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Energy Conservation for Certain Industrial Equipment: Alternative Efficiency Determination Methods and Test Procedures for Walk-In Coolers and Walk-In Freezers; Final Rule

DEPARTMENT OF ENERGY

10 CFR Parts 429 and 431

[Docket Number EERE–2011–BT–TP–0024]

RIN 1904–AC46

Energy Conservation for Certain Industrial Equipment: Alternative Efficiency Determination Methods and Test Procedures for Walk-In Coolers and Walk-In Freezers

AGENCY: Office of Energy Efficiency and Renewable Energy, Department of Energy.

ACTION: Final rule.

SUMMARY: The U.S. Department of Energy (DOE) is revising its regulations related to the use of methods for certifying compliance and reporting ratings in accordance with energy conservation standards as they apply to walk-in coolers and walk-in freezers. These revisions also include a number of clarifications to the relevant test procedure that will serve as the basis for any applicable alternative efficiency determination method that may be used to rate certain walk-in cooler and walk-in freezer components.

DATES: The effective date of this final rule is June 12, 2014. The incorporation by reference of certain standards in this rulemaking was approved by the Director of the Office of the Federal Register as of March 23, 2009 and April 15, 2011.

ADDRESSES: *Docket:* The docket is available for review at *www.regulations.gov,* including **Federal Register** notices, public meeting attendee lists and transcripts, comments, and other supporting documents/materials. All documents in the docket are listed in the *www.regulations.gov* index. However, not all documents listed in the index may be publicly available, such as information that is exempt from public disclosure.

A link to the docket Web page can be found at: *http://www.regulations.gov/#!docketDetail;D=EERE-2011-BT-TP-0024.* This Web page contains a link to the docket for this rule on the *www.regulations.gov* site. The *www.regulations.gov* Web page contains simple instructions on how to access all documents, including public comments, in the docket.

For information on how to review the docket, contact Ms. Brenda Edwards at (202) 586–2945 or by email: *Brenda.Edwards@ee.doe.gov.*

FOR FURTHER INFORMATION CONTACT:

Ms. Ashley Armstrong, U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, Building Technologies Program, EE–5B, 1000 Independence Avenue SW., Washington, DC 20585–0121. Telephone: (202) 586–6590. Email: *Ashley.Armstrong@ee.doe.gov.*

Mr. Michael Kido, U.S. Department of Energy, Office of the General Counsel, GC–71, 1000 Independence Avenue SW., Washington, DC 20585–0121. Telephone: (202) 586–8145. Email: *Michael.Kido@hq.doe.gov.*

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I. Authority and Background

A. Authority

Title III, Part C of the Energy Policy and Conservation Act of 1975 (''EPCA'' or ''the Act'', Pub. L. 94–163) sets forth a variety of provisions designed to improve energy efficiency. The National Energy Conservation Policy Act (''NECPA'', Pub. L. 95–619) amended EPCA and established the energy conservation program for certain industrial equipment. (42 U.S.C. 6311–6317) The Energy Independence and Security Act of 2007 (''EISA 2007'') further amended EPCA to include, among others, two types of industrial equipment that are the subject of today's notice: Walk-in coolers and walk-in freezers (collectively, ''walk-ins'' or ''WICFs''). (42 U.S.C. 6311(1)(G)) Walk-ins are enclosed storage spaces of less than 3,000 square feet that can be walked into and are refrigerated to temperatures above and at or below 32 degrees Fahrenheit, respectively. (42 U.S.C. 6311(20)(A)) This term, by statute, excludes equipment designed for medical, scientific, or research purposes. (42 U.S.C. 6311(20)(B))

Under EPCA, the energy conservation program generally consists of four parts: (1) Testing; (2) labeling; (3) establishing Federal energy conservation standards; and (4) certification and enforcement procedures. The testing requirements consist of test procedures that manufacturers of covered equipment must use as the basis for making representations about the efficiency of that equipment, including those representations made to DOE that the covered equipment complies with the applicable energy conservation standards adopted pursuant to EPCA. (42 U.S.C. 6314(d)) Similarly, DOE must use these test requirements to determine whether the products comply with the relevant energy conservation standards. See 42 U.S.C. 6313(a) (applying 42 U.S.C. 6295(s) to walk-ins). For certain consumer products and commercial and industrial equipment, DOE's testing regulations currently allow manufacturers to use an alternative efficiency determination method (AEDM), in lieu of actual testing, to simulate the energy consumption or efficiency of certain basic models of covered products and equipment under DOE's test procedure conditions. As explained in further detail below, an AEDM is a computer model or mathematical tool used to help determine the energy efficiency of a particular basic model.

Under 42 U.S.C. 6314, EPCA sets forth the criteria and procedures that DOE must follow when prescribing or amending test procedures for covered products. Included among these criteria is that the prescribed procedure be reasonably designed to produce test results that measure energy efficiency, energy use, or estimated annual operating cost of a covered product during a representative average use cycle or period of use, and must not be unduly burdensome to conduct. (42 U.S.C. 6314(a)(2)) DOE provides the public with an opportunity to comment on a proposal made under section 6314.

B. Background

1. Alternative Efficiency Determination Method

As briefly noted above, AEDMs are computer modeling or mathematical tools that predict the performance of non-tested basic models. They are derived from mathematical models and engineering principles that govern the energy efficiency and energy consumption characteristics of a type of covered equipment. These computer modeling and mathematical tools, when properly developed, can provide a relatively straightforward and reasonably accurate means to predict the energy usage or efficiency characteristics of a basic model of a given covered equipment type. These tools can be useful in reducing a manufacturer's testing burden.

Where authorized by regulation, AEDMs enable manufacturers to rate and certify their basic models by using the projected energy use or energy efficiency results derived from these simulation models. DOE currently permits manufacturers of a few, limited types of expensive or highly customized equipment to use AEDMs when rating and certifying their equipment.

DOE believes other similar equipment that must currently be rated and certified through testing, such as walk-in refrigeration systems, could also be rated and certified through the use of computer or mathematical modeling. Consequently, to examine whether AEDM usage would be appropriate for walk-in refrigeration systems, DOE sought comment on this topic and other related issues in a Request for Information (RFI). See 76 FR 21673 (April 18, 2011).

DOE subsequently issued a Notice of Proposed Rulemaking (NOPR) that proposed to expand and revise DOE's existing AEDM requirements for certain commercial equipment covered under EPCA. 77 FR 32038 (May 31, 2012). Among other things, the May 2012 NOPR proposed to allow manufacturers of walk-in refrigeration systems to use AEDMs when certifying the energy use or energy efficiency of basic models of equipment in lieu of testing.

Subsequent to the May 2012 NOPR's publication, the Appliance Standards and Rulemaking Federal Advisory Committee (ASRAC) unanimously decided to form a working group (''Working Group'') to engage in a negotiated rulemaking effort on the certification of commercial heating, ventilating, air conditioning (HVAC), water heating (WH), and refrigeration equipment. During the Working Group's first meeting on April 30, 2013, Working Group members voted to expand the scope of its efforts to include developing methods of estimating equipment performance based on AEDM simulations for commercial HVAC, WH, and refrigeration equipment. The issues discussed by the various participants during the negotiations with DOE were similar to those raised by the commenters in response to the May 2012 NOPR, which included AEDM validation and DOE verification of ratings derived using an AEDM. As a result of these negotiations and further consideration of written comments submitted in response to DOE's supplemental notice of proposed rulemaking (SNOPR) regarding the treatment of commercial HVAC, WH, and refrigeration equipment, see 78 FR 62472 (Oct. 22, 2013), DOE adopted the Working Group's AEDM recommendation with respect to this group of equipment. 78 FR 79579 (Dec. 31, 2013).

To comprehensively address the specific issues related to walk-ins, DOE published an SNOPR that proposed to align DOE's AEDM regulations by allowing the use of AEDMs when certifying the energy efficiency performance of walk-in refrigeration equipment in a manner similar to that which was recently established for commercial HVAC, refrigeration, and WH equipment. See 79 FR 9817 (Feb. 20, 2014). This approach, which was recommended by the Working Group, would help DOE establish a uniform, systematic, and fair approach to the use of these types of modeling techniques that will enable DOE to ensure that products in the marketplace are correctly rated—irrespective of whether they are subject to actual physical testing or are rated using modeling—without unnecessarily burdening regulated entities. DOE reopened the comment period for the February 20, 2014 SNOPR to allow interested parties additional time to provide the Department with comments, data, and information. See 79 FR 19844 (April 10, 2014). DOE did not receive any additional timely submitted comments in response to the reopened comment period. Today's notice is the culmination of DOE's efforts regarding AEDMs for walk-in coolers and freezers that were initiated with the May 2012 NOPR.

2. Test Procedures for WICF Refrigeration Equipment

A walk-in's refrigeration system performs the mechanical work necessary to cool the interior space of a walk-in. The system typically comprises two separate primary components, a condenser/compressor (''condensing unit'') and an expansion valve/evaporator (''unit cooler''). DOE's regulations at 10 CFR 431.304, Uniform test method for the measurement of energy consumption of walk-in coolers and walk-in freezers, incorporate by reference AHRI Standard 1250–2009, ''2009 Standard for Performance Rating of Walk-in Coolers and Freezers'' (AHRI 1250–2009) as the testing method for walk-in refrigeration systems. 10 CFR 431.304(b)(9). AHRI 1250–2009 establishes methods to follow when testing a complete refrigeration system (the ''matched system'' test), as well as separate methods to use for testing the unit cooler and condensing unit of a refrigeration system individually and then calculating a combined system rating (the ''mix-match'' test). AHRI 1250–2009 also contains standard rating conditions for: Cooler and freezer systems; systems where the condenser is located either indoors or outdoors; and systems with single-speed, two-speed, or variable-speed compressors. AHRI 1250–2009 also establishes a method for testing and rating unit coolers that are connected to a multiplex condensing system such as those typically found in a supermarket. The rating produced by the AHRI 1250–2009 test procedure is an annual walk-in energy factor (AWEF), defined as ''a ratio of the total heat, not including the heat generated by the operation of refrigeration systems, removed, in Btu [British thermal units], from a walk-in box during one year period of usage for refrigeration to the total energy input of refrigeration systems, in watt-hours, during the same period.'' AHRI 1250–2009, at sec. 3.1.

DOE recently proposed energy conservation standards for walk-ins. See 78 FR 55781 (Sept. 11, 2013) (September 2013 standards NOPR). In that notice, DOE proposed standards for complete walk-in refrigeration systems that would require the ratings for the refrigeration system to be derived using either the matched system or mix-match tests described above. DOE also proposed standards for unit coolers connected to a multiplex system, based on the unit cooler rating method described above. Responding to the NOPR, several interested parties discussed the concept of establishing separate standards for the unit cooler and condensing unit of a walk-in as a means to address the fundamental problem of how one manufacturer (e.g., unit cooler manufacturer) would be able to rate its equipment in the absence of knowing which equipment (e.g., condensing unit) would be matched with its own equipment. Performance characteristics of both the unit cooler and condensing unit are needed in order to rate the refrigeration system's performance under the methodology in AHRI 1250–2009.

In light of that discussion and the fact that unit coolers and condensing units are often sold separately or produced by different manufacturers, DOE proposed in the February 2014 SNOPR to adopt a methodology that would account for the issue noted above by relying on elements of AHRI 1250–2009, which includes a method to test both components separately (i.e., the mix-match test method). The proposed method would require the manufacturer of either the unit cooler or condensing unit, if sold separately, to test and certify compliance of a nominal refrigeration system with DOE's standards and make representations of a WICF refrigeration system. Under the proposal, manufacturers of a complete WICF refrigeration system could continue to develop a system rating for the purposes of certifying compliance with DOE's standards and making energy efficiency representations of the WICF refrigeration system. Furthermore, as DOE noted in the February 2014 SNOPR, in reviewing AHRI 1250–2009 and conducting limited testing on a WICF refrigeration system at a third-party laboratory to investigate the AEDM validation approach, DOE had discovered several issues in the refrigeration test procedures that required clarification and/or created unnecessary test burden. 79 FR at 9820. To simplify the procedure and to clarify certain aspects, DOE proposed alternate language to certain requirements contained in AHRI 1250–2009 that DOE's test procedure currently incorporates by reference.

3. Sampling Plan

In order to determine a rating for certifying compliance or making energy use representations, DOE requires manufacturers to test each basic model in accordance with the applicable DOE test procedure and apply the appropriate sampling plan. As part of the February 2014 SNOPR, DOE proposed a sampling plan for walk-ins consistent with other commercial equipment regulated under EPCA.

4. Test Procedures and Prescriptive Requirements for WICF Foam Panel R-Value

EPCA mandates prescriptive requirements for the thermal resistance of walk-in panels: Wall, ceiling, and doors must have an insulation value of at least R–25 for coolers and R–32 for freezers. (42 U.S.C. 6313(f)(1)(C)) EPCA also requires the use of ASTM C518–04, *Standard Test Method for Thermal Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus* (''ASTM C518–04'') to measure the insulation thermal resistance of a panel. (42 U.S.C. 6314(a)(9)(A)) The walk-in test procedure at 10 CFR 431.304 incorporates ASTM C518–04 by reference. This reference standard is the method by which thermal conductivity (the ''K factor'') of a walk-in panel is measured; the R-Value of the panel is then determined by multiplying 1/K (the reciprocal of K) by the thickness of the panel. The R-Value of a freezer panel is determined at a mean insulation foam temperature of 20 degrees Fahrenheit and the R-Value of a cooler panel is determined at a mean insulation foam temperature of 55 degrees Fahrenheit. (42 U.S.C. 6314(a)(9)(A)(iii) and (iv)) The regulations also currently require manufacturers to use the procedure detailed in 10 CFR 431.304(b) when certifying compliance with the panel energy conservation standards until January 1, 2015. Manufacturers must use the procedure in 10 CFR 431.304(c) when making representations of energy efficiency currently and when certifying compliance starting on January 1, 2015. In the February 2014 SNOPR, DOE proposed modifications to the test sample preparation procedures incorporated from ASTM C518–04 in both procedures to improve measurement accuracy.

5. Performance-Based Test Procedures for Energy Consumption of Envelope Components

In 10 CFR Part 431, Subpart R, Appendix A, DOE lays out a method for measuring performance-based efficiency metrics for certain WICF envelope components. This method draws from several existing industry test methods by incorporating by reference ASTM C1363–05 *Standard Test Method for Thermal Performance of Building Materials and Envelope Assemblies by Means of a Hot Box Apparatus* and *Annex C Determination of the aged values of thermal resistance and thermal conductivity* from both DIN EN 13164 and DIN EN 13165 (two European Union-developed testing protocols) for measuring the energy consumption of WICF floor and non-floor panels. Appendix A also incorporates NFRC 100–2010[E0A1] *Procedure for Determining Fenestration Product U-factors* for determining the energy use of walk-in display and non-display doors. In the February 2014 SNOPR, DOE proposed modifying (1) the test procedures for WICF floor and non-floor panels to address comments received from stakeholders during the standards rulemaking and (2) the WICF display and non-display door test procedure to improve the clarity of the test method.

II. Summary of the Final Rule

Today's final rule comprises six key elements.

First, the Department will allow WICF refrigeration manufacturers to use AEDMs to rate and certify their basic models by using the projected energy efficiency derived from these simulation models in lieu of testing. DOE is aligning the validation requirements proposed for WICF refrigeration AEDMs with those that have already been adopted for commercial HVAC, refrigeration, and WH equipment. DOE is adopting this approach because the cooling and refrigeration systems used by these equipment types operate under similar principles as the refrigeration systems used in walk-ins. This similarity, along with the practical considerations discussed elsewhere in this rule, lend support for applying similar or identical validation requirements for walk-ins as well.

Second, today's final rule adopts an alternative method for testing and rating the WICF refrigeration system for unit coolers and condensing units that are sold alone. Specifically, unit cooler manufacturers who distribute a unit cooler as a separate component must rate that cooler as though it were to be connected to a multiplex system and must comply with any applicable standard DOE may establish for a unit cooler connected to a multiplex system. Similarly, manufacturers who distribute a condensing unit as a separate component must use the nominal values for unit coolers, in lieu of actual unit cooler test data, when calculating AWEF using the mix-match rating method in AHRI 1250. Consistent with this methodology and pending the outcome of the standards rulemaking, DOE would consider modifications to the certification requirements based on the following approach:

(1) a manufacturer that only produces unit coolers would use the test method (''Walk-in Unit Cooler Match to Parallel Rack System'' in AHRI 1250, section 7.9) to establish a WICF refrigeration system rating for each basic model, and the unit cooler manufacturer would certify the compliance of each unit cooler model as a component of a WICF refrigeration system basic model;

(2) a manufacturer that only produces condensing units would test each condensing unit and combine it with the unit cooler nominal values adopted in today's final rule to establish a WICF refrigeration system rating for each basic model, and the condensing unit manufacturer would certify the compliance of each condensing unit model as a component of a WICF refrigeration system basic model; or

(3) a manufacturer that produces both unit cooler basic models and condensing unit basic models that are marketed and sold as a matched system would use the test method in AHRI 1250–2009 to test the unit cooler and the condensing unit as a matched system to obtain a WICF refrigeration system rating for each matched system it produces and then certify compliance, except where both components have been previously rated and certified separately. In this case, the manufacturer need not test and certify the matched system unless the manufacturer wishes to represent the matched system efficiency as being higher than the efficiency of either component.

Third, DOE is adopting the following modifications to the test procedure for WICF refrigeration components:

—Clarifying the defrost test procedure;
—Offering an alternative method for calculating the defrost energy and heat load of a system with electric defrost in lieu of a frosted coil test;
—Adding a method for calculating defrost energy and heat load of a system with hot gas defrost;
—Changing the minimum fan speed and duty cycle during the off-cycle evaporator fan test;
—Removing the refrigerant oil and refrigerant composition analysis testing requirements;
—Clarifying and modifying the temperature measurement requirements to reduce testing burden while ensuring accuracy;
—Adding a test condition tolerance for electrical power frequency and removing the test condition tolerance for air temperature leaving the unit;
—Quantifying the requirements for insulating refrigerant lines;
—Clarifying piping length requirement;
—Bringing consistency between the list of tests for unit coolers in Tables 15 and 16 of AHRI 1250–2009, and another similar test method; and
—Clarifying the voltage imbalance for three-phase power.

Fourth, DOE is modifying the current test procedure for measuring the insulation R-Value of WICF panels. (10 CFR 431.304) The current DOE test procedure allows, but does not require, panels to be tested with non-foam facers or protective skins attached. (10 CFR 431.304(b)(5)–(6) and (c)(5)–(6)) Also, the current DOE test procedure allows panel test samples to be up to 4 inches in thickness. (10 CFR 431.304(b)(5) and (c)(5)) The test procedure requires that the R-Value be measured at a mean temperature of 20 degrees Fahrenheit for freezer panels (10 CFR 431.304(b)(3) and (c)(3)) and 55 degrees Fahrenheit for cooler panels (10 CFR 431.304(b)(4) and (c)(4)); however, no tolerance is currently specified for these temperatures. With this final rule, DOE will require test samples to be 1-inch in thickness and without non-foam facers, protective skins, internal non-foam members or edge regions. DOE is also adding flatness and parallelism constraints on the test sample surfaces that contact the hot and cold plates in the heat flow meter apparatus. DOE is also adding a tolerance of ±1 degree Fahrenheit for the mean temperature during panel R-Value testing. DOE believes this clarification will help ensure that the panel testing is conducted in a repeatable and reproducible manner at different laboratories.

Fifth, to enable walk-in manufacturers to make energy use representations, DOE is implementing a sampling plan for walk-ins consistent with other commercial equipment regulated under EPCA.

Finally, in response to manufacturer comments on the September 2013 standards NOPR, DOE is removing the existing performance-based test procedures for WICF floor and non-floor panels (10 CFR Part 431, Subpart R, Appendix A, sections 4.2, 4.3, 5.1, and 5.2). DOE recognizes that these performance-based procedures for WICF floor and non-floor panels are in addition to the prescriptive requirements already established in EPCA for panel insulation R-Values and, therefore, may increase the test burden to manufacturers. This recognition of the overall burdens faced by manufacturers is based in part on the difficulty manufacturers have reportedly had in locating any testing laboratories capable of performing the applicable tests since DOE's issuance of the test procedure in April 2011. See 76 FR 21580. Based on market research, DOE agrees with manufacturers that there are a limited number of laboratories capable of conducting the performance-based procedures for WICF floor and non-floor panels.

All of the changes noted above, along with the appropriate sections of the CFR where these changes appear, are detailed in the summary table below.

TABLE II.1—SUMMARY OF CFR CHANGES

Change	10 CFR section
Allowing manufacturers to use AEDMs to rate WICF refrigeration systems	429.53.
Specific instructions for applying AEDMs to WICF refrigeration systems	429.70(f).
Changes to test procedures and prescriptive requirements for WICF foam panel R-Value	431.304(b)(3)–(6) and 431.304(c)(3)–(6).

TABLE II.1—SUMMARY OF CFR CHANGES—Continued

Change	10 CFR section
Amendments to AHRI 1250–2009 refrigeration system test method, and the panel and door test methods.	431.304(c)(8).
Methods for rating refrigeration components sold separately	431.304(c)(11).
Amendments to performance-based test procedures for energy consumption of envelope components.	431 Subpart R, Appendix A.

III. Discussion

In response to the February 2014 SNOPR, DOE received written comments from 9 interested parties, including manufacturers, trade associations and energy efficiency advocacy groups. Table III.1 lists the entities that commented on that SNOPR and their affiliation. (DOE also re-opened the comment period to allow for additional comments.) These comments are discussed in more detail below, and the full set of comments, including the public meeting transcript, can be found at: *http://www.regulations.gov/#!docketDetail;dct=FR%252BPR%252BN%252BO%252BSR%252BPS;rpp=25;po=0;D=EERE-2011-BT-TP-0024.*

TABLE III.1—INTERESTED PARTIES THAT COMMENTED ON THE FEBRUARY 2014 SNOPR

Commenter	Acronym	Organization type/affiliation	Comment No. (Docket reference)
Air-Conditioning, Heating, and Refrigeration Institute.	AHRI	Industry Trade Group	100
American Council for an Energy-Efficient Economy.	ACEEE	Advocacy Group	98
Appliance Standards Awareness Project, Earthjustice, Natural Resources Defense Council, Alliance to Save Energy, American Council for an Energy Efficient Economy, Northwest Energy Efficiency Alliance, and Northwest Power and Conservation Council.	ASAP, EJ, NRDC, ASE, ACEEE, NEEA, NPCC (ASAP, et al.).	Advocacy Group	99
Bally Refrigerated Boxes, Inc	Bally	Manufacturer	93
California Investor-Owned Utilities: Pacific Gas and Electric Company, Southern California Edison, and San Diego Gas & Electric.	PG&E, SCE, and SDG&E (CA IOUs)	Utility Association	101
Heat Transfer Products Group, LLC	HTPG	Manufacturer	96
Lennox International, Inc	Lennox	Manufacturer	97
National Coil Company	NCC	Manufacturer	95
National Refrigeration & Air Conditioning Canada Corp. (dba KeepRite).	KeepRite	Manufacturer	94

In response to the initial May 2012 NOPR, DOE received written comments from 28 interested parties, including manufacturers, trade associations and advocacy groups. Seven additional interested parties commented during the May 2012 NOPR Public Meeting on June 5, 2012. For reference, Table III.2 lists the entities that commented on the NOPR and their affiliation. These comments were discussed in the February 2014 SNOPR. The full set of comments, including the public meeting transcript, can be found at: *http://www.regulations.gov/#!docketDetail;dct=FR%252BPR%252BN%252BO%252BSR%252BPS;rpp=25;po=0;D=EERE-2011-BT-TP-0024.*

TABLE III.2—INTERESTED PARTIES THAT COMMENTED ON THE MAY 2012 NOPR

Name	Acronym	Organization type/affiliation
AAON, Inc	AAON	Manufacturer.
The ABB Group	ABB	Manufacturer.
Air-Conditioning, Heating, and Refrigeration Institute	AHRI	Industry Trade Group.
Appliance Standards Awareness Project & American Council for an Energy-Efficient Economy.	Joint Comment	Advocacy Group.
Baldor Electric	Baldor Electric	Manufacturer.
Bradford White Corporation	Bradford White	Manufacturer.
Burnham Commercial	Burnham	Manufacturer.
Cooper Power Systems	Cooper	Manufacturer.
Crown Boiler Company	Crown Boiler	Manufacturer.
CrownTonka/ThermalRite/International Cold Storage	CT/TR/ICS	Manufacturer.
Danfoss	Danfoss	Manufacturer.
First Co.	First Co.	Manufacturer.
Goodman Global, Inc	Goodman	Manufacturer.
Heatcraft Refrigeration Products LLC	Heatcraft Refrigeration	Manufacturer.

TABLE III.2—INTERESTED PARTIES THAT COMMENTED ON THE MAY 2012 NOPR—Continued

Name	Acronym	Organization type/affiliation
Hillphoenix, Inc	Hillphoenix	Manufacturer.
Hussmann Corporation	Hussmann	Manufacturer.
Ingersoll Rand	Ingersoll Rand	Manufacturer.
Johnson Controls, Inc	JCI	Manufacturer.
Lennox International, Inc	Lennox	Manufacturer.
Lochinvar, LLC	Lochinvar	Manufacturer.
Mitsubishi Electric	Mitsubishi Electric	Manufacturer.
Modine Manufacturing Company	Modine	Manufacturer.
Mortex Products, Inc	Mortex	Manufacturer.
National Electrical Manufacturers Association	NEMA	Industry Trade Group.
Nidec Motor Corporation	Nidec	Manufacturer.
Nordyne, LLC	Nordyne	Manufacturer.
Rheem Manufacturing Company	Rheem	Manufacturer.
Schneider Electric	SE	Manufacturer.
Southern Store Fixtures, Inc	Southern Store Fixtures	Manufacturer.
Trane	Trane	Manufacturer.
True Manufacturing Co. Inc	True Manufacturing	Manufacturer.
Unico, Inc	Unico	Manufacturer.
United Cool Air	United Cool Air	Manufacturer.
United Technologies Climate, Controls & Security and ITS Carrier	UTC/Carrier	Manufacturer.
Zero Zone, Inc	Zero Zone	Manufacturer

In response to the SNOPR on AEDMs for commercial HVAC, refrigeration and WH equipment, which was published in the **Federal Register** on October 22, 2013, 78 FR 62472, DOE received a comment relevant to this rulemaking from Lennox International, Inc., a manufacturer of HVAC and commercial refrigeration equipment. This comment was addressed in the February 2014 SNOPR. See 79 FR at 9824.

The Department also received relevant comments from 23 interested parties in response to the September 2013 Standards NOPR and related NOPR Public Meeting held on October 9, 2013. For reference, Table III.3 lists the entities that commented on that NOPR and their affiliation. These comments were also discussed in the February 2014 SNOPR. See generally 79 FR at 9822–9837. The full set of comments, including the public meeting transcript, can be found at: *http://www.regulations.gov/#!docketDetail;D=EERE-2008-BT-STD-0015.*

TABLE III.3—INTERESTED PARTIES THAT COMMENTED ON THE SEPTEMBER 2013 STANDARDS NOPR

Name	Acronym	Organization type/affiliation
Air Conditioning Contractors of America	ACCA	Industry Trade Group.
Air-Conditioning, Heating, and Refrigeration Institute	AHRI	Industry Trade Group.
American Council for an Energy Efficient Economy	ACEEE	Advocacy Group.
American Panel Corp	American Panel	Manufacturer.
Appliance Standards Awareness Project	ASAP	Advocacy Group.
Architectural Testing Inc	AT	Third Party Laboratory.
Bally Refrigerated Boxes, Inc	Bally	Manufacturer.
CrownTonka Walk-Ins, ThermalRite & International Cold Storage	CT/TR/ICS	Manufacturer.
Danfoss Group North America	Danfoss	Manufacturer.
Heatcraft Refrigeration Products LLC	Heatcraft	Manufacturer.
Hillphoenix	Hillphoenix	Manufacturer.
HussmanCorporation	HussmanCorp	Manufacturer.
Imperial Brown	IB	Manufacturer.
KysorWarren	Kysor	Manufacturer.
Lennox International Inc	Lennox	Manufacturer.
Louisville Cooler Mfg	Louisville Cooler	Manufacturer.
Manitowoc	Manitowoc	Manufacturer.
National Coil Company	NCC	Manufacturer.
Nor-Lake, Inc	Nor-Lake	Manufacturer.
Northwest Energy Efficiency Alliance & The Northwest Power and Conservation Council.	NEEA, et al.	Advocacy Group.
Pacific Gas & Electric, Southern California Gas, Southern California Edison, San Diego Gas & Electric (Ca. State Independently Owned Utilities).	CA IOU's	Utility.
Thermo-Kool	Thermo-Kool	Manufacturer.
US Cooler Co	US Cooler	Manufacturer.

A. Alternative Efficiency Determination Method

In the May 2012 NOPR, DOE proposed, among other things, to allow the use of AEDMs for WICFs and to establish specific requirements for manufacturer validation [1]—i.e., a

[1] In the May 2012 NOPR, DOE used the term ''substantiation'' to refer to the process

Continued

process in which manufacturers demonstrate the accuracy of an AEDM model—and DOE verification[2]—i.e., a process followed by DOE when verifying the accuracy of an AEDM model—that would apply to this equipment.

As discussed above, ASRAC formed a working group in April 2013 to discuss and negotiate a variety of issues related to the certification provisions for commercial heating, ventilation, and air conditioner (HVAC), refrigeration, and water heater (WH) equipment. Those discussions were expanded to include AEDMs, along with related validation and verification requirements. These negotiations eventually led to the October 2013 SNOPR and the December 2013 final rule that established a series of requirements related to basic model definitions and compliance provisions for commercial HVAC, WH, and refrigeration equipment. See 78 FR 62472 (SNOPR) and 78 FR 79579 (final rule). In the February 2014 SNOPR, DOE proposed to require that the AEDM validation regulations that apply to commercial HVAC, refrigeration, and WH equipment would also apply to AEDMs designed to simulate testing of WICF refrigeration systems as a whole and WICF refrigeration components–i.e., unit coolers and condenser units. DOE is retaining this approach in this final rule and addresses comments on the SNOPR below.

Generally, AHRI commented that while it supports AEDMs for walk-ins, the AEDM provisions for commercial HVAC, WH, and refrigeration equipment may not be applicable to walk-in coolers. AHRI explained that the Working Group was afforded the opportunity to amend basic model definitions and verification procedures for commercial HVAC, WH, and refrigeration equipment over the course of several months of meetings. AHRI asserted that while most of the AEDM recommendations could be applied to walk-ins, this type of equipment is very unique. To better address this subject, AHRI requested additional time to review basic model definitions for WICFs with respect to AEDMs. (AHRI, No. 100 at p. 2) DOE provided an additional comment period. See 79 FR 19844 (April 10, 2014).

In DOE's view, walk-in refrigeration equipment is sufficiently similar to commercial HVAC, WH, and refrigeration equipment to permit the AEDM regulatory framework for AEDMs established by the Working Group to be effectively applied to walk-in refrigeration systems. These systems are similar in operation and design to those refrigeration systems used in both commercial HVAC and refrigeration equipment systems and are commonly found in both walk-in and commercial refrigeration equipment applications. Additionally, similar to commercial refrigeration equipment, walk-in refrigeration systems have a high degree of customization. Permitting the AEDM regulatory framework to be applied to walk-ins, would also likely significantly reduce manufacturer testing burden for this equipment while maintaining a reasonable level of accuracy with respect to energy efficiency.

1. Applicable Equipment

In the February 2014 SNOPR, DOE proposed to allow WICF refrigeration system manufacturers to use AEDMs when rating the performance of this equipment. DOE did not propose to extend this allowance to WICF panel or door manufacturers. WICF panels are relatively simple pieces of equipment and the test results from a basic model of a given panel can be extrapolated to many other panel basic models under the provisions of the test procedure. As for WICF doors, the DOE test procedure already specifies the use of certain modeling techniques that are approved by the National Fenestration Rating Council (NFRC), which, in DOE's view, makes a parallel AEDM provision for these components unnecessary. 77 FR at 32041. Instead, the Department proposed other modifications in the February 2014 SNOPR to the walk-in panel test procedure to reduce the burden faced by panel manufacturers while ensuring the overall accuracy of the efficiency ratings. The modifications to the WICF panel test procedure are outlined in section III.C. DOE did not receive any comments regarding its proposal to extend AEDMs to walk-in refrigeration equipment and therefore is adopting this proposal in today's final rule.

DOE is allowing WICF refrigeration manufacturers to apply an AEDM to a basic model to determine its efficiency, provided that the AEDM meets certain requirements. The AEDM must be derived from a mathematical model that estimates the energy efficiency or consumption characteristics of the basic model as measured by the applicable DOE test procedure. The AEDM must be based on engineering or statistical analysis, computer simulation, modeling, or other type of analytical evaluation of performance data. Finally, the AEDM must be validated according to DOE requirements, which are discussed in section III.A.2 of this rule.

2. Validation

a. Number of Tested Units Required for Validation

In the February 2014 SNOPR, DOE proposed to apply the Working Group's recommendation for AEDM validation requirements to WICFs. That recommendation, which DOE adopted and is applying to those AEDMs used for commercial HVAC, refrigeration, and WH equipment, requires a manufacturer to select a minimum number of models from each validation class to which the AEDM will apply. (Validation classes are groupings of products based on equipment classes but used for AEDM validation.) DOE proposed to apply this same approach to WICF refrigeration systems using the validation classes listed in Table III.4. A unit of each basic model selected would undergo a single test conducted in accordance with the DOE test procedure (or, if applicable, a test procedure waiver issued by DOE) at a manufacturer's testing facility or a third-party testing facility. The test result should be directly compared to the result from the AEDM to determine the AEDM's validity. A manufacturer may develop multiple AEDMs per validation class and each AEDM may span multiple validation classes; however, the minimum number of tests must be maintained per validation class for every AEDM a manufacturer chooses to develop. An AEDM may be applied to any model within the applicable validation classes at the manufacturer's discretion. All documentation of test results for these models, the AEDM results, and subsequent comparisons to the AEDM would be maintained as part of both the test data underlying the certified rating and the AEDM validation package pursuant to 10 CFR 429.71. Specifically, manufacturers must maintain the AEDM, including the mathematical model, statistical analysis or other computer simulations that form the basis of the AEDM. Additionally, DOE requires manufacturers to maintain equipment information, complete test data, and AEDM calculations for each of the units that were used to validate the AEDM. Finally, manufacturers must

manufacturers used to demonstrate that their modeling tool, or AEDM, produced accurate results. See 77 FR at 32040. The Working Group elected to use the term ''validation,'' instead of ''substantiation,'' for this process. DOE clarifies that ''substantiation'' and ''validation'' are synonymous in this context and the Department will use the term ''validation'' henceforth.

[2] In the May 2012 NOPR, DOE used the term ''DOE validation'' to refer to the process DOE used to check that the modeling tool, or AEDM, produced accurate results. See 77 FR at 32046. The Working Group elected to use the ''verification,'', instead of ''DOE validation,'', for this process. DOE clarifies that ''DOE validation'' and ''verification'' are synonymous and the Department will use the term ''verification'' henceforth.

maintain equipment information and calculations for each basic model to which the AEDM was applied.

TABLE III.4—VALIDATION CLASSES PROPOSED IN THE SNOPR

Validation class	Minimum number of distinct models that must be tested
Dedicated Condensing, Medium Temperature, Indoor System	2 Basic Models.
Dedicated Condensing, Medium Temperature, Outdoor System	2 Basic Models.
Dedicated Condensing, Low Temperature, Indoor System	2 Basic Models.
Dedicated Condensing, Low Temperature, Outdoor System	2 Basic Models.
Unit Cooler connected to a Multiplex Condensing Unit, Medium Temperature	2 Basic Models.
Unit Cooler connected to a Multiplex Condensing Unit, Low Temperature	2 Basic Models.
Medium Temperature, Indoor Condensing Unit	2 Basic Models.
Medium Temperature, Outdoor Condensing Unit	2 Basic Models.
Low Temperature, Indoor Condensing Unit	2 Basic Models.
Low Temperature, Outdoor Condensing Unit	2 Basic Models.

ACEEE, Bally, KeepRite, NCC, HTPG, AHRI, and Lennox agreed with DOE's proposal to adopt the Working Group's AEDM validation requirements for WICF AEDMs. (ACEEE, No. 98 at p. 1; Bally, No. 93 at p. 1; KeepRite, No. 94 at p. 1; NCC, No. 95 at p. 1; HTPG, No. 96 at p. 2; AHRI, No. 100 at p. 2; Lennox, No. 97 at p. 3)

Interested parties also made additional recommendations regarding the validation classes. ACEEE suggested explicitly reserving to the Secretary the authority to enlarge the validation sample size if needed. (ACEEE, No. 98 at p. 1) DOE notes that while it is opting not to adopt ACEEE's suggestion, it may revisit and re-evaluate this issue and adjust the sample size as necessary.

Lennox commented that an AEDM that has been validated for outdoor condensing systems should be considered validated for indoor condensing units because these validation classes are very similar except that outdoor condensing units are exposed to a wider range of temperatures. (Lennox, No. 97 at p. 3) DOE agrees with Lennox. The test method in AHRI 1250–2009 for outdoor and indoor condensing units is identical except for the ambient rating conditions. Outdoor condensing units are tested at three ambient temperatures, 35 °F, 59 °F, and 95 °F. The ambient rating temperature for indoor units is 90 °F. DOE believes that this condition is sufficiently similar to the 95 °F outdoor rating condition such that an AEDM validated by testing of an outdoor condensing unit would provide accurate results for indoor condensing units. For this reason, DOE is allowing AEDMs validated for outdoor condensing units to be extended to indoor condensing units. However, DOE is not allowing AEDMs validated with test results from indoor condensing units only to extend to outdoor condensing units. DOE is making this distinction because of concerns that the other two rating conditions for outdoor units—35 °F and 59 °F—could not be adequately verified by testing at a single 90 °F rating condition. Should DOE receive additional data suggesting that such an approach would be adequate, it may consider revisiting this issue in a future rulemaking effort.

The CA IOUs commented that the current validation classes do not account for variation in capacities, compressor type, refrigerant, fan type, airflow volume, and heat exchanger coil materials and configurations. The CA IOUs expressed concern that AEDMs that cover all models in a validation class will be inaccurate and recommended DOE develop guidelines for what a single AEDM can cover. (CA IOUs, No. 101 at pp. 2–3) DOE has decided to retain in the final rule the validation classes proposed in the SNOPR. These validation classes were developed to minimize the test burden on manufacturers, and these classes do not preclude a manufacturer from conducting additional testing to verify its AEDM. Similar concerns were raised during the Commercial Certification Working Group meetings, and the parties agreed that the requirements for validation should be kept to the lowest possible test burden. The Working Group agreed that, because manufacturers are ultimately responsible for ensuring the compliance of their products, manufacturers will ensure that they have sufficient test data to validate their own AEDMs as appropriate for the variety of designs to which they are applying their AEDM. Additionally, DOE may request test data used to validate an AEDM from a manufacturer or conduct verification testing to ensure models are rated correctly. See generally, 10 CFR 429.71 (maintenance of records).

b. Tolerances for Validation

In the February 2014 SNOPR, DOE proposed to apply the Working Group's recommendation for validation tolerances to WICF AEDMs. For energy efficiency metrics, the AEDM results for a model must be less than or equal to 105 percent of the tested results for that same model. Additionally, the AEDM's predicted efficiency for each model must meet or exceed applicable federal energy conservation standards. DOE adopted these same tolerances for commercial HVAC, WH, and refrigeration equipment. See 78 FR 79579 (Dec. 31, 2013).

ACEEE, NCC, HTPG, AHRI, and Lennox supported the Department's proposal to align the validation tolerances for WICF AEDMs to the Working Group's recommended validation tolerances. (ACEEE, No. 98 at p. 1, NCC, No. 95 at p. 2; HTPG, No. 96 at p. 2; AHRI, No. 100 at p. 3; Lennox, No. 97 at p. 3) ACEEE, HTPG, and Lennox also supported DOE's proposal to utilize only one-sided tolerances that would allow manufacturers to rate equipment conservatively. (ACEEE No. 98 at p. 1, HTPG, No. 96 at p. 2; Lennox, No. 97 at p. 3)

Bally and KeepRite commented that DOE's proposed tolerances were too tight. Bally suggested a two-sided validation tolerance of 8 percent be adopted to be consistent with other commercial equipment. KeepRite made a similar suggestion. (Bally, No. 93 at p. 1; KeepRite, No. 94 at p. 1) In DOE's view, a 5 percent one-sided tolerance is more consistent with the AEDM validation tolerances for other types of commercial equipment than the 8 percent two-sided tolerance suggested by Bally and KeepRite. See 78 FR 79579 (Dec. 31, 2013) (applying a 5 percent, one-sided tolerance for all commercial HVAC, WH, and refrigeration equipment). DOE agrees with ACCEE, HTPG, and Lennox that a one-sided tolerance is preferable because it allows manufacturers to rate equipment conservatively and account for manufacturing and testing variability.

3. Certified Rating

DOE's current regulations provide manufacturers with some flexibility in rating each basic model by allowing the manufacturer the discretion to rate conservatively relative to tested values. The Working Group recommended that, when rating using an AEDM, manufacturers have the same flexibility. Accordingly, the Working Group recommended that, for energy consumption metrics, each model's certified rating must be less than or equal to the applicable Federal standard and greater than or equal to the model's AEDM result. For energy efficiency metrics, each model's certified rating must be less than or equal to the model's AEDM result and greater than or equal to the applicable Federal standard. In the February 2014 SNOPR, DOE proposed to adopt these requirements for WICF refrigeration equipment rated an AEDM. The Department did not receive any comments on its proposal regarding certified ratings and is adopting it in today's final rule.

4. Verification

DOE may randomly select and test a single unit of a basic model pursuant to 10 CFR 429.104, which extends to all DOE covered products, including those certified using an AEDM. As part of the AEDM requirements for commercial HVAC, WH, and refrigeration equipment, at DOE's request, manufacturers must perform simulations in the presence of a DOE representative, provide analyses of previous simulations conducted by the manufacturer, or conduct certification tests of basic models selected by the Department. See 10 CFR 429.74(c)(4). To maintain consistency, the Department is extending these requirements to WICF AEDMs.

a. Failure To Meet a Certified Rating

In the February 2014 SNOPR, DOE proposed to assess a unit's performance through third-party testing. Under this approach, DOE would begin the verification process by selecting a single unit of a given basic model for testing either from retail or by obtaining a sample from the manufacturer if none are available from retail sources. DOE would then select a third-party testing laboratory at its discretion to test the unit selected unless no third-party laboratory is capable of testing the equipment, in which case DOE may request testing at a manufacturer's facility. The Department would be responsible for the logistics of arranging the testing, and the laboratory would not be allowed to communicate directly with the manufacturer. Additionally, the test facility may not discuss DOE verification testing with the manufacturer without the Department present. See 79 FR at 9643–9644.

Further, under DOE's proposal, if a unit is tested and the results are determined to be outside the rating tolerances described in section III.A.2.b., DOE would notify the manufacturer. This approach would also enable the manufacturer to receive all documentation related to the test set up, test conditions, and test results for the unit if the unit falls outside the rating tolerances. At that time, a manufacturer would also be able to present all claims regarding any issues directly with the Department. See id. at 9644. If, after discussions with the manufacturer, DOE determined that the testing was conducted appropriately in accordance with the applicable DOE test procedure, the rating for the model would be considered invalid. The Department notes that 10 CFR 429.13(b) applies to equipment certified using an AEDM, and DOE may require a manufacturer to conduct additional testing if the manufacturer violates an applicable standard or certification requirement.

HTPG commented that DOE should allow the option for a second sample to be tested to ensure that abnormal failures unrelated to design or predictable variations do not adversely impact an otherwise sound model type. (HTPG, No. 96 at pp. 2–3) As stated above, if a unit is determined to be outside the prescribed rating tolerances, the Department would provide the manufacturer with all documentation related to the test set up, test conditions, and test results. At that time, the manufacturer may initiate a discussion with the Department regarding any concerns related to the test. For these reasons, DOE has determined it is not necessary to automatically allow testing of a second sample. DOE, at its discretion, may decide testing an additional sample is appropriate in cases where the tested sample has been found to be defective.

NCC commented that any basic model that fails to meet its certified rating should be re-certified based upon test data. If that model was used to validate an AEDM, then the AEDM should be re-validated (NCC, No. 95 at p. 2) DOE understand these suggestions and while DOE may require a manufacturer to conduct additional testing if the manufacturer has been found to be in violation of an applicable standard or certification requirement, the Department prefers not to mandate additional testing and instead evaluate such a requirement on a case-by-case basis. The Department is not inclined to mandate additional testing because of the burden it imposes. In terms of re-validation, as long as the manufacturer has sufficient test data underlying the AEDM to meet the validation requirements, additional testing for re-validation would not be required by DOE.

AHRI suggested that DOE apply the verification requirements adopted for commercial HVAC, WH, and refrigeration equipment to walk-ins. It requested that DOE include the provisions for witness testing and engineered-to-order equipment. (AHRI, No. 100 at p. 3) In this final rule, DOE has aligned the AEDM verification methodology for walk-ins to match the provisions for commercial HVAC, WH, and refrigeration equipment. However, the engineered-to-order concept is outside the scope today's rulemaking. DOE will address the engineered-to-order concept and other certification issues in a future rulemaking.

The CA IOUs commented that DOE's verification process is poor and not easily enforceable. Additionally, the CA IOUs raised the concern that WICF manufacturers are not as active in industry certification programs as other types of commercial equipment manufacturers. They assert that these two factors could undermine both the potential energy savings that would be likely to accrue from any standards that DOE issues and fair competition. The CA IOUs recommended that DOE work with AHRI and ASHRAE to develop calculation tools for WICF manufacturers. (CA IOUS, No, 101 at p. 2) The Department appreciates the suggestion from the CA IOUs; however, DOE finds that manufacturers are better suited for developing modeling tools for their own equipment because they have more intimate knowledge of their own equipment's operational and design characteristics. Thus, a model developed by the basic model's manufacturer is likely to be more accurate than a general model developed by the Department. And since DOE may request any of the relevant data and documentation a manufacturer has used to develop a given AEDM, in DOE's view, there is sufficient incentive for a manufacturer to take appropriate steps to ensure both the thoroughness and accuracy of its AEDMs.

b. Action Following Determination of Noncompliance Based Upon Enforcement Testing

Rather than require the revalidation of an AEDM if a noncompliant model had been used to validate that AEDM, DOE proposed that each AEDM must be supported by test data obtained from physical tests of current models. Because a noncompliant model may not be distributed in commerce, and so must be discontinued and can no longer be considered a current model, the manufacturer will need to ensure that the AEDM continues to satisfy the proposed validation requirements described in section III.A.2 Additional testing would only be necessary if the noncompliant equipment was used as a sample for validating the AEDM. In that case, the manufacturer must perform additional testing of a different model to ensure the AEDM is valid. Pursuant to this requirement, should such testing result in a change in the ratings of equipment certified using the AEDM, then those pieces of equipment must be re-rated and re-certified.

HTPG supported DOE's approach and stated that re-validation of an AEDM should only be required if a non-compliant model was used to validate the AEDM. (HTPG, No. 96 at pp. 2–3) It added that DOE should permit the use of a second sample to address possible abnormal failures. DOE notes that its proposed approach, which is based on the use of physical tests of a sample of models would not require on the results of tests from a single model and would account for abnormal failures that may occur. No other comments were received. Consequently, DOE is adopting the approach detailed in its proposal.

5. Re-Validation

DOE evaluated different circumstances that may require a manufacturer to re-validate an AEDM. These circumstances are described in more detail below. In response to this proposal in the SNOPR, ACEEE made a general comment that DOE's proposed treatment of the revalidation process appears to assure a good balance between testing burdens and trusted certifications. (ACEEE, No. 98 at p. 1)

a. Change in Standards or Test Procedures

In the February 2014 SNOPR, DOE proposed not to require re-validation every time the test procedure or standard changes. However, should DOE believe that re-validation is necessary pursuant to a final rule standard or test procedure, DOE would raise that issue in the appropriate NOPR and solicit comment from the public on the merits of including revalidation.

HTPG and NCC agreed with the Department's proposal to evaluate the necessity to re-validate an AEDM due to a federal energy conservation standard or test procedure change on a case-by-case basis. (HTPG, No. 96 at p. 3; NCC, No. 95 at p. 2) AHRI also commented that re-validation should only be required when a change in test procedure is significant enough to result in a product having a different rated value for energy consumption or efficiency. (AHRI, No. 100 at p. 3)

b. Re-Validation Using Active Models

DOE proposed to require manufacturers to re-validate their AEDMs if one of the basic models used for validation is no longer in production or if it becomes obsolete. See 79 FR at 9843. DOE did not receive any comments regarding this proposal and is adopting it in today's final rule. DOE is concerned that an AEDM's accuracy may be compromised if the models that are used to validate it become obsolete. DOE encourages manufacturers to test their models beyond the minimum validation requirements as a means to affirm an AEDM's validity. As long as the manufacturer has sufficient test data underlying the AEDM to meet the validation requirements and can readily produce that documentation on request, additional testing for re-validation would not be required by DOE.

c. Time Allowed for Re-Validation

In the February 2014 SNOPR, DOE declined to propose a time limit to re-validate an AEDM. A manufacturer would need to ensure that any AEDM it uses for purposes of certifying its equipment satisfies the validation requirements and that the necessary supporting documentation is available to DOE on request. AHRI agreed with DOE that a time limit should not be imposed because it is consistent with the AEDM requirements for commercial HVAC, WH, and refrigeration equipment. (AHRI, No. 100 at p. 3)

Lennox disagreed with the DOE's proposal not to include a time limit and the Department's statement that AEDMs must satisfy the fundamental validation requirements at all times. Lennox explained that without setting a time limit on the validity of a given AEDM, a change in federal standards, federal test procedure, basic model status, or a failure of a basic model could invalidate all certifications made using an AEDM. This situation could cause significant adverse economic impacts on manufacturers because it would reduce their ability to bring products to market while performing the additional testing required for re-validating the AEDM. Lennox recommended that if re-validation occurs due to an amended federal test procedure or energy conservation standard, then re-validation should not be required until the later of (1) 180 days after the final rule for the amended federal test procedure or energy conservation standards or (2) the effective date of that amended test procedure or standard. If re-validation is required due to a basic model becoming invalid or the failure of a basic model to meet its certified rating, DOE should allow a minimum of 120 days for the AEDM to be re-validated. (Lennox, No. 97 at p. 4) DOE agrees that in some circumstances a time limit should be imposed for re-validating AEDMs, such as in the case where a federal test procedure or energy conservation standard is amended. However, DOE prefers that the re-validation time limit be established on a case-by-case basis in the course of each particular rulemaking instead of mandating a specific time frame. Applying a more tailored approach would allow stakeholders of the particular rulemaking and the Department to evaluate how substantial the change may be and how much time would be required for the affected manufacturers to address such changes.

The February 2014 SNOPR also inadvertently included a request for comment on a 90-day allowance for manufacturers to re-validate, re-rate, and recertify an AEDM. DOE received comments from Bally, KeepRite, NCC, and HTPG stating that 90 days was insufficient and that a period of time around 120–180 days was more appropriate. (Bally, No. 93 at p. 2; KeepRite, No. 94 at p. 2; NCC, No. 95 at p. 2; HTPG, No. 96 at p. 3) As DOE is not establishing a time limit for re-validations in this Final Rule, and will instead handle this on a case-by-case basis, DOE is not adopting any of the suggested time periods offered by these commenters.

B. Refrigeration Test Procedure

During DOE's rulemaking to establish test procedures for WICF equipment, which resulted in a final rule published on April 15, 2011 (''April 2011 test procedure final rule;'' 76 FR 21580), interested parties supported DOE's approach to use AHRI 1250 (I–P)–2009, ''2009 Standard for Performance Rating of Walk-In Coolers and Freezers'' (''AHRI 1250–2009''), for WICF refrigeration testing. AHRI 1250–2009 is an industry-developed testing protocol used to measure walk-in efficiency. In the 2014 SNOPR, DOE proposed to add certain modifications to its procedures for manufacturers to follow when applying AHRI 1250–2009. These proposed changes were designed to either clarify certain steps in AHRI 1250–2009 or reduce the testing burden of manufacturers while ensuring that accurate measurements are obtained. These modifications are discussed in the following sections.

1. Component-Level Ratings for Refrigeration: Overall

Responding to a number of comments addressing DOE's proposed energy conservation standards, DOE's February 2014 SNOPR proposed an approach to allow manufacturers to test a separately-sold condensing unit or unit cooler and generate an AWEF metric consistent with the existing system-based test procedure. Under the proposed approach, a manufacturer who sells a unit cooler model without a matched condensing unit must rate and certify that model as part of a refrigeration system basic model containing that unit cooler model by testing according to the methodology in AHRI 1250–2009 for unit coolers used with a parallel rack system (see AHRI 1250–2009, section 7.9). The manufacturer would use a calculation method to determine the system AWEF and certify this AWEF to DOE. Additionally, all unit coolers tested with this method would need to comply with any of the applicable standards that DOE may decide to adopt for the multiplex equipment classes addressed in its standards proposal. A manufacturer who sells a condensing unit model separately must rate and certify that model as part of a refrigeration system basic model containing that condensing unit model by conducting the condensing unit portion of the AHRI 1250–2009 mix/match test method. The results from the mix/match test would be combined with a nominal unit cooler capacity and power, based on nominal values for saturated suction temperature and unit cooler fan and electric defrost energy use factors (or the hot gas defrost calculation methodology, as applicable), in order to calculate an AWEF for the refrigeration system basic model containing that condensing unit. 79 FR at 9830.

All commenters supported DOE's proposal to allow rating and certification for unit coolers and condensing units separately. (Bally, No. 93 at p. 2; Keeprite, No. 94 at p. 2; NCC, No. 95 at pp. 2–3; HTPG, No. 96 at p. 3; ACEEE, No. 98 at p. 1; ASAP, et al., No. 99 at p. 2; CA IOUs, No. 101 at p. 1; AHRI, No. 100 at p. 4; and Lennox, No. 97 at p. 5) Several commenters, however, suggested that DOE clarify the circumstances under which unit coolers and condensing units may be rated separately or as a matched system. Keeprite and AHRI suggested that if a manufacturer of a unit cooler and condensing unit rates each component as a separate basic model, the manufacturer should not need to re-rate the components as a combined system even if they are marketed and sold together. However, they further suggested the matched system test method should be used if the system is a packaged system or the components are exclusively marketed and sold as a matched system. (Keeprite, No. 94 at p. 2; AHRI, No. 100 at pp. 4–5) NCC stated that, except for packaged systems and those units paired in marketing literature, manufacturers should be permitted to rate all unit coolers and condensing units separately. (NCC, No. 95 at pp. 2–3) Similarly, Lennox requested that DOE clarify that only models exclusively marketed and sold as a matched system must be rated as a matched system, and that manufacturers should be allowed to match components as a service to the customer without having to test each combination if the components were previously rated separately. (Lennox, No. 97 at pp. 5–6)

The CA IOUs, on the other hand, recommended that DOE require unit coolers and condensing units to be rated separately unless they are part of a unitary (self-contained) system or a matched variable refrigerant flow system. Otherwise, if DOE allows matched equipment rating for combinations of ''remote'' unit coolers and condensing units (i.e., those produced as separate pieces of equipment), then DOE should also require the manufacturer to calculate the efficiency ratings of each component as though it were to be sold separately and, if they have a lower rating when rated separately, DOE should require an annual accounting of shipments to ensure they are always sold as combined systems. (CA IOUs, No. 101 at pp. 1–2) ASAP, et al. agreed that DOE should ensure that unit coolers and condensing units rated as ''matched pairs'' are only sold as ''matched pairs'' unless the components are also rated separately, to prevent the situation where an inefficient component is rated with a highly efficient component as a matched pair, but the inefficient component is also sold separately, resulting in lost energy savings. (ASAP, et al., No. 99 at pp. 1–2) HTPG, on the other hand, stated that the rating of matched systems should be allowed in order for the AWEF ratings to reflect technology advances that require closely matching unit coolers and condensing units. (HTPG, No. 96 at p. 3) The CA IOUs also recommended that the mix-match approach be dropped from the standard and that DOE not require measurement of condensing unit performance at two different suction pressures for each ambient temperature application, which reduces manufacturer test burden. (CA IOUs, No. 101 at p. 2)

In this rule, DOE finalizes an approach that would allow manufacturers to test a condenser or unit cooler separately, but rate that component as part of a refrigeration system with an AWEF metric consistent with DOE's proposed energy conservation standards for WICF refrigeration systems. First, DOE agrees with Keeprite, AHRI, NCC, and Lennox that, if components are rated separately for the purposes of certifying and complying with the DOE standard, they do not need to be rated as a matched system if they are later combined and sold as a matched system, either by their original manufacturer or an installer. If, however, a manufacturer wishes to make a representation of a matched system's efficiency that is higher than the ratings achieved individually by each component, the manufacturer must base that representation on the rating obtained through testing of the matched system. Second, DOE agrees with the CA IOUs and ASAP, et al. that a component must be certified individually and must individually comply with DOE's standards if it is sold separately by its manufacturer. However, DOE does not intend to prevent manufacturers from rating and certifying matched systems in order to reflect technological advances achievable with matched systems, as pointed out by HTPG. DOE recognizes that certain refrigeration systems, such as packaged or unitary systems that consist of a single piece of equipment, or systems that implement a multiple-capacity condensing unit, can only be rated as matched systems under the current test procedure. DOE recognizes that, as pointed out by the CA IOUs, the mix-match procedure is not needed under this approach, as components sold separately would be rated using the separate rating methodology, and components sold as a matched system would be rated using the matched system test procedure. Therefore, DOE is removing the mix-match suction temperature conditions from the test method for clarity and consistency with its overall rating and certification approach.

Some commenters also urged DOE to supplement the proposed separate-standards approach with a product labeling requirement to improve the enforceability of the standard. ASAP, et al. stated that the component level approach could create a loophole whereby a component manufacturer could avoid having to meet DOE's walk-in standards by claiming that its component is not designed for use in walk-ins or by declining to specify an application for the equipment. In the short term, it suggested that DOE should require all components sold for use in a walk-in to bear a label indicating that they are certified for walk-in use, and issue revised compliance guidance clarifying that walk-in component standards apply to equipment that has the attributes associated with typical walk-in components in the absence of a manufacturer's specific instruction that the equipment is not for use in walk-ins. In the long term, DOE should develop energy conservation standards for components independent of end-use. (ASAP, et al., No. 99 at pp. 2–3) Furthermore, ASAP, et al. stated that DOE should require unit coolers and condensing units rated and sold as matched pairs to bear a label stating that each is only for sale when matched with the other component. (ASAP, et al., No. 99 at p. 2) Similarly, the CA IOUs recommended that DOE develop compliance and labeling requirements such that all major walk-in components would carry a label certifying that they comply with the walk-in efficiency regulations. If DOE allows matched pairs of unit coolers and condensing units where one of the components does not comply with the standard individually, the labeling scheme should ensure that the deficient component is only installed with the matched component that results in the combined system efficiency that complies with the DOE standard. (CA IOUs, No. 101 at p. 6)

DOE agrees with the CA IOUs and ASAP, et al. and recognizes the importance of labeling in facilitating compliance and enforcement throughout the WICF distribution chain, and in ensuring that systems rated as matched systems are only sold in their matched configuration. Although DOE is not establishing labeling requirements at this time, it may consider establishing labeling requirements in a future certification, compliance, and enforcement rulemaking.

2. Component-Level Ratings for Refrigeration: Metrics

Two interested parties commented on the metrics used to rate individual components. The CA IOUs recommended that the performance metric for condensing units be the Annual Energy Efficiency Ratio (AEER) because it is simpler to calculate than AWEF and can be expanded to a broader range of condensing units than those used in walk-in applications. (CA IOUs, No. 101 at p. 3) AHRI also suggested that condensing units and unit coolers sold separately should have a separate metric than AWEF, as the use of AWEF implicitly allows for component ratings to be compared to system ratings. (AHRI, No. 100 at pp. 5–6)

In this final rule, DOE is retaining AWEF as the metric for rating refrigeration systems and for refrigeration system components (condensing units and unit coolers) rated as part of a refrigeration system, as this is the metric used in the DOE test procedure, which is based on the industry testing protocol AHRI 1250–2009. If the industry develops a future revision of this test method with different metrics, such as AEER or another, separate metric for component ratings, then DOE may consider adopting it in a future rulemaking.

Neither the refrigeration test procedure nor the proposed energy conservation standard incorporates standby or off-mode energy use because the vast majority of WICFs must operate at all times to keep their contents cold. The CA IOUs recommended that the refrigeration system metric account for stand-by losses, particularly for condensing units when the compressor is off, as condensing unit ancillary loads such as the crankcase heater, transformer, and control electronics can contribute significantly to the energy consumption. (CA IOUs, No. 101 at p. 4)

DOE agrees that, when considered individually, condensing units may experience standby energy use when the compressor is not running. DOE carefully considered this issue but is not currently aware of any recognized or well-accepted methods for measuring standby condenser energy use. However, if the industry develops a test method to determine this energy usage, then DOE may consider adopting it in a future rulemaking.

3. Component-Based Ratings for Refrigeration Systems: Nominal Calculation Values

In the SNOPR, DOE proposed nominal values for unit cooler capacity and power to be used when rating a condensing unit as an individual component of a refrigeration system using an AWEF metric. DOE developed the nominal values from DOE testing and modeling of WICF refrigeration systems and published the test data on which the nominal values were based. 79 FR at 9830.

In general, stakeholders agreed with the use of nominal unit cooler values to rate condensing units. (CA IOUs, No. 101 at p. 3; Bally, No. 93 at p. 2; NCC, No. 95 at p. 3; HTPG, No. 96 at p. 4; AHRI, No. 100 at p. 5; and Lennox, No. 97 at p. 2) However, some were concerned that components rated separately would not be able to meet DOE's energy conservation standards. AHRI expressed concern about the effect of the rating strategy on minimum efficiency levels and recommended that DOE conduct a thorough and public analysis to alleviate the concern that the AWEFs proposed in the energy conservation standards NOPR would not be achievable by refrigeration components rated separately. (AHRI, No. 100 at pp. 5–6) NCC also suggested that DOE conduct an evaluation to ensure the energy efficiency standard levels are achievable with this approach. (NCC, No. 95 at p. 3) With respect to AHRI's concern that the AWEF standards are not achievable by refrigeration components, DOE notes that it has structured its nominal values assuming that the condensing units are paired with unit coolers that would meet whatever standard, if any, that DOE may eventually adopt. Thus, condensing unit manufacturers should not incur a penalty if they rate their condensing unit as part of a matched system or as an individual component. The following paragraphs address specific comments or concerns about the three main nominal values used in the equations: on-cycle evaporator fan power, off-cycle evaporator fan power, and defrost energy.

a. On-Cycle Evaporator Fan Power

In the SNOPR, DOE proposed a nominal value for on-cycle evaporator fan power of 0.016 Watts per Btu/h of gross capacity at the highest ambient rating condition, based on test and modeling data. 79 FR at 9831.

Lennox commented that the proposed nominal value for fan power for unit coolers is based on test data that only covered the low end of the full range of capacities of equipment used in WICF enclosures. On-cycle fan power is not a constant value as a function of unit capacity, but increases as the unit capacity increases as a result of the long air throw (that is, the distance the air must travel after it leaves the fan) required by this type of equipment. (Lennox, No. 97 at pp. 2, 5)

In response to Lennox's comment, DOE surveyed a wider range of unit coolers to compare unit cooler fan wattage to unit capacity. DOE found that its nominal value of 0.016 for unit cooler fan wattage per capacity was valid for low temperature systems even at capacities up to 250,000 Btu/h; however, a lower nominal value was more appropriate for medium temperature systems. (DOE was not able to find manufacturer specifications for larger capacities of unit coolers). Therefore, DOE is retaining its nominal value of 0.016 for low temperature unit cooler on-cycle fan power and implementing a nominal value of 0.013 for medium temperature unit cooler on-cycle fan power. The data and analysis underlying this finding are included in the docket at *http://www.regulations.gov/#!docketDetail;D=EERE-2008-BT-STD-0015.*

b. Off-Cycle Evaporator Fan Power

In the SNOPR, DOE proposed a nominal value for off-cycle evaporator fan power of 0.2 times the on-cycle evaporator fan power. 79 FR at 9831. The CA IOUs noted that this default value is appropriate only if DOE assumes that unit coolers are using variable speed evaporator fans and dropping their fan speed to 50 percent of flow during the off-cycle periods. (CA IOUs, No. 101 at pp. 3–4) DOE's nominal fan power values are based on the approach taken in DOE's proposed standards. That approach, in turn, is based on the potential use of unit coolers that incorporate variable speed evaporator fans. Variable speed evaporator fans comprise one of the technology options on which the proposed energy conservation standard is based. Therefore, DOE is including this assumption to ensure that condensing unit manufacturers are not unfairly penalized in comparison to matched system manufacturers.

c. Defrost Energy

In the SNOPR, DOE proposed a nominal value for electric defrost energy of 0.12 Watt-hours per defrost cycle, per Btu/h of gross capacity at the highest ambient rating condition, and that four (4) cycles per day should be assumed unless specified otherwise in the manufacturer's installation instructions. See 79 FR at 9831. This 4-cycle approach uses the same number of cycles that DOE built into its walk-in standards analysis. Under this approach, the daily electric defrost heat contribution would be 0.95 times the daily electric defrost energy use, converted from Watt-hours to Btu. These nominal values are only applicable to low-temperature refrigeration systems. 79 FR at 9831. DOE also specified that condensing units designed to be used with a hot gas defrost unit cooler, rather than an electric defrost unit cooler, must use the nominal values for hot gas defrost heat load and energy use—that is, the daily hot gas defrost heat contribution would be 0.18 btu per defrost cycle, per Btu/h of gross capacity at the highest ambient rating condition; and the daily defrost energy shall be equivalent to half the calculated daily defrost heat converted from Btu to watt-hours. 79 FR at 9830–9832.

The CA IOUs suggested that the application of the unit cooler nominal values for defrost are fixed values that a manufacturer would use. In its view, the proposed regulatory text seems to imply that the manufacturer's instructions would never contain any assumed values regarding the number of applicable cycles that would apply. Consequently, the CA IOUs suggested that DOE clarify the final regulatory text by indicating that the assumed number of cycles be fixed at 4 cycles per day. (CA IOUs, No. 101 at pp. 3–4)

In response to the CA IOUs' comment, DOE believes there may be some defrost control mechanisms that reside in the condensing unit, with associated manufacturer instructions. To account for this possibility, DOE is providing manufacturers with the flexibility to specify the number of defrost cycles that may occur. In an effort to avoid limiting the manufacturers' ability to reduce the number of defrosts, DOE is retaining the option to test according to manufacturers' instructions. However, in investigating this issue, DOE recognizes that the approach taken in DOE's proposed standards is based on the potential use of defrost controls that may reside in the unit cooler and not in the condensing unit. Defrost controls comprise one of the technology options on which the proposed energy conservation standard is based. Therefore, DOE is revising its default value for the number of defrosts per day to 2.5 to ensure that condensing unit manufacturers are not unfairly penalized in comparison to matched system manufacturers.

Lennox commented that the test data used by DOE to establish the nominal value for defrost energy does not represent the full range of capacities used in WICFs. The nominal value for daily defrost energy use of 0.12 W-h/cycle per BTU/h of capacity is representative for smaller capacity units but not larger capacity units, because the defrost energy (W-h/cycle per BTU/h) is not a constant value as a function of unit capacity. The defrost energy increases, but not linearly, as the unit capacity increases due to the larger coil sizes and corresponding heater wattage required for larger capacity units. (Lennox, No. 97 at pp. 6–7)

In response to Lennox's comment, DOE surveyed a wider range of unit coolers (with capacities up to 250,000 Btu/h) to compare defrost wattage and energy-to-unit capacity. DOE found that electric defrost wattage increases linearly with capacity, but, consistent with the analysis DOE performed for its energy conservation standards rulemaking, defrost duration would also be expected to increase nonlinearly with capacity. Thus, DOE agrees with Lennox's assessment that total defrost energy increases non-linearly with capacity. As a result of its analysis, DOE is expressing the electric defrost energy as a power function instead of a linear equation. The data and analysis underlying the development of this equation are included in the docket at *http://www.regulations.gov/#!docketDetail;D=EERE-2008-BT-STD-0015.*

DOE also clarifies that condensing units designed to be used with hot gas defrost unit coolers may use the nominal values associated with hot gas defrost systems. For clarity, DOE has added these values as nominal values for unit cooler energy use factors. DOE is also expressing the values in the form of equations that incorporate the capacity variable to emphasize that they are functions of the given unit's capacity.

Table III.5, below, contains DOE's revisions to the nominal values for unit coolers.

TABLE III.5—CALCULATIONS FOR UNIT COOLER SATURATED SUCTION TEMPERATURE AND ENERGY USE FACTORS

	Medium temperature	Low temperature
Saturated Suction Temperature (°F)	25	−20.
On-cycle evaporator fan power (W)	$0.013 \times Q^*$	$0.016 \times Q$.
Off-cycle evaporator fan power (W)	$0.2 \times$ on-cycle evaporator fan power.	
Electric defrost energy per cycle (W-h/cycle)	0	$8.5 \times 10^{-3} \times Q^{1.27}$
Electric defrost heat contribution per cycle (Btu/cycle)	0	$0.95 \times$ electric defrost energy use per cycle $\times$ 3.412.
Hot gas defrost energy per cycle (W-h/cycle)	0	$0.5 \times$ hot gas defrost heat contribution per cycle/3.412.
Hot gas defrost heat contribution per cycle (Btu)	0	$0.18 \times Q$.
Number of cycles per day	As specified in installation instructions or, if no instructions, 2.5	

* Q represents the gross capacity at the highest ambient rating condition in Btu/h.

4. Other Test Procedure Changes

In the SNOPR, DOE proposed several other changes to clarify or simplify elements of the test procedure to reduce overall test burden. These changes, discussed below, consist of a variety of modifications related to both refrigeration systems and panel insulation. HTPG generally agreed with the changes and stated they would reduce testing burden and improve manufacturers' ability to respond to DOE's proposed standards. (HTPG, No. 96 at p. 4) Concurrent with this rulemaking, AHRI formed a committee to update the AHRI 1250–2009 test procedure. In its comment, AHRI stated that its latest updates to AHRI 1250 had adopted most of DOE's proposed changes in the SNOPR, with a few minor alterations. AHRI included a courtesy copy of the draft AHRI 1250 update, titled AHRI 1250–2014, with its comment to DOE. (AHRI, No. 100 at p. 2) DOE has reviewed AHRI's update to the test method and has incorporated many of the changes. (Specific details on changes and associated comments are discussed in the following sections.) DOE intends to begin the process of incorporating by reference the entirety of the updated version, which will require a separate rulemaking. Meanwhile, DOE is retaining its approach of amending the current test procedure (AHRI 1250–2009) in the regulatory language.

a. Nominal Values for Defrost Energy and Heat Load Calculations

In the SNOPR, DOE proposed a calculation methodology that would be used for calculating some aspects of electric defrost energy use in lieu of using certain tests for electric defrost energy use. Specifically, DOE proposed that the only required test for electric defrost energy use of unit coolers is the test to determine the energy input for the dry coil condition. The nominal values for frosted coil energy use, number of defrosts per day in the event that the unit cooler has an adaptive defrost system, and daily contribution of heat load attributed to defrost could then be calculated using nominal values rather than having to conduct their individual respective tests. Furthermore, as there is currently no industry-accepted method for calculating hot gas defrost energy use and heat load, DOE proposed nominal values for calculating these quantities for systems utilizing hot gas defrost. 79 FR at 9831–9832.

Lennox agreed with DOE's proposal to make the full defrost tests optional, as well as a portion of the adaptive defrost test. (Lennox, No. 97 at p. 6) AHRI incorporated DOE's nominal values and calculation methodology for electric and hot gas defrost into its update of AHRI 1250. (AHRI, No. 100 at pp. 56–58) HTPG, however, noted that the calculation methods for hot gas defrost do not allow for some of the advanced methods being utilized in the market or that may be likely to occur in the near future. HTPG proposed that DOE work with industry to develop a test method to give credit to the energy advantages of various hot gas defrost methods. (HTPG, No. 96 at p. 4)

After carefully considering these comments, DOE has decided to retain the nominal values for calculating frosted coil energy use, number of defrosts per day if the unit has an adaptive defrost system, and daily contribution of heat load, as well as nominal values for calculating hot gas defrost energy use and heat load. DOE agrees with HTPG that a test procedure for hot gas defrost would be beneficial to capture innovative technologies not currently accounted for by the calculation methodology. Should the industry develop a test method for rating hot gas defrost systems, DOE may consider adopting it.

b. Off-Cycle Evaporator Fan Test

In the SNOPR, DOE proposed to amend one aspect of its test procedure that incorporates AHRI 1250–2009. Specifically, DOE raised the possibility of amending that portion of its procedure that involves AHRI 1250–2009, section C10 by changing the currently specified requirement that when conducting the off-cycle evaporator fan test, controls shall be adjusted so that the greater of a 25 percent duty cycle or the manufacturer default is used for measuring off-cycle fan energy; and for variable speed controls, the greater of 25 percent fan speed or the manufacturer's default fan speed shall be used for measuring off-cycle fan energy. In the SNOPR, DOE proposed to amend the maximum off-cycle fan cycling or speed reduction to 50 percent of on-cycle duty cycle or 50 percent of on-cycle fan speed. 79 FR at 9832. The CA IOUs supported DOE's proposal, citing research that found that a 50 percent reduction in fan speed did not have significant impacts on product temperatures, room temperature stratification, or infiltration. (CA IOUs, No. 101 at pp. 4–5) Lennox and AHRI also agreed with the proposed modification, and AHRI noted that they included the modification in their revised test procedure, AHRI 1250–2014. (Lennox, No. 97 at p. 7; AHRI, No. 100 at p. 10) In the absence of any objection to its proposed approach, DOE is adopting its proposed amendment.

c. Refrigerant Oil Testing

In the SNOPR, DOE proposed to eliminate from its requirements that AHRI 1250–2009, section C3.4.6 be followed when conducting a test of walk-in refrigeration systems. That incorporated provision requires that a measurement be taken of the ratio of oil to refrigerant in the liquid refrigerant passing from the condenser to the unit cooler for all condensing units with on-board oil filters. 79 FR at 9832. Lennox agreed with DOE's proposal to eliminate the requirement for oil circulation test for units with integrated oil separators and with the assumption that the associated oil circulation ratio would be less than 1 percent. (Lennox, No. 97 at p. 7) The CA IOUs supported DOE's proposed removal of the requirement for refrigerant oil testing for systems with oil separators and added their collective belief that manufacturers do not anticipate that any new WICF refrigeration system being tested would likely have negligible oil in the refrigerant. They stated that the proposal to remove the oil testing requirement should apply to all systems and not just those with in-line oil separators. The CA IOUs recommended DOE investigate this claim and if correct, remove the requirement for all systems. (CA IOUs, No. 101 at p. 5) NCC and AHRI also supported removing the oil testing requirement for all systems, not just systems with oil separators, as single-compressor condensing units do not generally have oil separators. These commenters asserted that conducting oil testing would be time-consuming, expensive, and unnecessary. (NCC, No. 95 at p. 3; AHRI, No. 100 at p. 6) In light of these comments, DOE is removing the oil testing requirement for all systems due to the test burden involved and its belief that refrigerant oil is not a significant factor in new systems. If, however, DOE finds that refrigerant oil is affecting the repeatability or accuracy of the testing, DOE may reinstate this requirement at a later time.

d. Temperature Measurement

In the SNOPR, DOE proposed that the required tolerance for test temperature measurement be maintained at ±0.5 °F for measurements at the inlet and outlet of the unit cooler, but be altered to ±1.0 °F for all other temperature measurements, allowing for the use of smaller temperature measurement probes which can more easily be placed in contact with the refrigerant while not impeding its flow. Additionally, DOE proposed to allow the test to be conducted using sheathed sensors immersed in the flowing refrigerant for refrigerant temperature measurements upstream and downstream of the unit cooler, in order to reduce test burden. No refrigerant temperature measurements other than those upstream and downstream of the unit cooler would require a thermometer well or sheathed sensor immersion. 79 FR at 9832.

The CA IOUs supported DOE's proposal to allow refrigerant measurements upstream and downstream of the unit cooler to be conducted using either sheathed sensors or thermocouple wells immersed in flowing refrigerant. (CA IOUs, No. 101 at p. 5) AHRI noted its update to the test procedure, AHRI 1250–2014, incorporates DOE's proposed approach for temperature measurement. (AHRI, No. 100 at p. 10) Keeprite, on the other hand, believed the type of temperature sensor should not be specified as there are other methods or technologies that exist that could achieve the specified tolerances. (Keeprite, No. 94 at p. 2)

In light of the comments, DOE is adopting the modifications to the temperature measurement approach in this final rule. In response to Keeprite's comment, DOE notes that the approach being adopted today incorporates methods that have been established and accepted by industry for accurate measurement of temperature. If DOE becomes aware of other, equally valid methods or technologies for measuring temperature, it may consider adopting them as acceptable methods in the DOE test procedure.

e. Test Condition Tolerances

In the SNOPR, DOE proposed to modify the existing test procedure tolerances to:

- Set a test condition tolerance for the frequency of electrical power;
- Clarify that the stated maximum allowable voltage imbalance for three-phase power supply refers to the maximum imbalance for voltages measured between phases, rather than phase-to-neutral;
- Delete the requirements related to the test condition tolerances or measurements of air leaving the unit; and
- Remove the tolerances for wet bulb temperature on the outdoor system conditions, except for units with evaporative cooling.

DOE proposed to retain all other measurement tolerances for air entering the heat exchangers, including dry bulb outdoor conditions and dry bulb and wet bulb indoor conditions (wet bulb temperature or humidity levels greater than the required test conditions could cause excessive frosting of the coil and affect its rated capacity). 79 FR at 9832–9833.

The CA IOUs supported DOE's proposed changes to the instrumentation accuracy requirements and DOE's recommendation not to require or set accuracy requirements for air temperature exiting unit coolers. The CA IOUs also agreed that air temperature leaving unit coolers need not be measured and that maintaining condensing unit entering air wet-bulb temperatures should only be applicable to the testing of evaporatively cooled condensing units, but supported maintaining both the specified dry-bulb and relative humidity conditions for air entering the unit cooler. (CA IOUs, No. 101 at p. 5) AHRI noted that its update to the test procedure, AHRI 1250–2014, incorporates DOE's proposed test procedure tolerances. (AHRI, No. 100 at p. 10) In light of the comments, DOE is adopting its proposed tolerances.

f. Pipe Insulation and Length

In the SNOPR, DOE proposed that pipe lines between the unit cooler and condensing unit insulation be equivalent to a half-inch thick insulation with a material having an R-value of at least 3.7 per inch, and that flow meters would not need to be insulated but must not contact the floor. DOE also proposed to clarify the requirements on piping length such that:

- The length of piping between the condenser and unit cooler does not include any flow meters;
- The length of piping allowed within the cooled space shall be a maximum of 15 feet; and
- In the event that there are multiple branches of piping inside the cooled space, the 15-foot limit shall apply to each branch individually instead of the total piping length. 79 FR at 9833.

Lennox supported DOE's proposed clarification of pipe insulation and length requirements. (Lennox, No. 97 at p. 7) AHRI noted it has already incorporated DOE's proposed requirements for pipe insulation and length in its latest revision to the test method, AHRI 1250–2014. (AHRI, No. 100 at p. 73) In light of the comments, DOE is adopting its proposed modifications to piping insulation and length requirements.

g. Composition Analysis

In the SNOPR, DOE proposed to remove the current requirement in its procedure that a refrigerant composition analysis be conducted for systems with zeotropic refrigerant mixtures. 79 FR at 9833. Lennox and the CA IOUs supported the proposal. (Lennox, No. 97 at p. 7; CA IOUs, No. 101 at p. 5) ACEEE recommended that if changes in the ratios of the zeotropic blend could significantly affect capacity or efficiency, then verification that the composition meets industry standards may be needed; however, this could consist of laboratory certification documents provided by the manufacturer of the refrigerant blend. (ACEEE, No. 98 at p. 1) AHRI indicated that it removed the current requirement to test a sample of the superheated vapor refrigerant. (AHRI, No. 100 at p. 10) In light of the comments, DOE is removing the requirement to conduct a refrigerant composition analysis. If, however, DOE finds that refrigerant composition is affecting the repeatability or accuracy of the testing, DOE may reinstate this requirement at a later time.

h. Unit Cooler Test Conditions

In the SNOPR, DOE proposed to incorporate a modified version of Tables 15 and 16 from AHRI 1250–2009. Those tables list the unit cooler test conditions. DOE proposed to include the inlet saturation temperature and outlet superheat conditions required in AHRI 420–2008, ''Performance Rating of Forced-Circulation Free-Delivery Unit Coolers for Refrigeration,'' (''AHRI 420–2008'') for testing these types of unit coolers as part of the tables. 79 FR at 9833.

Lennox and the CA IOUs recommended that instead of setting the superheat conditions to 6.5 °F in all cases, as required by AHRI 420–2008, the superheat conditions should be set according to the manufacturer's specifications or installation instructions to ensure that the test method can credit the energy efficiency benefits of electronic expansion valves by allowing manufacturers to set lower superheat levels. (Lennox, No. 97 at pp. 7–8; CA IOUs, No. 101 at p. 6) Lennox also noted that the saturated suction values should reflect the freezer test conditions of − 20 and − 25 °F. (Lennox, No. 97 at p. 8) The CA IOUs supported fixing the liquid inlet saturation temperature at 105 °F. (CA IOUs, No. 101 at p. 6) Additionally, AHRI incorporated the AHRI 420–2008 conditions into the tables with test conditions for unit coolers, with the addition of a note instructing that superheat conditions shall be set according to the equipment specification in the equipment or installation manual. That note specifies that in instances where no specification is given, a default superheat value of 6.5 °F shall be used, and the superheat setting shall be reported as part of the standard rating. (AHRI, No. 100 at pp. 32–33)

DOE notes that manufacturers can often incorporate technologies that allow the superheat to be lowered from the industry default value to reduce energy consumption, but installers typically set the superheat by adjusting a valve. Manufacturers would need to specify a lower superheat value in their installation instructions in order for the equipment to realize an energy benefit. Therefore, DOE is requiring that superheat be set according to the manufacturer's specifications in order to give credit for electronic expansion valves or advanced controls. In instances where there are no specifications for superheat, then the superheat shall be set to 6.5 °F. In either case, superheat must be reported as part of the standard rating.

C. Test Procedure for WICF Panel R-Value (ASTM C518–04)

The DOE test procedure, 10 CFR 431.304 *Uniform test method for the measurement of energy consumption of walk-in coolers and walk-in freezers,* incorporates by reference ASTM C518–04, a standard method for determining thermal transmission properties (i.e., thermal conductance or conductivity) of a material. In the February 2014 SNOPR, DOE proposed several modifications and clarifications to the test procedure to ensure accuracy and reliability. These proposed revisions would apply to those testing provisions that manufacturers must currently use as well as those provisions that would need to be followed when evaluating the efficiency of a panel under any new standards that DOE may eventually adopt as part of its parallel standards rulemaking. The proposed revisions would require that test samples be no more than one (1) inch in thickness, be taken from the center of the panel and have all protective skins or facers removed prior to testing. See 79 FR at 9844. DOE received several comments on its proposed modifications, which are discussed in the following subsections.

1. Test Sample Specifications

In the SNOPR, DOE proposed that test samples for R-value measurement according to ASTM C518–04 be 1 inch in thickness and cut from the center of a walk-in cooler or walk-in freezer panel. AHRI agreed with DOE's proposal for test samples to be 1-inch in thickness and extracted from the center of a finished panel. (AHRI, No. 100 at p. 7) Bally also agreed that the requirement for a 1-inch thick sample cut from the center of a finished panel is appropriate. Bally further suggested the addition of a dimensional tolerance of +.125 inches and − 0.0 inches for this thickness. (Bally, No. 93 at p. 3)

DOE is adopting its proposal that test samples for R-value measurements made according to ASTM C518–04 be 1-inch in thickness and cut from the center of a walk-in cooler or walk-in freezer panel. This change should minimize any inaccuracy that may result from the differences in thickness and thermal conductance between the test sample and the standard reference material (SRM) used to calibrate the heat flow meter apparatus. ASTM C518–04 makes several statements that indicate that the test sample thickness and thermal properties should be comparable to those of the calibration standard used. (ASTM C518–04 Section 6.1 and 6.5.4) It also states that the thickness of test samples should be restricted in order to minimize the amount of lateral heat losses during testing. (ASTM C518–04 Section 7.6.1) The new requirement to use a 1-inch thick sample is in accordance with these recommendations of ASTM C518–04. The test sample will be required to be extracted from the center of a panel (rather than near the panel face) since the insulation foams used in WICF panels will have experienced the least amount of aging degradation near the center of the panel; also, edge regions are not to be included in testing. DOE agrees that a tolerance on the 1-inch requirement is appropriate in order to clarify this requirement. Using a sample thickness of precisely 1 inch is not important to the measurement because the heat flow meter apparatus adjusts its measurement for the exact thickness. The objective of the requirement is that the sample thickness be close to 1-inch, as opposed to 2 inches or 0.5 inch, to improve accuracy, as described above, and to achieve consistency of test results obtained in different laboratories. A tolerance of ±0.1-inch for the thickness of the test sample will help achieve these objectives, while being well within the precision of the cutting tools typically used to prepare the sample. (DOE understands that a high-speed band-saw is often used for cutting foam panels; moreover, a high-speed band-saw and meat slicer are the two recommended cutting tools suggested by ASTM C1303–09a *Standard Test Method for Predicting Long-Term Thermal Resistance of Closed-Cell Foam Insulation,* Section 6.2.2.3.) Given that these cutting tools are generally readily available and capable of the precision required, DOE believes that a ±0.1-inch tolerance for the thickness of the test sample is appropriate and sufficient.

DOE also agrees with Bally's statement that care be taken during any cutting processes so as to not alter the heat transfer properties of the cut surface. (Bally, No. 93 at p. 3) Section 6.2.2.4 of ASTM C1303–09a prohibits the use of hot-wire cutters for cutting test samples in closed-cell foams to prevent the formation of a surface skin. DOE will also adopt as part of this final rule a provision to prohibit the use of hot-wire cutters or other heated cutting instruments in preparing test samples in order to limit potential altering of the samples' heat transfer properties during the cutting process.

2. Removal of Panel Facers

DOE is also making explicit the requirement that facers or protective skins be removed. While these components make a negligible contribution to the overall thermal resistance of WICF panels in the direction transverse to the panel surface, DOE recognizes that the inclusion of metal facers or protective skins during testing using a heat flow meter apparatus results in unreliable measurements. ASTM C518–04 states that the presence of inhomogeneities or thermal bridges can produce inaccurate results. (ASTM C518–04 (4.4))

In its comments on the February 2014 SNOPR, AHRI related that requiring a 1-inch thick sample from a finished panel will already involve removal of the facers or protective skins. (AHRI, No. 100 at p. 7) DOE recognizes that facers or skins would be removed when cutting a 1-inch thick sample from the center of a thicker panel. DOE also agrees with AHRI's assertion that panels for testing should be supplied as fully fabricated panels intact prior to testing, and that the 1-inch thick test sample should be removed by the test laboratory at the time of testing. (AHRI, No. 100 at p. 7) The requirements of 10 CFR 431.304(b)(5) and (c)(5) require that the insulating foam for testing be supplied for testing in its final chemical state. For sprayed foams, the final chemical form inherently requires facers or protective skins to form the shape of the panel. Extruded foam board stock is typically provided to WICF panel manufacturers in its final chemical form; in this case, facers or protective skins may or may not be attached prior to testing. Nevertheless, DOE is explicitly requiring that facers or skins be removed to ensure that the process of cutting a sample from a thicker panel will always achieve this objective.

3. 48-Hour Testing Window

DOE also proposed a 48-hour window once a test sample has been cut from a WICF panel to perform ASTM C518–04 testing in order to minimize the effect of aging of the closed-cell foam that constitutes the panel insulation. Thermal resistance of polyurethane foams that are typical of WICF panels decreases over time due to the diffusion of air into the foam. DOE proposed the 48-hour window in order to ensure repeatability and comparability in test results. The 48-hour window was developed based on data from Wilkes, et al. at Oak Ridge National Laboratory.[3] In this study, thermal conductivity of a 0.4 inch thick polyurethane foam insulation increased between 6.0% and 20.7% (depending on the blowing agent used) when aged at 90 °F for 8 days and tested at 45 °F. Assuming that the rate of increase of thermal conductivity during this initial period is linear, the range of increase covered by these data over a 48-hour period would have been 1.5% to 5%. DOE understands that the higher temperature of 90 °F at which these samples were aged and the smaller thickness of the sample (0.4 inch compared to 1-inch as proposed for WICF panels) would also have played contributing roles in accelerating the aging process compared to what is to be expected in testing WICF panels.

AHRI commented that the 48-hour period is appropriate and sufficient. (AHRI, No. 100 at p. 7) Bally agreed that the time between cutting and testing should be minimized, but disagreed that 48 hours is an appropriate testing window for a cut sample. Bally stated that 48 hours may be appropriate for a conditioning period for the uncut panel but once the panel is cut, only one hour should be allowed before testing is performed (rather than the 48 hours as DOE has proposed). (Bally, No. 93 at p. 4) However, Bally provided no evidence or data suggesting that thermal conductivity would increase measurably between 1 and 48 hours after cutting the test sample. DOE notes that section 7.3 of ASTM C518–04 does not specify a conditioning period but states that the conditioning period is typically indicated by a material specification, that a typical material specification calls for conditioning ''at 22°C and 50% R.H. for a period of time until less than a 1% mass change is observed over a 24-h period,'' and that where the material specification does not indicate a conditioning period, materials shall not be exposed to temperatures that will irreversibly alter the test specimen. (ASTM C518–04 Section 7.3) As mentioned above, DOE expects that the range of potential increase of thermal conductivity for a 48-hour period is small; however, in response to Bally's concerns, DOE will reduce the allowable window after cutting from 48 hours to a maximum of 24 hours to remain conservative.

[3] ''Aging of Polyurethane Foam Insulation in Simulated Refrigerator Panels—Initial Results with Third-Generation Blowing Agents'' by Kenneth E. Wilkes et al., published by Oak Ridge National Laboratory for presentation at The Earth Technologies Forum, October 26–28, 1998, Figures 2 and 4(b).

4. Specimen Conditioning Temperatures

Bally suggested that specimens be conditioned at the mean temperatures at which they would be tested, namely 20 degrees Fahrenheit for freezers and 55 degrees Fahrenheit for coolers. (Bally, No. 93 at p. 4) However, it offered no rationale, evidence or data in support of this suggestion. DOE understands that the intent of the conditioning is to ensure consistency in the moisture level within the sample during testing. DOE expects that the closed cell insulation materials typically used for WICF panels would not rapidly change their internal moisture levels, neither absorbing a significant amount of moisture in a 24-hour period under normal ranges of ambient conditions, nor rejecting a significant amount of excess moisture in a reasonable time period, due to the closed-cell structure of the foam. As indicated in ASTM C518–04 testing for WICF panels, section 7.3, conditioning information is typically provided in the material specification for the material being tested, but DOE is not aware of any such conditioning specifications for insulation materials typically used for WICF panels. Further, DOE is concerned that conditioning at cooled temperatures could cause condensation when removed from a cooled conditioning environment and introduced to a warmer room temperature in a test laboratory. Finally, DOE is concerned that requiring a WICF panel, often 8 feet by 4 feet in area, to be chilled to 20 degrees Fahrenheit for an extended period of time may introduce undue test burden. Therefore, DOE is not requiring conditioning requirements beyond those already established by Section 7.3 of ASTM C518–04.

5. Flatness Tolerances on Contact Surfaces

Regarding its proposal to add parallelism and flatness constraints on the two surfaces that contact the heat flow meter hot and cold plates, DOE received two comments. That proposal, which included a tolerance range of ±0.03 inches, would apply to both parallelism and flatness. See 79 FR at 9844. AHRI stated that the proposed tolerances ''are impractical for the purposes of the proposed test, are inconsistent with normal WICF panel manufacturers' standard processes and are likely not within the capabilities of most current panel manufacturing processes.'' AHRI recommended that DOE withdraw this proposal. (AHRI, No. 100 at p. 7) It did not, however, offer an alternative means for ensuring sufficient contact between the test sample surfaces and the surfaces of the heat flow meter assembly. Contact between these surfaces is critical to test accuracy, as air gaps between the heat flow meter apparatus surfaces and the test sample surfaces will result in a higher conductivity and lower thermal resistance. To address AHRI's concern, DOE clarifies that these tolerances will apply only to the cut faces of the test sample itself, not the manufactured panel. DOE also notes that, in support of this requirement, Bally (a manufacturer of WICF panels) stated that the tolerances were acceptable. (Bally, No. 93 at p. 3) As noted in section III.C.1, in DOE's view, manufacturers should be able to achieve these tolerances with common cutting tools and techniques.

6. Panel Testing Temperature Tolerances

With respect to the appropriate temperatures for testing panels, DOE proposed a tolerance of ± 1 degree Fahrenheit on the average foam temperature (20 degrees Fahrenheit for freezers and 55 degrees Fahrenheit for coolers). DOE proposed these provisions to help ensure test repeatability. AHRI and Bally both stated that this provision is appropriate and sufficient. (AHRI, No. 100 at p. 7 and Bally, No. 93 at p. 3) No other comments were received. Accordingly, DOE is adopting its proposed approach.

7. Additional Modifications to the Panel Test Procedure

DOE proposed a number of additional clarifications and modifications to the panel test procedure. No comments were received on these issues, which are listed immediately below.

- Clarify and remove redundancy in 10 CFR 431.304(b)(5) and (c)(5) regarding foam in its final chemical form;
- Introduce an equation for WICF panels consisting of two or more dissimilar insulating materials other than facers or protective skins; and
- Remove language in paragraphs (b), (b)(6), (c) and (c)(6) of 10 CFR 431.304 that referenced manufacturers.

In light of the absence of any comments regarding these proposals, DOE is adopting them as part of this final rule.

D. Performance-Based Test Procedures for Panels and Doors of Walk-In Coolers and Freezers

1. Panels

As described above, WICF panels must meet requirements for foam insulation R-values based on ASTM C518–04 testing incorporated in 10 CFR 431.304. Additionally, the test procedure at Appendix A to Subpart R of Part 431 (Uniform Test Method for the Measurement of Energy Consumption of the Components of Envelopes of Walk-In Coolers and Walk-In Freezers) establishes the method and metrics by which the energy consumption (for envelope components) or efficiency (for refrigeration components) may be measured; this includes floor and non-floor panels. Sections 4.2 and 4.3 of that procedure establish the calculation procedures that result in a thermal conductivity, U-value, energy use metric for floor and non-floor panels, and sections 5.1 and 5.2 establish the methods used to make the measurements. Section 5.1 incorporates by reference ASTM C1363–05 Standard Test Method for Thermal Performance of Building Materials and Envelope Assemblies by Means of a Hot Box Apparatus; section 5.2 incorporates by reference Annex C Determination of the aged values of thermal resistance and thermal conductivity of DIN EN 13164 and DIN EN 13165.

While ASTM C518–04 testing is intended to establish the thermal resistance of the center of a WICF panel, the required testing under ASTM C1363–05 is intended to capture the overall thermal transmittance of a WICF panel, including thermal bridges and edge effects. (Thermal transmittance is the reciprocal of thermal resistance.) Similar to ASTM C518–04, DIN EN 13164/13165 testing is intended to measure the thermal resistance of the center of a WICF panel; however, DIN EN 13164/13165 also captures the effects of foam aging on a panel's thermal resistance.

In response to the September 2013 standards NOPR, the Department received a number of comments regarding the WICF panel test procedure. The comments largely presented two concerns: test burden and the availability of laboratories to conduct these tests. In these comments, multiple manufacturers suggested that no independent laboratories were capable of conducting DIN EN 13164/13165 tests, and that only two were capable of conducting ASTM C1363–05 tests. Several comments suggested that the cost of these tests could be excessive, particularly given the limited availability of independent test laboratories to perform these specific tests. (See section III.D. of the February 2014 SNOPR for a full comment summary.)

Responding to these comments, DOE proposed in the February 2014 SNOPR to remove the portions of the test procedure that referenced ASTM C1363–04 and DIN EN 13164/13165 testing; this would remove sections 4.2, 4.3, 5.1 and 5.2 from 10 CFR 431, Appendix A of Subpart R. 79 FR at 9837.

DOE received several comments regarding its proposal to remove these portions of the WICF test procedure. Bally supported the proposal to remove these test portions in order to reduce testing burden. (Bally, No. 93 at p. 4) AHRI also supported their removal. (AHRI, No. 100 at p. 8). AHRI further recommended that DOE ''translate the proposed remaining test standard ASTM C518–04 to prescriptive requirements which would eliminate testing requirements.'' (AHRI, No. 100 p. 8) In contrast to these industry commenters, ASAP, et al. suggested that DOE should not remove the sections that require ASTM C1363–04 and DIN EN 13164/13165 testing. (ASAP, et al., No. 99 at p. 4) ASAP, et al. stated that DOE would not be able to adopt the performance-based standards based on U-values that were proposed in the September 2013 standards NOPR and that the estimated energy savings calculated in the September 2013 standards NOPR could therefore not be achieved. (ASAP, et al., No. 99 at p. 4) Additionally, ASAP, et al. believe that the U-value metric fulfills the requirement that DOE establish ''performance-based standards'' for walk-ins. Finally, ASAP, et al. suggested that DOE allow use of an AEDM that can accurately predict the overall U-value for panels, thereby reducing test burden. (ASAP, et al., No. 99 at p. 4)

DOE acknowledges that the estimated savings in the September 2013 standards NOPR were based on U-values. DOE also had not been aware of the considerable difficulties that affected parties would likely face in attempting to locate testing laboratories to assist them in performing the test in anticipation of any standards with which manufacturers would need to comply. Given these difficulties, in DOE's view, modifications to the procedure are necessary to ensure that some method of measuring panel efficiency can be readily conducted. The prescriptive requirements established by EPCA for WICF panels are effectively performance-based, as they regulate the thermal performance of WICF panels and require a certain minimal level of performance be met. (DOE refers all interested parties to the standards rulemaking for updated estimates of the energy savings estimates, which will now be based on the R-value requirements (and U-factor for doors)). With respect to ASAP, et al.'s suggestion to allow use of an AEDM to predict U-factor, DOE notes that AEDMs must be validated by testing results and believes that even this minimal amount of testing would be burdensome in light of the lack of testing laboratories who can perform the testing required to obtain a U-value. In response to AHRI's request to translate the ASTM C518–04 test standard into prescriptive requirements, DOE notes that the required minimum R-value for panels is effectively a performance standard set forth by EPCA (42 U.S.C. 6313(f)(1)(C)) and the use of ASTM C518–04 for measuring the R-value is mandated by EPCA. (42 U.S.C. 6314(a)(9)(A))

2. Doors

With respect to the test procedure for doors, DOE is adopting several minor changes to section 5.3 for clarification purposes only. DOE is modifying the titles of section 5.3(a)(2) from ''Internal conditions'' to ''Cold-side conditions'' and section 5.3(a)(3) from ''External conditions'' to ''Warm-side conditions.'' The terms ''internal'' and ''external'' are irrelevant in the context of the testing apparatus described in NFRC 100[E0A1] (incorporated by reference). DOE is also making explicit the surface convective heat transfer coefficients referred to in paragraph (a)(1); these values are 30 Watts per meter-Kelvin (W/m-K) for the cold side of the hot box apparatus and 7.7 W/m-K for the warm side. This change only clarifies these terms. These values are specified in ASTM C1199–09 Standard Test Method for Measuring the Steady-State Thermal Transmittance of Fenestration Systems Using Hot Box Methods which is referred to by NFRC 100[E0A1]. These changes were also proposed as part of the February 2014 SNOPR.

In response to this SNOPR, AHRI indicated that they do not object to the proposed clarifications. (AHRI, No. 100 at p. 8) Bally, however, commented that they do not agree with evaluating non-display doors according to NFRC 100. (Bally, No. 93 at p. 4) Bally contended that ''surface convective heat transfer coefficients, in metric units [are] quite alien to us since convective heat transfer is such a small part of heat transfer except in high heat flow regions like fenestration.'' (Bally, No. 93 at p. 4) Bally also suggested that DOE's procedure based on NFRC 100 should be dropped or that, ''at a minimum, exclude view port windows with a total window surface area of 340 square inches or less.'' (Bally, No. 93 at p. 4) AHRI also suggested that non-display doors should have the option of meeting R-value-based standards. (AHRI, No. 100 at p. 8)

DOE acknowledges that doors are a type of fenestration; hence, DOE believes that NFRC 100 is appropriate for doors. The surface convective coefficients stipulated in ASTM C1199–09 (which is referenced by NFRC 100 by way of NFRC 102) are intended to ensure testing repeatability by establishing consistent boundary conditions. DOE reiterates that the changes proposed in the February 2014 SNOPR were for clarification purposes only, and that the substance of the test method is unchanged. With respect to Bally's suggestion that NFRC 100 be dropped or its application substantially modified, DOE infers that Bally is referring to NFRC 100 as a whole, and not just the convective surface coefficients specifically. DOE cannot abandon the use of NFRC 100 for measuring the performance of WICF doors without a viable alternative and Bally has offered none. With regards to non-display doors that include a small viewing port window, the presence of the window means that the information gained by measuring an overall door U-factor is all the more valuable given the thermal bridging the window creates. As previously stated, capturing the thermal bridging effects of all components in a door is critical in accurately reflecting its energy consumption due to the nature of fenestration. DOE is also reluctant to make an exception for non-display doors or doors with port windows, as it could potentially encourage manufacturers to add small windows to all of their doors, which would relieve them from having to meet performance standards. Should this occur, there would likely be an increase in energy consumption due to thermal bridging. Accordingly, DOE is leaving the NFRC 100 test in place for doors and display panels while clarifying the convective surface coefficients to be used for testing.

With respect to AHRI's suggestion that DOE apply R-value based standards to non-display doors, DOE notes that the scope of its proposal addresses only issues related to AEDMs as they would apply to walk-ins along with related test procedure requirements. Comments on the standards to which non-display doors should be held fall outside of that scope. Furthermore, even if DOE were to consider the possibility of applying an R-value-based standard—or any other standard—a non-display door includes more components in its assembly than a wall panel, which would make the consideration of potential standards for these items considerably more complex. According to the definition for ''door'' found in 10 CFR 431.302, the door ''includes the door panel, glass, framing materials, door plug, mullion, and any other elements that form the door or part of its connection to the wall.'' As such, there are more opportunities for thermal transmission. DOE believes that for doors (both display and non-display) capturing these effects by way of an overall U-factor through use of the NFRC 100 test procedure is critical for accurately reflecting the energy consumption of these WICF components. As a result, DOE is declining to adopt AHRI's suggestion in the context of today's rulemaking.

E. Sampling Plan

In order to determine a rating for certifying compliance and making energy use representations, DOE requires manufacturers to test each basic model in accordance with the applicable DOE test procedure and apply the sampling plan. DOE proposed a sampling plan for walk-ins consistent with other commercial equipment regulated under EPCA that would be included a proposed § 429.53 of Subpart B of 10 CFR Part 429. For consistency with other commercial equipment regulated under EPCA, DOE proposed that manufacturers test a sample of sufficient size of a WICF component basic model to ensure a representative rating—but not less than two units as prescribed in 10 CFR 429.11. DOE proposed that any represented energy consumption values of a walk-in basic model component shall be greater than or equal to the higher of the mean of the sample or the 95 percent upper confidence limit (UCL) of the true mean divided by 1.05. Additionally, DOE proposed that any represented energy efficiency values of a walk-in basic model component shall be the less than or equal to the lower of the mean of the sample or the 95 percent lower confidence limit (LCL) of the true mean divided by 0.95. DOE did not receive any comments on this proposal and so is adopting the proposed sampling requirements.

IV. Procedural Issues and Regulatory Review

A. Review Under Executive Order 12866

The Office of Management and Budget has determined that test procedure rulemakings do not constitute ''significant regulatory actions'' under section 3(f) of Executive Order 12866, ''Regulatory Planning and Review,'' 58 FR 51735 (Oct. 4, 1993). Accordingly, this regulatory action was not subject to review under the Executive Order by the Office of Information and Regulatory Affairs (OIRA) in the Office of Management and Budget (OMB).

B. Review Under the Regulatory Flexibility Act

The Regulatory Flexibility Act (5 U.S.C. 601, et seq.) requires the preparation of a final regulatory flexibility analysis (FRFA) for any rule that by law must be proposed for public comment, unless the agency certifies that the rule, if promulgated, will not have a significant economic impact on a substantial number of small entities. As required by Executive Order 13272, ''Proper Consideration of Small Entities in Agency Rulemaking,'' 67 FR 53461 (August 16, 2002), DOE published procedures and policies on February 19, 2003, to ensure that the potential impacts of its rules on small entities are properly considered during the DOE rulemaking process. 68 FR 7990. DOE has made its procedures and policies available on the Office of the General Counsel's Web site: www.gc.doe.gov. DOE reviewed the test procedures promulgated in today's final rule under the provisions of the Regulatory Flexibility Act (RFA) and the policies and procedures published on February 19, 2003.

As discussed in more detail below, DOE found that the provisions of this rule will not result in increased testing and/or reporting burden for manufacturers and permit additional manufacturers to use an AEDM for the purposes of rating and certifying their equipment, which would reduce manufacturer testing burden. Accordingly, based on DOE's review, manufacturers are unlikely to experience an increased financial burden because of the provisions established in today's final rule.

First, DOE is allowing manufacturers walk-in refrigeration systems to use an AEDM to determine the energy consumption of their products. Previously, no walk-in manufacturers were eligible to use an AEDM. Today's rule adopts voluntary methods for determining compliance in lieu of conducting actual physical testing—which, in turn, are expected to reduce the testing burden of walk-in manufacturers who elect to use an AEDM. Furthermore, the validation requirements for an AEDM do not require more testing than that which is already required under DOE's regulations at 10 CFR 429.12. While the Department believes that permitting greater use of AEDMs will reduce the affected manufacturer's test burden, their use is at the manufacturer's discretion. If, as a result of any of the regulations herein, a manufacturer believes that use of an AEDM would increase rather than decrease their financial burden compared to performing actual testing, the manufacturer may choose not to employ the method. Should a manufacturer choose to abstain from using an AEDM, this provision would not apply and the manufacturer would continue to remain subject to the requirements of the applicable DOE test procedures for walk-ins, which would result in no change in burden from that which was already required.

DOE is also codifying alternate methods for determining the compliance of individual walk-in refrigeration system components, which should further decrease the burden of the future test procedure for walk-in refrigeration systems. DOE is currently undertaking an energy conservation standards rulemaking to set performance standards for walk-in components, including panels, doors, and refrigeration systems. Under the provisions of the March 2011 Final Rule (76 FR 12422 (March 7, 2011)), the ''component'' manufacturer would be required to certify compliance with these standards once any applicable compliance date is reached—however, there were no provisions for manufacturers of individual refrigeration components (i.e., unit coolers and condensing units) to ensure the compliance of their components with an energy conservation standard because the proposed refrigeration system standard would apply to the whole refrigeration system. These manufacturers could potentially have incurred a large burden by having to test all combinations of the components they wished to distribute. Additionally, manufacturers of only one type of component could have been inadvertently prevented from selling their equipment because there would have been no available compliance mechanism. This rule establishes an alternate testing methodology by which manufacturers of either component of a walk-in refrigeration system—the condensing unit or the unit cooler—may determine compliance with the applicable standard without having to test every combination of components that they produce. DOE believes this approach will significantly reduce the testing burden for all manufacturers, including small businesses.

Finally, DOE is adopting several clarifications and modifications to the existing test procedures that are intended to further reduce testing burden. For example, DOE is not requiring the use of long-term thermal resistance testing of foam and is allowing manufacturers to test their panels based only on testing to ASTM C518, a simpler test method that is already in use in the industry. For a complete list of test procedure modifications, see section III.

For the reasons enumerated above, DOE is certifying that this final rule will not have a significant impact on a substantial number of small entities.

C. Review Under the Paperwork Reduction Act of 1995

A walk-in manufacturer must certify to DOE that its equipment complies with all applicable energy conservation standards. To certify compliance, manufacturers must test their products according to the DOE test procedures for walk-in equipment, including any amendments adopted for those test procedures. DOE has established regulations for the certification and recordkeeping requirements for all covered consumer products and commercial equipment, including walk-in coolers and freezers. 76 FR 12422 (March 7, 2011). The collection-of-information requirement for certification and recordkeeping is subject to review and approval by OMB under the Paperwork Reduction Act (PRA). This requirement has been approved by OMB under OMB control number 1910–1400. Public reporting burden for the certification is estimated to average 20 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information.

Notwithstanding any other provision of the law, no person is required to respond to, nor shall any person be subject to a penalty for failure to comply with, a collection of information subject to the requirements of the PRA, unless that collection of information displays a currently valid OMB Control Number.

D. Review Under the National Environmental Policy Act of 1969

DOE is amending its test procedures and related provisions for walk-ins. DOE has determined that this rule falls into a class of actions that are categorically excluded from review under the National Environmental Policy Act of 1969 (42 U.S.C. 4321 *et seq.*) and DOE's implementing regulations at 10 CFR part 1021. This rule amends the existing test procedures without affecting the amount, quality, or distribution of energy usage, and, therefore, will not result in any environmental impacts. Thus, this rulemaking is covered by Categorical Exclusion A5 under 10 CFR part 1021, subpart D, which applies to any rulemaking that interprets or amends an existing rule without changing the environmental effect of that rule. Accordingly, neither an environmental assessment nor an environmental impact statement is required.

E. Review Under Executive Order 13132

Executive Order 13132, ''Federalism,'' 64 FR 43255 (August 10, 1999), imposes certain requirements on Federal agencies formulating and implementing policies or regulations that preempt State law or that have federalism implications. The Executive Order requires agencies to examine the constitutional and statutory authority supporting any action that would limit the policymaking discretion of the States, and to carefully assess the necessity for such actions. The Executive Order also requires agencies to have an accountable process to ensure meaningful and timely input by State and local officials in the development of regulatory policies that have federalism implications. On March 14, 2000, DOE published a statement of policy describing the intergovernmental consultation process it will follow in the development of such regulations. (65 FR 13735) DOE has examined this rule and has tentatively determined that it would not have a substantial direct effect on the States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among the various levels of government. EPCA governs and prescribes Federal preemption of State regulations as to energy conservation for the products that are the subject of today's rule. States can petition DOE for exemption from such preemption to the extent, and based on criteria, set forth in EPCA. (42 U.S.C. 6297) No further action is required by Executive Order 13132.

F. Review Under Executive Order 12988

Regarding the review of existing regulations and the promulgation of new regulations, section 3(a) of Executive Order 12988, ''Civil Justice Reform,'' 61 FR 4729 (Feb. 7, 1996), imposes on Federal agencies the general duty to adhere to the following requirements: (1) Eliminate drafting errors and ambiguity; (2) write regulations to minimize litigation; (3) provide a clear legal standard for affected conduct rather than a general standard; and (4) promote simplification and burden reduction. Regarding the review required by section 3(a), section 3(b) of Executive Order 12988 specifically requires that Executive agencies make every reasonable effort to ensure that the regulation: (1) Clearly specifies the preemptive effect, if any; (2) clearly specifies any effect on existing Federal law or regulation; (3) provides a clear legal standard for affected conduct while promoting simplification and burden reduction; (4) specifies the retroactive effect, if any; (5) adequately defines key terms; and (6) addresses other important issues affecting clarity and general draftsmanship under any guidelines issued by the Attorney General. Section 3(c) of Executive Order 12988 requires Executive agencies to review regulations in light of applicable standards in sections 3(a) and 3(b) to determine whether they are met or it is unreasonable to meet one or more of them. DOE has completed the required review and determined that, to the extent permitted by law, the rule meets the relevant standards of Executive Order 12988.

G. Review Under the Unfunded Mandates Reform Act of 1995

Title II of the Unfunded Mandates Reform Act of 1995 (UMRA) requires each Federal agency to assess the effects of Federal regulatory actions on State, local, and Tribal governments and the private sector. (Pub. L. 104–4, sec. 201, codified at 2 U.S.C. 1531) For regulatory actions likely to result in a rule that may cause the expenditure by State, local, and Tribal governments, in the aggregate, or by the private sector of $100 million or more in any one year (adjusted annually for inflation), section 202 of UMRA requires a Federal agency to publish a written statement that estimates the resulting costs, benefits, and other effects on the national economy. (2 U.S.C. 1532(a)–(b)) UMRA also requires a Federal agency to develop an effective process to permit timely input by elected officers of State, local, and Tribal governments on a ''significant intergovernmental mandate,'' and requires an agency plan for giving notice and opportunity for timely input to potentially affected small governments before establishing any requirements that might significantly or uniquely affect them. On March 18, 1997, DOE published a statement of policy on its process for intergovernmental consultation under UMRA. (62 FR 12820) (This policy is also available at *http://www.energy.gov/gc.*) DOE examined today's rule according to UMRA and its statement of policy and has determined that the rule contains neither an intergovernmental mandate, nor a mandate that may result in the expenditure by State, local, and Tribal governments, in the aggregate, or by the private sector, of $100 million or more in any year. Accordingly, no further assessment or analysis is required under UMRA.

H. Review Under the Treasury and General Government Appropriations Act, 1999

Section 654 of the Treasury and General Government Appropriations Act, 1999 (Pub. L. 105–277) requires Federal agencies to issue a Family Policymaking Assessment for any rule that may affect family well-being. This rule would not have any impact on the autonomy or integrity of the family as an institution. Accordingly, DOE has concluded that it is not necessary to prepare a Family Policymaking Assessment.

I. Review Under Executive Order 12630

Pursuant to Executive Order 12630, ''Governmental Actions and Interference with Constitutionally Protected Property Rights,'' 53 FR 8859 (March 18, 1988), DOE has determined that this rule would not result in any takings that might require compensation under the Fifth Amendment to the U.S. Constitution.

J. Review Under Treasury and General Government Appropriations Act, 2001

Section 515 of the Treasury and General Government Appropriations Act, 2001 (44 U.S.C. 3516, note) provides for Federal agencies to review most disseminations of information to the public under information quality guidelines established by each agency pursuant to general guidelines issued by OMB. OMB's guidelines were published at 67 FR 8452 (Feb. 22, 2002), and DOE's guidelines were published at 67 FR 62446 (Oct. 7, 2002). DOE has reviewed today's rule under the OMB and DOE guidelines and has concluded that it is consistent with applicable policies in those guidelines.

K. Review Under Executive Order 13211

Executive Order 13211, ''Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use,'' 66 FR 28355 (May 22, 2001), requires Federal agencies to prepare and submit to OIRA at OMB, a Statement of Energy Effects for any significant energy action. A ''significant energy action'' is defined as any action by an agency that promulgates or is expected to lead to promulgation of a final rule, and that: (1) Is a significant regulatory action under Executive Order 12866, or any successor order; and (2) is likely to have a significant adverse effect on the supply, distribution, or use of energy; or (3) is designated by the Administrator of OIRA as a significant energy action. For any significant energy action, the agency must give a detailed statement of any adverse effects on energy supply, distribution, or use should the rule be implemented, and of reasonable alternatives to the action and their expected benefits on energy supply, distribution, and use.

DOE has reviewed today's rule and determined, it would not have a significant adverse effect on the supply, distribution, or use of energy, nor has it been designated as a significant energy action by the Administrator of OIRA. Therefore, it is not a significant energy action, and, accordingly, DOE has not prepared a Statement of Energy Effects for this rulemaking.

L. Review Under Section 32 of the Federal Energy Administration Act of 1974

Under section 301 of the Department of Energy Organization Act (Pub. L. 95–91; 42 U.S.C. 7101, *et seq.*), DOE must comply with all laws applicable to the former Federal Energy Administration, including section 32 of the Federal Energy Administration Act of 1974 (Pub. L. 93–275), as amended by the Federal Energy Administration Authorization Act of 1977 (Pub. L. 95–70). (15 U.S.C. 788; FEAA) Section 32 provides in relevant part that, where a rule authorizes or requires use of commercial standards, the notice of the final rule must inform the public of the use and background of such standards. In addition, section 32(c) requires DOE to consult with the Attorney General and the Chairman of the Federal Trade Commission (FTC) concerning the impact of the commercial or industry standards on competition. Today's rule does not incorporate any commercial standards. The commercial standards discussed in today's rulemaking were already adopted in the Test Procedures for Walk-In Coolers and Walk-In Freezers, which was published in the **Federal Register** on April 15, 2011. 76 FR 21580. DOE conducted a review under Section 32 of the Federal Energy Administration Act of 1974 in the April 2011 test procedure final rule. 76 FR 21580, 21604.

V. Approval of the Office of the Secretary

The Secretary of Energy has approved publication of today's final rule.

List of Subjects

10 CFR Part 429

Administrative practice and procedure, Confidential business information, Energy conservation, Reporting and recordkeeping requirements.

10 CFR Part 431

Administrative practice and procedure, Confidential business information, Energy conservation, Incorporation by reference, Reporting and recordkeeping requirements.

Issued in Washington, DC, on May 5, 2014.

Kathleen B. Hogan,

Deputy Assistant Secretary for Energy Efficiency, Energy Efficiency and Renewable Energy.

For the reasons stated in the preamble, DOE is amending parts 429 and 431 of Chapter II, Subchapter D of Title 10, Code of Federal Regulations, as set forth below:

PART 429—CERTIFICATION, COMPLIANCE, AND ENFORCEMENT FOR CONSUMER PRODUCTS AND COMMERCIAL AND INDUSTRIAL EQUIPMENT

■ 1. The authority citation for part 429 continues to read as follows:

Authority: 42 U.S.C. 6291–6317.

■ 2. Section 429.53 is revised to read as follows:

§ 429.53 Walk-in coolers and walk-in freezers.

(a) *Determination of represented value*—(1) *Refrigeration equipment:* Manufacturers must determine the represented value, which includes the certified rating, for each basic model of walk-in cooler or freezer refrigeration equipment, either by testing, in conjunction with the applicable sampling provisions, or by applying an AEDM satisfying the criteria provided at § 429.70(f)(1).

(i) *Units to be tested.* (A) If the represented value for a given basic model is determined through testing, the general requirements of § 429.11 apply; and

(B) For each basic model selected for testing, a sample of sufficient size shall be randomly selected and tested to ensure that—

(*1*) Any represented value of energy consumption or other measure of energy use of a basic model for which consumers would favor lower values shall be greater than or equal to the higher of:

(*i*) The mean of the sample, where:

$$\bar{x} = \frac{1}{n}\sum_{i=1}^{n} x_i$$

and, $\bar{x}$ is the sample mean; n is the number of samples; and x_i is the i^{th} sample; or,

(*ii*) The upper 95 percent confidence limit (UCL) of the true mean divided by 1.05, where:

$$UCL = \bar{x} + t_{0.95}\left(\frac{s}{\sqrt{n}}\right)$$

And $\bar{x}$ is the sample mean; s is the sample standard deviation; n is the number of samples; and $t_{0.95}$ is the t statistic for a 95% one-tailed confidence interval with n − 1 degrees of freedom (from Appendix A to subpart B). And,

(*2*) Any represented value of energy efficiency or other measure of energy consumption of a basic model for which consumers would favor higher values shall be less than or equal to the lower of:

(*i*) The mean of the sample, where:

$$\bar{x} = \frac{1}{n}\sum_{i=1}^{n} x_i$$

And, $\bar{x}$ is the sample mean; n is the number of samples; and x_i is the i^{th} sample; or,

(*ii*) The lower 95 percent confidence limit (LCL) of the true mean divided by 0.95, where:

$$LCL = \bar{x} - t_{0.95}\left(\frac{s}{\sqrt{n}}\right)$$

And $\bar{x}$ is the sample mean; s is the sample standard deviation; n is the number of samples; and $t_{0.95}$ is the t statistic for a 95% one-tailed confidence interval with n − 1 degrees of freedom (from Appendix A to subpart B).

(ii) *Alternative efficiency determination methods.* In lieu of testing, a represented value of efficiency or consumption for a basic model of a walk-in cooler or freezer refrigeration system must be determined through the application of an AEDM pursuant to the requirements of § 429.70 and the provisions of this section, where:

(A) Any represented value of energy consumption or other measure of energy use of a basic model for which consumers would favor lower values shall be greater than or equal to the output of the AEDM and less than or equal to the Federal standard for that basic model; and

(B) Any represented value of energy efficiency or other measure of energy consumption of a basic model for which consumers would favor higher values shall be less than or equal to the output of the AEDM and greater than or equal to the Federal standard for that basic model.

(iii) If the represented value of a refrigeration system was determined using the unit cooler testing provisions at 10 CFR 431.304(c)(12), that represented value may be used for all refrigeration systems containing that unit cooler irrespective of whether such equipment is sold separately or as part of a matched refrigeration system. However, for any representations of matched-system efficiency that exceed the refrigeration system rating as determined by the unit cooler testing provisions at 10 CFR 431.304(c)(12) and for which a manufacturer wishes to make representations of the more-efficient rating, then the matched refrigeration system must be tested separately in accordance with the DOE test procedure for matched systems and applicable sampling plan.

(2) *WICF components other than those specified in (a)(1) of this section*—(i) *Units to be tested.*

(A) The general requirements of § 429.11 apply; and

(B) For each basic model selected for testing, a sample of sufficient size shall be randomly selected and tested to ensure that—

(*1*) Any represented value of energy consumption or other measure of energy use of a basic model for which consumers would favor lower values shall be greater than or equal to the higher of:

(*i*) The mean of the sample, where:

$$\bar{x} = \frac{1}{n}\sum_{i=1}^{n} x_i$$

and, $\bar{x}$ is the sample mean; n is the number of samples; and x_i is the i^{th} sample; or,

(*ii*) The upper 95 percent confidence limit (UCL) of the true mean divided by 1.05, where:

$$UCL = \bar{x} + t_{0.95}\left(\frac{s}{\sqrt{n}}\right)$$

And $\bar{x}$ is the sample mean; s is the sample standard deviation; n is the number of samples; and $t_{0.95}$ is the t statistic for a 95% one-tailed confidence interval with n − 1 degrees of freedom (from Appendix A to subpart B). And,

(*2*) Any represented value of energy efficiency or other measure of energy consumption of a basic model for which consumers would favor higher values shall be less than or equal to the lower of:

(*i*) The mean of the sample, where:

$$\bar{x} = \frac{1}{n}\sum_{i=1}^{n} x_i$$

And, $\bar{x}$ is the sample mean; n is the number of samples; and x_i is the i^{th} sample; or,

(*ii*) The lower 95 percent confidence limit (LCL) of the true mean divided by 0.95, where:

$$LCL = \bar{x} - t_{0.95}(\frac{s}{\sqrt{n}})$$

And $\bar{x}$ is the sample mean; s is the sample standard deviation; n is the number of samples; and $t_{0.95}$ is the t statistic for a 95% one-tailed confidence interval with n − 1 degrees of freedom (from Appendix A to subpart B).

(b) *Certification reports.* (1) The requirements of § 429.12 are applicable to manufacturers of the components of walk-in coolers and freezers (WICFs) listed in paragraph (b)(2) of this section, and;

(2) Pursuant to § 429.12(b)(13), a certification report shall include the following public product-specific information:

(i) For WICF doors: The door type, R-value of the door insulation, and a declaration that the manufacturer has incorporated the applicable design requirements. In addition, for those WICFs with transparent reach-in doors and windows: The glass type of the doors and windows (e.g., double-pane with heat reflective treatment, triple-pane glass with gas fill), and the power draw of the antisweat heater in watts per square foot of door opening.

(ii) For WICF panels: The R-value of the insulation (except for glazed portions of the doors or structural members).

(iii) For WICF refrigeration systems: The motor's purpose (i.e., evaporator fan motor or condenser fan motor), the horsepower, and a declaration that the manufacturer has incorporated the applicable design requirements.

■ 3. Section 429.70 is amended by adding paragraph (f) to read as follows:

§ 429.70 Alternative methods for determining energy efficiency or energy use.

* * * * *

(f) *Alternative efficiency determination method (AEDM) for walk-in refrigeration equipment*—

(1) *Criteria an AEDM must satisfy.* A manufacturer may not apply an AEDM to a basic model to determine its efficiency pursuant to this section unless:

(i) The AEDM is derived from a mathematical model that estimates the energy efficiency or energy consumption characteristics of the basic model as measured by the applicable DOE test procedure;

(ii) The AEDM is based on engineering or statistical analysis, computer simulation or modeling, or other analytical evaluation of performance data; and

(iii) The manufacturer has validated the AEDM, in accordance with paragraph (f)(2) of this section.

(2) *Validation of an AEDM.* Before using an AEDM, the manufacturer must validate the AEDM's accuracy and reliability as follows:

(i) The manufacturer must select at least the minimum number of basic models for each validation class specified in paragraph (f)(2)(iv) of this section to which the particular AEDM applies. Test a single unit of each basic model in accordance with paragraph (f)(2)(iii) of this section. Using the AEDM, calculate the energy use or energy efficiency for each of the selected basic models. Compare the results from the single unit test and the AEDM output according to paragraph (f)(2)(ii) of this section. The manufacturer is responsible for ensuring the accuracy and repeatability of the AEDM.

(ii) *Individual model tolerances.* (A) The predicted efficiency for each model calculated by applying the AEDM may not be more than five percent greater than the efficiency determined from the corresponding test of the model.

(B) The predicted energy efficiency for each model calculated by applying the AEDM must meet or exceed the applicable federal energy conservation standard.

(iii) *Additional test unit requirements.* (A) Each AEDM must be supported by test data obtained from physical tests of current models; and

(B) Test results used to validate the AEDM must meet or exceed current, applicable Federal standards as specified in part 431 of this chapter;

(C) Each test must have been performed in accordance with the applicable DOE test procedure with which compliance is required at the time the basic model is distributed in commerce; and

(D) For rating WICF refrigeration system components, an AEDM may not simulate or model portions of the system that are not required to be tested by the DOE test procedure. That is, if the test results used to validate the AEDM are for either a unit cooler only or a condensing unit only, the AEDM must estimate the system rating using the nominal values specified in the DOE test procedure for the other part of the refrigeration system.

(iv) *WICF refrigeration validation classes.*

Validation class	Minimum number of distinct models that must be tested
Dedicated Condensing, Medium Temperature, Indoor System	2 Basic Models.
Dedicated Condensing, Medium Temperature, Outdoor System [1]	2 Basic Models.
Dedicated Condensing, Low Temperature, Indoor System	2 Basic Models.
Dedicated Condensing, Low Temperature, Outdoor System [2]	2 Basic Models.
Unit Cooler connected to a Multiplex Condensing Unit, Medium Temperature	2 Basic Models.
Unit Cooler connected to a Multiplex Condensing Unit, Low Temperature	2 Basic Models.
Medium Temperature, Indoor Condensing Unit	2 Basic Models.
Medium Temperature, Outdoor Condensing Unit [3]	2 Basic Models.
Low Temperature, Indoor Condensing Unit	2 Basic Models.
Low Temperature, Outdoor Condensing Unit [4]	2 Basic Models.

[1] AEDMs validated for dedicated condensing, medium temperature, outdoor systems may be used to determine representative values for dedicated condensing, medium temperature, indoor systems, and additional validation testing is not required. AEDMs validated for only dedicated condensing, medium temperature, indoor systems may not be used to determine representative values for dedicated condensing, medium temperature, outdoor systems.

[2] AEDMs validated for dedicated condensing, low temperature, outdoor systems may be used to determine representative values for dedicated condensing, low temperature, indoor systems, and additional validation testing is not required. AEDMs validated for only dedicated condensing, low temperature, indoor systems may not be used to determine representative values for dedicated condensing, low temperature, outdoor systems.

[3] AEDMs validated for medium temperature, outdoor condensing units may be used to determine representative values for medium temperature, indoor condensing units, and additional validation testing is not required. AEDMs validated for only medium temperature, indoor condensing units may not be used to determine representative values for medium temperature, outdoor condensing units.

[4] AEDMs validated for low temperature, outdoor condensing units may be used to determine representative values for low temperature, indoor condensing units, and additional validation testing is not required. AEDMs validated for only low temperature, indoor condensing units may not be used to determine representative values for low temperature, outdoor condensing units.

(3) *AEDM records retention requirements.* If a manufacturer has used an AEDM to determine representative values pursuant to this section, the manufacturer must have available upon request for inspection by the Department records showing:

(i) The AEDM, including the mathematical model, the engineering or statistical analysis, and/or computer simulation or modeling that is the basis of the AEDM;

(ii) Equipment information, complete test data, AEDM calculations, and the statistical comparisons from the units tested that were used to validate the AEDM pursuant to paragraph (f)(2) of this section; and

(iii) Equipment information and AEDM calculations for each basic model to which the AEDM has been applied.

(4) *Additional AEDM requirements.* If requested by the Department the manufacturer must perform at least one of the following:

(i) Conduct simulations before representatives of the Department to predict the performance of particular basic models of the product to which the AEDM was applied;

(ii) Provide analyses of previous simulations conducted by the manufacturer; or

(iii) Conduct certification testing of basic models selected by the Department.

(5) *AEDM verification testing.* DOE may use the test data for a given individual model generated pursuant to § 429.104 to verify the certified rating determined by an AEDM as long as the following process is followed:

(i) *Selection of units.* DOE will obtain units for test from retail, where available. If units cannot be obtained from retail, DOE will request that a unit be provided by the manufacturer.

(ii) *Lab requirements.* DOE will conduct testing at an independent, third-party testing facility of its choosing. In cases where no third-party laboratory is capable of testing the equipment, it may be tested at a manufacturer's facility upon DOE's request.

(iii) *Manufacturer participation.* Testing will be performed without manufacturer representatives on-site.

(iv) *Testing.* All verification testing will be conducted in accordance with the applicable DOE test procedure, as well as each of the following to the extent that they apply:

(A) Any active test procedure waivers that have been granted for the basic model;

(B) Any test procedure guidance that has been issued by DOE;

(C) If during test set-up or testing, the lab indicates to DOE that it needs additional information regarding a given basic model in order to test in accordance with the applicable DOE test procedure, DOE may organize a meeting between DOE, the manufacturer and the lab to provide such information.

(D) At no time during the process may the lab communicate directly with the manufacturer without DOE present.

(v) *Failure to meet certified rating.* If a model tests worse than its certified rating by an amount exceeding the tolerance prescribed in paragraph (f)(5)(vi) of this section, DOE will notify the manufacturer. DOE will provide the manufacturer with all documentation related to the test set up, test conditions, and test results for the unit. Within the timeframe allotted by DOE, the manufacturer may then present all claims regarding testing validity.

(vi) *Tolerances.* for efficiency metrics, the result from a DOE verification test must be greater than or equal to the certified rating × (1 − the applicable tolerance).

Equipment	Metric	Applicable tolerance
Refrigeration systems (including components)	AWEF	5%

(vii) *Invalid rating.* If, following discussions with the manufacturer and a retest where applicable, DOE determines that the testing was conducted appropriately in accordance with the DOE test procedure, the rating for the model will be considered invalid. Pursuant to 10 CFR 429.13(b), DOE may require a manufacturer to conduct additional testing as a remedial measure.

PART 431—ENERGY CONSERVATION PROGRAM FOR CERTAIN COMMERCIAL AND INDUSTRIAL EQUIPMENT

■ 4. The authority citation for part 431 continues to read as follows:

Authority: 42 U.S.C. 6291–6317.

§ 431.303 [Amended]

■ 5. Section 431.303 is amended by:
■ a. Removing and reserving paragraph (c)(2);
■ b. Removing paragraph (d); and
■ c. Redesignating paragraph (e) as (d).

■ 6. Section 431.304 is amended by:
■ a. Revising paragraphs (b) introductory text, and (b)(3) through (6);
■ b. Adding paragraph (b)(7);
■ c. Revising paragraphs (c) introductory text, and (c)(3) through (6);
■ d. Redesignating paragraphs (c)(7) through (c)(10) as paragraphs (c)(8) through (c)(11), respectively;
■ e. Adding new paragraph (c)(7);
■ f. Revising redesignated paragraph (c)(8), (c)(9) and (c)(10); and,
■ g. Adding paragraph (c)(12).

The revisions and additions read as follows:

§ 431.304 Uniform test method for the measurement of energy consumption of walk-in coolers and walk-in freezers.

* * * * *

(b) This paragraph (b) shall be used for the purposes of certifying compliance with the applicable R-value energy conservation standards for panels until compliance with amended standards is required.

* * * * *

(3) When calculating the R value for freezers, the K factor of the foam at 20 ± 1 degrees Fahrenheit (average foam temperature) shall be used. Test results from a test sample 1 ± 0.1-inches in thickness may be used to determine the R value of panels with various foam thickness as long as the foam is of the same final chemical form.

(4) When calculating the R value for coolers, the K factor of the foam at 55 ± 1 degrees Fahrenheit (average foam temperature) shall be used. Test results from a test sample 1 ± 0.1-inches in thickness may be used to determine the R value of panels with various foam thickness as long as the foam is of the same final chemical form.

(5) Foam shall be tested after it is produced in its final chemical form. (For foam produced inside of a panel (''foam-in-place''), ''final chemical form'' means the foam is cured as intended and ready for use as a finished panel. For foam produced as board stock (typically polystyrene), ''final chemical form'' means after extrusion and ready for assembly into a panel or after assembly into a panel.) Foam from foam-in-place panels must not include any structural members or non-foam materials. Foam produced as board stock may be tested prior to its incorporation into a final panel. A test sample 1 ± 0.1-inches in thickness must be taken from the center of a panel and any protective skins or facers must be removed. A high-speed band-saw and a meat slicer are two types of recommended cutting tools. Hot wire cutters or other heated tools must not be used for cutting foam test samples. The two surfaces of the test sample that will contact the hot plate assemblies (as defined in ASTM C518 (incorporated by reference, see § 431.303)) must both maintain ±0.03 inches flatness tolerance and also maintain parallelism with respect to one another within ±0.03 inches. Testing must be completed within 24 hours of samples being cut for testing.

(6) Internal non-foam member and/or edge regions shall not be considered in ASTM C518 testing.

(7) For panels consisting of two or more layers of dissimilar insulating materials (excluding facers or protective skins), test each material as described in paragraphs (c)(1) through (6) of this section. For a panel with *N* layers of insulating material, the overall R-Value shall be calculated as follows:

$$R_{panel} = \sum_{i=1}^{N} \frac{t_i}{k_i}$$

Where:

k_i is the k factor of the *i*th material as measured by ASTM C518,

t_i is the thickness of the *i*th material that appears in the panel, and

N is the total number of material layers that appears in the panel.

(c) This paragraph (c) shall be used for any representations of energy efficiency or energy use starting on October 12, 2011, and to certify compliance to the energy conservation standards of the R-value of panels on or after the compliance date of amended energy conservation standards for walk-in cooler and freezers.

* * * * *

(3) For calculating the R value for freezers, the K factor of the foam at 20 ± 1 degrees Fahrenheit (average foam temperature) shall be used. Test results from a test sample 1 ± 0.1-inches in thickness may be used to determine the R value of panels with various foam thickness as long as the foam is of the same final chemical form.

(4) For calculating the R value for coolers, the K factor of the foam at 55 ± 1 degrees Fahrenheit (average foam temperature) shall be used. Test results from a test sample 1 ± 0.1-inches in thickness may be used to determine the R value of panels with various foam thickness as long as the foam is of the same final chemical form.

(5) Foam shall be tested after it is produced in its final chemical form. (For foam produced inside of a panel (''foam-in-place''), ''final chemical form'' means the foam is cured as intended and ready for use as a finished panel. For foam produced as board stock (typically polystyrene), ''final chemical form'' means after extrusion and ready for assembly into a panel or after assembly into a panel.) Foam from foam-in-place panels must not include any structural members or non-foam materials. Foam produced as board stock may be tested prior to its incorporation into a final panel. A test sample 1 ± 0.1-inches in thickness must be taken from the center of a panel and any protective skins or facers must be removed. A high-speed band-saw and a meat slicer are two types of recommended cutting tools. Hot wire cutters or other heated tools must not be used for cutting foam test samples. The two surfaces of the test sample that will contact the hot plate assemblies (as defined in ASTM C518 (incorporated by reference, see § 431.303)) must both maintain ±0.03 inches flatness tolerance and also maintain parallelism with respect to one another within ±0.03 inches. Testing must be completed within 24 hours of samples being cut for testing.

(6) Internal non-foam member and/or edge regions shall not be considered in ASTM C518 testing.

(7) For panels consisting of two or more layers of dissimilar insulating materials (excluding facers or protective skins), test each material as described in paragraphs (c)(1) through (6) of this section. For a panel with *N* layers of insulating material, the overall R-Value shall be calculated as follows:

$$R_{panel} = \sum_{i=1}^{N} \frac{t_i}{k_i}$$

Where:

k_i is the k factor of the *i*th material as measured by ASTM C518, and

t_i is the thickness of the *i*th material that appears in the panel.

N is the total number of material layers that appears in the panel.

(8) Determine the U-factor, conduction load, and energy use of walk-in cooler and walk-in freezer display panels by conducting the test procedure set forth in appendix A to this subpart section 4.1.

(9) Determine the energy use of walk-in cooler and walk-in freezer display doors and non-display doors by conducting the test procedure set forth in appendix A to this subpart, sections 4.4 and 4.5, respectively.

(10) Determine the Annual Walk-in Energy Factor of walk-in cooler and walk-in freezer refrigeration systems by conducting the test procedure set forth in AHRI 1250–2009 (incorporated by reference; see § 431.303), with the following modifications:

(i) In Table 2, Test Operating and Test Condition Tolerances for Steady-State Test, electrical power frequency shall have a Test Condition Tolerance of 1 percent. Also, refrigerant temperature measurements shall have a tolerance of ± 0.5 F for unit cooler in/out, ± 1.0 F for all other temperature measurements.

(ii) In Table 2, the Test Operating Tolerances and Test Condition Tolerances for Air Leaving Temperatures shall be deleted.

(iii) In Tables 2 through 14, The Test Condition Outdoor Wet Bulb Temperature requirement and its associated tolerance apply only to units with evaporative cooling.

(iv) In section C3.1.6, refrigerant temperature measurements upstream and downstream of the unit cooler may use sheathed sensors immersed in the flowing refrigerant instead of thermometer wells.

(v) In section C3.5, for a given motor winding configuration, the total power input shall be measured at the highest nameplate voltage. For three-phase power, voltage imbalances shall be no more than 2 percent from phase to phase.

(vi) In the test setup (section C8.3), the condenser and unit cooler shall be connected by pipes of the manufacturer-specified size. The pipe lines shall be insulated with a minimum total thermal resistance equivalent to ½″ thick insulation having a flat-surface R-Value of 3.7 ft²-°F-hr/Btu per inch or greater. Flow meters need not be insulated but must not be in contact with the floor. The lengths of the connected liquid line and suction line shall be 25 feet, not including the requisite flow meters, each. Of this length, no more than 15 feet shall be in the conditioned space. In the case where there are multiple branches of piping, the maximum length of piping applies to each branch individually as opposed to the total length of the piping.

(vii) In section C3.4.5, for verification of sub-cooling downstream of mass flow meters, only the sight glass and a temperature sensor located on the tube surface under the insulation are required.

(viii) Delete section C3.3.6.

(ix) In section C11.1, to determine frost load defrost conditions, the Frost Load Conditions Defrost Test (C11.1.1) is optional. If the frost load test is not performed, the frost load defrost DF_f shall be equal to 1.05 multiplied by the dry coil energy consumption DF_d measured using the dry coil condition test in section C11.1 and the number of defrosts per day N_{DF} shall be set to 4.

(x) In section C11.2, if the system has an adaptive or demand defrost system, the optional test may be run as specified to establish the number of defrosts per day under dry coil conditions and this number shall be averaged with the number of defrosts per day calculated under the frost load conditions. If the system has an adaptive or demand defrost system and the optional test is not run, the number of defrosts per day N_{DF} shall be set to the average of 1 and the number of defrosts per day calculated under the frost load conditions (paragraph (c)(8)(ix) of this section).

(xi) In section C11.3, if the frost load test is not performed, the daily contribution of the load attributed to defrost Q_{DF} in Btu shall be calculated as follows:

$$Q_{DF} = 0.95 \times 3.412 \text{ Btu/W-h} \times \frac{DF_d + DF_f}{2} \times N_{DF}$$

Where:

DF_d = the defrost energy, in W-h, at the dry coil condition

DF_f = the defrost energy, in W-h, at the frosted coil condition

N_{DF} = the number of defrosts per day

(xii) In section C11, if the unit utilizes hot gas defrost, Q_{DF} and DF shall be calculated as follows:

Q_{DF} = 0.18 Btu/defrost per Btu/h capacity $\times Q_{ref} \times N_{DF}$

Where:

Q_{ref} = Gross refrigeration capacity in Btu/h as measured at the high ambient condition (90 °F for indoor systems and 95 °F for outdoor systems)

N_{DF} = Number of defrosts per day; this value shall be set to the number recommended in the installation instructions for the unit (or if no instructions, shall be set to 4) for units without adaptive defrost and 2.5 for units with adaptive defrost

For unit coolers connected to a multiplex system: The defrost energy, DF, in W-h = 0

For dedicated condensing systems or condensing units tested separately:

$DF = 0.5 \times Q_{DF}/3.412$ Btu/W-h

(xiii) Delete section C3.4.6.

(xiv) *Off-cycle evaporator fan test.* In lieu of section C10, follow the following procedures: Upon the completion of the steady state test for walk-in systems, the compressors of the walk-in systems shall be turned off. The unit cooler's fans' power consumption shall be measured in accordance with the requirements in Section C3.5. Off-cycle fan power shall be equal to on-cycle fan power unless evaporator fans are controlled by a qualifying control. Qualifying evaporator fan controls shall have a user adjustable method of destratifying air during the off-cycle including but not limited to: adjustable fan speed control or periodic ''stir cycles.'' Qualifying evaporator fan controls shall be adjusted so that the greater of a 50% duty cycle or the manufacturer default is used for measuring off-cycle fan energy. For variable speed controls, the greater of 50% fan speed or the manufacturer's default fan speed shall be used for measuring off-cycle fan energy. When a cyclic control is used at least three full ''stir cycles'' are measured.

(xv) In lieu of Table 15 and Table 16, use the following Tables:

TABLE 15—REFRIGERATOR UNIT COOLER

Test description	Unit cooler air entering dry-bulb, °F	Unit cooler air entering relative humidity, %	Saturated suction temp, °F	Liquid inlet saturation temp, °F	Liquid inlet subcooling temp, °F	Compressor capacity	Test objective
Off Cycle Fan Power.	35	<50	—	—	—	Compressor Off.	Measure fan input power during compressor off cycle.
Refrigeration Capacity Suction A.	35	<50	25	105	9	Compressor On.	Determine Net Refrigeration Capacity of Unit Cooler.
Refrigeration Capacity Suction B.	35	<50	20	105	9	Compressor On.	Determine Net Refrigeration Capacity of Unit Cooler.

Note: Superheat to be set according to equipment specification in equipment or installation manual. If no superheat specification is given, a default superheat value of 6.5 °F shall be used. The superheat setting used in the test shall be reported as part of the standard rating.

TABLE 16—FREEZER UNIT COOLER

Test Description	Unit cooler air entering dry-bulb, °F	Unit cooler air entering relative humidity, %	Saturated suction temp, °F	Liquid inlet saturation temp, °F	Liquid inlet subcooling temp, °F	Compressor capacity	Test objective
Off Cycle Fan Power.	−10	<50	—	—	—	Compressor Off.	Measure fan input power during compressor off cycle.
Refrigeration Capacity Suction A.	−10	<50	25	105	9	Compressor On.	Determine Net Refrigeration Capacity of Unit Cooler.
Refrigeration Capacity Suction B.	−10	<50	20	105	9	Compressor On.	Determine Net Refrigeration Capacity of Unit Cooler.
Defrost	−10	Various	—	—	—	Compressor Off.	Test according to Appendix C Section C11.

Note: Superheat to be set according to equipment specification in equipment or installation manual. If no superheat specification is given, a default superheat value of 6.5 °F shall be used. The superheat setting used in the test shall be reported as part of the standard rating.

* * * * *

(12) *Calculation of AWEF for a walk-in cooler and freezer refrigeration system component distributed individually.* This section only applies to fixed capacity condensing units. Multiple-capacity condensing units must be tested as part of a matched system.

(i) Calculate the AWEF for a refrigeration system containing a unit cooler that is distributed individually using the method for testing a unit cooler connected to a multiplex condensing system.

(ii) Calculate the AWEF for a refrigeration system containing a condensing unit that is distributed individually using the following nominal values:

Saturated suction temperature at the evaporator coil exit T_{evap} (°F) = 25 for coolers and −20 for freezers

For medium temperature (cooler) condensing units: On-cycle evaporator fan power $EF_{comp,\ on}$ (W) = 0.016 W-h/Btu × $q_{mix,\ cd}$ (Btu/h); where $q_{mix,\ cd}$ is the gross cooling capacity at the highest ambient rating condition (90 °F for indoor units and 95 °F for outdoor units)

For low temperature (freezer) condensing units: On-cycle evaporator fan power $EF_{comp,\ on}$ (W) = 0.016 W-h/Btu × $q_{mix,\ cd}$ (Btu/h); where $q_{mix,\ cd}$ is the gross cooling capacity at the highest ambient rating condition (90 °F for indoor units and 95 °F for outdoor units)

Off-cycle evaporator fan power $EF_{comp,\ off}$ (W) = 0.2 × $EF_{comp,\ on}$ (W)

For medium temperature (cooler) condensing units: Daily defrost energy use DF (W-h) = 0 and daily defrost heat load contribution Q_{DF} (Btu) = 0

For low temperature (freezer) condensing units without hot gas defrost capability:

Daily defrost energy use DF (W-h) = 8.5 × 10^{-3} × ($q_{mix,\ cd}$ (Btu/h))$^{1.27}$ × N_{DF} for freezers

Defrost heat load contribution Q_{DF} (Btu) = 0.95 × DF (W-h)/3.412 Btu/W-h

For low temperature (freezer) condensing units with hot gas defrost capability, DF and Q_{DF} shall be calculated using the method in paragraph (c)(10)(xii) of this section.

The number of defrost cycles per day (N_{DF}) shall be set to the number recommended in the installation instructions for the unit (or if no instructions, shall be set to 2.5).

■ 7. Appendix A to Subpart R of Part 431 is amended by:

■ a. Removing and reserving sections 4.2, 4.3, 5.1, and 5.2;

■ b. Revising paragraph 5.3(a)(1);

■ c. Removing in paragraph 5.3(a)(2) introductory text ''Internal'' and adding ''Cold-side'' in its place; and

■ d. Removing in paragraph 5.3(a)(3) introductory text ''External'' and adding ''Warm-side'' in its place.

The revision reads as follows:

Appendix A to Subpart R of Part 431—Uniform Test Method for the Measurement of Energy Consumption of the Components of Envelopes of Walk-In Coolers and Walk-In Freezers

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4.2 [Reserved]

4.3 [Reserved]

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5.1 [Reserved]

5.2 [Reserved]

5.3 * * *

(a) * * *

(1) The average surface heat transfer coefficient on the cold-side of the apparatus shall be 30 Watts per square-meter-Kelvin ($W/m^2 * K$) ± 5%. The average surface heat transfer coefficient on the warm-side of the apparatus shall be 7.7 Watts per square-meter-Kelvin ($W/m^2 * K$) ± 5%.

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