpart;

(2) Identification of State, local and private fleets that will participate in the plan;

(3) Number of new alternative fueled vehicles to be acquired by each plan participant;

(4) A written statement from each plan participant to assure commitment;

(5) A statement of contingency measures by the State to offset any failure to fulfill significant commitments by plan participants, in order to meet the requirements of section 490.201;

(6) A provision by the State to monitor and verify implementation of the plan;

(7) A provision certifying that all acquisitions and conversions under the plan are voluntary and will meet the requirements of §247 of the Clean Air Act, as amended (42 U.S.C. 7587) and all applicable safety requirements.

(c) *When to submit plan.* (1) For model year 1997, a State shall submit its plan on or before March 14, 1997.

(2) Beginning with model year 1998, a State shall submit its plan to DOE no later than June 1 prior to the first model year covered by such plan.

(d) *Review and approval.* DOE shall review and approve a plan which meets the requirements of this subpart within 60 days of the date of receipt of the plan by DOE at the address in paragraph (g)(1) of this section.

(e) *Disapproval of plans.* If DOE disapproves or requests a State to submit additional information, the State may revise and resubmit the plan to DOE within a reasonable time.

(f) *How a State may modify an approved plan.* If a State determines that it cannot successfully implement its plan, it may submit to DOE for approval, at any time, the proposed modifications with adequate justifications.

(g) *Where to submit plans.* (1) A State shall submit to DOE an original and two copies of the plan and shall be addressed to the U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, EE–33, 1000 Independence Ave., SW., Washington, DC 20585, or to such other address as DOE may announce in a FEDERAL REGISTER notice.

(2) Any requests for modifications shall also be sent to the address in paragraph (g)(1) of this section.

(h) *MY 1997 Exemption.* (1) On or after September 1, 1996, a State shall be deemed automatically exempt from section 490.201 (a)(1) until DOE makes a final determination on a timely application to approve a plan for model year 1997 under this section if the State:

(i) Has submitted the application; or

(ii) Has sent a written notice to the Assistant Secretary, at the address under paragraph (g)(1) of this section, that it will file such an application on or before March 14, 1997.

(2) During the period of an automatic exemption under this paragraph, a State may procure light duty motor vehicles in accordance with its normal procurement policies.

§ 490.204 Process for granting exemptions.

(a) To obtain an exemption, in whole or in part, from the vehicle acquisition mandate in section 490.201 of this part, a State shall submit to DOE a written request for exemption, along with supporting documentation which must demonstrate that—

(1) Alternative fuels that meet the normal requirements and practices of the principal business of the State fleet

are not available from fueling sites that would permit central fueling of fleet vehicles in the area in which the vehicles are to be operated; or

(2) Alternative fueled vehicles that meet the normal requirements and practices of the principal business of the State fleet are not available for purchase or lease commercially on reasonable terms and conditions in the State; or

(3) The application of such requirements would pose an unreasonable financial hardship.

(b) Requests for exemption may be submitted at any time and must be accompanied with supporting documentation.

(c) Exemptions are granted for one model year only, and they may be renewed annually, if supporting documentation is provided.

(d) Exemptions may be granted in whole or in part. When granting an exemption in part, DOE may, depending upon the circumstances, completely relieve a State from complying with a portion of the vehicle acquisition requirements for a model year, or it may require a State to acquire all or some of the exempted vehicles in future model years.

(e) If a State is seeking an exemption under—

(1) Paragraph (a)(1) of this section, the types of documentation that are to accompany the request must include, but are not limited to, maps of vehicle operation zones and maps of locations providing alternative fuel; or

(2) Paragraph (a)(2) of this section, the types of documentation that are to accompany the request must include, but are not limited to, alternative fueled vehicle purchase or lease requests, a listing of vehicles that meet the normal practices and requirements of the State fleet, and any other documentation that exhibits good faith efforts to acquire alternative fueled vehicles; or

(3) Paragraph (a)(3) of this section, it must submit a statement identifying what portion of the alternative fueled vehicle acquisition requirement should be subject to the exemption and describing the specific nature of the financial hardship that precludes compliance.

(f) Requests for exemption shall be addressed to the U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, EE–33, 1000 Independence Ave., SW., Washington, DC 20585, or to such other address as DOE may announce in a FEDERAL REGISTER notice.

(g) The Assistant Secretary shall provide to the State, within 45 days of receipt of a request that complies with this section, a written determination as to whether the State's request has been granted or denied.

(h) If the Assistant Secretary denies an exemption, in whole or in part, and the State wishes to exhaust administrative remedies, the State must appeal within 30 days of the date of the determination, pursuant to 10 CFR part 1003, subpart C, to the Office of Hearings and Appeals, U.S. Department of Energy, 1000 Independence Ave., SW., Washington, DC 20585. The Assistant Secretary's determination shall be stayed during the pendency of an appeal under this paragraph.

§ 490.205 Reporting requirements.

(a) Any State subject to the requirements of this subpart must file an annual report for each State fleet on or before the December 31 after the close of the model year, beginning with model year 1997. The State annual report may consist of a single State report or separately prepared State agency reports.

(b) The report shall include the following information:

(1) Number of new light duty motor vehicles acquired for the fleet by a State during the model year;

(2) Number of new light duty alternative fueled vehicles that are required to be acquired during the model year;

(3) Number of new light duty alternative fueled vehicle acquisitions by the State during the model year;

(4) Number of alternative fueled vehicle credits applied against acquisition requirements;

(5) For each new light duty alternative fueled vehicle acquisition—

(i) Vehicle make and model;

(ii) Model year;

(iii) Vehicle identification number;

(iv) Dedicated or dual-fueled (including flexible fuel); and

(v) Type of alternative fuel the vehicle is capable of operating on; and

(6) Number of light duty alternative fueled vehicles acquired by municipal and private fleets during the model year under an approved Light Duty Alternative Fueled Vehicle Plan (if applicable).

(c) If credits are applied against vehicle acquisition requirements, then a credit activity report, as described in subpart F of this part, must be submitted with the report under this section to DOE.

(d) Records shall be maintained and retained for a period of three years.

(e) All reports, marked ''Annual Report,'' shall be sent to the Office of Energy Efficiency and Renewable Energy, U.S. Department of Energy, EE–33, 1000 Independence Ave., SW., Washington, DC, 20585, or such other address as DOE may provide by notice in the FEDERAL REGISTER.

§ 490.206 Violations.

Violations of this subpart are subject to investigation and enforcement under subpart G of this part.

Subpart D—Alternative Fuel Provider Vehicle Acquisition Mandate

§ 490.300 Purpose and Scope.

This subpart implements section 501 of the Act, which requires, subject to some exemptions, that certain annual percentages of new light duty motor vehicles acquired by alternative fuel providers must be alternative fueled vehicles.

§ 490.301 Definitions.

In addition to the definitions found in section 490.2, the following definitions apply to this subpart—

Affiliate means a person that, directly or indirectly, controls, is controlled by, or is under common ownership or control of a person subject to vehicle acquisition requirements in this part.

Alternative Fuels Business means activities undertaken to derive revenue from—

(1) Producing, storing, refining, processing, transporting, distributing, importing, or selling at wholesale or retail any alternative fuel other than electricity; or

(2) Generating, transmitting, importing, or selling at wholesale or retail electricity.

Business Unit means a semi-autonomous major grouping of activities for administrative purposes and organizational structure within a business entity and that is controlled by or under control of a person subject to vehicle acquisition requirements in this part.

Division means a major administrative unit of an enterprise comprising at least several enterprise units or constituting a complete integrated unit for a specific purpose and that is controlled by or under control of a person subject to vehicle acquisition requirements in this part.

Normal Requirements and Practices means the operating business practices and required conditions under which the principal business of a person subject to vehicle acquisition requirements in this part operates.

Principal Business means the sales-related activity that produces the greatest gross revenue.

Substantial Portion means that at least 30 percent of the annual gross revenue of a covered person is derived from the sale of alternative fuels.

Substantially Engaged means that a covered person, or affiliate, division, or other business unit thereof, regularly derives more than a negligible amount of sales-related gross revenue from an alternative fuels business.

§ 490.302 Vehicle acquisition mandate schedule.

(a) Except as provided in section 490.304 of this part, of the light duty motor vehicles newly acquired by a covered person described in section 490.303 of this part, the following percentages shall be alternative fueled vehicles for the following model years:

(1) 30 percent for model year 1997.

(2) 50 percent for model year 1998.

(3) 70 percent for model year 1999.

(4) 90 percent for model year 2000 and thereafter.

(b) Except as provided in section 490.304 of this part, this acquisition schedule applies to all light duty motor vehicles that a covered person newly

acquires for use within the United States.

(c) If, when the mandated acquisition percentage of alternative fuel vehicles is applied to the number of new light duty motor vehicles to be acquired by a covered person subject to this subpart, a number results that requires the acquisition of a partial vehicle, an adjustment will be made to the required acquisition number by rounding down to the next whole number if the fraction is less than one half and by rounding up the number of vehicles to the next whole number if the fraction is equal to or greater than one half.

(d) Only acquisitions satisfying the mandate, as defined by section 490.305, count toward compliance with the acquisition schedule in paragraph (a) of this section.

(e) A covered person that is first subject to the acquisition requirements of this part after model year 1997 shall acquire alternative fueled vehicles in the next model year at the percentage applicable to that model year, according to the schedule in paragraph (a) of this section, unless the covered person is granted an exemption or reduction of the acquisition percentage pursuant to the procedures and criteria in section 490.308.

§ 490.303 Who must comply.

(a) Except as provided by paragraph (b) of this section, a covered person must comply with the requirements of this subpart if that person is—

(1) A covered person whose principal business is producing, storing, refining, processing, transporting, distributing, importing or selling at wholesale or retail any alternative fuel other than electricity; or

(2) A covered person whose principal business is generating, transmitting, importing, or selling, at wholesale or retail, electricity; or

(3) A covered person—

(i) Who produces, imports, or produces and imports in combination, an average of 50,000 barrels per day or more of petroleum; and

(ii) A substantial portion of whose business is producing alternative fuels.

(b) This subpart does not apply to a covered person or affiliate, division, or other business unit of such person whose principal business is—

(1) transforming alternative fuels into a product that is not an alternative fuel; or

(2) consuming alternative fuels as a feedstock or fuel in the manufacture of a product that is not an alternative fuel.

§ 490.304 Which new light duty motor vehicles are covered.

(a) *General rule.* Except as provided in paragraph (b) of this section, the vehicle acquisition mandate schedule in section 490.302 of this part applies to all light duty motor vehicles newly acquired for use within the United States by a covered person described in section 490.303 of this part.

(b) *Exception.* If a covered person has more than one affiliate, division, or other business unit, then section 490.302 of this part only applies to light duty motor vehicles newly acquired by an affiliate, division, or other such business unit which is substantially engaged in the alternative fuels business.

§ 490.305 Acquisitions satisfying the mandate.

The following actions within the model year qualify as acquisitions for the purpose of compliance with the requirements of section 490.302 of this part—

(a) The purchase or lease of an Original Equipment Manufacturer light duty vehicle (regardless of the model year of manufacture), capable of operating on alternative fuels that was not previously under the control of the covered person;

(b) The purchase or lease of an aftermarket converted light duty vehicle (regardless of the model year of manufacture), that was not previously under the control of the covered person; and

(c) The conversion of a newly purchased or leased light duty vehicle to operate on alternative fuels within four months after the vehicle is acquired by a covered person; and

(d) The application of alternative fueled vehicle credits allocated under subpart F of this part.

§ 490.306 Vehicle operation requirements.

The alternative fueled vehicles acquired pursuant to section 490.302 of this part shall be operated solely on alternative fuels, except when these vehicles are operating in an area where the appropriate alternative fuel is unavailable.

§ 490.307 Option for Electric Utilities.

(a) A covered person or its affiliate, division, or business unit, whose principal business is generating, transmitting, importing, or selling, at wholesale or retail, electricity has the option of delaying the vehicle acquisition mandate schedule in section 490.302 until January 1, 1998, if the covered person intends to comply with this regulation by acquiring electric motor vehicles.

(b) If a covered person or its affiliate, division, or business unit, whose principal business is generating, transmitting, importing, or selling at wholesale or retail electricity has notified the Department as required by the Act, of its intent to acquire electric motor vehicles, the following percentages of new light duty motor vehicles acquired shall be alternative fueled vehicles for the following time periods:

(1) 30 percent from January 1, 1998 to August 31, 1998.

(2) 50 percent for model year 1999.

(3) 70 percent for model year 2000.

(4) 90 percent for model year 2001 and thereafter.

(c) Any covered person or its affiliate, division, or business unit, that chooses the option provided by this section may apply for an exemption from the vehicle acquisition mandate in accordance with section 490.308 of this regulation.

(d) Any covered person or its affiliate, division, or business unit, that chooses to rescind its election of the option provided in this section shall be required, unless otherwise exempt, to acquire alternative fueled vehicles in accordance with the vehicle acquisition schedule in section 490.302.

§ 490.308 Process for granting exemptions.

(a) To obtain an exemption from the vehicle acquisition mandate in this subpart, a covered person, or its affiliate, division, or business unit which is subject to section 490.302 of this part, shall submit a written request for exemption to the Office of Energy Efficiency and Renewable Energy, U.S. Department of Energy, EE–33, 1000 Independence Ave., SW., Washington, DC 20585, or such other address as DOE may publish in the FEDERAL REGISTER, along with the supporting documentation required by this section.

(b) A covered person requesting an exemption must demonstrate that—

(1) Alternative fuels that meet the normal requirements and practices of the principal business of the covered person are not available from fueling sites that would permit central fueling of that person's vehicles in the area in which the vehicles are to be operated; or

(2) Alternative fueled vehicles that meet the normal requirements and practices of the principal business of the covered person are not available for purchase or lease commercially on reasonable terms and conditions in any State included in a MSA/CMSA that the vehicles are operated in.

(c) *Documentation.* (1) Except as provided in paragraph (c) (2) of this section, if a covered person is seeking an exemption under paragraph (b)(1) of this section, the types of documentation that are to accompany the request include, but are not limited to, maps of vehicle operation zones and maps of locations providing alternative fuel.

(2) If a covered person seeking an exemption under paragraph (b)(1) of this section operates light duty vehicles outside of the areas listed in Appendix A of subpart A, and central fueling of those vehicles does not meet the normal requirements and practices of that person's business, then that covered person shall only be required to justify in a written request why central fueling is incompatible with its business.

(3) If a covered person is seeking an exemption under paragraph (b)(2) of this section, the types of documentation that are to accompany the request include, but are not limited to, alternative fueled vehicle purchase or lease requests, a listing of vehicles that meet the normal practices and requirements of the covered person and any other

documentation that exhibits good faith efforts to acquire alternative fueled vehicles.

(d) Exemptions are granted for one model year only and may be renewed annually, if supporting documentation is provided.

(e) Exemptions may be granted in whole or in part. When granting an exemption in part, DOE may, depending upon the circumstances, completely relieve a covered person from complying with a portion of the vehicle acquisition requirements for a model year, or it may require a covered person to acquire all or some of the exempted vehicles in future model years.

(f) The Assistant Secretary shall provide to the covered person within 45 days after receipt of a request that complies with this section, a written determination as to whether the State's request has been granted or denied.

(g) If a covered person is denied an exemption, that covered person may file an appeal within 30 days of the date of determination, pursuant to 10 CFR part 1003, subpart C, with the Office of Hearings and Appeals, U.S. Department of Energy, 1000 Independence Ave, SW, Washington, DC 20585. The Assistant Secretary's determination shall be stayed during the pendency of an appeal under this paragraph.

§ 490.309 Annual reporting requirements.

(a) If a person is required to comply with the vehicle acquisition schedule in section 490.302 or section 490.307, that person shall file an annual report under this section, on a form obtainable from DOE, with the Office of Energy Efficiency and Renewable Energy, U.S. Department of Energy, EE–33, 1000 Independence Ave., SW., Washington, DC 20585, or such other address as DOE may publish in the FEDERAL REGISTER, on or before the December 31 after the close of the applicable model year.

(b) This report shall include the following information—

(1) Number of new light duty motor vehicles acquired by the covered person in the United States during the model year;

(2) Number of new light duty alternative fueled vehicles that are required to be acquired during the model year;

(3) Number of new light duty alternative fueled vehicle acquisitions in the United States during the model year;

(4) Number of alternative fueled vehicle credits applied against acquisition requirements;

(5) For each new light duty alternative fueled vehicle acquisition—

(i) Vehicle make and model;

(ii) Model year;

(iii) Vehicle Identification Number;

(iv) Dedicated or dual-fueled (including flexible fuel); and

(v) Type of alternative fuel the vehicle is capable of operating on.

(c) If credits are applied against alternative fueled vehicle acquisition requirements, then a credit activity report, as described in subpart F, must be submitted with the report under this section to DOE.

(d) Records shall be maintained and retained for a period of three years.

§ 490.310 Violations.

Violations of this subpart are subject to investigation and enforcement under subpart G of this part.

Subpart E [Reserved]

Subpart F—Alternative Fueled Vehicle Credit Program

§ 490.500 Purpose and Scope.

This subpart implements the statutory requirements of section 508 of the Act, which provides for the allocation of credits to fleets or covered persons who acquire alternative fueled vehicles in excess of the number they are required or obtain alternative fueled vehicles before the model year when they are first required to do so under this part.

§ 490.501 Applicability.

This subpart applies to all fleets and covered persons who are required to acquire alternative fueled vehicles by this part.

§ 490.502 Creditable actions.

A fleet or covered person becomes entitled to alternative fueled vehicle credits by—

(a) Acquiring alternative fueled vehicles, including those in excluded categories under section 490.3 of this part and those exceeding 8,500 gross vehicle weight rating, in excess of the number of alternative fueled vehicles that fleet or covered person is required to acquire in a model year when acquisition requirements apply; or

(b) Acquiring alternative fueled vehicles, including those in excluded categories under section 490.3 of this part and those exceeding 8,500 gross vehicle weight rating, in model years before the model year when that fleet or covered person is first required to acquire alternative fueled vehicles.

(c) For purposes of this subpart, a fleet or covered person that acquired a motor vehicle on or after October 24, 1992, and converted it to an alternative fueled vehicle before April 15, 1996, shall be entitled to a credit for that vehicle notwithstanding the time limit on conversions established by sections 490.202(a)(3) and 490.305(a)(3) of this part.

§ 490.503 Credit allocation.

(a) Based on annual credit activity report information, as described in section 490.507 of this part, DOE shall allocate one credit for each alternative fueled vehicle a fleet or covered person acquires that exceeds the number of alternative fueled vehicles that fleet or person is required to acquire in a model year when acquisition requirements apply.

(b) If an alternative fueled vehicle is acquired by a fleet or covered person in a model year before the first model year that fleet or person is required to acquire alternative fueled vehicles by this part, as reported in the annual credit activity report, DOE shall allocate one credit per alternative fueled vehicle for each year the alternative fueled vehicle is acquired before the model year when acquisition requirements apply.

(c) DOE shall allocate credits to fleets and covered persons under paragraph (b) of this section only for alternative fueled vehicles acquired on or after October 24, 1992.

§ 490.504 Use of alternative fueled vehicle credits.

At the request of a fleet or covered person in an annual report under this part, DOE shall treat each credit as the acquisition of an alternative fueled vehicle that the fleet or covered person is required to acquire under this part. Each credit shall count as the acquisition of one alternative fueled vehicle in the model year for which the fleet or covered person requests the credit to be applied.

§ 490.505 Credit accounts.

(a) DOE shall establish a credit account for each fleet or covered person who obtains an alternative fueled vehicle credit.

(b) DOE shall send to each fleet and covered person an annual credit account balance statement after the receipt of its credit activity report under section 490.507.

§ 490.506 Alternative fueled vehicle credit transfers.

(a) Any fleet or covered person that is required to acquire alternative fueled vehicles may transfer an alternative fueled vehicle credit to—

(1) A fleet that is required to acquire alternative fueled vehicles; or

(2) A covered person subject to the requirements of this part, if the transferor provides certification to the covered person that the credit represents a vehicle that operates solely on alternative fuel.

(b) Proof of credit transfer may be on a form provided by DOE, or otherwise in writing, and must include dated signatures of the transferor and transferee. The proof should be received by DOE within 30 days of the transfer date to the Office of Energy Efficiency and Renewable Energy, U.S. Department of Energy, EE–33, 1000 Independence Ave., SW., Washington, DC 20585 or such other address as DOE publishes in the FEDERAL REGISTER.

§ 490.507 Credit activity reporting requirements.

(a) A covered person or fleet applying for allocation of alternative fueled vehicle credits must submit a credit activity report by the December 31 after the close of a model year to the Office of Energy Efficiency and Renewable Energy, U.S. Department of Energy, EE–33, 1000 Independence Ave, SW., Washington, DC 20585 or other such address as DOE may publish in the FEDERAL REGISTER.

(b) This report must include the following information:

(1) Number of alternative fueled vehicle credits requested for:

(i) alternative fueled vehicles acquired in excess of required acquisition number; and

(ii) alternative fueled vehicles acquired in model years before the first model year the fleet or covered person is required to acquire vehicles by this part.

(2) Purchase of alternative fueled vehicle credits:

(i) Credit source; and

(ii) Date of purchase;

(3) Sale of alternative fueled vehicle credits:

(i) Credit purchaser; and

(ii) Date of sale.

Subpart G—Investigations and Enforcement

§ 490.600 Purpose and scope.

This subpart sets forth the rules applicable to investigations under titles III, IV, V, and VI of the Act and to enforcement of section 501, 503(b), 507 or 508 of the Act, or any regulation issued under such sections.

§ 490.601 Powers of the Secretary.

For the purpose of carrying out titles III, IV, V, and VI of the Act, DOE may hold such hearings, take such testimony, sit and act at such times and places, administer such oaths, and require by subpena the attendance and testimony of such witnesses and the production of such books, papers, correspondence, memoranda, contracts, agreements, or other records as the Secretary of Transportation is authorized to do under section 505(b)(1) of the Motor Vehicle Information and Cost Savings Act (15 U.S.C. 2005(b)(1)).

§ 490.602 Special orders.

(a) DOE may require by general or special orders that any person—

(1) File, in such form as DOE may prescribe, reports or answers in writing to specific questions relating to any function of DOE under this part; and

(2) Provide DOE access to (and for the purpose of examination, the right to copy) any documentary evidence of such person which is relevant to any function of DOE under this part.

(b) File under oath any reports and answers provided under this section or as otherwise prescribed by DOE, and file such reports and answers with DOE within such reasonable time and at such place as DOE may prescribe.

§ 490.603 Prohibited acts.

It is unlawful for any person to violate any provision of section 501, 503(b), or 507 of the Act, or any regulations issued under such sections.

§ 490.604 Penalties and Fines.

(a) *Civil Penalties.* Whoever violates § 490.603 of this part shall be subject to a civil penalty of not more than $5,500 for each violation.

(b) *Willful violations.* Whoever willfully violates section 490.603 of this part shall pay a criminal fine of not more than $10,000 for each violation.

(c) *Repeated violations.* Any person who knowingly and willfully violates section 490.603 of this part, after having been subjected to a civil penalty for a prior violation of section 490.603 shall pay a criminal fine of not more than $50,000 for each violation.

[61 FR 10653, Mar. 14, 1996, as amended at 62 FR 46183, Sept. 2, 1997]

§ 490.605 Statement of enforcement policy.

DOE may agree not to commence an enforcement proceeding, or may agree to settle an enforcement proceeding, if the person agrees to come into compliance in a manner satisfactory to DOE. DOE normally will not commence an enforcement action against a person subject to the acquisition requirements of this part without giving that person notice of its intent to enforce 90 days

before the beginning of an enforcement proceeding.

§ 490.606 Proposed assessments and orders.

DOE may issue a proposed assessment of, and order to pay, a civil penalty in a written statement setting forth supporting findings of violation of the Act or a relevant regulation of this part. The proposed assessment and order shall be served on the person named therein by certified mail, return-receipt requested, and shall become final for DOE if not timely appealed pursuant to section 490.607 of this part.

§ 490.607 Appeals.

(a) In order to exhaust administrative remedies, on or before 30 days from the date of issuance of a proposed assessment and order to pay, a person must appeal a proposed assessment and order to the Office of Hearings and Appeals, U.S. Department of Energy, 1000 Independence Avenue, SW., Washington, DC 20585.

(b) Proceedings in the Office of Hearings and Appeals shall be subject to subpart F of 10 CFR part 1003 except that—

(1) Appellant shall have the ultimate burden of persuasion;

(2) Appellant shall have right to a trial-type hearing on contested issues of fact only if the hearing officer concludes that cross examination will materially assist in determining facts in addition to evidence available in documentary form; and

(3) The Office of Hearings and Appeals may issue such orders as it may deem appropriate on all other procedural matters.

(c) The determination of the Office of Hearings and Appeals shall be final for DOE.

Subpart H—Biodiesel Fuel Use Credit

SOURCE: 64 FR 27174, May 19, 1999, unless otherwise noted.

§ 490.701 Purpose and scope.

(a) This subpart implements provisions of the Energy Conservation Reauthorization Act of 1998 (Pub. L. 105–388) that require, subject to some limitations, the allocation of credit to a fleet or covered person under Titles III and V of the Energy Policy Act of 1992 for the purchase of a qualifying volume of the biodiesel component of a fuel containing at least 20 percent biodiesel by volume.

(b) Fleets and covered persons may use these credits to meet, in part, their mandated alternative fueled vehicle acquisition requirements.

§ 490.702 Definitions.

In addition to the definitions found in §490.2, the following definitions apply to this subpart—

Biodiesel means a diesel fuel substitute produced from nonpetroleum renewable resources that meets the registration requirements for fuels and fuel additives established by the Environmental Protection Agency under section 211 of the Clean Air Act; and

Qualifying volume means—

(1) 450 gallons; or

(2) If DOE determines by rule that the average annual alternative fuel use in light duty vehicles by fleets and covered persons exceeds 450 gallons or gallon equivalents, the amount of such average annual alternative fuel use.

§ 490.703 Biodiesel fuel use credit allocation.

(a) DOE shall allocate to a fleet or covered person one credit for each qualifying volume of the biodiesel component of a fuel that contains at least 20 percent biodiesel by volume if:

(1) Each qualifying volume of the biodiesel component of a fuel was purchased after November 13, 1998;

(2) The biodiesel component of fuel is used in vehicles owned or operated by the fleet or covered person; and

(3) The biodiesel component of the fuel is used in vehicles weighing more than 8,500 pounds gross vehicle weight rating.

(b) No credit shall be allocated under this subpart for a purchase of the biodiesel component of a fuel if the fuel is:

(1) For use in alternative fueled vehicles; or

(2) Required by Federal or State law.

§ 490.704 Procedures and documentation.

(a) To receive a credit under this subpart, the fleet or covered person shall submit its request, on a form obtained from DOE, to the Office of Energy Efficiency and Renewable Energy, U. S. Department of Energy, EE–34, 1000 Independence Ave. SW., Washington, DC 20585, or such other address as DOE may publish in the FEDERAL REGISTER, along with the documentation required by paragraph (b) of this section.

(b) Each request for a credit under this subpart must be submitted on or before the December 31 after the close of the applicable model year and must include written documentation stating the quantity of biodiesel purchased, for the given model year, for use in vehicles weighing in excess of 8,500 lbs. gross vehicle weight;

(c) A fleet or covered person submitting a request for a credit under this subpart must maintain and retain purchase records verifying information in the request for a period of three years from December 31 immediately after the close of the model year for which the request is submitted.

§ 490.705 Use of credits.

(a) At the request of a fleet or covered person allocated a credit under this subpart, DOE shall, for the model year in which the purchase of a qualifying volume is made, treat that purchase as the acquisition of one alternative fueled vehicle the fleet or covered person is required to acquire under sections 490.201, 490.302 and 490.307, and Title III of the Energy Policy Act of 1992.

(b) Except as provided in paragraph (c) of this section, credits allocated under this subpart may not be used to satisfy more than 50 percent of the alternative fueled vehicle requirements of a fleet or covered person under sections 490.201, 490.302 and 490.307, and Title III of the Energy Policy Act of 1992.

(c) A fleet or covered person that is a biodiesel alternative fuel provider described in section 490.303 of this part may use its credits allocated under this subpart to satisfy all of its alternative fueled vehicle requirements under section 490.302.

§ 490.706 Procedure for modifying the biodiesel component percentage.

(a) DOE may, by rule, lower the 20 percent biodiesel volume requirement of this subpart for reasons related to cold start, safety, or vehicle function considerations.

(b) Any person may use the procedures in section 490.6 of this part to petition DOE for a rulemaking to lower the biodiesel volume percentage. A petitioner should include any data or information that it wants DOE to consider in deciding whether or not to begin a rulemaking.

§ 490.707 Increasing the qualifying volume of the biodiesel component.

DOE may increase the qualifying volume of the biodiesel component of fuel for purposes of allocation of credits under this subpart only after it:

(a) Collects data establishing that the average annual alternative fuel use in light duty vehicles by fleets and covered persons exceeds 450 gallons or gallon equivalents; and

(b) Conducts a rulemaking to amend the provisions of this subpart to change the qualifying volume to the average annual alternative fuel use.

§ 490.708 Violations.

Violations of this subpart are subject to investigation and enforcement under subpart G of this part.

PARTS 491–499 [RESERVED]

A list of CFR titles, subtitles, chapters, subchapters and parts and an alphabetical list of agencies publishing in the CFR are included in the CFR Index and Finding Aids volume to the Code of Federal Regulations which is published separately and revised annually.

Material Approved for Incorporation by Reference
Table of CFR Titles and Chapters
Alphabetical List of Agencies Appearing in the CFR
List of CFR Sections Affected

Material Approved for Incorporation by Reference

(Revised as of January 1, 2000)

The Director of the Federal Register has approved under 5 U.S.C. 552(a) and 1 CFR Part 51 the incorporation by reference of the following publications. This list contains only those incorporations by reference effective as of the revision date of this volume. Incorporations by reference found within a regulation are effective upon the effective date of that regulation. For more information on incorporation by reference, see the preliminary pages of this volume.

10 CFR (PARTS 200–499)
DEPARTMENT OF ENERGY

	10 CFR
American Society of Heating, Refrigerating and Air Conditioning Engineers, Inc. 345 E. 47th St., New York, NY 10017	
Standard 90, Energy Conservation in New Building Design, Sections 4–9 (Aug. 11, 1975).	420.2; 420.7
ASHRAE/ESNA 90.1–1989, Energy Efficient Design of New Buildings Except Low-Rise Residential Buildings, including Addenda 90.16–1992, 90.1d–1992, 90.1e–1992. 90.1g–1993, 90.1i–1993.	420.02; 420.06; 420.15
Air-Conditioning and Refrigeration Institute 1815 N. Fort Myer Drive, Arlington, VA 22209	
ARI 210–79 Standard for Unitary Air Conditioning Equipment	Part 430, Subpart B, Appendix M
ARI 240–77 Standard for Air-Source Unitary Heat Pump Equipment	Part 430, Subpart B, Appendix M
ARI 280–74 Standard for Central Forced-Air Electric Heating Equipment.	Part 430, Subpart B, Appendix N
ARI 320–76 Standard for Water Source Heat Pumps	Part 430, Subpart B, Appendix M
ARI 610–74 Standard for Central System Humidifiers	Part 430, Subpart B, Appendix K1
American National Standards Institute 11 West 42nd Street, New York, NY 10036 Telephone: (212) 642–4900	
ANSI B38.1–1970 Method of testing for Household Refrigerators, Combination Refrigerator Freezers and Household Freezers.	Part 430, Subpart B, Appendix A and B
ANSI B149.1–1972 Dehumidifiers	Part 430, Subpart B, Appendix L
ANSI C16.13–1961 Monochrome Television Broadcast Receivers	Part 430, Subpart B, Appendix H
ANSI C78.1–1991, For Fluorescent Lamps—Rapid-Start Types—Dimensional and Electrical Characteristics.	430.22; 430.2
ANSI C78.2–1991, For Fluorescent Lamps—Preheat-Start Types—Dimensional and Electrical Characteristics.	430.22; 430.2
ANSI C78.3–1991, For Fluorescent Lamps—Instant-Start and Cold-Cathode Types—Dimensional and Electrical Characteristics.	430.22; 430.2
ANSI C78.21–1989, Incandescent Lamps - PAR and R Shapes	430.22

10 CFR (PARTS 200–499)—Continued
DEPARTMENT OF ENERGY—Continued

	10 CFR
ANSI C78.375–1991, For Fluorescent Lamps—Guide for Electrical Measurements.	430.22; 430.2
ANSI C79.1–1994, Nomenclature for Glass Bulbs - Intended for Use with Electric Lamps.	430.22
ANSI C82.2–1984 Flourescent Lamp Ballasts—Methods of Measurements, approved Oct. 21, 1983.	Part 430, Appendix Q
ANSI C82.1983, For Reference Ballasts for Fluorescent Lamps	430.22; 430.2
ANSI Z11.182–1965 (R 1971), Standard Method of Test for Smoke Density in the Flue Gases from Distillate Fuels (ASTM D 2156–65 (1975)).	Part 430, Subpart B, Appendix N and O
ANSI Z21.10.1–1975 Gas Water Heaters	Part 430, Subpart B, Appendix E
ANSI Z21.11.1–1974 ANS for Gas-Fired Room Heaters, Vol. 1, Vented Room Heaters.	Part 430, Subpart B, Appendix O
ANSI Z21.13–1974 ANS for Gas-Fired Low Pressure Steam and Hot Water Heating Boilers.	Part 430, Subpart B, Appendix N
ANSI Z21.44–1973 Gas Fired Gravity and Fan Type Direct Vent Wall Furnaces.	Part 430, Subpart B, Appendix O
ANSI Z21.47–1978 Gas Fired Central Furnaces	Part 430, Subpart B, Appendix N and O
ANSI Z21.56–1994, Gas-Fired Pool Heaters	430.22
ANSI Z21.48–1976 Gas Fired Gravity and Fan Type Floor Furnaces	Part 430, Subpart B, Appendix O
ANSI Z21.49–1975 Gas Fired Gravity and Fan Type Vented Wall Furnace.	Part 430, Subpart B, Appendix O
ANSI Z91.1–1972 ANS Performance Requirements for Oil-Powered Central Furnaces.	Part 430, Subpart B, Appendix N
ANSI Z224.1–1971 Performance Evaluation Procedures for Household Washers (AHAM HLW–1, Dec. 1971).	Part 430, Subpart B, Appendix J
ANSI Z234.1–1972 Room Air Conditioners	Part 430, Subpart B, Appendix F
ANSI Z235.1–1972 Appliance Humidifier Standard (AHAM HU–1–72).	Part 430, Subpart B, Appendix K2
American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. 345 E. 47th St., New York, NY 10017	
ASHRAE Standard 16–69 Method of Testing for Rating Room Air Conditioners.	Part 430, Subpart B, Appendix F
ASHRAE Standard 37–78 Method of Testing for Rating Unitary Air Conditioning and Heat Pump Equipment.	Part 430, Subpart B, Appendix M
American Society of Mechanical Engineers (ASME) Three Park Avenue, New York, NY 10016–5990; Telephone: (800) THE–ASME	
ASME/ANSI Standard A112.18.1M-1996, Plumbing Fixture Fittings	430.22(b)(6)
ASME/ANSI Standard A112.19.6-1995, Hydraulic Requirements for Water Closets and Urinals.	430.22(b)(6)
American Society for Testing and Materials (ASTM) 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959, Telephone (610) 832-9585, FAX (610) 832-9555	
ASTM D 396–78 Standard Specification for Fuel Oils	430.2
ASTM D 2156–65 (1975) Method of Test for Smoke Density in Flue Gases from Distillate Fuels (ANSI Z 11.182–1965 (R 1971)).	Part 430, Subpart B, Appendix N and O

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	10 CFR
Association of Home Appliance Manufacturers 20 N. Wacker Dr., Chicago, IL 60606	
AHAM HLD–1, June 1974 Performance Evaluation Procedure for Household Tumble Type Clothes Dryers.	Part 430, Subpart B, Appendix O
AHAM HLD–2EC, Dec. 1975 Test Method for Measuring Energy Consumption of Household Tumble Type Clothes Dryers.	Part 430, Subpart B, Appendix D
AHAM HLW–2EC, Dec. 1975 Test Method for Measuring Energy Consumption of Household Clothes Washers.	Part 430, Subpart B, Appendix J
AHAM HLW–1, Dec. 1971 Household Washer Performance Evaluation Procedure. (ANSI Z 224.1–1971).	Part 430, Subpart B, Appendix J
AHAM HU–1–72, Appliance Humidifier Standard (ANSI Z 235.1–1972).	Part 430, Subpart B, Appendix K2
AHAM HRF–2–ECFT–1975 Test Procedures to Determine the Temperature and Energy Consumption of Household Refrigerators, Combination Refrigerator-Freezers, and Freezers.	Part 430, Subpart B, Appendix A and B
Council of American Building Officials 5203 Leesburg Pike, Falls Church, VA 22041	
Model Energy Code, 1993, including Errata	420.2; 420.06; 420.15
Hydronics Institute 35 Russo Pl., Berkeley Heights, NJ 07922	
Testing and Rating Standards for Cast Iron and Steel Heating Boilers, Jan. 1977.	Part 430, Subpart B, Appendix N
Illuminating Engineering Society of North America, Publications Department 345 E. 47th Street, New York, NY 10017, (212) 705–7925	
Illuminating Engineering Society of North America Lighting Handbook, Reference and Application, 8th Edition, 1993, Chapter 6, Light Sources.	430.22
IES LM–9–88, IES Approved Method for the Electrical and Photometric Measurements of Fluorescent Lamps.	430.22, Subpart B, Appendix R
IES, LM–16, –84, IES Pratical Guide to Colorimetry of Light Sources	430.22, Subpart B, Appendix R
IESNA LM–16–1993m IESNA Practical Guide to Colorimetry of Light Sources.	430.22
IES LM–20–1982, IES Approved Method for Photometric Measuring and Reporting Tests on Reflector Type Lamps.	430.22, Subpart B, Appendix R
IESNA LM–20–1994, IESNA Approved Method for Photometric Testing of Reflector-Type Lamps.	430.22
IES LM–45–91, IES Approved Method for Electrical and Photometric Measurements of General Service Incandescent Filament Lamps.	430.22, Subpart B, Appendix R
IES LM–58–83, IES Guide to Spectroradiometric Measurements	430.22, Subpart B, Appendix R
IESNA LM–58–1994, IESNA Guide to Spectroradiometric Measurements.	430.22
IES LM–66–1991, IES Approved Method for the Electrical and Photometric Merasurements of Single-Ended Compact Fluorescent Lamps.	430.22, Subpart B, Appendix R
International Commission on Illumination Bureau Central De La CIE, 4 AV. Du Recteur-Poincare, 75 782 Paris, Cedex 16, France	
International Commission on Illumination Publication No. 13.2, 1974, corrected reprint 1993, Method of Measuring and Specifying Color Rendering Properties of Light Sources, ISBN 3 900 734 39 9.	430.22, Subpart B, Appendix R

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International Electrotechnical Commission	
Available from: American National Standards Institute, 11 West 42nd. St., New York, NY 10036	
IEC Standard 705, Methods for Measuring the Performance of Microwave Ovens for Household and Similar Purposes, Section 4, Methods of Measurement, Paragraph 13 Electrical Power Input Measurement and Paragraph 14 Efficiency (1988).	430.22
IEC Standard 705, Amendment 2, Methods for Measuring the Performance of Microwave Ovens for Household and Similar Purposes, Section 4, Methods of Measurement, Paragraph 12 Microwave Power Output Measurement (1993).	430.22
Underwriters Laboratories, Inc.	
Available from: Global Engineering Documents, 15 Inverness Way East, Englewood, CO 80112, Telephone (800) 854–7179 or Global Engineering Documents, 7730 Carondelet Ave., Suite 470, Clayton, MO 63105, Telephone (800) 854–7179	
UL 729–1976 Standard for Safety: Oil-Fired Floor Furnaces	Part 430, Subpart B, Appendix O
UL 730–1974 Standard for Safety: Oil-Fired Wall Furnaces	Part 430, Subpart B, Appendix O
UL 896–1973 Standard for Safety: Oil-Burning Stoves	Part 430, Subpart B, Appendix O
American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. 345 E. 47th St., New York, NY 10017	
Standard 93–77 Methods of Testing to Determine the Thermal Performance of Solar Collectors.	436.76
ASHRAE 103–1993, Methods of Testing for Annual Fuel Utilization Efficiency of Residential Central Furnaces and Boilers (with Errata of October 24, 1996) except for Sections 3.0, second paragraph of section 7.2.2.2, 7.2.2.5, 8.6.1.1, 9.1.2.2, 9.5.1.1, 9.5.1.2.1, 9.5.1.2.2, 9.5.2.1, 9.7.1, 10.0, 11.2.12, 11.3.12, 11.4.12, 11.5.12, and Appendices B and C.	Part 430, Subpart B, Appendix N
More information regarding the standards in this reference can be obtained from the following sources:	
Environmental Protection Agency, 401 M Street, NW, Washington, DC 20006; (202) 554–1080	
National Institute of Standards and Technology, U.S. Department of Commerce, Gaithersburg, MD 20899, (301) 975–2000	
Weatherization Assistance Programs Division, Conservation and Renewable Energy, Mail Stop 5G–023, Forrestal Bldg., 1000 Independence Ave, SW, Washington, DC 20585; (202) 586–2207	
Air Conditioning and Refrigeration Institute 1501 Wilson Blvd., Arlington, VA 22209; (703) 524–8800	
ARI 470–1987	Part 440, Appendix A
ARI 210/240–1989	Part 440, Appendix A
American National Standards Institute/American Architectural Manufacturers Association 1540 East Dundee Road, Palatine, IL 60067; (708) 202–1350	
ANSI/AAMA 1102.7–89	Part 440, Appendix A

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ANSI/AAMA 101–88	Part 440, Appendix A
ANSI/AAMA 1002.10–83	Part 440, Appendix A
American Gas Association 1515 Wilson Blvd., Arlington, VA 22209; (703) 841–8400	
AGA No. 1–80, Requirements for Heat Reclaimer Devices for Use with Gas-Fired Appliances, June 1, 1980.	Part 440, Appendix A
American National Standards Institute, Inc. 11 West 42nd Street, New York, NY 10036 Telephone: (212) 642–4900	
ANSI Z21.8–1984	Part 440, Appendix A
ANSI Z21.17–1984, and Z21.17a–1990	Part 440, Appendix A
ANSI Z21.21–1987 and Z21.21a–1989	Part 440, Appendix A
ANSI Z21.47–1987, Z21.47a–1988 and Z21.47b–1989	Part 440, Appendix A
ANSI Z21.66–1988, including Exhibits A & B	Part 440, Appendix A
ANSI Z21.71–1981, Z21.71a1985 and Z21.71b–1989	Part 440, Appendix A
ANSI Z223.1–1988	Part 440, Appendix A
ANSI Z223.1–1988, including Appendix H	Part 440, Appendix A
ANSI Z223.1–1988, including Part 9 and Appendices G & H	Part 440, Appendix A
ANSI Z223.1–1988, including Appendices H, I, J and K	Part 440, Appendix A
ANSI/American Home Appliance Manufacturers ANSI/AHAM RAC–1–1982.	Part 440, Appendix A
American National Standards Institute/National Wood Window and Door Association 1400 East Touhy Avenue, Suite 470, Des Plaines, IL 60018; (847) 299–5200	
ANSI/NWWDA I.S. 1–87 Exterior door provisions)	Part 440, Appendix A
ANSI/NWWDA I.S. 2–87	Part 440, Appendix A
ANSI/NWWDA I.S. 2–87 (Section 3)	Part 440, Appendix A
ANSI/NWWDA I.S. 3–83	Part 440, Appendix A
ANSI/NWWDA I.S. 6–86	Part 440, Appendix A
American National Standards Institute/Steel Door Institute 712 Lakewood Center North, 14600 Detroit Avenue, Cleveland, OH 44107; (216) 899–0100	
ANSI/SDI 100–1985	Part 440, Appendix A

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	10 CFR
American Society for Testing and Materials 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959, Telephone (610) 832-9585, FAX (610) 832-9555	
National Standards Association 1200 Quince Orchard Blvd., Gaithersburg, MD 20878; (301) 590–2300. (NSA is a local contact for materials from ASTM)	
ASTM C208–72 (1982)	Part 440, Appendix A
ASTM C509–84	Part 440, Appendix A
ASTM C516–80 (1990)	Part 440, Appendix A
ASTM C517–71 (1979)	Part 440, Appendix A
ASTM C533–85 (1990)	Part 440, Appendix A
ASTM C534–88	Part 440, Appendix A
ASTM C547–77	Part 440, Appendix A
ASTM C549–81 (1986)	Part 440, Appendix A
ASTM C552–88	Part 440, Appendix A
ASTM C553–70 (1977)	Part 440, Appendix A
ASTM C570–72 (1989)	Part 440, Appendix A
ASTM C578–87a	Part 440, Appendix A
ASTM C591–85	Part 440, Appendix A
ASTM C592–80	Part 440, Appendix A
ASTM C610–85	Part 440, Appendix A
ASTM C612–83	Part 440, Appendix A
ASTM C665–88	Part 440, Appendix A
ASTM C669–75 (1989)	Part 440, Appendix A
ASTM C720–89	Part 440, Appendix A
ASTM C726–88	Part 440, Appendix A
ASTM C728–89a	Part 440, Appendix A
ASTM C739–88	Part 440, Appendix A
ASTM C755–85 (1990)	Part 440, Appendix A

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ASTM C764–88	Part 440, Appendix A
ASTM C834–76 (1986)	Part 440, Appendix A
ASTM C892–89	Part 440, Appendix A
ASTM C920–87	Part 440, Appendix A
ASTM C971–82	Part 440, Appendix A
ASTM C984–83	Part 440, Appendix A
ASTM D3678–88	Part 440, Appendix A
ASTM D4099–89	Part 440, Appendix A
ASTM E84–89a	Part 440, Appendix A
ASTM E96–90	Part 440, Appendix A
American Society of Mechanical Engineers Three Park Avenue, New York, NY 10016–5990; Telephone: (800) THE–ASME	
ASME Boiler and Pressure Vessel Code, 1992, Sections II, V, VIII, IX, and X.	Part 440, Appendix A
ASME CSD–1–1988	Part 440, Appendix A
CSA International 178 Rexdale Blvd., Etobicoke, Ontario, Canada M9W 1R3	
C390–93 Energy Effieiency Test Method for Three-Phase Induction Motors, Test Method (1).	431.22
Federal Specifications, General Services Administration Specification Section, Room 6654, 7th and D Streets, SW, Washington, DC 20407; (202) 708–5082	
FS HH–I–1972/1, August 12, 1981	Part 440, Appendix A
FS HH–I–1972/2, August 12, 1981 and Amendment 1, October 3, 1985.	Part 440, Appendix A
FS HH–I–1972/4, August 12, 1981	Part 440, Appendix A
FS HH–I–558C, January 7, 1992	Part 440, Appendix A
FS TT–P–00791B, October 16, 1969 and Amendment 2, March 23, 1971.	Part 440, Appendix A
FS TT–S–001657, October 8, 1970	Part 440, Appendix A
FS TT–S–00230C, February 2, 1970 and Amendment 2, October 9, 1970.	Part 440, Appendix A
Institute of Electrical and Electronics Engineers, Inc. 445 Hoes Lane, P.O. Box 1131, Piscataway, NJ 08855–1331	
IEEE Std. 112–1996, Test Procedure for Polyphase Induction Motors and Generators, Test Method B, with correction to the calculation at item (28) in section 10.2, Form B, issued on January 20, 1998.	431.22

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DEPARTMENT OF ENERGY—Continued

	10 CFR
Institute of Electrotechnical Commission	
Copies made available through Global Engineering Documents, 15 Inverness Way East, Englewood, CO 80112–5776	
IEC Std. 60034–1 (1996) Rotating Electrical Machines (Part 1, Section 3, Clause 3.2.1 and Figure 1) with Amendment 1 (1997).	431.22
IEC Std. 60034–12 (1980) Rotating Electrical Machines (Part 12, Clauses 1, 2, 3.1, 4, 5, and 6, and Tables I, II, III) with Amendment 1 (1992) and Amendment 2 (1995).	431.22
IEC Std. 60050–411 (1996) International Electrotechnical Vocabulary (Chapter 411, Sections 411–33–07 and 411–37–26).	431.22
IEC Std. 60072–1 (1991) Dimensions and Output Series for Rotating Electrical Machines (Part 1, Frame Numbers 56 to 400 and Flange Numbers 55 to 1080, Clauses 2, 3, 4.1, 6.1, 7, and 10, and Tables 1, 2, and 4).	431.22
National Electrical Manufacturers Association	
1300 North 17th Street, Suite 1847, Rosslyn, VA 22209 Telephone: (703) 841–3200; FAX: (703) 841–3300	
NEMA DC3–1989	Part 440, Appendix A
Copies made available through Global Engineering Documents, 15 Inverness Way East, Englewood, CO 80112–5776	
MG1–1993 ''Motors and Generators'' (Section I, Part 1, Paragraphs 1.16.1, 1.16.1.1, 1.17.1, 1.17.1.2, and 1.40.1; Part 4, Paragraph 4.01, and Figures 4–1, 4–2, 4–3, and 4–4; and Section II, Part 11, Paragraphs 11.01.2, 11.31 (except the lines for frames 447T, 447TS, 449T, and 449TS), 11.32, 11.34 (except the line for frames 447TC and 449TC, and the line for frames 447TSC and 449TSC), 11.35, and 11.36 (except the line for frames 447TD and 449TD, and the line for frames 447TSD and 449TSD; and Table 11–1; Part 12, Paragraphs 12.35.1, 12.35.5, 12.38.1, 12.39.1, 12.40.1, 12.58.1, and Tables 12–2 and 12–8; and Part 14, Paragraphs 14.02 and 14.03) with Revisions 1, 2, 3, and 4.	431.22
National Fire Protection Association	
1 Batterymarch Park, Quincy, MA 022697ndash;9101, Telephone: (800) 344-3555	
NFPA 70–1993, National Electrical Code	Part 440, Appendix A
NFPA 31–1987	Part 440, Appendix A
NFPA 58–1989	Part 440, Appendix A
NFPA 211–1988	Part 440, Appendix A
Sheet Metal and Air Conditioning Contractors Association	
P.O. Box 221230, Chantilly, VA 22022–1230; (703) 803–2980	
SMACNA Energy Recovery Equipment and Systems, Air-to-Air (1978)	Part 440, Appendix A
Tubular Exchange Manufacturers Association	
25 North Broadway, Tarrytown, NY 10591; (914) 332–0040	
Standards of the Tubular Exchanger Manufactuers Association, Seventh Ed., 1988.	Part 440, Appendix A
Underwriters Laboratories, Inc.	
Available from: Global Engineering Documents, 15 Inverness Way East, Englewood, CO 80112, Telephone (800) 854–7179 or	

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Global Engineering Documents, 7730 Carondelet Ave., Suite 470, Clayton, MO 63105, Telephone (800) 854–7179	
UL 17, November 28, 1988	Part 440, Appendix A
UL 296, February 28, 1989	Part 440, Appendix A
UL 507, August 23, 1990	Part 440, Appendix A
UL 727, August 27, 1991	Part 440, Appendix A
UL 1995, November 30, 1990	Part 440, Appendix A
American National Standards Institute 11 West 42nd Street, New York, NY 10036 Telephone: (212) 642–4900	
ANSI Z21.13–1977 Gas-Fired Low Pressure Steam Hot Water Heating Boilers..	456.814; 456.914
ANSI Z21.20–1979 Automatic Gas Ignition Systems and Components	456.814
ANSI Z21.47–1978 Gas-fired Central Furnaces	456.814; 456.914
ANSI Z21.59–1974 Gas-fired High Pressure Steam and Hot Water Heating Boilers.	456.814
ANSI Z21.66–1978 Electrically-Operated Automatic Vent Damper Devices for Use with Gas-fired Appliances.	456.814; 456.914
ANSI Z21.67–1978 Mechanically-Actuated Automatic Vent Damper Devices for Use with Gas-fired Appliances.	456.814; 456.914
ANSI Z21.68–1978 Thermally-Actuated Automatic Vent Damper Devices for Use with Gas-fired Appliances.	456.814; 456.914
ANSI Z91.2–1976 Performance Requirements for Automatic Pressure Oil Burners of the Mechanical Draft Type.	456.814; 456.913
ANSI Z96.1–1978/UL 727 Oil-fired Central Furnaces	456.814
ANSI Z96.2–1974/UL 296 Oil Burners	456.814
ANSI Z96.3–1975/UL 726 Oil-fired Boiler Assemblies	456.814
ANSI/AAMA 1002.9–1977 Voluntary Specification for Aluminum Combination Storm Windows for External Applications.	456.813
ANSI/AAMA 1102.7–1977 Voluntary Specifications for Aluminum Storm Doors.	456.813
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