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[6450-01-P]

DEPARTMENT OF ENERGY

10 CFR Part 431

[EERE-2017-BT-TP-0008]

RIN 1904-AD83

Energy Conservation Program: Test Procedure for Commercial Refrigerators, Refrigerator-Freezers, and Freezers

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

ACTION: Notice of proposed rulemaking and announcement of public meeting.

SUMMARY: The U.S. Department of Energy ("DOE") proposes to amend the test procedures for commercial refrigerators, refrigerator-freezers, and freezers to reference the latest versions of the applicable industry standards. DOE also proposes to establish definitions and test procedures for new equipment categories, adopt test procedures consistent with recently published waivers and interim waivers, establish product-specific enforcement provisions, allow for volume determinations based on computer aided designs, specify a sampling plan for volume and total display area, and adopt additional clarifying amendments. DOE is seeking comment from interested parties on the proposal.

DATES: DOE will accept comments, data, and information regarding this proposal no later than **[INSERT DATE 60 DAYS AFTER DATE OF PUBLICATION IN THE**

***FEDERAL REGISTER*]**. See section [V], "Public Participation," for details. DOE will hold a webinar on Monday, August 1, 2022, from 1:00 p.m. to 4:00 p.m. See section V, "Public Participation," for webinar registration information, participant instructions, and information about the capabilities available to webinar participants.

ADDRESSES: Interested persons are encouraged to submit comments using the Federal eRulemaking Portal at *www.regulations.gov* under docket number EERE–2017–BT–TP-0008. Follow the instructions for submitting comments. Alternatively, interested persons may submit comments, identified by docket number EERE–2017–BT–TP-0008, by any of the following methods:

1) *Email*: *CRE2017TP0008@ee.doe.gov*. Include the docket number EERE–2017–BT–TP-0008 in the subject line of the message.

2) *Postal Mail*: Appliance and Equipment Standards Program, U.S. Department of Energy, Building Technologies Office, Mailstop EE-5B, 1000 Independence Avenue, SW., Washington, DC, 20585-0121. Telephone: (202) 287-1445. If possible, please submit all items on a compact disc ("CD"), in which case it is not necessary to include printed copies.

3) *Hand Delivery/Courier*: Appliance and Equipment Standards Program, U.S. Department of Energy, Building Technologies Office, 950 L'Enfant Plaza, SW., 6th Floor, Washington, DC, 20024. Telephone: (202) 287-1445. If

possible, please submit all items on a CD, in which case it is not necessary to include printed copies.

No telefacsimiles ("faxes") will be accepted. For detailed instructions on submitting comments and additional information on this process, see section V of this document.

Docket: The docket, which includes *Federal Register* notices, public meeting attendee lists and transcripts (if a public meeting is held), comments, and other supporting documents/materials, is available for review at *www.regulations.gov*. All documents in the docket are listed in the *www.regulations.gov* index. However, some documents listed in the index, such as those containing information that is exempt from public disclosure, may not be publicly available.

The docket web page can be found at *www.regulations.gov/docket/EERE-2017-BT-TP-0008*. The docket web page contains instructions on how to access all documents, including public comments, in the docket. See section V for information on how to submit comments through *www.regulations.gov*.

FOR FURTHER INFORMATION CONTACT:

Dr. Stephanie Johnson, U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, Building Technologies Office, EE-2J, 1000 Independence Avenue, SW., Washington, DC, 20585-0121. Telephone: (202) 287-1943. E-mail *ApplianceStandardsQuestions@ee.doe.gov*.

Mr. Peter Cochran, U.S. Department of Energy, Office of the General Counsel, GC-33, 1000 Independence Avenue, SW., Washington, DC, 20585-0121. Telephone: (202) 586-9496. E-mail: *Peter.Cochran@Hq.Doe.Gov*.

For further information on how to submit a comment, review other public comments and the docket, or participate in a public meeting (if one is held), contact the Appliance and Equipment Standards Program staff at (202) 287-1445 or by e-mail: *ApplianceStandardsQuestions@ee.doe.gov*.

SUPPLEMENTARY INFORMATION:

DOE proposes to maintain previously approved incorporations by reference and to incorporate by reference the following industry standards into 10 CFR part 431:

Air-Conditioning, Heating, and Refrigeration Institute ("AHRI") Standard 1200, ("AHRI 1200-202X"), "Performance Rating of Commercial Refrigerated Display Merchandisers and Storage Cabinets," draft version submitted to DOE with expected publication in 2022.

American National Standards Institute ("ANSI")/AHRI Standard 1320, ("ANSI/AHRI 1320-2011"), "Performance Rating of Commercial Refrigerated Display Merchandisers and Storage Cabinets for Use With Secondary Refrigerants," approved 2011.

ANSI/American Society of Heating, Refrigerating, and Air-Conditioning Engineers ("ASHRAE") Standard 72, ("ANSI/ASHRAE 72-2018R"), "Method of

Testing Open and Closed Commercial Refrigerators and Freezers," second public review version with expected publication in 2022.

American Society for Testing and Materials, ("ASTM F2143-16"), "Standard Test Method for Performance of Refrigerated Buffet and Preparation Tables," approved 2016.

Copies of the draft version of AHRI 1200-202X can be obtained by going to *www.regulations.gov/docket/EERE-2017-BT-TP-0008*. Copies of AHRI 1320-2011 can be obtained by going to *ahri.net.org/search-standards*. Copies of the second public review version of ASHRAE 72-2018R can be obtained by going to *www.regulations.gov/docket/EERE-2017-BT-TP-0008*. Copies of ASTM F2143-16 can be purchased at *www.astm.org/f2143-16.html*.

For a further discussion of these standards, see section IV.M of this document.

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I. Authority and Background

Commercial refrigerators, refrigerator-freezers, and freezers (collectively, commercial refrigeration equipment, or "CRE") are included in the list of "covered equipment" for which DOE is authorized to establish and amend energy conservation standards and test procedures. (42 U.S.C. 6311)(1)(E)) DOE's energy conservation standards and test procedures for CRE are currently prescribed at subpart C of part 431 of title 10 of the Code of Federal Regulations ("CFR"). The following sections discuss DOE's authority to establish test procedures for CRE and relevant background information regarding DOE's consideration of test procedures for this equipment.

A. Authority

The Energy Policy and Conservation Act, as amended ("EPCA"),[1] authorizes DOE to regulate the energy efficiency of a number of consumer products and certain industrial equipment. (42 U.S.C. 6291–6317) Title III, Part C[2] of EPCA, added by Pub.

[1] All references to EPCA in this document refer to the statute as amended through the Energy Act of 2020, Pub. L. 116-260 (Dec. 27, 2020), which reflect the last statutory amendments that impact Parts A and A-1 of EPCA.

[2] For editorial reasons, upon codification in the U.S. Code, Part C was redesignated Part A-1.

L. 95-619, Title IV, section 441(a), established the Energy Conservation Program for Certain Industrial Equipment, which sets forth a variety of provisions designed to improve energy efficiency. This equipment includes CRE, the subject of this document. (42 U.S.C. 6311 (1)(E))

The energy conservation program under EPCA consists essentially of four parts: (1) testing, (2) labeling, (3) Federal energy conservation standards, and (4) certification and enforcement procedures. Relevant provisions of EPCA specifically include definitions (42 U.S.C. 6311), test procedures (42 U.S.C. 6314), labeling provisions (42 U.S.C. 6315), energy conservation standards (42 U.S.C. 6313), and the authority to require information and reports from manufacturers (42 U.S.C. 6316; 42 U.S.C. 6296).

The Federal testing requirements consist of test procedures that manufacturers of covered equipment must use as the basis for: (1) certifying to DOE that their equipment complies with the applicable energy conservation standards adopted pursuant to EPCA (42 U.S.C. 6316(a); 42 U.S.C. 6295(s)), and (2) making representations about the efficiency of that equipment (42 U.S.C. 6314(d)). Similarly, DOE must use these test procedures to determine whether the equipment complies with relevant standards promulgated under EPCA. (42 U.S.C 6316(a); 42 U.S.C. 6295(s))

Federal energy efficiency requirements for covered equipment established under EPCA generally supersede State laws and regulations concerning energy conservation testing, labeling, and standards. (42 U.S.C. 6316(a) and 42 U.S.C. 6316(b); 42 U.S.C. 6297) DOE may, however, grant waivers of Federal preemption for particular State laws

or regulations, in accordance with the procedures and other provisions of EPCA. (42 U.S.C. 6316(b)(2)(D))

Under 42 U.S.C. 6314, EPCA sets forth the criteria and procedures DOE must follow when prescribing or amending test procedures for covered equipment. EPCA requires that any test procedures prescribed or amended under this section must be reasonably designed to produce test results which reflect energy efficiency, energy use or estimated annual operating cost of a given type of covered equipment during a representative average use cycle and requires that test procedures not be unduly burdensome to conduct. (42 U.S.C. 6314(a)(2))

With respect to CRE, EPCA requires DOE to use the test procedures determined by the Secretary to be generally accepted industry standards, or industry standards developed or recognized by the American Society of Heating, Refrigerating, and Air-Conditioning Engineers ("ASHRAE") or American National Standards Institute ("ANSI"). (42 U.S.C. 6314(a)(6)(A)(i)) With regard to self-contained CRE to which statutory standards are applicable, the required initial test procedure is the ASHRAE 117 test procedure in effect on January 1, 2005. (42 U.S.C. 6314(a)(6)(A)(ii)) Additionally, EPCA requires that if ANSI 117 is amended, the Secretary shall, by rule, amend the test procedure for the product as necessary to ensure that the test procedure is consistent with the amended ASHRAE 117 test procedure, unless the Secretary makes a determination, by rule, and supported by clear and convincing evidence, that to do so would not meet the statutory requirements regarding representativeness and burden. (42 U.S.C. 6314(a)(6)(E)) Finally, EPCA states if a test procedure other than the ASHRAE 117 test

procedure is approved by ANSI, DOE must review the relative strengths and weaknesses of the new test procedure relative to the ASHRAE 117 test procedure and adopt one new test procedure for use in the standards program. (42 U.S.C. 6314(a)(6)(F)(i))[3]

EPCA also requires that, at least once every 7 years, DOE evaluate test procedures for each type of covered equipment, including CRE, to determine whether amended test procedures would more accurately or fully comply with the requirements for the test procedures to not be unduly burdensome to conduct and be reasonably designed to produce test results that reflect energy efficiency, energy use, and estimated operating costs during a representative average use cycle. (42 U.S.C. 6314(a)(1))

In addition, if the Secretary determines that a test procedure amendment is warranted, the Secretary must publish proposed test procedures in the *Federal Register,* and afford interested persons an opportunity (of not less than 45 days' duration) to present oral and written data, views, and arguments on the proposed test procedures. (42 U.S.C. 6314(b)) If DOE determines that test procedure revisions are not appropriate, DOE must publish its determination not to amend the test procedures. DOE is publishing this notice of proposed rulemaking ("NOPR") in satisfaction of the 7-year review requirement specified in EPCA. (42 U.S.C. 6314(a)(1)(A)(ii))

[3] In 2005, ASHRAE combined Standard 72-1998, "Method of Testing Open Refrigerators," and Standard 117-2002 and published the test method as ASHRAE Standard 72-2005, "Method of Testing Commercial Refrigerators and Freezers," which was approved by ANSI on July 29, 2005.

B. Background

DOE's current test procedure for CRE appears at 10 CFR part 431, subpart C, appendix B ("Amended Uniform Test Method for the Measurement of Energy Consumption of Commercial Refrigerators, Freezers, and Refrigerator-Freezers").

DOE last amended the test procedure for CRE in a final rule published on April 24, 2014. ("April 2014 Final Rule"). 79 FR 22277. Specifically, DOE clarified certain terms, procedures, and compliance dates to improve repeatability and provide additional detail compared to the prior version of the test procedure. DOE noted that the amendments in the April 2014 Final Rule would not affect the measured energy use of CRE as measured under the prior version of the test procedure. 79 FR 22277, 22280–22281.

The test procedure incorporates by reference the following industry standards: (1) Air-Conditioning, Heating, and Refrigeration Institute ("AHRI") Standard 1200 (I-P)-2010 ("AHRI 1200-2010"), "Performance Rating of Commercial Refrigerated Display Merchandisers and Storage Cabinets"; (2) ASHRAE Standard 72-2005 ("ASHRAE 72-2005"), "Method of Testing Commercial Refrigerators and Freezers," which was approved by the American National Standards Institute ("ANSI") on July 29, 2005; and (3) ANSI/Association of Home Appliances ("AHAM") Standard HRF-1-2008 ("AHAM HRF-1-2008"), "Energy, Performance, and Capacity of Household Refrigerators, Refrigerator-Freezers, and Freezers," for determining refrigerated volumes for CRE.

On June 11, 2021, DOE published in the *Federal Register* an early assessment request for information ("June 2021 RFI") seeking comments on the existing DOE test procedure for CRE. 86 FR 31182. In the June 2021 RFI, DOE requested comments, information, and data regarding a number of issues, including (1) scope and definitions, (2) updates to industry standards, (3) test conditions for specific CRE categories, (4) harmonization with food safety standards, (5) remote condensing units, (6) test procedure clarifications, (7) alternative refrigerants, (8) compartment volume certification, and (9) test procedure waivers.

DOE received comments in response to the June 2021 RFI from the interested parties listed in Table I.1.

Table I.1 List of Commenters with Written Comments Received in Response to June 2021 RFI

Commenter(s)	Reference in this NOPR	Commenter Type
ITW-Food Equipment Group, LLC	ITW	Manufacturer
Air-Conditioning, Heating, and Refrigeration Institute	AHRI	Trade Association
True Manufacturing Company, Inc.	True	Manufacturer
Northwest Energy Efficiency Alliance	NEEA	Efficiency Organization
Continental Refrigerator	Continental	Manufacturer
Institute for Governance & Sustainable Development	IGSD	Efficiency Organization
Pacific Gas and Electric Company, Southern California Edison, and San Diego Gas & Electric; collectively, the California Investor-Owned Utilities	CA IOUs	Energy Utilities
Arneg USA	Arneg	Manufacturer
Hoshizaki America, Inc.	Hoshizaki	Manufacturer
Hussmann Corporation	Hussmann	Manufacturer
Appliance Standards Awareness Program, American Council for an Energy-Efficient Economy, and Natural Resource Defense Council	Joint Commenters	Efficiency Organizations
Aarin King	King	Individual

A parenthetical reference at the end of a comment quotation or paraphrase provides the location of the item in the public record.[4]

C. Deviation from Appendix A

In accordance with section 3(a) of 10 CFR part 430, subpart C, appendix A ("appendix A"), applicable to CRE under 10 CFR 431.4, DOE notes that it is deviating from the provision in appendix A regarding the pre-NOPR stages for a test procedure

[4] The parenthetical reference provides a reference for information located in the docket of DOE's rulemaking to develop test procedures for CRE. (Docket No. EERE-2017-BT-TP-0008, which is maintained at *www.regulations.gov*). The references are arranged as follows: (commenter name, comment docket ID number, page of that document).

rulemaking. Section 8(b) of appendix A states that if DOE determines that it is appropriate to continue the test procedure rulemaking after the early assessment process, it will provide further opportunities for early public input through *Federal Register* documents, including notices of data availability and/or requests for information. DOE is opting to deviate from this provision due to the substantial feedback and information supplied by commenters in response to the June 2021 RFI.

As discussed in section **Error! Reference source not found.** of this NOPR, the June 2021 RFI requested submission of comments, data, and information pertinent to test procedures for CRE. In response to the June 2021 RFI, stakeholders provided substantial comments and information, which DOE has found sufficient to identify the need to modify the test procedures for CRE. Additionally, DOE does not expect that further opportunities for early public input would result in additional substantive comments from interested parties. This NOPR discusses the comments received in response to the June 2021 RFI and considered in forming DOE's proposals to amend the CRE test procedure.

II. Synopsis of the Notice of Proposed Rulemaking

In this NOPR, DOE proposes to update subpart C of 10 CFR part 431 as follows:

1) Establish new definitions for high-temperature refrigerator, medium-temperature refrigerator, low-temperature freezer, mobile refrigerated cabinet, and amend the definition for ice-cream freezer;

2) Incorporate by reference the most current versions of industry standards AHRI 1200, ASHRAE 72, and AHRI 1320;
3) Establish definitions and a new appendix C including test procedures for buffet tables and preparation tables;
4) Establish definitions and a new appendix D including test procedures for blast chillers and blast freezers;
5) Amend the definition for chef base or griddle stand;
6) Specify refrigerant conditions for CRE that use carbon dioxide ("CO_2") refrigerant;
7) Allow for certification of compartment volumes based on computer aided design ("CAD") models;
8) Incorporate provisions for defrosts and customer order storage cabinets currently specified in waivers and interim waivers;
9) Adopt product-specific enforcement provisions;
10) Clarify use of the lowest application product temperature ("LAPT") provisions;
11) Remove the obsolete test procedure in appendix A; and
12) Specify a sampling plan for volume and total display area ("TDA").

DOE's proposed actions are summarized in Table compared to the current test procedure as well as the reason for the proposed change.

Table II.A Summary of Changes in Proposed Test Procedure Relative to Current Test Procedure

Current DOE Test Procedure	Proposed Test Procedure	Attribution
Defines commercial refrigerator without delineating between units that operate at medium and high temperatures	Defines high-temperature refrigerator and medium-temperature refrigerator to account for new high-temperature rating point	Improves representativeness
Defines ice-cream freezer as a type of commercial freezer	Defines low-temperature freezer to delineate between ice-cream freezers and other commercial freezers	Improves representativeness
Ice-cream freezer definition refers only to "ice cream"	Ice-cream definition refers more broadly to "frozen desserts"	Improves representativeness
References AHRI 1200-2010 for rating requirements	References AHRI 1200-202X for rating requirements	Harmonizes with most recent industry standard
References ASHRAE 72-2005 for test requirements	References ASHRAE 72-2018R for test requirements	Harmonizes with most recent industry standard
References AHAM HRF-1-2008 for volume measurement	References AHRI 1200-202X for volume requirements	Harmonizes with most recent industry standard
Includes a single 38 °F rating point for commercial refrigerators	Specifies 38 °F rating point for medium-temperature refrigerators and 55 °F rating point for high-temperature refrigerators	Improves representativeness; harmonizes with industry standard
Does not specify a method for testing CRE with secondary coolants	References AHRI 1320-2011 for CRE used with secondary coolants	Improves representativeness; harmonizes with industry standard
Does not specify definitions or test procedures for buffet tables and preparation tables	Defines buffet table and preparation table and establishes test procedures based on ASTM F2143-16	Improves representativeness; harmonizes with industry standard
Does not specify definitions or test procedures for blast chillers and blast freezers	Defines blast chiller and blast freezer and establishes test procedures based on expected industry test method	Improves representativeness; harmonizes with industry standard
Chef bases and griddle stands definition does not refer to a maximum height	Clarifies chef base and griddle stand definition by specifying a maximum height of 32 inches for this equipment	Improves representativeness
Does not provide procedures for CRE with no automatic defrost or with long duration defrost cycles	References ASHRAE 72-2018R for test instructions for units with no automatic defrost and adopts optional two-part test for CRE with defrost cycles longer than 24 hours	Addresses existing waiver; harmonizes with industry standard
Includes conflicting instructions regarding TDA calculation	Corrects errors in current test procedure by reference to AHRI 1200-202X	Improves representativeness, repeatability, and reproducibility; harmonizes with industry standard
Provides refrigerant conditions that applicable to common refrigerants	Specifies refrigerant conditions to allow for testing with carbon dioxide refrigerant	Improves representativeness; harmonizes with existing waiver
Requires determining volume based on testing	Allows the use of computer-aided design ("CAD") models to certify volume	Reduces test burden

Current DOE Test Procedure	Proposed Test Procedure	Attribution
Specifies a single door opening sequence	Defines customer order storage cabinet equipment category and specifies an alternate door opening sequence for this equipment	Improves representativeness; harmonizes with existing waiver
Does not specify product-enforcement provisions	Includes product-enforcement provisions for determining volume and TDA	Improves clarity
Specifies LAPT instructions for temperatures above target test temperature	Clarifies use of LAPT provisions for operating temperatures below the target test temperature	Improves clarity
Includes obsolete appendix A and current appendix B test procedures	Removes obsolete appendix A; adds new appendix C for testing buffet tables and preparation tables, and new appendix D for testing blast chillers and blast freezers.	Improves readability
Does not specify a sampling plan for volume and TDA	Specifies that volume and TDA be determined based on the mean of the test sample	Improves representativeness, repeatability, and reproducibility

DOE has tentatively determined that the proposed amendments described in section III of this NOPR would not alter the measured efficiency of CRE currently subject to energy conservation standards and would not require retesting or recertification solely as a result of DOE's adoption of the proposed amendments to the test procedures, if made final. Additionally, DOE has tentatively determined that the proposed amendments, if made final, would not increase the cost of such testing. Additionally, for buffet tables and preparation tables, and blast chillers and blast freezers, testing according to the proposed test procedure would not be required until the compliance date of any energy conservation standards for that equipment. To the extent manufacturers of these CRE are making voluntary representations regarding energy use, they would experience costs associated with retesting. DOE provides a discussion of these testing costs in section III.O.1 of this NOPR. Discussion of DOE's proposed actions are addressed in detail in section III of this NOPR.

III. Discussion

A. Scope and Definitions

"Commercial refrigerator, freezer, and refrigerator-freezer" means refrigeration equipment that is not a consumer product (as defined in 10 CFR 430.2); is not designed and marketed exclusively for medical, scientific, or research purposes; operates at a chilled, frozen, combination chilled and frozen, or variable temperature; displays or stores merchandise and other perishable materials horizontally, semi-vertically, or vertically; has transparent or solid doors, sliding or hinged doors, a combination of hinged, sliding, transparent, or solid doors, or no doors; is designed for pull-down temperature applications or holding temperature applications; and is connected to a self-contained condensing unit or to a remote condensing unit. 10 CFR 431.62.

For the purpose of determining applicability of certain test procedure provisions, DOE is proposing to amend certain existing definitions and to establish certain new definitions, as discussed in the following paragraphs. DOE discusses additional equipment definitions and test procedures for specific equipment categories in section III.C of this NOPR.

1. Ice-Cream Freezers

DOE defines certain categories of CRE, including "ice-cream freezer." DOE defines an "ice-cream freezer" as a commercial freezer that is designed to operate at or below −5 °F (± 2 °F) (−21 °C ± 1.1 °C) and that the manufacturer designs, markets, or intends for the storing, displaying, or dispensing of ice cream. 10 CFR 431.62.

In the June 2021 RFI, DOE requested comment on the technical features that characterize ice-cream freezers and distinguish them from other categories of commercial freezers capable of operating at or below -5 °F. 86 FR 31182, 31184.

ITW commented that in general, ice-cream freezers are standard "commercial freezers" operating at a modified storage temperature. (ITW, No. 2, p. 1) True commented that when considering vertical freezers, there are no features that would distinguish a freezer storing ice cream from a standard commercial freezer, since both are designed to maintain the same integrated average temperature ("IAT").[5] (True, No. 4, p. 2) However, True commented that there are significant differences between a CRE able to maintain an IAT of -15 °F and one that is only designed to maintain an IAT of 0 °F. (True, No. 4, p. 2)

ITW commented that dipping cabinets (*i.e.*, cabinets intended for ice cream service) are the obvious model type that can be easily distinguished from other freezers and are generally characterized by product visibility and accessories sold with the unit. (ITW, No. 2, p. 1)

Hussmann, AHRI, and Continental commented that ice-cream freezers often have a manual defrost to maintain frozen products, which may be a distinguishing feature for most ice-cream freezers. (AHRI, No. 3, p. 2; Hussmann, No. 14, p. 2; Continental, No. 6, p. 1) Hussmann, AHRI, and Continental commented that many of these models are of a

[5] Integrated average temperature means the average temperature of all test package measurements taken during the test. 10 CFR 431.62.

cold wall design rather than forced air evaporation. (AHRI, No. 3, p. 2; Hussmann, No. 14, p. 2; Continental, No. 6, p. 1) Hussmann and AHRI stated that in ice cream applications it is imperative to avoid formation of ice crystals by maintaining temperature, particularly surrounding defrost cycles. (AHRI, No. 3, p. 2; Hussmann, No. 14, p. 2) Continental commented that features such as manual defrost and cold wall evaporators minimize temperature fluctuations. (Continental, No. 6, p.1)

Dipping cabinets are one configuration of CRE that likely is readily understood to be an ice-cream freezer; however, not all ice-cream freezers are dipping cabinets. As such DOE is not proposing to limit the definition of "ice-cream freezer" to those units. Additionally, while ice-cream freezers may implement manual defrosts or cold wall evaporators, DOE is aware of these equipment designs in other commercial freezers, such that they do not uniquely distinguish ice-cream freezers. DOE has not identified any technical features that would allow for distinguishing ice-cream freezers from other commercial freezers capable of operating at low temperatures and is therefore not proposing to include any additional equipment characteristics in the ice-cream freezer definition.

DOE notes that the equipment term and definition reference "ice cream," but "ice cream" is not defined. DOE understands that other frozen products may be similarly stored and displayed. For example, gelato, frozen yogurt, sorbet, and other ice-cream-like products are typically displayed, stored, and dispensed in the same manner as ice-cream. The CRE used for these food products is likely similar, if not identical, to equipment used to store, display, or dispense ice cream. In the June 2021 RFI, DOE

requested comment on whether further specificity is needed for the term "ice-cream." 86 FR 31182, 31184.

ITW commented that ice-cream and ice-cream like products can be divided into 3 temperature classes: 1) -5 °F to 5 °F, equipment designed to hold ice cream for immediate consumption; 2) -10 °F to -15 °F, equipment designed to hold ice cream for short term storage or retail sale; 3) -20 °F to -40 °F, equipment designed to hold ice cream for long term storage. (ITW, No. 2, p. 1)

Hussmann and AHRI agreed that the term "ice cream" does not exclusively apply to products that are designed to and tested at -15 °F, and that simply including or excluding the term "ice cream" does not accurately distinguish the appropriate product category. (Hussmann, No. 14, p. 2-3; AHRI, No. 3, p. 2) AHRI and Hussmann stated that they do not support the removal of the term "ice cream," but support differentiating temperature categories for the various uses of ice-cream applications. (Hussmann, No. 14, p. 2-3; AHRI, No. 3, p. 2)

Hussmann and AHRI commented that the product category should be based on the designed, marketed, and intended use of the equipment. (Hussmann, No. 14, p. 2-3; AHRI, No. 3, p. 2) Hussmann and AHRI commented that there is an important distinction between many products that operate in the 0 °F to -5 °F range that are not designed to operate at -15 °F. (Hussmann, No. 14, p. 2-3; AHRI, No. 3, p. 2)

True commented that the use of the term "ice-cream" to distinguish a different equipment category does not make sense given the range of operating temperatures for different types of ice-cream and ice-cream like products, and that more generic terms should be used such as "commercial low temperature freezer" (IAT of 0 °F) and "commercial lower temperature freezer" (IAT of -15 °F). (True, No. 4, p. 2-3)

DOE recognizes that the reference to "ice cream" in the ice-cream freezer definition does not itself distinguish this equipment from other commercial freezers, and that the additional descriptors specified in the definition (*i.e.*, designed to operate at or below −5 °F) together classify a unit as an ice-cream freezer. However, to clarify the equipment classification and to avoid a potential understanding that the term is limited to equipment associated with ice cream and not other similar products, DOE is proposing to amend the ice-cream freezer definition to refer to equipment designed, marketed, or intended for the storing, displaying, or dispensing of "frozen desserts," rather than ice cream specifically. DOE does not expect this proposal to affect testing or certifications for existing CRE because equipment designed for frozen desserts other than ice cream that otherwise meets the ice-cream freezer definition are likely already tested and certified as an ice-cream freezer.

DOE requests comment on the proposed amended definition of ice-cream freezer, and on whether any additional characteristics may better differentiate this equipment from other commercial freezers.

Appendix B requires testing all ice-cream freezers to an IAT of -15 °F. However, the term "ice-cream freezer" includes a variety of equipment with a range of typical operating temperatures during normal use. For example, certain ice-cream freezers are designed to operate considerably below -5 °F (sometimes referred to as "hardening" cabinets and specifically designed for ice cream storage), while other ice-cream freezers are designed to operate closer to 0 °F during typical use (*e.g.*, "dipping cabinets" and other equipment used to hold ice cream intended for immediate consumption). Ice-cream freezers intended for higher-temperature operation are often not capable of achieving an IAT of −15 °F. In such an instance, appendix B requires testing the units to the LAPT.

If certain ice-cream freezers not capable of reaching an IAT of -15 °F should instead be tested at an IAT of 0 °F, there may be an opportunity to better distinguish between ice-cream freezers and other freezers, as discussed earlier in this section. For example, the ice-cream freezer definition could be revised to refer to any freezer capable of operating at an IAT of −15 °F, regardless of the intended end use of the equipment. Any other equipment currently meeting the ice-cream freezer definition but not capable of reaching an IAT of −15 °F could instead be classified and tested as freezers, rather than ice-cream freezers. Such an approach would use the measured IAT of the equipment as the basis for this equipment definition, thus eliminating the reliance on manufacturer intent or the end use of the equipment.

In the June 2021 RFI, DOE requested comment on whether equipment that meets the current ice-cream freezer definition but cannot operate at an IAT of -15 °F ± 2 °F should be tested at an IAT of 0 °F ± 2 °F instead of the LAPT. 86 FR 31182, 31184.

DOE additionally requested comment on whether the ice-cream freezer definition should refer only to equipment that is capable of achieving an IAT of −15 °F ± 2 °F without reference to the manufacturer's designed, marketed, or intended use. *Id*.

The Joint Commenters, True, and NEEA supported changing the definition of "ice-cream freezer" to refer to operating capabilities instead of design intent, or replacing "ice-cream" with a more generic term, to remove ambiguity of equipment classes and ensure a standardized temperature (-15 °F or 0 °F). (Joint Commenters, No. 8, p. 1; True, No. 4, p. 3; NEEA, No. 5, p. 4) ITW, NEEA, and CA IOUs further supported testing at standard IATs instead of LAPT to create a more direct comparison of daily energy consumption. (ITW, No. 2, p. 1; NEEA, No. 5, p. 4-5) True commented that the test procedure, in specifying IATs of 0 °F and -15 °F, is acceptable. True also commented that CRE capable of maintaining an IAT of -15 °F should have a greater energy allowance than CRE only capable of maintaining an IAT of 0 °F. (True, No. 4, p. 3)

Hussmann, AHRI, Hoshizaki, and True agreed that "ice-cream" freezers that are not designed, marketed, and intended to operate at -15 °F could be tested at an IAT of 0 °F ± 2 °F instead of the LAPT. (Hussmann, No. 14, p. 2-3; AHRI, No. 3, p. 2; Hoshizaki, No. 13, p. 1; True, No. 4, p. 3) Hussmann, AHRI, Hoshizaki, and Continental disagreed that the ice-cream freezer definition should only refer to equipment that can achieve an IAT of -15 °F ± 2 °F without reference to the manufacturer's designed, marketed, or intended use, asserting that the product category and definition should be based on these factors. (Hussmann, No. 14, p. 2-3; AHRI, No. 3, p. 2, Hoshizaki, No. 13, p. 1; Continental, No. 6, p. 1) Continental added that this terminology is commonly used by

manufacturers and dealers to identify the appropriate equipment for these applications. (Continental, No. 6, p. 1)

NEEA commented that as of July 16, 2021, there were 434 commercial ice-cream freezers listed in DOE's compliance certification database, with 410 rated for operation at either -10 °F or -15 °F, and the remaining 24 units with an LAPT of -5 °F. (NEEA, No. 5, p. 4) NEEA added that the 24 units rated at -5 °F were all service over counter ("SOC") units, demonstrating that their intended use is for immediate consumption, whereas the other 410 units' primary function was for hardening. (NEEA, No. 5, p. 4) The CA IOUs commented on this same dataset; however, they noted that 88 percent (382 units) of models were tested at -15 °F, with the remaining 12 percent (52 units) tested at -5 °F or -10 °F. (CA IOUs, No. 10, p. 5)

NEEA commented that DOE should define ice-cream freezers as those able to operate at -10 °F, and that -10 °F is appropriate for both testing and the definition, since it is more representative of field usage and is low enough to achieve ice cream hardening. (NEEA, No. 5, p. 4-5) NEEA commented that the definitions in both 10 CFR 431.62 and ENERGY STAR define ice-cream freezers as designed to operate at or below -5 °F, further supporting a temperature higher than -15 °F for testing, and that this higher temperature (*i.e.*, -10 °F) would capture a greater number of units under one definition and test. (*Id.*)

The CA IOUs commented that there are two distinct uses for ice-cream freezers: ice cream storage cabinets (with a cold holding temperature of -15 °F) and ice cream

dipping cabinets (which provide malleable ice cream serving at -5 °F). (CA IOUs, No. 10, p. 5) The CA IOUs commented that in their investigation they found that models tested at non-standard temperatures (*i.e.*, above -15 °F) occurred primarily in horizontal closed solid ("HCS") equipment, of which 30 percent of products were tested at -10 °F; and service over counter equipment, of which 51 percent of products were tested at -5 °F. (CA IOUs, No. 10, p.5-6). The CA IOUs commented that the DOE should consider renaming the HCS ice-cream freezers to "solid door ice cream dipping cabinet" and SOC ice-cream freezer to "glass door ice cream dipping cabinet" to better align with industry terms and differentiate between products tested at -15 °F. (*Id.)* The CA IOUs suggested testing these two equipment classes for ice cream dipping applications at -5 °F. *(Id.)*

DOE participated in the committee meetings to consider updates to AHRI 1200-2013, eventually leading to the development of AHRI 1200-202X. During these meetings, the committee discussed ice-cream freezer rating temperatures and considered additional or alternate rating temperatures for ice-cream freezer applications. The committee determined that the existing rating points for commercial freezers (*i.e.*, -15 °F for ice-cream freezers and 0 °F for freezers) are appropriate rating points for the range of typical commercial freezer operation and maintained these rating points in section 3.15 "Product Temperature" of AHRI 1200-202X. Consistent with the latest industry rating standard, DOE is not proposing to amend the commercial freezer target IATs for testing.

Of the 418 ice-cream freezer models certified to DOE,[6] 50 are rated based on LAPTs higher than -15 °F, including 24 models with a rating temperature of -5 °F. Many of these models have a horizontal or service over counter configuration and are intended to hold ice cream for immediate consumption.

DOE recognizes that testing and rating certain commercial freezers to 0 °F may be more appropriate than testing and rating to -15 °F. DOE already requires a 0 °F rating temperature for commercial freezers. Based on comments from interested parties and a review of the commercial freezer market, DOE has tentatively determined that ice-cream freezers that meet the current ice-cream freezer definition but cannot operate as low as an IAT of -15 °F ± 2 °F can be tested at an IAT of 0 °F ± 2 °F. Therefore, DOE is proposing to amend the ice-cream freezer definition in this NOPR to specify that the designed operating temperature is required to be at or below −15.0 °F (±2.0 °F), upon the compliance date(s) of any amended energy conservation standard(s) for ice-cream freezers.

To clarify which commercial freezers are required to test at an IAT of 0 °F according to appendix B, DOE is proposing to define the term "low-temperature freezer" to mean a commercial freezer that is not an ice-cream freezer.

[6] Based on review of DOE's Compliance Certification Database, available at *www.regulations.doe.gov/certification-data* (accessed February 1, 2022).

DOE requests comment on the proposed amended definition for ice-cream freezer and the proposed definition for low-temperature freezer.

2. High-Temperature CRE

DOE defines "commercial refrigerator as" a unit of commercial refrigeration equipment in which all refrigerated compartments in the unit are capable of operating at or above 32 °F (±2 °F). 10 CFR 431.62.

Section 2.1 of appendix B requires testing commercial refrigerators to an IAT of 38 °F ± 2 °F. DOE is aware of equipment that meets the definition of a commercial refrigerator but is capable of operating only at temperatures above the 38 °F ± 2 °F IAT required for testing. Examples of these types of equipment include CRE designed for storing or displaying chocolate and/or wine, with typical recommended storage temperatures around 55 °F. Consistent with the current test procedure, manufacturers certify such equipment using the LAPT setting. LAPT can vary by model, so this approach which does not rely on a uniform operating temperature can result in measured energy consumptions that are not necessarily comparable between models.

In the June 2021 RFI, DOE stated that it was considering adding a definition for "high-temperature refrigerator" to better delineate commercial refrigerators not capable of operating at the IAT required for testing a commercial refrigerator. 86 FR 31182, 31184.

The Joint Commenters, NEEA, CA IOUs, AHRI, and Hussmann supported DOE establishing a new definition for "high-temperature refrigerator" and separate test requirements for this equipment. (Joint Commenters, No. 8, p. 1-2; NEEA, No. 5, p.6; CA IOUs, No. 10, p. 5; AHRI, No. 3, p. 3; Hussmann, No. 14, p. 4)

AHRI and Hussmann commented that they support a higher temperature category and requested that it be representative of the higher temperature ranges used in the marketplace (*e.g.*, floral, wine, cigars, meat aging, etc.). (AHRI, No. 3, p. 3; Hussmann, No. 14, p. 4)

ITW commented that it is desirable to maintain consistent testing criteria between DOE equipment families to eliminate errors and misunderstandings between nationally recognized testing laboratories ("NRTLs"), DOE, manufacturers, and consumers. (ITW, No. 2, p. 2) ITW commented that changes to the test procedure for high-temperature refrigerators would account for only nominal differences in the measured energy consumption rate, while adding complexity. (*Id.*)

NEEA commented that DOE should develop a definition and test procedure for high temperature commercial cabinets as a parallel to DOE's definition of residential high temperature refrigerators, and stated that there is a the potential for energy savings in this equipment category. (NEEA, No. 5, p. 6-7)

DOE is aware of certain commercial refrigerators that are intended for use only at IATs higher than the 38 °F ± 2 °F required by the existing DOE test procedure. For

example, 133 models of single-compartment commercial refrigerators are rated at LAPTs at or above 40 °F. By definition, these models are not capable of operating at the required test integrated average temperature. 10 CFR 431.62. As indicated in comments from interested parties, categorizing these commercial refrigerators in a separate high-temperature category would allow DOE to consider test procedures for this equipment that may better represent actual use.

To allow for differentiating typical commercial refrigerators from commercial refrigerators that operate only at higher temperature, DOE proposes to define "high-temperature refrigerator" as a commercial refrigerator that is not capable of operating with an integrated average temperature as low as 38.0 °F (± 2.0 °F). DOE recognizes that certain commercial refrigerators may be capable of operating with IAT of 38.0 °F (± 2.0 °F) but are intended for use at higher storage temperatures. However, DOE is proposing to define "high-temperature refrigerator" based on operating capability rather than intended use to ensure consistent application of DOE's definitions and to ensure that CRE currently tested and rated with IATs of 38.0 °F (± 2.0 °F) would continue to be categorized, tested, and rated at that operating condition.

To clarify the classification of commercial refrigerators overall, DOE is also proposing to define the term "medium-temperature refrigerator" to refer to commercial refrigerators capable of operating with IATs of 38.0 °F (± 2.0 °F) or lower. As discussed further in section III.B.1.b of this document, DOE is proposing to require testing high-temperature refrigerators according to AHRI 1200-202X, which requires an IAT of 55 °F ± 2.0 °F. Under the proposed approach, a commercial refrigerator would be tested and

rated as either a medium-temperature refrigerator (if capable of operating with an IAT of 38.0 °F (± 2.0 °F)) or as a high-temperature refrigerator (if not capable of operating with an IAT as low as 38.0 °F (± 2.0 °F)).

DOE recognizes that certain commercial refrigerators may be capable of operating at both IATs of 38 °F (± 2.0 °F) and 55 °F (± 2.0 °F). In the April 2014 Final Rule, DOE stated that CRE capable of operating at IATs that span multiple equipment categories must be certified and comply with DOE's regulations for each applicable equipment category. 79 FR 22277, 22291. The proposed definition of high-temperature refrigerator would exclude CRE capable of operating at medium temperatures (*i.e.*, an IAT of 38 °F), and therefore would exclude models capable of operating at both IATs. Thus, as proposed, a unit of CRE capable of operating at both IATs of 38 °F and 55 °F would meet the definition of only a medium-temperature refrigerator.

As an alternative to the proposed definition, DOE could instead define high-temperature refrigerator based only on the capability of a commercial refrigerator to operate at IATs of 55 °F (± 2.0 °F). Under such an alternate approach, a unit of CRE capable of operating at both IATs of 38 °F and 55 °F would meet the definition of both a medium-temperature refrigerator and a high-temperature refrigerator.

DOE requests comment on the proposed definitions for high-temperature refrigerator and medium-temperature refrigerator, including whether the terms should be mutually exclusive or constructed such that equipment could be considered to meet both definitions.

DOE discusses proposed test requirements for this equipment in section III.B.1.b of this NOPR.

3. Convertible Equipment

In the April 2014 Final Rule, DOE noted that some basic models of CRE may have operating characteristics that include an operating temperature range that spans multiple equipment classes and subsequently required that self-contained equipment or remote condensing equipment with thermostats capable of operating at IATs that span multiple equipment categories be certified and comply with DOE's regulations for each applicable equipment category. 79 FR 22277, 22291. Similarly, DOE adopted requirements for remote condensing equipment without a thermostat that specify that if a given basic model of CRE is marketed, designed, or intended to operate at IATs spanning multiple equipment categories, the CRE basic model must be certified and comply with the relevant energy conservation standards for all applicable equipment categories. *Id.*

DOE is proposing to specify in 10 CFR 429.42 the requirements from the April 2014 Final Rule that require basic models of CRE that operate in multiple equipment classes to certify and comply with the energy conservation standards for each applicable equipment class. This proposal is consistent with the notice of petition for a test procedure waiver that DOE published on May 26, 2017, for AHT Cooling Systems GmbH and AHT Cooling Systems USA Inc. ("AHT") in which DOE declined to grant AHT an interim waiver that would allow for testing only in the ice-cream freezer equipment class for AHT's specified multi-mode CRE basic models. 82 FR 24330.

DOE requests comment on the proposal to specify the requirements from the April 2014 Final Rule regarding basic models of CRE that operate in multiple equipment classes.

B. Updates to Industry Test Standards

DOE's test procedure for CRE currently adopts through reference certain provisions of AHRI 1200-2010, ASHRAE 72-2005, and AHAM HRF-1-2008. 10 CFR 431.63. With regard to the provisions relevant to the DOE test procedure, AHRI 1200-2010 references certain provisions of ASHRAE 72-2005 and AHAM HRF-1-2008.

Since establishing the DOE test procedure in appendix B, AHRI, ASHRAE, and AHAM have published updated versions of the referenced test standards. On October 1, 2013, ANSI approved an updated version of AHRI 1200, ANSI/AHRI Standard 1200 (I-P), "2013 Standard for Performance Rating of Commercial Refrigerated Display Merchandizers and Storage Cabinets," ("AHRI 1200-2013"). On August 1, 2018, ANSI approved an updated version of ASHRAE 72, ANSI/ASHRAE Standard 72-2018, "Method of Testing Open and Closed Commercial Refrigerators and Freezers," ("ASHRAE 72-2018"). AHAM more recently approved and published an updated version of its industry test standard, AHAM HRF-1-2019, "Energy and Internal Volume of Refrigerating Appliances," ("AHAM HRF-1-2019"). For each of these industry test standards, DOE has initially determined that the changes within these updated industry test standards are either editorial, improve clarity, better harmonize with the DOE test procedure, or not relevant to CRE (*e.g.*, relevant to products such as consumer refrigerators). Based on DOE's initial assessment, the changes in the updated versions of

the industry test standards would not impact the measured energy consumption, volume, or TDA of CRE, as applicable.

DOE is also aware of updates being considered for AHRI 1200-2013 and ASHRAE 72-2018. DOE has participated in the industry committee meetings in which updates to these industry standards are being developed. Based on these meetings, the changes being considered by the industry committee appear intended largely to improve the clarity, consistency, and representativeness of the industry test methods. DOE discusses these changes further in sections III.B.1 and III.B.2 of this NOPR.

In the June 2021 RFI, DOE requested comment on whether it should reference the most recent versions of AHRI 1200 or ASHRAE 72 and whether any of the updates to these standards would have an impact on the measured energy consumption of CRE, and if so, how. 86 FR 31182, 31185. DOE additionally requested comment on whether the CRE test procedure should reference the most current version of AHAM HRF-1 and whether any of the updates to that standard would have an impact on measured volume, and if so, how. *Id.*

Hoshizaki and Continental commented in support of referencing AHRI 1200-2013 and ASHRAE 72-2018. (Hoshizaki, No. 13, p. 1; Continental, No. 6, p. 1) The CA IOUs commented in support of referencing ASHRAE 72-2018. (Hoshizaki, No. 13, p. 1; Continental, No. 6, p. 1CA IOUs, No. 10, p. 2) ITW commented that the DOE should only consider the ANSI approved versions of AHRI 1200-2013, ASHRAE 72-2018, and

AHAM HRF-1-2008[7] standards, stating that any reference to standards not yet approved would be premature and would not consider the final impact. (ITW, No. 2, p. 2) AHRI and Hussmann commented that DOE should incorporate by reference the upcoming versions of AHRI 1200 and ASHRAE 72. (AHRI, No. 3, p. 3-4; Hussmann, No. 14, p. 5) AHRI and Hussmann commented that both draft standards are in the review phase and that draft copies were available to DOE upon request. (*Id.*)

AHRI and Hussmann commented that the AHAM HRF-1-2008 volume calculations have been incorporated into the latest version of AHRI 1200 and ASHRAE 72 and that the appropriate volume requirements are covered in appendix C of AHRI Standard 1200 to avoid referencing a standard that does not specifically apply to industry equipment. (AHRI, No. 3, p. 3-4; Hussmann, No. 14, p. 5) AHRI and Hussmann also commented that appendix C of AHRI 1200 encourages the use of computer models to determine measured volumes. (*Id.*)

Hoshizaki and Continental commented that DOE should not require retesting and recertification of already certified products, as doing so would create additional burden on manufacturers. (Hoshizaki, No. 13, p. 1; Continental, No. 6, p. 1) AHRI and Hussmann commented that DOE would need to evaluate if the updated standards would

[7] ITW and other commenters did not reference a specific ANSI approved version of AHRI 1200, ASHRAE 72, and AHAM HRF-1. DOE assumed commenters referenced the most recent ANSI approved versions of these standards—AHRI 1200-2013 and ASHRAE 72-2018—unless otherwise specified by the commenter. DOE assumed commenters referenced the ANSI approved version of AHAM HRF-1 (*i.e.*, HRF-1-2008) referenced by ASHRAE 72-2018 and AHRI 1200-2013, unless otherwise specified by the commenter.

require retesting of already certified equipment or reevaluation of energy efficiency metrics and levels. (AHRI, No. 3, p. 3-4; Hussmann, No. 14, p. 5)

DOE is aware that revisions to AHRI 1200-2013 and ASHRAE 72-2018 are underway. Specifically, DOE expects the ongoing revision to AHRI 1200-2013 to be near complete and has considered a draft version[8] of the updated standard for the purposes of the proposals in this NOPR (referred to as "AHRI 1200-202X" to distinguish this from existing versions of the standard). Similarly, DOE expects that the ongoing revision to ASHRAE 72 is also nearly complete. On April 22, 2022, ASHRAE published a second public review draft of the revision to ASHRAE 72-2018 (referred to as "ASHRAE 72-2018R").

DOE is proposing to incorporate by reference the most current versions of AHRI 1200 and ASHRAE 72, as discussed in the following sections. For the purposes of this NOPR, DOE references AHRI 1200-202X and ASHRAE 72-2018R to indicate the language in the available draft updates. DOE has participated in the committee processes to develop the revised standards for both AHRI 1200 and ASHRAE 72. Based on this participation, DOE does not expect that substantive revisions will be made to AHRI 1200-202X and ASHRAE 72-2018R in the final published versions of the standards. DOE's intent is to adopt the final versions of these industry standards (with deviations as

[8] On August 17, 2021, AHRI shared with DOE a draft version of AHRI 1200 for the purposes of referencing. AHRI indicated an expected publication date by the end of 2021. The updated AHRI 1200 has not yet published, so DOE is referencing the draft standard in this NOPR. As indicated in the AHRI correspondence, AHRI Standard 1200-202X is in draft form and its text was provided to the Department for the purposes of review only during the drafting of this NOPR. Free copies of published AHRI Standards and a listing of documents open for Public Comment are available on the AHRI website. The draft of AHRI 1200 is available in the docket for this proposed rulemaking on *regulations.gov*.

proposed in this NOPR) when they are available, to the extent that they are consistent with the review drafts discussed in this document. DOE will review and consider the final published versions of each standard when available.

DOE acknowledges that the versions of the industry test standards proposed for incorporation by reference in this NOPR are not yet ANSI approved. However, DOE has tentatively determined that these standards provide an appropriate basis for testing that would produce test results which reflect energy use of CRE during a representative average use cycle and would not be unduly burdensome to conduct as required by 42 U.S.C. 6314(a)(2).

The following sections discuss the revisions made in each of these industry test standards and DOE's proposed adoption of certain provisions of the industry standards into the DOE test procedure.

1. AHRI 1200

As stated in the June 2021 RFI, the 2013 revision to AHRI 1200 provides editorial, clarifying, or harmonizing updates that would not impact the measured energy consumption, volume, or TDA of CRE as compared to the current test procedure. 86 FR 31182, 31184. As compared to AHRI 1200-2013, DOE has tentatively determined that the revisions in AHRI 1200-202X are largely to improve clarity of the test standard. These draft updates address application of the standard and its use in relation to other industry standards (*i.e.*, ASHRAE 72-2018). Specifically, AHRI 1200-202X includes the following updates: harmonized definitions for consistency with ASHRAE 72-2018 and

DOE's existing regulations; updated definitions for consistency with the use of the rating standard; removal of test requirements that were duplicative with ASHRAE 72-2018; clarified measurement requirements and the use of calculations; inclusion of direct refrigerated volume measurement instructions (rather than referencing the AHAM test standard); and detailed total display area requirements and examples.

DOE is proposing to incorporate by reference AHRI 1200-202X for use in the DOE test procedure because DOE has tentatively determined that the updates compared to AHRI 1200-2013 would improve the clarity of the test standard, ensure consistent testing, and as a result would improve reproducibility of the test procedure. As stated, AHRI 1200-202X includes procedures for measuring refrigerated volume rather than referring to the AHAM standard (although the procedures are consistent between these standards). Therefore, DOE is proposing to remove the incorporation by reference of AHAM HRF-1-2008 and instead refer to AHRI 1200-202X directly for refrigerated volume measurement. Based on DOE's review of AHRI 1200-202X, the updates included in the standard are primarily editorial and are not expected to change test results as compared to the existing test procedure, except for the specific updates as discussed in the following paragraphs. Therefore, DOE has tentatively determined that any existing test data for CRE currently available on the market are expected to be consistent with the proposed test procedure.

DOE requests comment on the proposal to incorporate by reference AHRI 1200-202X and on whether the use of the updated test method would impact CRE ratings based on the current DOE test procedure.

In addition to the clarifying revisions that would not substantively change testing as compared to the current approach using the DOE test procedure and AHRI 1200-2013, AHRI 1200-202X also includes two substantive additions: addressing the use of high glide refrigerants and providing an additional temperature rating point for "high temperature" applications. DOE is proposing to adopt these provisions in its test procedure, as discussed in the following sections.

a. High Glide Refrigerants

For remote condensing CRE, AHRI 1200 provides calculations to estimate the compressor energy consumption necessary to provide the cooling to the refrigerator or freezer. These calculations are based on the dew point of the refrigerant during testing, which is intended to be representative of the evaporator temperature. See Table 1 and section 5.2.1 of AHRI 1200-2013 and AHRI 1200-202X.

For certain refrigerants, the saturated vapor temperature (*i.e.*, the dew point) can be different from the saturated liquid temperature at a given pressure, in which case the refrigerant is considered to have "glide." AHRI 1200-202X includes a definition for "high glide refrigerant" as a zeotropic refrigerant blend whose temperature glide is greater than 2 °F. ASHRAE defines "glide" as the absolute value of the difference between the starting and ending temperatures of a phase-change process by a refrigerant

within a component of a refrigerating system, exclusive of any subcooling or superheating. This term usually describes condensation or evaporation of a zeotrope.[9]

For high glide refrigerants, the refrigerant dew point is not necessarily representative of the overall evaporator temperature. AHRI 1200-202X specifies that for high glide refrigerants, the temperature used to calculate compressor energy consumption is based on an adjusted mid-point evaporator temperature rather than an adjusted dew point temperature.

Because the evaporator provides cooling to the CRE over the entire heat exchanger surface, using the evaporator mid-point temperature would ensure that the temperature used to calculate compressor energy consumption is more representative of the overall evaporator temperature. DOE has initially determined that the AHRI 1200-202X approach of using the evaporator mid-point temperature rather than refrigerant dew point is more representative of actual remote condensing CRE use for which the equipment uses high glide refrigerants and would improve consistency of remote testing using different refrigerants. Additionally, this approach would improve consistency when testing a given remote condensing CRE model with either high glide or low glide refrigerants by ensuring that the evaporator mid-point temperature for a high glide refrigerant is similar to the refrigerant dew point for a low glide refrigerant.

[9] See ASHRAE's glossary of defined terms at *xp20.ashrae.org/terminology/*.

DOE is proposing to adopt through reference the high glide refrigerant provisions of AHRI 1200-202X. Because the existing DOE test procedure, by reference to AHRI 1200-2013, only references adjusted dew point for calculating compressor energy consumption, this proposed amendment would result in different test results for remote condensing CRE models tested with a high glide refrigerant. However, DOE expects that current remote condensing CRE models are typically tested and rated using low glide refrigerants (most commonly R-404A); therefore, DOE has tentatively determined that this proposed test procedure amendment is not expected to result in changes to rated energy consumption for any currently available remote CRE models.

DOE requests comment on the proposal to incorporate by reference AHRI 1200-202X, including the new provisions regarding high glide refrigerants. DOE also requests information on whether any remote condensing CRE are currently tested and rated using high glide refrigerants and whether the proposed test procedure would impact the rated energy consumption for such models.

b. High Temperature Applications

As discussed in section III.A.2 of this NOPR, DOE is proposing a definition for "high-temperature refrigerator." In the context of consumer refrigeration products, DOE established the miscellaneous refrigeration product category to capture similar consumer products, with "coolers" tested at a standardized cabinet temperature of 55 °F.[10]

[10] *See* 10 CFR part 430, subpart B, appendix A.

In the June 2021 RFI, DOE requested comment on whether an IAT of 55 °F ± 2 °F is an appropriate test condition for high-temperature CRE and data on the typical operating temperatures for this equipment. 86 FR 31182, 31184. DOE also requested comment on whether any additional clarifications to the test procedure are needed (*i.e.*, appropriate loading and door-opening requirements for high-temperature CRE). *Id.*

AHRI, Hussmann, NEEA, and CA IOUs commented that an IAT of 55 °F ± 2 °F is an appropriate test condition for commercial high-temperature refrigerators. (AHRI, No. 3, p. 4; Hussmann, No. 14, p. 3; NEEA, No. 5, p. 7; CA IOUs, No. 10, p. 5) AHRI and Hussmann commented that this test condition was incorporated into the latest draft version of AHRI Standard 1200. (AHRI, No. 3, p. 4; Hussmann, No. 14, p. 4)

NEEA also commented that higher-temperature CRE are sometimes designed to have a highly specific end use such as the following: high humidity floral cabinets (~35 °F), wine chillers (~55 °F), low humidity chocolate cabinets (~65 °F), higher humidity (~70 percent relative humidity) cigar cabinets (~70 °F). (NEEA, No. 5, p. 7) NEEA commented in support of the 55 °F IAT, but encouraged DOE to identify whether more than one IAT is needed to effectively represent higher-temperature CRE. (*Id.)* The CA IOUs also commented in support of the DOE testing high temperature CRE products at a consistent operating temperature rather than at an LAPT. (CA IOUs, No. 10, p. 5).

AHRI and Hussmann commented that the door openings and loadings outlined in the ASHRAE 72-2018 are an adequate representation of high temperature CRE systems. (AHRI, No. 3, p. 3; Hussmann, No. 14, p. 4)

NEEA recommended that DOE evaluate if the International Electrotechnical Commission ("IEC") standard 62552:2015, "Household refrigerating appliances - Characteristics and test methods" ("IEC 62552:2015") can be used with high temperature CRE. (NEEA, No. 5, p. 6-7)

Section 3.15.1 of AHRI 1200-202X specifies that CRE intended for high temperature applications shall have an integrated average temperature of 55 °F ± 2.0 °F. As stated, DOE requires testing high-temperature consumer refrigeration products (*i.e.*, "coolers") at a standardized cabinet temperature of 55 °F. 10 CFR part 430, subpart B, appendix A.

Based on consideration of comments from interested parties, the industry rating method, and the analogous existing test procedure for consumer refrigeration products, DOE is proposing to require testing high-temperature refrigerators according to AHRI 1200-202X, which requires an integrated average temperature of 55 °F ± 2.0 °F.

As noted by commenters, high-temperature refrigerators may serve many distinct applications, each with specific intended storage conditions. However, DOE has initially determined that the IAT specified in AHRI 1200-202X is most representative of high-temperature refrigerator operating conditions overall because the high-temperature refrigerators that DOE identified have operating temperature ranges which include 55 °F and allows for consistent measurements of energy use for equipment in this category.

In referencing AHRI 1200-202X, the DOE test procedure would also require that high-temperature refrigerators be tested according to the same procedure as other CRE, other than the IAT. Supported by comments from AHRI and Hussmann, DOE has tentatively determined that the door opening and loading procedures in ASHRAE 72-2018R are appropriate for high-temperature refrigerators. Following the proposed test approach would also ensure consistent test methods across CRE categories, albeit at different IATs.

In response to NEEA's comment regarding the use of IEC 62552:2015 for high-temperature refrigerators, DOE notes that IEC 62552:2015 is intended for testing household refrigerating appliances. Additionally, DOE's test procedures for consumer refrigeration products do not follow the approach in IEC 62552:2015 and instead reference AHAM HRF-1-2019. See 10 CFR part 430, subpart B, appendix A and appendix B. Based on available industry standards and for consistency with existing DOE test procedures, DOE has tentatively determined that testing according to AHRI 1200-202X would be more appropriate for high-temperature CRE than IEC 62552:2015.

DOE requests comment on the proposal to adopt a rating point of 55 °F ± 2.0 °F for high-temperature refrigerators by adopting through reference certain provisions of AHRI 1200-202X.

Because the proposed test procedure for high-temperature refrigerators would amend the current test approach for certain commercial refrigerators (*i.e.*, those currently rated using the LAPT), DOE is proposing that the high-temperature refrigerator

provisions in AHRI 1200-202X would not be required for use until the compliance date of any energy conservation standards established for high-temperature refrigerators based on the proposed test procedure. Under this approach, CRE that would be defined as high-temperature refrigerators would continue to be tested and rated at the LAPT and subject to the current DOE energy conservation standards for CRE.

2. ASHRAE 72

As stated in the June 2021 RFI, the 2014 and 2018 revisions to ASHRAE 72 provide editorial, clarifying, or harmonizing revisions that would not impact the measured energy consumption, volume, or TDA of CRE as compared to the existing DOE test procedure. 86 FR 31182, 31184.

The revisions in ASHRAE 72-2018R as compared to the most recent 2018 version are largely to improve clarity of the test standard and include substantial re-organization of the test standard. Specifically, the foreword to ASHRAE 72-2018R states that the revision reorganizes the standard to make it easier to read and use; includes updates in the loading of test simulators and filler material; revises the sequence of operations during the test; provides instructions for certain measurements; and adds provisions for roll-in racks. The following paragraphs describe these revisions in more detail.

The reorganization of the test standard in ASHRAE 72-2018R is not expected to substantively change any test requirements as compared to the current test procedure. DOE understands that the intent of the reordering was to more closely align the test

standard with the order of operations that a test facility would follow when conducting testing.

The updates to the loading of test simulators (a small package with temperature measuring device) and filler material (material loaded between test simulators for additional product mass, intended to approximate food product loading) in ASHRAE 72-2018R revise certain requirements included in ASHRAE 72-2005. These updates change certain instructions regarding loading, but DOE has tentatively determined that these updates are either clarifying in nature or more closely align ASHRAE 72 with the capability of test facilities to conduct testing. Specifically, ASHRAE 72-2018R would improve the clarity of the simulator loading location instructions, more clearly define net usable volume to determine the loaded volume, and adjust the fill volumes from 70 to 90 percent of the net usable volume to 60 to 80 percent. See Section 5.4 of ASHRAE 72-2018R.

DOE has tentatively determined that in principle the update to the fill volume requirement would be a substantive change to the current DOE test procedure. However, DOE understands that ASHRAE implemented this revision because test facilities currently may have difficulty loading to more than 80 percent of the net usable volume. Based on this difficulty, DOE expects that most tests are currently conducted with loads between 70 to 80 percent of the net usable volume. Additionally, the revision to allow loading as low as 60 percent of net usable volume would allow additional flexibility for test facilities when loading equipment for testing and any impact on measured energy use is expected to be minimal. DOE also expects that to the extent that testing with a lower

load percentage would have any impact on measured energy use, it would likely increase measured energy use as CRE with doors would have more internal compartment volume occupied by air rather than the test load, allowing for more internal air to exchange with warm ambient air during the test procedure's door opening period. Therefore, DOE has tentatively determined that this proposed amendment to the test procedure would not allow any CRE not currently complying with DOE's energy conservation standards to become compliant.

Section 7.1 of ASHRAE 72-2018R specifies the sequence of operations for conducting a test. The overall sequence requires conducting two tests, Test A and Test B, to verify stability of the unit under test. Both Test A and Test B would be conducted in the same way—starting with a defrost and with door or drawer openings, night curtains, and lighting occupancy sensors and controls, as applicable—as specified in section 7.3 of ASHRAE 72-2018R. The test is determined to be stable if the average temperature of simulators during Test B is within 0.4 °F of the average measured temperature during Test A. *See* section 7.5 of ASHRAE 72-2018R. As compared to the current DOE test procedure and ASHRAE 72-2005, the 2018R version provides specificity for how to determine that a test is stable. ASHRAE 72-2005 currently requires steady-state conditions for the test (section 7.1.1) and a stabilization period during which the CRE operates with no adjustment to controls for at least 12 hours (section 7.4). Section 3 of ASHRAE 72-2005 defines steady-state as the condition in which the average temperature of all test simulators changes less than 0.4°F from one 24-hour period or refrigeration cycle to the next. ASHRAE 72-2005 does not specify whether the 24-hour periods used to determine steady-state conditions include door openings, which are required to be

performed during the 24-hour performance test. Additionally, the temperatures maintained over a 24-hour period with door openings may differ from a 24-hour period with no door openings. If steady-state is determined without door openings, the door openings during a test may increase simulator temperatures outside of the desired range for a test, requiring a change to the temperature setting and re-starting the steady-state determination prior to another test period.

Whereas, the approach included in ASHRAE 72-2018R specifies that Test A and Test B are conducted in the same way, and therefore the temperatures used to determine stability would also be at the target temperatures for the test. DOE has determined that this approach provides clarity to the existing test procedure while limiting burden by reducing the need for re-tests (*i.e.*, by maintaining target temperatures during the stability determination). Because the sequence of operations in ASHRAE 72-2018R is generally consistent with ASHRAE 72-2005 but with added specificity, DOE does not expect that the updated sequence of operations would impact current CRE ratings based on the current DOE test procedure.

Additionally, ASHRAE 72-2018R more explicitly specifies test conditions and data collection requirements in a new appendix A: "Measurement Locations, Tolerances, Accuracies, and Other Characteristics." This appendix includes a table that presents the measurements required during testing, the measurement location (if applicable), the period of time the measurement is taken (*e.g.*, once per minute throughout Test A and Test B, once before Test B, and once after Test B, *etc.*), the required measurement accuracy, and the required value (*i.e.*, the test condition, if applicable). The measurement

instructions and requirements in appendix A to ASHRAE 72-2018R are generally consistent with those required by the current DOE test procedure, by reference to ASHRAE 72-2005, but with added specificity to clarify the applicable requirements. Because the measurement instructions in ASHRAE 72-2018R are generally consistent with ASHRAE 72-2005 but with added specificity, DOE does not expect that the updated requirements in appendix A would impact current CRE ratings based on the current DOE test procedure.

ASHRAE 72-2018R also adds provisions for testing CRE used with roll-in racks. Sections 5.4.1 and 5.4.5 of ASHRAE 72-2018R provide loading instructions for CRE used with roll-in racks. These sections are generally consistent with the existing test requirements for CRE, but with additional clarification specific to roll-in racks to describe the determination of net usable volume and loading of test simulators. Whereas, ASHRAE 72-2005 includes roll-in racks within the scope of the test standard (see section 9.1) but does not provide additional test instructions for these models. Because the instructions for testing CRE used with roll-in racks in ASHRAE 72-2018R are generally consistent with ASHRAE 72-2005 but with added specificity, DOE does not expect that the updated requirements in appendix A would impact current CRE ratings based on the current DOE test procedure.

As discussed, the test procedure in ASHRAE 72-2018R is generally consistent with the existing DOE test procedure, which references ASHRAE 72-2005. The updates included in ASHRAE 72-2018R are generally editorial, clarifying, or harmonizing revisions. Additionally, the substantive revisions in ASHRAE 72-2018R provide

additional specificity to the existing test procedure requirements and would improve repeatability, reproducibility, and representativeness of the test procedure while limiting test burden. For these reasons, DOE is proposing to incorporate by reference ASHRAE 72-2018R into the DOE test procedure. For these same reasons, DOE has tentatively determined that any test data for CRE currently available on the market are expected to be consistent with the proposed test procedure.

DOE requests comment on its proposal to incorporate by reference ASHRAE 72-2018R, including on whether the updates included in the industry test standard would impact the measured energy consumption of any CRE currently available.

In response to the June 2021 RFI, Hoshizaki recommended that the ASHRAE 72 committee review the testing with drawers and determine the requirements for loading of drawers, opening of drawers, and sequence of such actions. (Hoshizaki, No. 13, p. 3) DOE understands that the ASHRAE 72 committee is reviewing test procedures for CRE with drawers to consider whether additional direction is needed.

Section 1.3.16 of appendix B of the DOE test procedure specifies that drawers are to be treated as identical to doors when conducting the DOE test procedure, and that drawers should be configured with the drawer pans that allow for the maximum packing of test simulators and filler packages without the filler packages and test simulators exceeding 90 percent of the refrigerated volume. Packing of test simulators and filler packages must be in accordance with the requirements for commercial refrigerators

without shelves, as specified in section 6.2.3 of ASHRAE 72-2005. Section 1.3.16 of appendix B.

CRE with drawers are typically configured to hold standardized food pans for food storage. Pans loaded into the drawers are not typically filled with food above the top edge of the pan to prevent spilling or interfering with other drawers. Additionally, these CRE may require the space above the pans to be unloaded to allow for air circulation within the cabinet.

The current DOE test procedure instructions do not specify any test simulator or filler package load limits for the pans, other than not exceeding 90 percent of the refrigerated volume. For other CRE tests, ASHRAE 72-2005 and ASHRAE 72-2018R specify test simulator and filler package loading based on net usable volume (*i.e.*, the volume of interior usable space intended for refrigerated storage or display, specifically consisting of the usable interior volume within the claimed load limit boundaries; see Section 3 of ASHRAE 72-2005) rather than refrigerated volume. See Section 5.4.2 of ASHRAE 72-2018R and Section 6.2.5 of ASHRAE 72-2005. Loading based on the net usable volume accounts for load limits within the CRE and would prevent overloading a CRE to the extent that could impact airflow circulation within the cabinet.

To ensure consistent testing for CRE with drawers, and to allow for testing that is most representative of typical use, DOE is proposing to specify in appendix B that CRE with drawers be tested according to the existing requirements with the additional

instruction that, for the purposes of loading pans in drawers, the net usable volume is the storage volume of the pans up to the top edge of the pan.

The drawer loading instructions in appendix B reference section 6.2.3 of ASHRAE 72-2005, which specifies instructions for loading compartments without shelves. Specifically, section 6.2.3 requires situating test simulators at the left and right ends (*i.e.*, sides), at the front and back, and top and bottom locations of the compartment. To make explicit the application of this instruction to standardized food pans, DOE is proposing to require that test simulators be placed at the corner locations of each pan. For any pans not wide or deep enough to allow for test simulators at each corner (*i.e.*, less than 7.5 inches wide or deep, based on the 3.75 inch test simulator width), DOE is proposing that the test simulators would be centered along the width or depth accordingly. Similarly, for any pans not tall enough to allow for test simulators at the specified top and bottom locations (*i.e.*, pans less than 4 inches tall, based on the 2 inch test simulator height), DOE is proposing that a test simulator only be loaded at the specified top location within the standardized food pan.

DOE requests comment on the proposed additional instructions regarding loading drawers. DOE requests information on whether the proposed approach is consistent with any future industry standard revisions to address this issue. DOE requests comment on whether other instructions for CRE with drawers should be revised (e.g., fully open definition for drawers) or if additional instructions are needed.

3. Secondary Coolants

Certain CRE are installed for use with a secondary coolant. In this configuration, a remotely cooled fluid (*e.g.*, a propylene glycol solution) is supplied to the cabinet and absorbs heat from the cabinet without the secondary coolant undergoing a phase change.

AHRI publishes a rating standard that is applicable to CRE that use a secondary coolant or refrigerant, AHRI Standard 1320 (I-P), "2011 Standard for Performance Rating of Commercial Refrigerated Display Merchandisers and Storage Cabinets for Use With Secondary Refrigerants," ("AHRI 1320-2011"), approved by ANSI on April 17, 2012. AHRI 1320-2011 is applicable to CRE that are equipped and designed to work with electrically driven, medium-temperature, single-phase secondary coolant systems, but excludes equipment used for low-temperature applications, secondary coolants involving a phase change (*e.g.*, ice slurries or carbon dioxide), and self-contained CRE. AHRI 1320-2011 includes similar rating temperature conditions as those in AHRI 1200-2013 and references ASHRAE 72-2005 and AHAM HRF-1-2008 for the measurement of energy consumption and calculation of refrigerated volume, respectively. The only substantive differences between AHRI 1200-2013 and AHRI 1320-2011 are the inclusion of secondary refrigerant circulation pump energy consumption in the calculation of total daily energy consumption and revised coefficients of performance to determine compressor energy consumption.

In the June 2021 RFI, DOE requested comment on whether AHRI 1320-2011 would be an appropriate test method to measure the total daily energy consumption of CRE that use a secondary refrigerant circuit, and whether it would provide representative

measurements of energy use. 86 FR 31182, 31185. DOE also sought information and data on CRE designed to work with electrically driven, medium-temperature, single-phase secondary coolant systems, including the typical field installations and operating conditions. *Id.*

AHRI and Hussmann commented that AHRI 1320-2011 is due to begin revisions as soon as the updated AHRI 1200-202X completes the review cycle, and that the updated AHRI 1320 standard will then cover the applicable secondary coolant systems and would be an appropriate test method to measure the total daily energy consumption of CRE that use a secondary refrigerant circuit. (AHRI, No. 3, p. 4; Hussmann, No. 14, p. 5)

DOE also requested comment on whether manufacturers sell or plan to sell CRE with secondary coolant that would be outside the stated applicability of AHRI 1320-2011, including low-temperature equipment or CRE using secondary coolants with a phase change (*e.g.*, ice slurries or carbon dioxide), and on whether any other existing test standards are appropriate for rating such equipment. *Id.*

Hussmann commented that they are not aware of any equipment with secondary coolant that would be outside the stated applicability of AHRI 1320-2011. (Hussmann, No. 14, p. 6)

IGSD commented in support of DOE considering AHRI 1320-2011 for secondary coolant systems, stating that studies have found that these systems can consume just as

much or less energy than systems that do not, with the added benefit of using low-global warming potential ("GWP") refrigerants. (IGSD, No. 7, p. 1)

AHRI and Arneg commented that the use of secondary coolants is requested by few end users and diminishing in number sold on the market, including for phase change systems using CO_2. (AHRI, No. 3, p. 4; Arneg, No. 12, p. 1) Arneg commented that regulatory emphasis should be placed on other types of equipment. AHRI commented that it is not aware of any standards that measure the energy use of CO_2 with pumped overfeed phase change systems. (Id.)

AHRI commented that regardless of the cooling medium, the display case will generally require the same amount of cooling. (AHRI, No. 3, p. 4)

While CRE cooled by secondary coolants are less common than self-contained or remote CRE, DOE is proposing to incorporate by reference AHRI 1320-2011 to provide a method for testing and rating the energy use of such CRE. As stated, the only substantive difference between AHRI 1200-2013 and AHRI 1320-2011 is the inclusion of secondary refrigerant circulation pump energy consumption in the calculation of total daily energy consumption.

DOE is proposing to incorporate by reference AHRI 1320-2011 for testing CRE used with secondary coolants and to reference only the specific sections within the standard that apply to CRE tested with secondary coolants (*i.e.*, those referring to pump energy and coolant flow) and to otherwise reference the applicable requirements in AHRI

1200-202X. DOE understands that AHRI 1320-2011 may be updated consistent with the updates in AHRI 1200-202X. DOE would consider the updated version of AHRI 1320-2011 if it is available at the time of any subsequent final rule to establish amended DOE test procedures for CRE.

Because CRE cooled by secondary coolants are not currently subject to DOE's test procedure, DOE is proposing that the test procedure referencing AHRI 1320-2011 would not be required for use until the compliance date of any amended energy conservation standards for CRE that consider such testing. DOE is aware that direct-expansion remote CRE may also be capable of being installed with a secondary coolant. Under this proposal, such equipment would continue to be tested and rated using the approach currently required for remote condensing CRE. The test procedure for secondary coolants proposed in this NOPR would be applicable to equipment only capable of being installed with secondary coolants, should any such models become available.

DOE requests comment on the proposal to incorporate by reference AHRI 1320-2011 for CRE used with secondary coolants, including the proposal to only reference the industry standard for provisions specific to secondary coolants and to otherwise reference AHRI 1200-202X, as proposed for other CRE.

4. International Standards Development

IGSD commented that the United for Efficiency public private partnership, under the leadership of the United Nations Environment Program, developed model regulation

guidelines for CRE,[11] which IGSD suggested may contain information of interest to DOE. (IGSD, No. 7, p. 3)

DOE has reviewed the model regulation guidelines for CRE and recognizes the potential benefit of international harmonization and of providing an example framework for regulations to facilitate establishing them for jurisdictions where they are not yet in place. The model regulation guidelines include scope of coverage, definitions, test procedures, energy consumption requirements, additional equipment regulations, and verification guidelines. The definitions and test procedures referenced in the guidelines are not consistent with the scope, definitions, and test procedures established by DOE under EPCA. DOE has tentatively determined that requiring the approach as specified in the model regulation guidelines would represent a significant burden to the CRE industry while not resulting in test procedures that are more representative of average use of CRE.

DOE is additionally proposing to define certain CRE and applicable test procedure provisions for equipment that is outside of the scope of the model regulation guidelines – *e.g.*, high-temperature refrigerators, blast chillers and blast freezers. The model regulation guidelines do not present an opportunity to harmonize test procedures with such CRE.

[11] Available at *united4efficiency.org/resources/model-regulation-guidelines-for-energy-efficient-and-climate-friendly-commercial-refrigeration-equipment/*.

For the reasons stated in the preceding paragraph, DOE is not proposing to adopt the model regulation guidelines.

DOE requests comment on the model regulation guidelines and on whether there are opportunities for DOE to harmonize its regulations with other regulations in place for CRE.

C. Test Conditions for Specific CRE Categories

DOE has identified specific categories of CRE that are not currently subject to the DOE test procedure or that the current test procedure may not produce results that are representative of their use. Additionally, the U.S. Environmental Protection Agency ("EPA") ENERGY STAR program considered three of these equipment categories for scope expansion and test method development during the Version 5.0 Specification development process: Refrigerated preparation and buffet tables; chef bases or griddle stands; and blast chillers and freezers.[12] DOE has considered information gathered through the ENERGY STAR process when developing the proposals included in this NOPR.

In response to the June 2021 RFI, the Joint Commenters and CA IOUs commented in support of developing test methods for salad bars, buffet tables, and refrigerated preparation tables; blast chillers and blast freezers; chef bases and griddle stands; and mobile refrigerated cabinets. (Joint Commenters, No. 8, p. 2; CA IOUs, No.

[12] Information and materials for ENERGY STAR's Specification Version 5.0 process are available at *www.energystar.gov/products/spec/commercial_refrigerators_and_freezers_specification_version_5_0_pd.*

10, p. 1) The Joint Commenters commented in support of the test methods to allow for comparable efficiency information across models and to allow the consideration of both DOE and ENERGY STAR specifications for this equipment. (Joint Commenters, No. 8, p. 2) NEEA recommended that DOE align CRE test methods for these categories with the ENERGY STAR Commercial Refrigerators and Freezers Specification Version 5.0.[13] (NEEA, No. 5, p. 3)

DOE discusses each of these categories in the following sections.

1. Salad Bars, Buffet Tables and Refrigerated Preparation Tables

Salad bars, buffet tables, and other refrigerated holding and serving equipment, including refrigerated preparation tables,[14] are CRE that store and display perishable items temporarily during food preparation or service. These units typically have design attributes, such as easily accessible or open bins that allow convenient and unimpeded access to the refrigerated products, which make them unique from CRE designed for storage or retailing. In the April 2014 Final Rule, DOE did not establish test procedures for this equipment, but maintained that this equipment meets the definition of CRE and is covered equipment that could be subject to future test procedures and energy conservation standards. 79 FR 22277, 22281. In the June 2021 RFI, DOE considered

[13] EPA's ENERGY STAR program released a Final Draft Version 5.0 Eligibility Criteria for commercial refrigerators and freezers on January 19, 2022. For information on the Version 5.0 specification development, see *www.energystar.gov/products/spec/commercial_refrigerators_and_freezers_specification_version_5_0_pd*.

[14] While the April 2014 Final Rule did not specifically refer to refrigerated preparation tables, DOE is including them in this category because they have similar features to salad bars and buffet tables. Each of these equipment categories includes an open top area for holding refrigerated pans and is used during food preparation and service.

definitions and test procedures applicable to salad bars, buffet tables, and refrigerated preparation tables. DOE also requested information on other refrigerated holding and serving equipment, including definitions and appropriate test procedures.

NEEA and the CA IOUs commented generally in support of DOE developing test procedures for refrigerated salad bars, buffet tables, and preparation tables. (NEEA, No. 5, p. 3; CA IOUs, No. 10, p. 3)

a. Definitions

In the June 2021 RFI, DOE noted that ASTM International F2143-16 "Standard Test Method for Performance of Refrigerated Buffet and Preparation Tables" ("ASTM F2143-16") provides the following definitions for refrigerated buffet and preparation tables:

- *Refrigerated buffet and preparation table*—equipment designed with a refrigerated open top or open condiment rail.

- *Refrigerated buffet table or unit*—equipment designed with mechanical refrigeration that is intended to receive refrigerated food and maintain food product temperatures and is intended for customer service such as a salad bar. A unit may or may not be equipped with a lower refrigerated compartment.

- *Refrigerated food preparation unit*—equipment designed with a refrigerated open top or open condiment rail such as refrigerated sandwich units, pizza preparation tables, and similar equipment. The unit may or may not be equipped with a lower refrigerated compartment.

86 FR 31182, 31185-31186. DOE noted that certain terms used within these definitions are undefined (*e.g.*, condiment rails, food product temperatures). *Id.* DOE additionally noted that it was not aware of any other industry standard definitions for these equipment. *Id.*

DOE additionally notes that the California Code of Regulations ("CCR")[15] defines "buffet table" and "preparation table" as follows:

- "Buffet table" means a commercial refrigerator, such as a salad bar, that is designed with mechanical refrigeration and that is intended to receive refrigerated food, to maintain food product temperatures, and for customer service; and

- "Preparation table" means a commercial refrigerator with a countertop refrigerated compartment with or without cabinets below, and with self-contained refrigeration equipment. 20 CCR §1602.

[15] California's regulations for buffet tables and preparation tables refer to the 2001 version of ASTM F2143. DOE has reviewed ASTM F2143-16 for this NOPR as it is the most current version of the standard.

Furthermore, EPA's ENERGY STAR program's Final Draft Version 5.0 Eligibility Criteria for commercial refrigerators and freezers includes a definition for "preparation or buffet table" as a commercial refrigerator, freezer, or refrigerator-freezer with a food condiment rail designed to hold open perishable food and may or may not be equipped with a lower compartment that may or may not be refrigerated.

In the June 2021 RFI, DOE requested information on the suitability of the ASTM F2143-16 definitions for refrigerated buffet and preparation tables (and also their applicability to salad bars) as potential regulatory definitions for this equipment. 86 FR 31182, 31186. DOE also requested comment on whether any further delineation would be necessary to account for the range of performance related features available in this equipment (*e.g.*, presence of pan covers, refrigerated storage compartments, and any other unique configurations or features that may require consideration for any potential test procedures). DOE further requested comment on the specific features and equipment capabilities that should be included in definitions for refrigerated salad bars, buffet tables, and preparation tables. *Id*. For example, DOE sought information on the factors that would differentiate this equipment from other typical CRE. *Id.* DOE also requested comment on whether potential definitions should specify temperature operating ranges, and if so, what the appropriate ranges would be. *Id.*

In the June 2021 RFI, DOE also noted that the configuration of salad bars, buffet tables, and refrigerated preparation tables may raise questions as to whether a unit is commercial hybrid refrigeration equipment. *Id.* DOE defines "commercial hybrid refrigeration equipment" as a unit of CRE (1) that consists of two or more thermally

separated refrigerated compartments that are in two or more different equipment families, and (2) that is sold as a single unit. 10 CFR 431.62.

DOE discussed in the June 2021 RFI that additional detail may be necessary to distinguish between a unit that is a salad bar, buffet table, or refrigerated preparation table and a unit that is commercial hybrid equipment that includes a salad bar, buffet table, or refrigerated preparation table. 86 FR 31182, 31186. Refrigerated salad bars, buffet tables, and preparation tables typically have removable pans or bins that directly contact the chilled air in the refrigerated compartment of the unit. With that configuration, the entirety of the chilled compartment and surface pans would potentially be considered a refrigerated salad bar, buffet table, or preparation table. In contrast, if a unit includes solid partitions between the chilled compartment and the pans or bins on top of the unit, such a configuration would potentially be considered thermal separation and the unit would be considered a commercial hybrid consisting of a refrigerated salad bar, buffet table, or preparation table with a refrigerator and/or freezer.

DOE requested comment on whether the presence of thermally separating partitions should be considered as a factor to differentiate between (a) refrigerated salad bars, buffet tables, and preparation tables; and (b) commercial hybrid units consisting of a refrigerated salad bar, buffet table, or preparation table with a refrigerator and/or freezer. *Id.*

AHRI commented that salad bars and buffet tables are generally self-service equipment, whereas preparation tables are store-service equipment, stating that service

could be either employee or customer operated for salad bars, condiment rails, *etc*. (AHRI, No. 3, p. 5)

AHRI and Continental commented that buffet and preparation tables often have upsized refrigeration systems with larger compressors, larger evaporators, additional fans, and modified or specialized air flow patterns to maintain food-safe temperatures in the open pans. (AHRI, No. 3, p. 5; Continental, No. 6, p. 2) ITW commented that long-term stability required by operators increases the demand for refrigeration system capacity. (ITW, No. 2, p. 3)

AHRI and Hussmann commented that the definition for "Refrigerated Buffet and Preparation Table" should be split to better define each unique case type, with "open top" and "open condiment rail" also being defined. (AHRI, No. 3, p. 4-5; Hussmann, No. 14, p. 6) AHRI and Hussmann commented that the definition for "refrigerated food preparation unit" should be clearly defined since the definition is similar to "refrigerated buffet and preparation table." (*Id.*)

AHRI and Hussmann further commented that the ASTM definition for "refrigerated buffet table or unit" states that the unit is intended to receive refrigerated food and maintain food product temperatures and is intended for customer service such as a salad bar, and that the "refrigerated food" temperature should be included in the definition as well as the temperature at which the food must be maintained and for an expected duration. (AHRI, No. 3, p. 4-5; Hussmann, No. 14, p. 6)

Hoshizaki commented that the ability to have cooled products in pans on the top and a refrigerated section below the pans in one unit is a feature of preparation tables. (Hoshizaki, No. 13, p. 1) Hoshizaki commented that refrigerated preparation tables are already defined in NSF International ("NSF")[16]/ANSI 7-2019, "Commercial Refrigerators and Freezers," ("NSF 7-2019") and ASTM F2143-16 and suggested that DOE utilize the current definitions of those products.[17] (*Id.*)

True, ITW, and Continental commented in support of using NSF 7-2019 (defined within NSF/ANSI 170-2019[18], "Glossary of Food Equipment Terminology," ("NSF 170-2019")), "Commercial Refrigerators and Freezers" definitions, which defines "Refrigerated Buffet Units" and "Refrigerated Food Preparation Units" with "open display area" and also "open-top refrigerated equipment." (True, No. 4, p 6-7; ITW, No. 2, p. 2-3; Continental, No. 6, p. 1)

ITW recommended the definitions based on NSF 7-2019 for : "refrigerated buffet units (salad bars)," "refrigerated food preparation units (tables)." (ITW, No. 2, p. 2-3) ITW commented that refrigerated buffet units (salad bars) could be viewed as open-top storage "like" cabinets with modifiable features, but that food preparation units (tables) are designed around specific applications (*e.g.*, salads, pizzas, sandwiches, grilling, *etc*.),

[16] Founded in 1944 as the National Sanitation Foundation, the organization changed its name to NSF International in 1990.
[17] Hoshizaki did not include a specific version of NSF 7 in their comments. DOE assumes Hoshizaki was referencing the latest version available at the time of comment (*i.e.*, the 2019 version).
[18] A specific version of NSF 170 was not referenced by commenters. DOE assumed commenters referenced the 2019 version of NSF 170 associated with NSF 7-2019. DOE notes there is an updated 2021 version that published September 1, 2021, after the June 2021 RFI comment period ended, but DOE determined there are no updates in this version that would impact the comments received.

such that a single overarching cabinet design cannot meet the specific needs of the end user. (ITW, No. 2, p. 3) ITW questioned if there is any value in regulating units without an integrated storage compartment, stating that there is minimal power consumption, installation base, and shorter daily operating hours for such units. (ITW, No. 2, p. 7)

Regarding whether potential definitions should specify temperature operating ranges, and if so, what the appropriate ranges would be, ITW, AHRI, True, and Continental commented that the food safety temperature is between 33 °F and 41 °F (further specified for open pan versus lower refrigerated area in NSF 7-2019) with the lids open and covers removed for a specified period of time, which AHRI noted is 4 hours per NSF 7-2019. (ITW, No. 2, p. 3; AHRI, No. 3, p. 5; True, No. 4, p. 8; Continental, No. 6, p. 2)

Regarding whether the presence of thermally separated compartments differentiates units that are refrigerated salad bars, buffet tables, and preparation tables from units that are commercial hybrid units, the CA IOUs commented that a single-compressor, self-contained condenser product with top and bottom compartments that are not thermally separated are the predominant configuration for refrigerated preparation tables, as they can be used in a variety of kitchen and food service environments. (CA IOUs No. 10, p. 3)

AHRI commented that some systems may share a coil between a prep or buffet station and a display or storage case already covered by DOE regulations. (AHRI, No. 3, p. 5) Hussmann commented that "multi-zone" units should be defined for a clear

understanding of equipment that may/may not share a coil between the prep/buffet section of a case and another section of the case that is already covered under an existing DOE category. (Hussmann, No. 14, p. 7) Hussmann and AHRI commented that the "lower refrigerated compartment" should be clearly defined as having either the same or separate coil. (Hussmann, No. 14, p. 6; AHRI, No. 3, p. 4-5)

Hussmann, AHRI, True, and ITW commented that thermally separating partitions should not be considered a factor in differentiating equipment type. (Hussmann, No. 14, p. 8; AHRI, No. 3, p. 5-6; True, No. 4, p. 8; ITW, No. 2, p. 3) ITW commented that thermally separating partitions do improve temperature stability between two areas but do not significantly change the heat load on the cabinet. (ITW, No. 2, p. 3)

True commented that a unit should contain a complete refrigeration [unit] for each section for it to be considered "commercial hybrid." (True, No. 4, p. 8) True commented that a unit containing two thermally separated refrigerated compartments with one common condensing unit should not be considered a hybrid unit. (*Id.*)

Regarding whether any further delineation is necessary to account for the range of performance related features available in this equipment, Hussmann commented that there should be definitions for different types of hybrid equipment, including: refrigerated buffet or prep table sharing a coil with a refrigerated compartment that is already covered by the DOE; refrigerated equipment that may split a single cooling zone between condiment rails, prep surfaces, pans with lids, pans without lids, non-critical temperature wells, etc.; equipment with wells that can switch from refrigerated to heated; and

equipment intended to be used with different sized pans on the same rail. (Hussmann, No. 14, p. 7)

Hussmann commented that the condiment and self-service zones may not be thermally separated but should still be considered a hybrid unit. (Hussmann, No. 14, p. 8) AHRI commented that equipment can incorporate frozen, cold, and hot food storage without thermally separated compartments and these systems should be considered hybrid refrigeration units. (AHRI, No. 3, p. 5-6) Hussmann commented that further definition would be needed for refrigerated preparation tops that require colder temperatures such as sushi or ice cream. (Hussmann, No. 14, p. 6-7)

ITW commented that the thermal heat load of open-top refrigeration equipment with an integral storage compartment is influenced by its physical characteristics, including the following: (1) condiment pan area (TDA) and configuration (slope vs flat, cold wall vs forced air vs glycol), (2) lid or cover design, (3) storage cabinet volume, (4) door or drawer design and configuration, and (5) the flow path of room air entering and leaving the condenser coil. (ITW, No. 2, p. 3) ITW also commented that refrigerated buffet tables and food preparation tables require equipment categorization by how their contents are displayed, either horizontal or semi-vertical. (*Id.*) ITW commented that this presentation angle affects the stability of the chilled air blanket above the product, with a greater angle causing a decrease in stability and increase in energy consumption. (*Id.*) ITW further commented that refrigerated food preparation units (tables) should be subcategorized by end application use and their ability to hold potentially hazardous food items at food safe temperatures. (*Id.*)

The comments from interested parties in response to the June 2021 RFI generally indicated support either for the definitions in the ASTM F2143-16 standard, as presented earlier in this section, or based on NSF 7-2019 (by reference to NSF 170-2019). Comments from interested parties; existing industry, State, and Federal definitions; and DOE's review of equipment available on the market indicate that the primary characteristic that differentiates salad bars, buffet tables, and refrigerated preparation tables from other types of CRE is the open-top refrigerated area (with or without lids) that allows access to pans or other removable containers that display or store merchandise and other perishable materials for customers or food preparation staff during food preparation or service. The merchandise and other perishable materials are only displayed or stored in pans or other removable containers when loaded into the open-top refrigerated area of this equipment (*i.e.*, the open-top refrigerated area does not provide for any display or storage outside of the pans or other removable containers). Additionally, the equipment can include other refrigerated compartments, either as an integrated combined refrigerated space (*i.e.*, the pans or other removable containers loaded in the open-top refrigerated area are in direct contact with the refrigerated compartment), or with thermal separation between the open-top refrigerated area and refrigerated compartments.

To delineate this equipment from other types of CRE, DOE is proposing to define the term "buffet table or preparation table". DOE is proposing a definition for this term that combines elements of the existing industry and ENERGY STAR definitions, includes language for consistency with DOE's existing CRE definitions, and includes

further specificity regarding the characteristics of this equipment. Specifically, DOE is proposing to define this term as follows:

"Buffet table or preparation table" means a commercial refrigerator with an open-top refrigerated area, that may or may not include a lid, for displaying or storing merchandise and other perishable materials in pans or other removable containers for customer self-service or food production and assembly. The unit may or may not be equipped with a refrigerated storage compartment underneath the pans or other removable containers that is not thermally separated from the open-top refrigerated area.

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DOE is not proposing to define the term "salad bar," as this equipment would be captured within the proposed definition of "buffet table or preparation table." DOE has tentatively determined that additional equipment definitions are not necessary for the purposes of testing buffet tables and preparation tables as proposed in this NOPR.

Additionally, DOE has not proposed any reference to temperature storage temperature or duration in the proposed buffet table or preparation table definition. DOE recognizes that these are important aspects of the equipment operation but has tentatively determined that they are not necessary for the purpose of defining the equipment to establish test procedures. By specifying that such units are commercial refrigerators, buffet tables and preparation tables would be units capable of operating at or above 32 °F (±2 °F).

As discussed, CRE may include single refrigeration systems to provide cooling to multiple compartments or areas within a unit. Additionally, CRE may include multiple distinct refrigeration systems or evaporator coils to individually cool separate compartments or refrigerated areas. DOE's proposed definition would include units both with and without a refrigerated storage compartment underneath the pans or other removable containers. The proposed definition, however, specifies that units including a refrigerated storage compartment underneath the pans or other removable containers may not be thermally separated from the open-top refrigerated area.

DOE notes that while industry may use the term "hybrid" to refer to different combinations of equipment capabilities and configurations, the term "commercial hybrid" is specifically defined by DOE in 10 CFR 431.62 as discussed earlier in this section. Currently, CRE with refrigerated storage compartments thermally separated from the open-top refrigerated area of the buffet table or preparation table are "commercial hybrid" CRE and must be tested in accordance with the applicable test procedures and comply with the applicable standards. Such equipment would continue to be tested as currently required to determine compliance with the existing energy conservation standards applicable to the non-buffet table or preparation table element. As noted, DOE has not established energy conservation standards for CRE covered under the proposed definition of buffet table or preparation table. DOE discussed in the April 2014 Final Rule that because only the refrigerated storage compartment is subject to current energy conservation standards, the unit would be tested with the buffet table or preparation table portion disabled and not included in the determination of energy consumption. 79 FR 22277, 22289. If the same refrigeration system serves both the refrigerated compartment

and the open-top refrigerated area and refrigeration of the open-top area cannot be disabled, manufacturers may apply for a test procedure waiver for such equipment if the measured energy use would not be representative of the portion of the unit that is not a buffet table or preparation table of the CRE basic model. *Id.*

Many of the comments received from interested parties reference the impact on buffet table or preparation table design on overall measured energy use. DOE acknowledges that the configuration, capability, and operation of this equipment can vary depending on application. However, for the purposes of proposing test procedures, DOE has initially determined that additional equipment definitions are not necessary. The definition for buffet table or preparation table as proposed in this NOPR would identify the equipment subject to the proposed test procedure, which, as discussed in the following section, would include general instructions for test setup and conduct that would be applicable to the equipment configurations identified in comments from interested parties.

To the extent that the equipment configurations and capabilities of buffet tables or preparation tables may impact measured energy use, DOE would consider such impacts were it to consider energy conservation standards for such equipment. Specifically, a rule prescribing an energy conservation standard for a type (or class) of covered products must specify a level of energy use or efficiency higher or lower than that which applies (or would apply) for such type (or class) for any group of covered products which have the same function or intended use, if the Secretary determines that covered products within such group- (A) consume a different kind of energy from that consumed by other

covered products within such type (or class); or (B) have a capacity or other performance-related feature which other products within such type (or class) do not have and such feature justifies a higher or lower standard from that which applies (or will apply) to other products within such type (or class). (42 U.S.C. 6316(e)(1); 42 U.S.C. 6295(q)) In making a determination concerning whether a performance-related feature justifies the establishment of a higher or lower standard, the Secretary must consider such factors as the utility to the consumer of such a feature, and such other factors as the Secretary deems appropriate. (*Id.*)

DOE requests comment on the proposed definition for buffet table or preparation table. DOE requests information on whether any additional definitions are necessary for the purposes of testing this equipment, or whether any additional equipment characteristics are necessary to differentiate this equipment from other categories of CRE.

b. Test Methods

In considering potential test methods for buffet tables and preparation tables, DOE reviewed ASTM F2143-16 and identified several differences between this test method and DOE's current test procedure for CRE, as discussed in the June 2021 RFI. 86 FR 31182, 31186-31188. DOE requested comment on specific test procedure provisions in ASTM F2143-16 and how they relate to other requirements in the current DOE test procedure. 86 FR 31182, 31188. As discussed in the following paragraphs, DOE received comments on the general test approaches that may be appropriate for buffet tables and preparation tables.

NEEA and the CA IOUs commented that a report created by Southern California Edison discussed testing on eight different refrigerated preparation tables from six manufacturers using ASTM F2143-16 that showed a range of performance, with the least efficient product tested using twice as much energy per day per volume. (NEEA, No. 5, p. 3-4; CA IOUs, No. 10, p. 3)

Hoshizaki commented that it has utilized ASTM F2143-16 for its preparation tables to list with the California Energy Commission ("CEC") and support DOE adoption of this standard. (Hoshizaki, No. 13, p. 1)

AHRI commented that there are many customizable appurtenances for this equipment, and that ASTM F2143-16 captures the base model distinctions to some degree but does not clearly distinguish between product categories and may lead to overlap between categories. (AHRI, No. 3, p. 4-5) AHRI also commented that self-contained versus remote applications would need to be considered. (AHRI, No. 3, p. 5)

Hussmann commented that ASTM F2143-16 includes only self-contained products and seeks clarification from DOE whether remote cases are intended to be covered as buffet tables and preparation tables. (Hussmann, No. 14, p. 7)

True commented that ASTM F2143-16 is not the correct industry standard to reference for buffet tables and preparation tables, asserting that it is not used by the food service industry, would add additional burden to overextended labs, and is not robust enough to withstand scrutiny. (True, No. 4, p. 6-7) True commented that NSF 7-2019 is

the correct standard to be used instead of ASTM F2143-16 because, for at least the last 30 years, the three categories (refrigerated buffet and preparation table, refrigerated buffet table or unit, refrigerated food prep unit) have been defined and tested according to NSF 7-2019 (defined within NSF 170-2019) and it is the standard followed by the CRE industry. (*Id.*) True commented that state and local health departments enforce health codes based on NSF 7-2019 when they test for food safety. (*Id.*)

DOE reviewed both ASTM F2143-16 and NSF 7-2019 in considering test methods for buffet tables and preparation tables. As described in section 1 of ASTM F2143-16 ("Scope"), that test method covers evaluation of the energy consumption of refrigerated buffet and preparation tables and allows food service operators to use this evaluation to select a refrigerated buffet and preparation table and understand its energy performance. The foreword to NSF 7-2019 specifies that the purpose of the industry testing standard is to establish minimum food protection and sanitation requirements for the materials, design, construction, and performance of commercial refrigerators and freezers.

The general test approach in ASTM F2143-16 is to load the unit with distilled water in pans and no load in any refrigerated compartment, operate the unit to confirm stability, then conduct testing for 24 hours, with an eight hour "active period" with lid and door openings followed by a 16 hour "standby period" with no door openings. DOE understands that this test is intended to represent unit operation and energy consumption over a day.

The NSF 7-2019 test approach requires loading the unit pans with refrigerated food-simulating test media (a specified mixture of water, salt, and hydroxypropyl methylcellulose) and no load in any refrigerated compartment and operating the unit for four hours to determine whether temperatures at all measured locations are within the acceptable range. DOE understands that this test is intended to evaluate the ability of a unit to maintain the temperature of refrigerated pans (and any compartments) during a four-hour period.

While these two industry test methods contain certain similarities – *e.g.*, loading pans but not compartments, ambient temperature conditions – DOE has initially determined that ASTM F2143-16 provides the more appropriate basis for an energy consumption test that is representative of typical use. As discussed in more detail in the following sub-sections, DOE has initially determined that 24-hours of maintaining stable temperatures, as required in the ASTM F2143-16 method, is representative of average use for this equipment. DOE has also tentatively determined that the stabilization and operating periods specified in ASTM F2143-16 would ensure that units are maintaining temperatures on a consistent basis during testing and would allow for comparative energy use measurements across units. NSF 7-2019 provides a basis for determining whether a unit is capable of maintaining certain temperatures over a shorter period, but without additional instructions to ensure energy consumption testing on a consistent basis – *i.e.*, the temperatures maintained over the shorter test period may not necessarily be stable.

For these reasons, DOE is proposing to reference ASTM F2134-16 as the basis for testing buffet tables and preparation tables. Consistent with the scope of ASTM

F2134-16, DOE is proposing test procedures only for self-contained buffet tables and preparation tables. While DOE is proposing to base the test procedure for buffet tables and preparation tables on ASTM F2134-16, DOE is also proposing certain additional and different requirements for test conditions, setup, and conduct, to ensure the representativeness of the test procedure, as discussed in the following sections.

To avoid confusion regarding testing of other CRE, DOE is also proposing to establish the test procedure for buffet tables and preparation tables as a new Appendix C to subpart C of 10 CFR 431. DOE is also proposing to refer to the proposed Appendix C as the test procedure for buffet tables and preparation tables in 10 CFR 431.64.

DOE requests comment on its proposal to adopt through reference certain provisions of ASTM F2143-16 as the basis for testing buffet tables and preparation tables. DOE also seeks comment on the proposal to specify test procedures only for self-contained buffet tables and preparation tables, consistent with ASTM F2143-16.

Test Conditions

ASTM F2143-16 specifies different rating conditions for test room dry-bulb temperature and moisture content than the current DOE test procedure. NSF 7-2019 also specifies test conditions similar to those in ASTM F2143-16. Table III.1 summarizes these differences.

Table III.1 - Test Room Dry-Bulb Temperature & Moisture Content Standards Comparison

Equipment type	Test standard	Test room dry bulb temperature	Wet bulb temperature (relative humidity)	Moisture content (lb/lb dry air)
Currently Covered CRE	ASHRAE 72 (2005 and 2018R)	75.2 °F ± 1.8 °F	64.4 °F ± 1.8 °F (49-62 percent)	0.009-0.011
Buffet and Preparation Tables	ASTM F2143-16	86 °F ± 2 °F	66.2 °F ± 1.8 °F (30-40 percent)	0.008-0.010
Buffet and Preparation Tables	NSF 7-2019	86 °F ± 2 °F	Max 72 °F (based on max 50 percent)	Max 0.013

In the June 2021 RFI, DOE requested comment and supporting data on test room dry-bulb temperature and moisture content typically experienced by buffet tables and preparation tables operating in the field. 86 FR 31182, 31186. DOE requested comment on whether these conditions are significantly different from those encountered by conventional CRE and would justify adopting separate rating conditions for buffet tables and preparation tables. *Id.*

ITW and Hussmann commented in support of the current ASHRAE 72-2018 test condition. (ITW, No. 2, p. 4; Hussmann, No. 14, p. 8) Hussmann commented that adopting ASTM F2143-16 would add burden on manufacturers, who would be required to test at two different dry-bulb temperatures for hybrid equipment. (Hussmann, No. 14, p. 8) ITW commented that manufacturers and test laboratories have invested significant effort to assemble laboratories and environmental chambers to hold tight tolerances around the ASHRAE 72-2018 test conditions. (ITW, No. 2, p. 4)

The CA IOUs commented in support of DOE aligning with the higher temperature and more humid ambient test conditions used in ASTM F2143-16 for

refrigerated preparation and buffet tables, stating that these products are often found in similar spaces as chef bases, including commercial kitchens. (CA IOUs, No. 10, p. 3-4)

ITW commented that the performance requirements and installation sites for refrigerated buffet (salad bars) and food preparation tables are comparable to existing CRE and do not require different environmental conditions for a representative energy evaluation. (ITW, No. 2, p. 4) ITW commented that most units are in proximity to the customer dining area, where ambient conditions are controlled at or below the ASHRAE 72-2018 specification, stating that dew points typically fall into the mid-40s °F and dry bulb temperatures average 72 °F. (*Id.*)

Hoshizaki commented that ambient temperature, moisture content, and elevation vary across the country, with ambient temperatures ranging from 70 to 100 °F and humidity ranging from 30 to 80 percent. (Hoshizaki, No. 13, p. 1) Arneg commented that field conditions vary widely, but that restaurants and supermarkets consistently maintain the 75 °F (dry bulb) and 55 °F (wet bulb) condition; and convenience stores usually have higher ambient conditions (*i.e.*, 80 °F dry bulb). (Arneg, No. 12, p. 1)

True and AHRI commented in support of the NSF 7-2019 test conditions (86 °F ± 2 °F, maximum relative humidity of 50 percent). (True, No. 4, p. 9; AHRI, No. 3, p. 6) True argued there is no such thing as a "real world" energy test. (True, No. 4, p. 13) True stated that they currently test vertical closed refrigerators and freezers at ASHRAE 72-2005 test conditions (75 °F ambient temperature, 55 percent relative humidity), but that commercial kitchens operate at 90-100 °F with 60-70 percent relative humidity. (*Id.*)

True commented that in this case, the ASHRAE 72-2005 test works as a "baseline" or "marker" comparison point between units. (*Id.*)

Continental suggested that the NSF 7-2019 test conditions should be evaluated for the suitability of energy testing. (Continental, No. 6, p. 2) AHRI and Continental commented that refrigerated preparation tables in particular are often subject to high ambient temperatures and additional loads, similar to other conventional reach-in CRE, since they are used by kitchen staff and in close proximity to commercial kitchens. (AHRI, No. 3, p. 6; Continental, No. 6, p. 2) AHRI commented that salad bars and buffet tables have shorter operating windows but are open to ambient conditions that can differ from conventional CRE and commented that the NSF 7-2019 definition for these units state they are intended for "customer self-service." (AHRI, No. 3, p. 6) Continental encouraged DOE to work with ASHRAE, AHRI, and ASTM to develop suitable test procedures for any additional product categories. (Continental, No. 6, p. 2)

NEEA and the CA IOUs commented in support of using ASTM F2143-16 for refrigerated buffet and preparation tables. (NEEA, No. 5, p. 4; CA IOUs, No. 10, p. 3) NEEA commented that many of the factors DOE is seeking information on are addressed in detail within the ASTM F2143-16 standard. (NEEA, No. 5, p. 4) The CA IOUs commented that DOE should leverage the work completed by the ASTM Committee F26 on Food Service equipment and related ASTM F2143-16 to serve as the starting point for the test procedure. (CA IOUs, No. 10, p. 3) NEEA commented that DOE should consider aligning test procedure with EPA ENERGY STAR to reduce manufacturer burden and establish consistency in the industry. (*Id.*)

As previously described, the apparent purpose of the NSF 7-2019 test is to determine the capability of a unit to maintain refrigerated temperature in the conditions specified by the industry testing standard. The ASTM F2143-16 ambient conditions match those in NSF 7-2019. However, DOE has initially determined that these conditions are not necessarily the most representative of typical use. As indicated in comments, buffet tables and preparation tables are typically installed in locations similar to other CRE (*e.g.*, food service areas, supermarkets, commercial kitchens) and would be subject to the same ambient conditions during typical use. DOE acknowledges that while the ambient conditions at the point of installation may vary, DOE has determined that the conditions in ASHRAE 72 (in both the currently referenced 2005 version and the 2018R version proposed for use in this NOPR) are appropriately representative of the average use of CRE. 79 FR 22277, 22283. For consistency with other CRE testing, DOE is proposing that the ambient conditions specified in ASHRAE 72-2018R also apply for testing buffet tables and preparation tables.

For measuring these ambient conditions, ASHRAE 72-2018 and ASTM F2143-16 specify the same measurement locations; however, the locations may require further specificity depending on the configuration of the refrigerated buffet table or preparation table under test. For example, the specified measurement location based on the highest point of the unit under test as provided in ASTM F2143-16 could be based on the height of the refrigerated table surface and pan openings or on the height of any lid or cover over the pans, if included. Additionally, the specified measurement location at the center of the unit as provided in ASTM F2143-16 could be based on the geometric center of the

unit determined from the height of the open pan surfaces or on the geometric center of any door openings (for those units with refrigerated compartments below the pan area).

In the June 2021 RFI, DOE requested comment on the appropriate locations for recording ambient conditions when testing buffet tables and preparation tables to ensure repeatable and reproducible testing for a range of equipment configurations. 86 FR 31182, 31186.

Hussmann, AHRI, Arneg, and ITW commented in support of using ASHRAE 72-2018 for ambient temperature measurement locations. (Hussmann, No. 14, p. 8; AHRI, No. 3, p. 6; Arneg, No. 12, p. 1; ITW, No. 2, p. 4) AHRI and Hussmann commented in support of consistency with testing of other CRE categories wherever possible, and AHRI suggested that DOE work with ASHRAE to incorporate measurement locations into ASHRAE 72-2018 or a new method of test. (AHRI, No. 3, p. 6; Hussmann, No. 14, p. 8) ITW provided measurement location options for DOE consideration based on the configuration and geometries of the test equipment. (ITW, No. 2, p. 4)

Continental commented that ambient temperature locations are prescribed in ASTM F2143-16 and ASHRAE 72-2018 and that DOE should work with ASHRAE, AHRI, and ASTM to evaluate the suitability of testing buffet tables and refrigerated preparation tables. (Continental, No. 6, p. 2)

Hoshizaki commented that ASTM F2143-16 provides ambient measurement locations and that no changes are needed to them. (Hoshizaki, No. 13, p. 1)

True commented that ambient measurement locations should follow NSF 7-2019 because buffet tables and preparation tables are short-term holding units, such that the NSF 7-2019 test procedure would best capture the energy use of these units. (True, No. 4, p. 9)

As described, DOE is proposing to incorporate by reference ASTM F2143-16 rather than NSF 7-2019 as the basis of testing buffet tables and preparation tables. The ASTM F2143-16 ambient measurement locations are generally consistent with those in the current DOE test procedure and the provisions in ASHRAE 72-2018R proposed for adoption in this NOPR, but ASHRAE 72-2018R includes additional specificity regarding ambient measurement locations. To ensure appropriate measurement locations, DOE is proposing to reference ASHAE 72-2018R rather than ASTM F2143-16 for ambient condition measurement locations. To provide additional specifications for thermocouple placement to accommodate different buffet table and preparation table configurations, DOE is proposing to add instruction that the "highest point" of the buffet table or preparation table is determined as the highest point of the open-top refrigerated area of the buffet table or preparation table, without including the height of any lids or covers. DOE is also proposing to specify that the geometric center of the buffet table or preparation table is: for buffet tables or preparation tables without refrigerated compartments, the geometric center of the top surface of the open-top refrigerated area; and for buffet tables or preparation tables with refrigerated compartments, the geometric center of the door opening area for the refrigerated compartment. DOE is proposing this specification because the geometric center of the unit is used to measure ambient temperature gradient. For units with refrigerated compartments, this instruction

referencing the center of the door opening area would ensure that the air entering the compartment during door openings is within the allowable temperature range.

Regarding electrical supply requirements and measurements, appendix A to ASHRAE 72-2018R provides greater specificity for testing as compared to ASTM F2143-16. To improve test repeatability and reproducibility, DOE is proposing to reference the electric supply and measurement requirements specified in appendix A to ASHRAE 72-2018R for testing buffet tables and preparation tables.

DOE is similarly proposing to adopt through reference certain provisions in ASHRAE 72-2018R rather than ASTM F2143-16 for instrumentation requirements for consistency with other CRE testing and with the proposed test conditions (*e.g.*, wet-bulb temperature as specified in ASHRAE 72-2018R rather than relative humidity as specified in ASTM F2143-16).

DOE requests comment on the proposal for testing buffet tables and preparation tables with test conditions (*i.e.*, test chamber conditions, measurement location, and electric supply conditions) consistent with ASHRAE 72-2018R, with additional detail specific to buffet tables and preparation tables.

Test Setup

Section 9.1 of ASTM F2143-16 specifies installation of the buffet table or preparation table for testing according to the manufacturer's instructions, with 6 inches of rear clearance, at least 12 inches of clearance to any side wall or partition, and at least 3

feet of clearance from the front of the unit. Section 5.2 of ASHRAE 72-2018R specifies that the test unit be installed next to a wall or vertical partition in the direction of (a) the exhaust, (b) the intake, or (c) both the exhaust and the intake at the minimum clearance, ± 0.5 inches, as specified in the installation instructions; if the installation instructions do not provide a minimum clearance, the vertical partition or wall shall be located 4 ± 0.5 inches from the sides or rear of the cabinet and extend at least 12 inches beyond each side of the cabinet from the floor to at least 12 inches above the top of the cabinet.

DOE has initially determined that the installation instructions in ASHRAE 72-2018R are more representative of actual use, as they require testing according to the minimum manufacturer-specified clearance in the direction of air exhaust or intake rather than a constant 6 inches. DOE expects that CRE are typically installed with minimum installation clearances due to the space-constrained locations in which they operate (*e.g.*, commercial kitchens or food service areas). DOE is proposing to reference the installation requirements in Section 5.2 of ASHRAE 72-2018R for buffet table and preparation table testing to represent typical use and to ensure consistency with appendix B test requirements.

Sections 5.1 and 5.3 of ASHRAE 72-2018R also provide additional instructions regarding test unit installation and setup that are not addressed in ASTM F2143-16. Specifically, section 5.1 provides instructions regarding test unit installation within the test facility and section 5.3 specifies test requirements for components and accessories. While these provisions were established for conventional CRE, DOE has initially determined that they are also applicable to buffet table and preparation table installation

and use due to both categories having similar installation locations and similar accessories available for use. DOE is proposing to also reference these Sections in ASHRAE 72-2018R for buffet table and preparation table testing to ensure consistent testing that is representative of actual use.

DOE requests comment on the proposal for testing buffet tables and preparation tables with test setup instructions consistent with ASHRAE 72-2018R rather than ASTM F2143-16.

Test Load

ASTM F2143-16 specifies that temperature measurements for preparation tables or buffet tables be taken from standardized pans filled with distilled water. ASTM F2143-16 also specifies measuring the temperature in any chilled compartments for refrigerated buffet and preparation tables using three thermocouples in an empty, unloaded compartment. DOE's current test procedure for CRE requires that integrated average temperature measurements be taken from test simulators consisting of a plastic container filled with a sponge saturated with a 2-percent mixture of propylene glycol and distilled water. *See* ASHRAE 72-2005, section 6.2.1. Additionally, the DOE test procedure requires 70 to 90 percent of the compartment net usable volume to be loaded with filler material and test simulators for testing (60 to 80 percent as proposed in this NOPR by referencing Section 5.4.8 of ASHRAE 72-2018R). *See* ASHRAE 72-2005, section 6.2.5. Buffet tables and preparation tables may not typically be loaded to 70 percent of their net usable volume due to their use for service rather than long-term

storage, but testing with the refrigerated compartment entirely empty also may not be representative of average use.

In the June 2021 RFI, DOE requested comment on the appropriateness of using only distilled water as the test medium to represent thermo-physical properties of foods that are typically stored in the surface pans of buffet tables and preparation tables. 86 FR 31182, 31187.

AHRI commented that DOE should work with the ASHRAE committee to consider revisions to ASHRAE 72 to incorporate appropriate requirements if they are unique enough to warrant a separate ASHRAE method of test. (AHRI, No. 3, p. 6)

ITW, Hussmann, and Hoshizaki commented in support of DOE using distilled water as the test medium because it is cost effective and easy to replicate. (ITW, No. 2, p. 5; Hussmann, No. 14, p. 9; Hoshizaki, No. 13, p. 2) Hoshizaki commented that they tested preparation tables with the glycol mixture and distilled water and did not see a difference of pan temperature. (Hoshizaki, No. 13, p. 2) ITW commented that open-top refrigeration equipment is designed to hold foods of all types (liquids, solids, loosely filled combinations of both, *etc*.) with varying thermo-physical properties, but that in general all variations are composed of mostly water. (ITW, No. 2, p. 5) ITW commented that distilled water has the advantages of providing a consistent and readily available medium that closely approximates the properties of most food types under the specified test conditions; allowing for bulk containers to be filled and pre-chilled; and allowing for food pans regardless of shape or dimensions to be "quickly" and evenly

filled. (ITW, No. 2, p. 5) ITW also stated that pre-marking each pan one half inch below the top rim minimizes the total pan loading time as compared to the "balance scale" method outlined in the ASTM F2143-16 standard, sections 10.4.3.5 through 10.4.3.7. (*Id.*)

Arneg and True commented that distilled water should not be used as the test medium. (Arneg, No. 12, p. 1; True, No. 4, p. 9) Arneg commented that although food temperatures are typically above 32 °F, depending on the type of food, the intended product temperature could be below 32 °F. (Arneg, No. 12, p. 1) True commented that the test media in NSF 7-2019 (methocel) should be used to represent foods. (True, No. 4, p. 9, 11) True commented that using distilled water is a problem because the pan temperature cannot be properly measured if testing below 32 °F since the water temperature will only change once completely solidified into ice. (*Id.*) CA IOUs commented that a 2014 study from Pacific Gas and Electric ("PG&E") showed some units periodically dropping below 32 °F and suggested DOE explore alternatives to distilled water to validate if any alternatives would be warranted when weighing the added test complexity and costs. (CA IOUs, No. 10, p. 3)

Hussmann commented that DOE should allow the use of methocel as an alternative to align with NSF 7-2019. (Hussmann, No. 14, p. 9)

DOE has initially determined that the distilled water pan loading as specified in ASM F2143-16 provides a representative test load for the open-top refrigerated areas of buffet tables and preparation table, while limiting test burden, and is consistent with the

filler material specified in both ASHRAE 72-2005 and ASHRAE 72-2018R (*i.e.*, filler material that consists of water, a 50/50 mixture (±2%) of distilled water and propylene glycol, or wood blocks with an overall density not less than 480 kg/m^3 (30 lb/ft^3). As stated in the ITW comment, typical food loads are composed mostly of water, such that water is a representative test medium. Additionally, distilled water does not require any additional preparation by the test laboratory, limiting test burden and ensuring a consistent test medium across different test facilities.

DOE acknowledges that using water would not accommodate testing at conditions at and below 32 °F. However, ASTM F2143-16 specifies pan temperature to be within 33 °F and 41 °F for a valid test. As discussed later in this section, DOE is proposing that the integrated average pan temperature be 38 °F ± 2 °F for buffet table and preparation table testing. At these temperatures, the distilled water would be liquid and would not result in the testing issues associated with freezing. Additionally, DOE observed during investigative testing that individual pans filled with distilled water did not reach temperatures lower than 33 °F when tested with an integrated average pan temperature of 38 °F ± 2 °F.

In addition to proposing the water test load, DOE is proposing that pans for testing be loaded to within one half inch of the top of the pan. For pans that are not configured in a horizontal orientation, DOE is proposing that only the lowest side of the pan be loaded to within one half inch of the top of the pan. ASTM F2143-16 specifies a pan loading procedure based on the weight of water needed to load pans to one half inch of the top of the pan. DOE expects a loading method based on marking pans or

measuring distance from the water to the top of the pan would limit test burden as compared to the weight-based method in ASTM F2143-16 and that both the loads and loading methods would be substantively the same.

ASTM F2143-16 specifies the pans for holding water to be standard 4-inch deep 1/6-size metal steam table pans with a weight of 0.70 ± 0.07 lb. ASTM F2143-16 allows for manufacturer-specified pans if the unit is designed specifically for such pans. DOE notes that manufacturers typically specify pan dimensions or provide pans for their units, but some manufacturers do not provide a pan depth or may specify a range of possible pan depths. DOE also notes that pan materials can vary and are not always specified by the manufacturer.

In the June 2021 RFI, DOE requested comment on whether pan dimensions should be standardized if testing buffet tables and preparation tables is required, or whether these units should be tested with pans meeting manufacturer-recommended pan dimensions. 86 FR 31182, 31187. If pans were standardized, DOE requested comment on whether the dimensions described in ASTM F2143-16 are appropriately representative of what is used, or whether another set of dimensions or materials would be more appropriate. *Id.* DOE also requested information on whether the pan material should be defined in greater detail, recognizing that ASTM F2143-16 specifies only that the pans be "metal." *Id.*

True commented that the 1/6 metal steam table pans have a larger surface area (to product or media) than the 1/2 size metal steam table pans in NSF 7-2019, and suggested

the following based on NSF 7-2019: "standard half-size hotel (4 in [102mm]) shall be used unless the equipment being evaluated is specifically and permanently designed to hold alternate size pans," "stainless steel pans shall be used unless otherwise specified by the manufacturer." (True, No. 4, p. 10)

ITW, AHRI, Hussmann, Hoshizaki, Arneg, and Continental commented that a standardized pan size should not be used due to the variety of pan sizes and configurations across different manufacturers. (ITW, No. 2, p. 5; AHRI, No. 3, p. 7; Hussmann, No. 14, p. 9; Hoshizaki, No. 13, p. 2; Arneg, No. 12, p. 1; Continental, No. 6, p. 2) Hoshizaki commented that manufacturers should specify what pan size they require for testing their unit as part of their test setup instructions. (Hoshizaki, No. 13, p. 2) AHRI and Hussmann commented that the pan(s) size should only be required to fill the pan opening in the unit and of a material offered by the manufacturer. (AHRI, No. 3. p. 7; Hussmann, No. 14, p. 9) ITW commented that a standardized food pan/pan configuration should only be used if the manufacturer does not supply food pans with their equipment or provide a list of acceptable pans with specifications to be used with their equipment. (ITW, No. 2, p. 5)

Based on a review of buffet tables and preparation tables available on the market, manufacturers typically allow for a range of pan configurations in the open top refrigerated area. These configurations can nearly always accommodate the 1/6 size steam table pans referenced in ASTM F2143-16. To ensure consistent testing for units that offer multiple pan configurations, DOE is proposing to reference the pan instructions in ASTM F2143-16. If a buffet table or preparation table cannot be loaded with the

specified standard pans, DOE is proposing to test with the pans that are consistent with the manufacturer installation instructions and with the dimensions as close to the standard pans as is available, consistent with the ASTM F2143-16 loading instructions.

In the June 2021 RFI, DOE requested comment on the feasibility of requiring temperature measurements in closed refrigerated compartments of buffet tables and preparation tables using test packages as specified in ASHRAE 72 (specified in the 2005, 2018, and 2018R versions), and whether the compartments should be loaded with any filler packages (and to what percent of the net usable volume) for testing. 86 FR 31182, 31187. DOE requested comment on alternatives that should be used if the test packages are not appropriate for measuring compartment temperatures (*e.g.*, thermocouples located in pans filled with distilled water, thermocouples as specified in ASTM F2143-16, or weighted thermocouples[19]). *Id.*

As discussed in section III.C.1 of this document, under the current test procedure a thermal separation would be required between the buffet table or preparation table and a refrigerated compartment for the refrigerated compartment to be subject to the testing requirements, which include test simulators and loading requirements. Buffet tables and preparation tables may include refrigerated compartments that are not thermally separated from the open-top refrigerated area, and DOE considered whether different loads (or no load) would be appropriate for testing such compartments.

[19] ASHRAE 72-2018R describes a weighted thermocouple as a thermocouple in thermal contact with the center of a 45 g (1.6 oz) cylindrical brass slug with a diameter and height of 19 mm (0.75 in).

AHRI commented that DOE should work with ASHRAE SSPC 72 to incorporate appropriate requirements for these units or determine if they are unique enough to warrant a separate ASHRAE method of test. (AHRI, No. 3, p. 6)

Hussmann and Hoshizaki commented that the method to measure compartment temperature should follow the locations specified in ASTM F2143-16. (Hussmann, No. 14, p. 9; Hoshizaki, No. 13, p. 2) Hussmann commented that the thermocouples could be as stated in ASTM F2143-16 or brass slugs, as specified in NSF 7-2019. (Hussmann, No. 14, p. 9) Hoshizaki commented that this measurement of the refrigerated cabinet is the same as the NSF 7-2019 test in which three slugs are positioned at different parts of the cabinet. (Hoshizaki, No. 13, p. 2) Hoshizaki recommended testing with only slugs, as currently shown in ASTM F2143-16. (Hoshizaki, No. 13, p. 2)

True and Continental commented in support of using weighted thermocouples, as prescribed in NSF 7-2019, for air temperature measurements in closed refrigerated compartments. (True, No. 4, p. 10; Continental, No. 6, p. 2) Continental commented that requiring filler packages in the storage compartment would add significant unnecessary testing burden on manufacturers. (Continental, No. 6, p. 2)

True and Hoshizaki commented that the addition of filler packages would add a thermal mass that will decrease the cooling requirements by helping to stabilize the temperature once stabilization temperature is reached for the closed refrigeration compartment, such that NSF 7-2019 would offer the worst case for energy use and would decrease test and stabilization time. (True, No. 4, p. 10; Hoshizaki, No. 13, p. 2)

DOE is proposing that any refrigerated compartment of a buffet table or preparation table (*i.e.*, any refrigerated compartment that is not thermally separated from the open-top refrigerated area) be tested with no load. DOE is proposing to reference the ASTM F2143-16 requirements, which specifies placing three thermocouples in specific locations within the empty refrigerated compartment. DOE has tentatively determined that this approach would limit test burden by not requiring additional test simulator preparation or loading of filler materials. Additionally, DOE expects that the refrigerated compartments of buffet tables and preparation tables are typically used for short-term storage of items used during food service and food preparation (*i.e.*, with additional pans of prepared food or ingredients for food preparation) rather than long-term storage, and that therefore an unloaded cabinet would be more representative of typical usage. This is also consistent with the DOE test procedures for consumer refrigeration products, which measure internal compartment temperatures with no load. See 10 CFR part 430, subpart b, appendix A and appendix B.

ASTM F2143-16 does not specify whether the internal compartment thermocouples are weighted or unweighted. For consistency with the NSF 7-2019 approach, DOE is proposing that the thermocouples be weighted – *i.e.*, in thermal contact with the center of a 1.6-oz (45-g) cylindrical brass slug with a diameter and height of 0.75 in. The brass slugs shall be placed at least 0.5 in from any heat-conducting surface. While ASHRAE 72-2018R requires internal compartment temperatures to be measured using test simulators, ambient temperature measurements are similarly made by thermocouples in contact with cylindrical brass slugs with the same specifications.

DOE requests comment on the proposed test loads and temperature measurement locations for buffet tables and preparation tables – *i.e.*, distilled water in pans for the open-top refrigerated area and no load in any refrigerated compartment – consistent with the approach in ASTM F2143-16.

Test Conduct – Defrosts

ASTM F2143-16 does not provide specific instructions for addressing defrost cycles when testing buffet tables and preparation tables, other than indicating in the test report whether a defrost cycle occurred. Section 7.3 of ASHRAE 72-2018R directs that the test period begins with a defrost cycle. This section also requires that for refrigerators with manual defrost or off-cycle defrost, the test is started at the beginning of a refrigeration system off cycle (if the off-cycle defrost is not identifiable); or, if the refrigeration system never cycles off, the test is started at any point during refrigeration system operation.

Defrost cycles can increase the energy consumption of refrigeration equipment as compared to stable operation; however, DOE has observed that most buffet tables and preparation tables often incorporate off-cycle defrosts, which melt frost accumulation by running the evaporator fan during a compressor off-cycle. This method of defrost does not actively introduce heat to melt the accumulated frost and may occur during the compressor's normal cycling operation. With this defrost approach, there may not be an identifiable defrost occurrence in the measured test data.

In the June 2021 RFI, DOE requested comment on whether a possible test procedure should consider defrost cycles for buffet tables and preparation tables, and if so, how. 86 FR 31182, 31188.

Hussmann, AHRI, Hoshizaki, and True commented that the test procedure should not include defrost cycles. (Hussmann, No. 14, p. 12; AHRI, No. 3, p. 9; Hoshizaki, No. 13, p. 3; True, No. 4, p. 13) AHRI commented these units have shorter operating windows than typical CRE, with manual defrost often conducted overnight outside the operating window. (AHRI, No. 3, p.9) Hussmann commented that if the defrost interval is less than 4 hours, then it could be considered. (Hussmann, No. 14, p. 12) Hoshizaki commented that a truncated test should not address defrost cycles if the goal is to test for a given time because designing a test around defrost cycles, as done in the ASHRAE 72-2018 24-hour test, would be time consuming and would provide negligible insight to actual energy use. (Hoshizaki, No. 13, p. 3)

ITW commented that refrigerated salad bars, buffet tables, and preparation tables that include an integrated storage compartment typically operate on a 24-hour daily cycle and should have their defrost cycles considered, but units without this storage compartment do not need to include the defrost cycle in the energy evaluation since they typically operate on shorter schedules. (ITW, No. 2, p. 7)

ITW commented that for units with a refrigerated storage compartment, the start of the defrost cycle should initiate the testing cycle in order to have a consistent

methodology and to provide information on the characteristics of different defrost types. (ITW, No. 2, p. 7)

DOE has initially determined that to the extent that buffet tables or preparation tables incorporate automatic electric or hot gas defrosts (*i.e.*, heating the evaporator to melt frost accumulation), or any automatic extended off-cycle defrost (*i.e.*, off-cycle defrost with a duration longer than a compressor off-cycle), the energy consumption of these defrosts should be captured in the test period to measure energy use representative of typical use. DOE observed during investigative testing that automatic extended off-cycle defrost is used in both buffet tables and preparation tables. To incorporate this energy use and ensure consistent testing of buffet tables and preparation tables, DOE is proposing to require that test periods for buffet tables and preparation tables account for any defrosts consistent with the requirements in ASHRAE 72-2018R. This would require capturing a defrost at the start of the test period or starting the test period at the beginning of a refrigeration off-cycle if there is no identifiable defrost (or at any point during refrigeration system operation if the refrigeration system never cycles off).

DOE requests comment on the proposal to account for defrosts when testing buffet tables and preparation tables, consistent with the approach in ASHRAE 72-2018R.

Test Conduct – Moving Pans

Section 10.5.6 of ASTM F2143-16 specifies that if it is possible to control cooling to the display area independently of the refrigerated cabinet, the cooling to the display area is turned off and all pans are to be moved from the display area to the refrigerated

cabinet underneath after the active period. The ability to control cooling in both the display area and the refrigerated cabinet independently of each other suggests that this language applies to units with thermally-separated compartments and pan areas.

In the June 2021 RFI, DOE requested comment on whether moving pans from the display area to the refrigerated compartment as specified in Section 10.5.6 of ASTM F2143-16 is appropriate for testing buffet tables and preparation tables. 86 FR 31182, 31187. DOE further requested feedback on whether storing pans in a refrigerated compartment is typical only for those units with certain configurations—*e.g.*, thermal separation between the compartment and refrigerated pan area or closable covers for the pan area. *Id.*

AHRI and Hussmann commented that the open pan area testing in NSF 7-2019 should be considered for possible incorporation into industry test standards, and that ASHRAE 72-2018 has provisions for storage compartment testing methods. (AHRI, No. 3, p. 7; Hussmann, No. 14, p. 10)

Hoshizaki and True commented that requiring the movement of pans to refrigerated sections during the test should not be considered as part of an energy test standard. (Hoshizaki, No. 13, p. 2; True, No. 4, p. 11) Hoshizaki commented that the movement of pans is only a suggestion in ASTM F2143-16 and suggested that manufacturers specify that as part of their test setup instructions. (Hoshizaki, No. 13, p. 2)

Continental, AHRI, and Hussmann commented that equipment with the ability to turn off the open-top refrigeration system should have pans moved to the refrigerated storage compartment if it conforms with the manufacturer's instructions for unloading the display area at night. (Continental, No. 6, p. 2; AHRI, No. 3, p. 7; Hussmann, No. 14, p. 10)

ITW commented that equipment with the ability to turn off the open-top refrigeration system should not move the food pans to the storage compartment. (ITW, No. 2, p. 5-6) ITW commented that food pans should not be removed during the evaluation period because it would introduce variations or inconsistencies between test laboratories and manufacturers because the time to complete the activity would be inconsistent. (*Id.*)

ITW commented that removing food pans from the open-top "rail" after 8 hours changes the thermodynamic load placed on the refrigeration system, and movement to the integral storage compartment is dependent on the unit's ability to switch off the cooling for the "rail." (ITW, No. 2, p. 5-6) ITW commented that DOE has consistently indicated that all manually operated on/off switches that increase energy consumption should be in the on position throughout the evaluation period, such that switching off the "rail" refrigeration system after 8 hours would be inconsistent with DOE's previous position. (*Id.*)

AHRI and Hussmann commented that the open pan area testing in NSF 7-2019 should be considered for possible incorporation into industry test standards, and that

ASHRAE 72-2018 has provisions for storage compartment testing methods. (AHRI, No. 3, p. 7; Hussmann, No. 14, p. 10)

DOE currently provides test procedures for any refrigerated compartments that are combined with buffet tables and preparation tables and that are thermally separate from the open-top refrigerated area. DOE is not proposing to amend the test requirements for such thermally separate refrigerated compartments.

As discussed earlier in this section, DOE is proposing to reference ASTM F2143-16 rather than NSF 7-2019 as the basis for buffet table and preparation table testing. Section 10.5.6 of ASTM F2143-16 specifies moving pans from the display area to the refrigerated cabinet underneath after the active period if it is possible to control cooling to the display area independently of the refrigerated cabinet. As stated, the separate cooling control suggests thermal separation between the open-top area and the refrigerated cabinet. Because DOE is not proposing changes to the current test requirements for any thermally separated refrigerated cabinets, DOE is proposing that all buffet tables and preparation tables be tested with the pans in the display area for the entire test, including the "standby period" specified in Section 10.5.6 of ASTM F2143-16.

DOE has initially determined that this proposed approach would limit test burden and variability by avoiding moving pans during the test period, which could introduce varying heat loads depending on how the movement is conducted. Additionally, DOE expects that the proposed test procedure is representative of typical buffet table and preparation table use. As previously discussed, DOE expects that buffet tables and

preparation tables are used for short-term storage during food service and food preparation. Therefore, it is unlikely that these units would be used for storage in the refrigerated compartment without any pans loaded in the open-top pan area.

DOE requests comment on its proposal to require loading pans in the open-top refrigerated area and not moving them to a refrigerated compartment, if applicable, during testing.

Test Conduct – Operating Periods and Door/Lid Openings

As described, buffet tables and preparation tables temporarily store and display perishable items during food preparation or service. Because buffet tables and preparation tables are used only during food preparation or service, these equipment types may not be used for the same 24-hour duration used to characterize performance for other categories of CRE. Sections 10.5.5 and 10.5.6 of ASTM F2143-16 specify a 24-hour test, with an active period of 8 hours and a standby period of 16 hours. The active period specified in section 10.5.5 contains instructions for a cover, if equipped (open for 2 hours, then closed for 4 hours, then open for 2 hours), and a door opening sequence for any refrigerated compartments (every 30 minutes, each cabinet door or drawer, or both, shall be fully opened sequentially, one at a time, for 6 consecutive seconds; for units with pass-thru doors, only the doors on one side of the unit are opened).

In the June 2021 RFI, DOE requested comment on the typical daily usage of buffet tables and preparation tables. 86 FR 31182, 31187. Additionally, DOE requested feedback on whether these CRE are used for long-term storage of food or only short-term

storage during food preparation or service periods. *Id.* DOE also requested comment on whether the daily use of this equipment varies depending on configuration or other technical characteristics. *Id.*

AHRI, Hussmann, Arneg, and True commented that the typical use is only during service operating hours (approximately 8-12 hours), such that the typical use is short-term during food preparation or service periods rather than long-term food storage. (AHRI No. 3, p. 8; Hussmann, No. 14, p. 10-11; Arneg, No. 12, p. 1; True, No. 4, p. 11) Hoshizaki commented that preparation table units are typically used for a period of 11 hours for restaurants with active food prep areas. (Hoshizaki, No. 13, p. 2) Arneg and True commented that it is common to store foods in salad bars and buffet tables for short periods of time during "rush periods" (*i.e.*, breakfast, lunch, dinner, bar closing time). (Arneg, No. 12, p. 1; True, No. 4, p. 11) Arneg commented that if food safety time-temperature relations are used, depending on how long the food is displayed, the cabinets may not need to be refrigerated. (Arneg, No. 12, p. 1) True commented that most food service operators use walk-in coolers for overnight storage, not the storage section of these CRE models. (True, No. 4, p. 11) True commented the NSF 7-2019 test procedure provides the worst case for energy use during a four-hour period with the covers open. (True, No. 4, p. 11) True commented that ASTM F2143-16 is not appropriate for food safety nor performance testing and suggests the use of NSF 7-2019, which covers the performance requirements for these types of units and encompasses food safety. (True, No. 4, p. 13) True suggested multiplying the four-hour NSF 7-2019 test for energy consumption by six to get a 24-hour energy consumption "baseline" number that could be used as a comparison. (True, No, 4, p. 7)

Continental commented that refrigerated preparation tables are designed and utilized for continued storage of products whenever the facility is operating, which can be 24 hours a day. (Continental, No. 6, p. 2)

ITW, AHRI, Hussmann, and Hoshizaki commented that there is no typical daily use of this equipment and that it will vary based on the configuration of the equipment and design characteristics (*e.g.*, if the equipment is provided with a storage compartment), and that usage applications can vary from small sandwich shops to high volume 24-hour fast food chains. (ITW, No. 2, p. 6; AHRI, No. 3, p. 8; Hussmann, No. 14, p. 10-11; Hoshizaki, No. 13, p. 2)

ITW provided common operational characteristics among all applications depending on equipment configurations, including 24-hour unit operation and various pan/lid operating durations. (ITW, No. 2, p. 6)

Based on comments from interested parties, DOE has tentatively determined that buffet tables and preparation tables are typically used for food service and food preparation rather than longer term food storage. As described earlier in this section, DOE is proposing to test this equipment with pans loaded into the open-top display areas for the duration of the test, which DOE has tentatively determined represents typical use during food service and food preparation.

DOE recognizes that the duration of use per day varies based on application and installation location for this equipment. Based on comments from interested parties,

buffet tables and preparation tables can be used for up to 24 hours per day. DOE has initially determined that a 24-hour test period as specified in ASTM F2143-16 incorporates the likely aspects of buffet table and preparation table operation – *i.e.*, an active door-opening period and a period of stable operation. While the actual durations of use may vary based on end use application, the measured energy use in kWh/day is representative of the energy use of a unit operated in 24 hours and allows for consistent energy use comparisons among models. DOE is proposing to require a 24-hour test period for buffet tables and preparation tables as specified in ASTM F2143-16. The proposed 24-hour test period is consistent with the industry test procedure, the test procedure for other CRE, limits test burden and variability by allowing for stable operation over a longer period, and incorporates the door openings and stable operation expected during typical usage.

DOE requests comment on the proposed 24-hour test period, which is consistent with the approach in ASTM F2143-16.

In the June 2021 RFI, DOE requested comment on the applicability of the ASTM F2143-16 door and cover opening specifications. 86 FR 31182, 31187. DOE requested comment on whether the door-opening requirements specified in ASHRAE 72-2018 are appropriate for buffet tables and preparation tables. *Id.*

The CA IOUs commented that the door opening methodology in ASTM F2143-16 was developed specifically for units that have an open-top refrigerated area connected to a refrigerated bottom compartment, and that they understand this to be the most

common configuration for these products. (CA IOUs, No. 8, p. 3) The CA IOUs commented that this methodology implements product loading and door opening that mirrors field observations from a 2014 PG&E study. (*Id.*) AHRI and Hussmann commented that further evaluation is needed for door opening provisions. (ASTM F2143-16 methods and target IATs). (AHRI, No. 3, p. 8; Hussmann, No. 14, p. 11)

Hoshizaki commented in support of a longer cover opening time, stating that 2 hours up, 4 hours down, and 2 hours up is adequate but unrealistic. (Hoshizaki, No. 13, p. 2) Hoshizaki suggested running a modified NSF 7-2019 test in which the lids are up for 4 hours and then closed for 4 hours, with the 8 hour energy consumption test scaled to get a daily usage value. (*Id.*)

ITW commented that due to variability in end use, the cover opening period should reflect usage time and pattern claimed by the manufacturer. (ITW, No. 2, p. 6)

True and ITW commented that there is no typical use case for door openings, and True stated that no door openings should occur during testing. (True, No. 4, p. 11-12; ITW, No. 2, p. 6) ITW commented that if DOE were to adopt the door opening period, frequency, and length specified in ASHRAE 72-2018 (for the storage compartment), the simulated product loading requirements specified in the standard should also be adopted. (ITW, No. 2, p. 6)

As discussed, ASTM F2143-16 includes an eight hour "active period" which includes instructions for any open-top display area covers (two hours open, four hours

closed, and two hours open) and any refrigerated compartment doors and/or drawers (fully opened sequentially for six seconds every 30 minutes). DOE recognizes that the actual use of buffet tables and preparation tables can vary depending on application. The cover and door opening requirements in ASTM F2143-16 were developed by an industry committee with the intent of evaluating energy performance. While the door-openings specified in ASTM F2143-16 are less frequent than those required in ASHRAE 72-2018R, DOE expects that any refrigerated compartments in buffet tables or preparation tables are accessed less frequently than in other CRE because maintaining the refrigerated temperature of food items held in the open-top pan area is the primary function of buffet tables or preparation tables during operation. Additionally, the eight-hour "active period" during which door openings occur is consistent with the eight-hour period of door openings required in ASHRAE 72-2018R. Based on the foregoing, DOE has tentatively determined that the cover and door opening provisions of ASTM F2143-16 are appropriately representative.

Accordingly, DOE is proposing to incorporate the "active period" requirements for cover and door and/or drawer openings as specified in section 10.5.5 of ASTM F2143-16.

DOE requests comment on the proposed door and cover opening procedures, which are consistent with the approach specified in ASTM F2143-16. DOE requests data and information on representative usage of buffet tables and preparation tables, including door and cover openings.

Test Conduct – Stabilization

Sections 10.3 and 10.4 of ASTM F2143-16 require that the unit be operated with empty pans and open covers for at least 24 hours, that the unit operate with empty pans for at least 2 hours, that water be pre-cooled before being loaded into the pans, and, once the water has been loaded into the pans, that the thermostat be calibrated until the pan temperatures are never outside of 33 °F to 41 °F for any 15-minute period over a 4-hour measurement period. In contrast, the current CRE test procedure, by reference to ASHRAE 72-2005, generally provides that the unit be loaded with test simulators and filler packages prior to pre-cooling, operated to establish steady-state conditions over consecutive 24-hour periods or refrigeration cycles, and, once steady-state conditions have been achieved, continue to operate for at least 12 hours without any adjustment to the controls.

In the June 2021 RFI, DOE requested comment on the appropriate stabilization method to use when testing buffet tables and preparation tables. 86 FR 31182, 31187.

AHRI and Hussmann commented that further evaluation is needed regarding stabilization provisions. (AHRI, No. 3, p. 11; Hussmann, No. 14, p. 8)

AHRI, Hussmann, Continental, and True commented that covers should be closed during the stabilization period, as prescribed in NSF 7-2019. (AHRI, No. 3, p. 11; Hussmann, No. 14, p. 8; Continental, No. 6, p. 2; True, No. 4, p. 12) Continental commented that ASTM F2143-16 Section 10.3.3 prescribes placing pans in the open top area and leaving covers open for a 24-hour stabilization period, which Continental stated

is not representative of typical use. (Continental, No. 6, p. 2) True commented that deviation from the NSF 7-2019 standard for loading and stabilization requirements of product and filler pans would cause additional test burden since handling of pans and probes can lead to errors and the need to repeat tests. (True, No. 4, p. 11-12)

Hoshizaki commented that the 24-hour stabilization period specified in ASTM F2143-16 is appropriate for their units, as they observe temperatures stabilizing in that period, and the 24-hour period helps with scheduling. (Hoshizaki, No. 13, p. 2) Hoshizaki commented that the ASTM F2143-16 requirement for the unit to operate with empty pans for at least 2 hours poses an access challenge, since most manufacturers prefer to use a door opener mechanism, which would prevent clear access to the pans and front of the machine. (*Id.*)

As discussed, DOE is proposing generally to reference ASTM F2143-16 rather than NSF 7-2019 for buffet table and preparation table testing. However, the stabilization and thermostat calibration requirements in Sections 10.3 and 10.4 of ASTM F2143-16 may require an iterative process of thermostat adjustment and recalibration to achieve stability and then to ensure that appropriate conditions are maintained during the test period. The recent update to ASHRAE 72-2018R specifies provisions for other CRE that require stability to be confirmed over two test periods with identical operation in order to avoid the need for an iterative process. DOE is proposing to reference sections 7.1 through 7.5 (excluding sections 7.2.1, 7.2.2, 7.3.1, 7.3.2, 7.3.3, and 7.3.4, as those sections would not be applicable to self-contained buffet tables or preparation tables because those sections are intended for CRE with remote condensing units, CRE without

doors, CRE with different door opening sequences, and CRE with lighting occupancy sensors and controls) of ASHRAE 72-2018R for determining stabilization and specifying the testing sequence for testing buffet tables and preparation tables. The preparation period under Section 7.2 of ASHRAE 72-2018R would include loading the pans with water and adjusting the necessary controls to maintain the specified temperatures. For the purposes of determining stability as specified in Section 7.5 of ASHRAE 72-2018R, the average temperatures of measured pans would be used to compare Test A and Test B rather than the temperatures of test simulators. DOE has tentatively determined that this approach would ensure stability over the test period and limit test burden by avoiding an iterative approach to determine stability and test conditions. This approach would also maintain consistency with the procedures used for testing other CRE.

DOE requests comment on the proposed stabilization approach for buffet table and preparation table testing, which would reference the approach specified in ASHRAE 72-2018R.

Test Conduct – Target Temperatures

ASTM F2143-16 instructs that if a buffet table or preparation table is equipped with a refrigerated compartment, the compartment air temperature is to be between 33 °F and 41 °F. Likewise, the water temperature in each of the pans placed in the display area also is to be between 33 °F and 41 °F. The DOE test procedure for other CRE requires IATs of 38 °F ± 2.0 °F for medium temperature applications.

Through preliminary research, DOE has found that buffet and preparation tables use a variety of refrigeration methods for cooling the pans in the display area and the refrigerated compartment. In some configurations, units might not be able to maintain all pans and the refrigerated compartment within the specified temperature range. For example, units with a single refrigeration system and thermostat control for temperatures in either the refrigerated compartment or in the pan area would control for temperature in either the pan area or refrigerated compartment, and both may not be within the target range. As a result, certain equipment may maintain only the refrigerated compartment or the pan area, but not both, within a specified temperature range during operation.

In the June 2021 RFI, DOE requested comment on appropriate temperature ranges for all pans and compartments during testing, and whether the test temperature should be specified as an allowable range or as a target IAT with a specified tolerance. 86 FR 31182, 31188. Additionally, if a target IAT is appropriate, the pans and any refrigerated compartment IAT could be measured separately from each other, or all temperature measurement locations within the refrigerated compartment and pans could be averaged together to determine a single IAT. If separate IATs of the pans and the compartment should be used, DOE requested comment on which IAT should be used to determine the appropriate thermostat control (if the unit has only one overall temperature control). *Id.*

AHRI commented that further evaluation is needed to incorporate the appropriate IAT provisions into industry test standards. (AHRI, No. 3, p. 8) AHRI also commented that preparation or service of cold temperature foods (*e.g.*, sushi or ice cream) would need to be considered. (AHRI, No. 3, p. 5)

True, Hoshizaki, and Continental commented in support of the NSF 7-2019 standard. (True, No. 4, p. 12; Hoshizaki, No. 13, p. 2; Continental, No. 6, p. 3) True commented that during the NSF 7-2019 test, the product is moved from a separate holding cabinet (*e.g.*, a reach in refrigerator or walk in cooler). (True, No. 4, p. 12) Hoshizaki and Continental commented in support of the moving box car average temperature (*i.e.*, a data treatment method that replaces a group of consecutive data points with its average) for open-top pans, along with the maximum and minimum temperature range for thermocouples, stating that this approach would provide a good indicator of maintaining temperatures over an extended period of time. (Hoshizaki, No. 13, p. 2; Continental, No. 6, p. 3)

Hussmann and Continental commented in support of an IAT of below 41 °F with a specified tolerance for the storage compartment. (Hussmann, No. 14, p. 11; Continental, No. 6, p. 3)

ITW commented in support of a target temperature range of 35 °F in the open-top for consistency and repeatability. (ITW, No. 2, p. 7) ITW commented that this would represent the best approach, assuming that distilled water pre-cooled to 35 °F in bulk is used in filling empty food pans already placed in the open-top pans at the initiation of the evaluation, that the environmental conditions for the evaluation match those found in the ASHRAE 72-2018 standard, and that the temperatures of the simulated product held within the storage compartment are recorded but not specified. (*Id.*)

As discussed, ASTM F2143-16 and NSF 7-2019 both specify a pan and compartment temperature range of 33 °F to 41 °F for testing. The current DOE test procedure for CRE requires testing to an IAT within 2 °F of the specified target temperature. DOE expects that this smaller allowable temperature range would limit test variability as compared to the 8 °F allowable range specified in ASTM F2143-16 and NSF 7-2019.

The ASTM F2143-16 and NSF 7-2019 temperature ranges apply to all measured pan and compartment temperatures, whereas DOE's current temperature specifications apply to the IAT – *i.e.*, the average of all test simulator temperature measurements over the test period. DOE has tentatively determined that the temperature specification based on an average temperature rather than individual temperature measurements would limit test burden by limiting the need for re-tests in the case of individual temperature measurements being outside of the required range. Additionally, DOE has initially determined that the average temperature approach would allow for testing buffet tables and preparation tables with configurations not capable of maintaining all temperature measurements within the required range. For example, if the refrigerated compartment provides cooling to the open-top pan area, the refrigerated compartment temperature measurements may be colder than the pan temperatures and not necessarily within a specified range. Additionally, certain temperature measurement locations may be warmer or colder than others depending on proximity to the evaporator or refrigerated areas, resulting in "hot" or "cold" spots. Testing to a specified average temperature would consider the overall average measured temperature and would allow for testing such configurations.

Based on these initial determinations, DOE is proposing to require testing buffet tables and preparation tables to a specified average temperature rather than an allowable range. DOE is proposing that the average temperature be calculated over the test period separately for the pan temperature measurements (*i.e.*, the average of temperatures measured throughout the test period at each pan measurement location specified in ASTM F2143-16) and the temperature measurements in any refrigerated compartment (*i.e.*, the average of temperatures measured throughout the test period at each of the three compartment measurement locations specified in ASTM F2143-16). DOE is proposing that the average temperature of all refrigerated pans be 38 °F ± 2 °F. This temperature is consistent with the current DOE test procedure for medium temperature CRE and is within the allowable range specified in ASTM F2143-16 and NSF 7-2019. Testing to a lower average temperature, such as 35 °F as recommended in the ITW comment, could increase the likelihood of refrigerated pans freezing during the test period. DOE is similarly proposing that the average temperature of any refrigerated compartment also be 38 °F ± 2 °F. If the buffet table or preparation table configuration does not allow independent control of the refrigerated compartment and both the pan average temperature and refrigerated compartment average temperature cannot be maintained within 38 °F ± 2 °F over the test period, DOE is proposing that the refrigerated compartment be tested to the average temperature necessary to maintain the pan average temperature within the specified range. Similar to the existing LAPT provision in section 2.2 of appendix B, DOE also proposes that if a unit is not capable of maintaining average pan temperatures within the specified range, the unit would be tested at the LAPT.

DOE requests comment on the proposed approach for testing buffet tables and preparation tables based on separate pan and compartment average temperatures. DOE also requests feedback on the proposed target temperature of 38 °F ± 2 °F for each average temperature.

Test Conduct – Capacity Metrics

ASTM F2143-16 specifies the reporting of "production capacity," which is defined as the total volume of the pans when each pan is filled within one-half inch of the rim. Energy consumption of refrigerated buffet and preparation tables likely varies with pan volume as well as the volume of any closed refrigerated compartments. Therefore, both values are of interest when considering metrics that define energy performance. Pan surface area could be another possible metric for evaluating energy performance, similar to TDA for horizontal open equipment classes. Reliance on pan surface area may eliminate the variability with different test pan dimensions.

In the June 2021 RFI, DOE requested comment on the potential methodologies for determining pan volume, pan surface area, and pan TDA, as well as refrigerated compartment volume for buffet tables and preparation tables in a potential test procedure for this equipment. 86 FR 31182, 31188. DOE additionally requested comment on which parameter(s) (*e.g.*, total pan volume, pan surface area, TDA, or a combined metric), may best represent the useful "capacity" of this equipment. *Id.*

AHRI and Hussmann commented that because these units are highly customizable, the volume, surface area, and TDA should be used as specified by the manufacturer. (AHRI, No. 3, p. 9; Hussmann, No. 14, p. 12)

ITW commented that DOE has already specified measuring storage compartment volume in accordance with AHAM HRF-1-2008 for units for which the open-top refrigeration system can be turned off, and that this should be applied to all units regardless of the on/off feature or the existence of a thermally separating barrier. (ITW, No. 2, p. 7) Hoshizaki commented that computer-aided design ("CAD") is a good way to calculate compartment volume. (Hoshizaki, No. 13, p. 2)

ITW commented that the pan surface area or TDA provides a more accurate representation of the heat load placed on open-top refrigeration units than total food pan volume because the environmental energy introduced into the system crosses the horizontal plane at the pan surface, not along the vertical sides or bottom representing the pan volume. (ITW, No. 2, p. 7) Hoshizaki commented that pans come in standard sizes with designated volumes, such that it would make for an easy calculation of total pan volume by selecting the number and size of pans. (Hoshizaki, No. 13, p. 2)

DOE has tentatively determined that pan storage volume, pan display area, and refrigerated volume may all contribute to the capacity and energy consumption of a buffet table or preparation table; therefore, DOE is proposing that the test procedure include measures of these three metrics. DOE is proposing to define and measure "pan volume" consistent with the production capacity specified in ASTM F2143-16. DOE is

proposing to refer to pan volume rather than production capacity to avoid confusion with the other relevant capacity metrics.

DOE is proposing that the refrigerated volume of buffet table and preparation table refrigerated compartments be tested in accordance with AHRI 1200-202X, consistent with the method proposed for use with other CRE. To avoid double counting of refrigerated pan volumes, DOE is proposing that the refrigerated compartment volume would not include any volume occupied by the pans loaded in the open-top display area for testing. DOE discusses volume measurements based on CAD drawings in section III.H of this NOPR.

DOE is proposing that pan display area be defined and measured as the surface area of the test pan when filled to within one half inch of the rim. This surface area measurement would ensure that the pan display area would be consistent with the pan storage volume (*i.e.*, both measurements would be based on the pans as filled for testing). Additionally, the measurement based on the surface area of the water as loaded for testing would ensure that the surface area measurement accounts for the actual food storage area and excludes any areas not providing refrigerated storage for food service or food preparation.

DOE requests comment on the proposed capacity metrics of pan storage volume, compartment volume, and pan display area. DOE requests feedback on the proposed methods for measuring each and the extent to which these metrics are relevant capacity metrics for buffet tables and preparation tables.

2. Pull-Down Temperature Applications

As defined, CRE is equipment that is designed for holding temperature applications[20] or pull-down temperature applications. 10 CFR 431.62 (*see also* 42 U.S.C. 6311(9)(A)(vi)). "Pull-down temperature application" is a commercial refrigerator with doors that, when fully loaded with 12-ounce beverage cans at 90 °F, can cool those beverages to an average stable temperature of 38 °F in 12 hours or less. 10 CFR 431.62 (42 U.S.C. 6311(9)(D)). CRE within this definition are typically known as beverage merchandisers or beverage coolers because of their use in displaying individually packaged beverages for sale, and their ability to pull-down temperatures of such beverages. Pull-down temperature applications with transparent doors and a self-contained condensing unit are the only pull-down temperature applications currently subject to DOE's energy conservation standards specified at 10 CFR 431.66(e).

DOE's current CRE test procedure does not include specific provisions related to the performance criteria in the pull-down temperature application definition. For example, the test procedure does not provide instructions for the starting conditions of the equipment (*e.g.*, whether the equipment begins the test in a pre-cooled state or at ambient temperature conditions), loading of the cans (*e.g.*, whether the equipment must be loaded to full within a certain amount of time), or a method to measure the temperature of the cans to confirm cooling to 38 °F. The current CRE test procedure specifies that commercial refrigerators designed for pull-down applications be tested at steady state

[20] "Holding temperature application" means a use of commercial refrigeration equipment other than a pull-down temperature application, except a blast chiller or freezer. 10 CFR 431.62 (*see also* 42 U.S.C. 6311(9)(B)).

(see 10 CFR 431.64(b), and appendix B section 2.1), consistent with testing other covered CRE categories.

In the June 2021 RFI, DOE sought information on whether CRE that provides pull-down temperature applications is sufficiently differentiated from other types of CRE. 86 FR 31182, 31188. If not, DOE sought comment on how manufacturers currently determine whether a model meets the pull-down temperature application criteria. *Id.* DOE also requested comment on appropriate starting conditions, loading methods, and other necessary specifications for a potential test method to verify the pull-down performance of a commercial refrigerator. *Id.* Additionally, DOE requested comment and data on the energy consumption associated with pull-down operation and steady-state operation for CRE designed for pull-down temperature applications, and on whether a modified test method would be appropriate to represent the energy consumption of such equipment. *Id*.

AHRI commented that AHRI members and working group participants discussed pull down applications during AHRI 1200-202X revisions. (AHRI, No. 3, p. 9-10) AHRI commented that requirements for pull down temperatures vary greatly based on product, end use, and stocking, and that the industry does not have a test method for these systems. (*Id.*) AHRI commented that based on the varied conditions, customized nature, and small market segment, the working group determined not to address pull down units at this time, and suggested this may need to be addressed separately from CRE or alongside blast chillers and freezers given the unique application. (*Id.*)

True commented that 75 °F ambient temperature, 55 percent relative humidity, and pull down of 90 °F products is typical. (True, No. 4, p. 14) True commented that this category is irrelevant if the models meet the DOE energy conservation standards for holding temperature applications, and that this category should not exist. (*Id.*)

The Joint Commenters expressed support for DOE developing a test procedure to verify pull-down performance. (Joint Commenters, No. 8, p. 2) The Joint Commenters stated that the test procedure contains a definition for "pull-down temperature application," but that there is no procedure to verify whether a unit meets that definition, such that it would make sense to develop a pull-down test procedure to verify performance so that a manufacturer, DOE, or third party can determine if a unit meets the "pull-down temperature application" definition. (*Id.*)

While DOE defines "pull-down temperature application" and has established energy conservation standards for self-contained commercial refrigerators with transparent doors for pull-down temperature applications, no models are currently certified to DOE in this equipment class.[21] DOE has not established energy conservation standards for other categories of CRE for pull-down temperature applications.

DOE recognizes that manufacturers may represent their models as for use in pull-down temperature applications rather than holding temperature applications. To ensure appropriate application of DOE's definitions, DOE is proposing a method to determine

[21] Based on DOE's Compliance Certification Database (accessed January 23, 2022), available at *www.regulations.doe.gov/certification-data/#q=Product_Group_s%3A**.

whether a model meets the definition of "pull-down temperature application." Specifically, DOE is proposing to include product-specific enforcement provisions for CRE, as discussed further in section III.J of this NOPR, and proposes to include a section to specify how DOE would confirm whether a commercial refrigerator meets the definition of pull-down temperature application.

As stated, the pull-down temperature application definition requires that a model be capable of cooling a full load of 12 ounce beverage cans from 90 °F to an average stable temperature of 38 °F in 12 hours or less. To confirm this capability, DOE is proposing to specify in 10 CFR 429.134 that a classification as pull-down temperature application is valid based on meeting the pull-down temperature application definition by:

1) measuring the temperatures of 12-ounce beverage cans loaded into the commercial refrigerator at locations consistent with those specified in ASHRAE 72-2018R (*i.e.*, those temperature measurement locations required for test simulators during DOE testing of other commercial refrigerators);

2) operating the commercial refrigerator under the required commercial refrigerator test conditions (e.g., 75.2 °F ± 1.8 °F dry-bulb temperature) and at the control setting necessary to achieve a stable integrated average temperature of 38 °F, prior to loading;

3) fully loading the commercial refrigerator with 12-ounce beverage cans maintained at 90 °F ± 2 °F;

4) determining the duration of pull-down (which must be 12 hours or less) starting from closing the commercial refrigerator door after completing the 12-ounce beverage can loading until the integrated average temperature reaches 38 °F ± 2 °F; and

5) determining an average stable temperature of 38 °F by operating the commercial refrigerator for an additional 12 hours after initially reaching 38 °F ± 2 °F with no changes to control settings, and determining an integrated average temperature of 38 °F ± 2 °F at the end of the 12 hour stability period.

The proposed product-specific enforcement provisions are consistent with the existing definition of pull-down temperature application, but would provide additional clarity regarding how DOE would determine whether a commercial refrigerator could be classified as such.

DOE requests comment on the proposed product-specific enforcement provisions regarding how DOE would determine whether a model meets the pull-down temperature application definition. DOE also requests data and comment on whether the proposed product-specific enforcement provisions sufficiently differentiate pull-down temperature applications from holding temperature applications.

3. Blast Chillers and Blast Freezers

As stated, CRE is equipment that, in part, is designed for holding temperature applications. (42 U.S.C. 6311(9)(A)(vi)) EPCA defines "holding temperature application" as use of commercial refrigeration equipment other than a pull-down temperature application, except a blast chiller or freezer. (42 U.S.C. 6311(9)(B)) Per the definition, "holding temperature application" includes blast chillers and blast freezers, even if such equipment meets the criteria of "pull down temperature application."

In general, blast chillers and blast freezers are commercial refrigeration equipment with solid doors intended for the rapid temperature pull-down of hot-food products.

Blast chiller and blast freezer operation is typically characterized by three cycles. The first cycle pulls the air temperature within the unit down until it reaches a target air temperature set by the manufacturer (*e.g.*, 0 °F for blast chillers and -28 °F for blast freezers). This target air temperature within the unit is maintained until the food reaches a certain temperature, set by the manufacturer, as measured by the unit's temperature probe. Once the food reaches a certain temperature, the second cycle begins by allowing the air temperature within the unit to drift up until it reaches the same temperature as the target food temperature (*e.g.*, 38 °F for blast chillers and 0 °F for blast freezers). Once the food reaches the target food temperature, the last cycle begins by proceeding to a holding pattern during which the blast chiller or blast freezer behaves similar to a typical CRE – *i.e.*, cycling the refrigeration system to maintain a target temperature.

Within the general sequence of operations, many blast chillers and blast freezers provide users options to alter the specific pull down profile based on the food load. For example, a "soft chill" mode may provide a slower temperature pull-down intended for more delicate food, as compared to a "hard chill" mode that cools food as quickly as possible.

ASHRAE has established a standard project committee ("SPC") to consider the development of an industry test standard for this equipment: SPC 220P, *Method of Testing for Rating Small Commercial Blast Chillers, Chiller-Freezers, and Freezers* ("ASHRAE 220").[22] DOE is participating in this process and is aware of a draft test standard underway that contains certain definitions, requirements, and procedure. DOE will consider referencing the final version of the SPC 220P standard when it is made publicly available.

a. Definitions

DOE does not define blast chiller or blast freezer. The California Code of Regulations provides the following definition for a blast chiller:

- *Blast chiller*—a refrigerator designed to cool food products from 140 °F to 40 °F within four hours. (CCR, Title 20, section 1602)

[22] See *www.ashrae.org/technical-resources/standards-and-guidelines/project-committee-interim-meetings*.

The SPC for ASHRAE 220 has provided the following tentative definitions for blast chiller and blast freezer, and a related term:

- *Blast chiller*—a rapid pull down cooler designed to cool food to a safe refrigerated temperature (typically between 32 °F and 41 °F), but not freeze it.

- *Blast freezer*—a rapid pull down cooler designed to freeze food.

- *Rapid pull down cooler*—commercial refrigeration equipment intended for the rapid intermediate chilling or freezing of hot food products within a specified time period and holding the food at a safe temperature when not engaged in the chilling or freezing process.

NSF 7-2019 provides the following performance specification for rapid pull-down refrigerators and freezers:

- *Rapid pull-down refrigerators and freezers*—capable of reducing the internal temperature of their contents from 135 °F to 40 °F within a period of 4 hours or in the time specified by the manufacturer, whichever is less.

In the June 2021 RFI, DOE requested comment on whether definitions are needed for blast chillers and blast freezers to further delineate the equipment subject to the DOE test procedures and standards. 86 FR 31182, 31188. If definitions are needed, DOE

requested comment on the appropriate definitions for blast chillers and blast freezers, including how to differentiate such equipment from CRE currently subject to testing and compliance with DOE's energy conservation standards. 86 FR 31182, 31188-31189.

NEEA commented in support of DOE establishing a definition for blast chillers and blast freezers. (NEEA, No. 5, p. 3) NEEA commented that the scope of the pull-down temperature application definition is better suited to focus exclusively on beverage merchandisers and coolers, due to the differences in intended operation of blast chillers and freezers. *Id.* NEEA commented that delineating both the definition and test procedure to highlight the different use cases of pull-down equipment and blast chillers will lead to more representative energy use projections. *Id.*

The Joint Commenters stated that blast chillers and blast freezers have oversized refrigeration systems compared to other CRE, such that blast chillers and freezers use more energy compared to other equipment with similar volumes. (Joint Commenters, No. 8, p. 2)

Based on the comments from interested parties and DOE's review of existing State definitions, tentative and established industry definitions, and equipment available on the market, DOE has tentatively determined that the characteristic of blast chillers and blast freezers that differentiate this equipment from other categories of CRE are the oversized refrigeration systems that allow for the rapid temperature pull-down of hot food products within a specified time period. Blast chillers and blast freezers specifically differ from other types of CRE intended for pull-down temperature applications because

of the intended product (hot food product for blast chillers and blast freezers versus 12 ounce beverage cans for pull-down temperature applications), initial product temperature (minimum 135 °F[23] for blast chillers and blast freezers versus 90 °F for pull-down temperature applications), and intended product storage duration (minimal storage duration for blast chillers and blast freezers versus long-term storage duration for pull-down temperature applications).

As discussed, blast chillers and blast freezers provide rapid cooling to ensure hot food is quickly pulled down to safe refrigerated storage temperatures. DOE tentatively identified the capability to pull down hot food from 135 °F to 40 °F within four hours as the primary operating characteristic of blast chillers and blast freezers. This is consistent with the performance specification for rapid pull-down refrigerators and freezers specified in NSF 7-2019, the California definition, and tentative definitions provided by the SPC for ASHRAE 220. Although DOE is not proposing to test blast chillers and blast freezers according to NSF 7-2019, as discussed in the following section, DOE expects that any blast chiller or blast freezer meeting the NSF 7-2019 performance specification would be capable of pulling down hot food from 135 °F to 40 °F within four hours when tested as proposed in this NOPR. As discussed in section III.C.1.b, DOE is proposing a lower ambient temperature condition than the ambient temperature condition specified in NSF 7-2019.

[23] See NSF/ANSI 7 - 2019, "Commercial Refrigerators and Freezers".

To delineate blast chillers and blast freezers from other categories of CRE, including from CRE designed for pull-down temperature applications, DOE is proposing to define the terms "blast chiller" and "blast freezer." DOE is proposing definitions for these terms that combine parts of existing definitions, add language for consistency with DOE's existing CRE definitions, and include further specificity regarding the characteristics of this equipment. Specifically, DOE is proposing to add the following definitions to 10 CFR 431.62:

"Blast chiller" means commercial refrigeration equipment, other than a blast freezer, that is capable of the rapid temperature pull-down of hot food products from 135 °F to 40 °F within a period of four hours, when measured according to the DOE test procedure.

"Blast freezer" means commercial refrigeration equipment that is capable of the rapid temperature pull-down of hot food products from 135 °F to 40 °F within a period of four hours and capable of achieving a final product temperature of less than 32 °F, when measured according to the DOE test procedure.

DOE seeks comment on the proposed definitions of "blast chiller" and "blast freezer."

b. Test Methods

DOE has reviewed the ASHRAE 220 test method in development to determine the suitability of the test method for a DOE test procedure. The draft ASHRAE 220 test method determines the pull-down energy consumption per pound of food product, hot food product temperature pull-down performance, and other performance factors for self-contained commercial blast chillers and blast freezers that have a refrigerated volume of up to 500 ft^3. DOE understands that the ASHRAE 220 test method has certain deviations from DOE's current CRE test procedures and ASHRAE 72-2018R.

In the June 2021 RFI, DOE stated that it was not aware of any existing test methods for assessing the energy performance of blast chillers and blast freezers but acknowledged the ongoing industry work to develop ASHRAE 220. 86 FR 31182, 31189. DOE requested information on typical blast chiller and blast freezer operation to evaluate any eventual test methods available for this equipment. *Id.*

NEEA commented in support of collaboration between DOE and EPA regarding test procedures for blast chillers and freezers. (NEEA, No. 5, p. 3) The CA IOUs commented that DOE should work with the ASHRAE 220 committee to finalize an approach for evaluating the performance of blast chillers and freezers that will be consistent with DOE's statutory requirements for a test procedure. (CA IOUs, No. 10, p. 4) The CA IOUs commented that ASHRAE 220 was expected to be published in late 2021, and that International Organization for Standardization ("ISO") 22042:2021, ("ISO 22042:2021"), "Blast chiller and freezer cabinets for professional use — Classification,

requirements and test conditions was published in March 2021. *Id*. The CA IOUs provided a comparison of the two standards. *Id.*

NEEA commented that DOE's test procedure for pull-down temperature application is only reflective of steady state operation and does not account for energy usage in pull-down mode or percentage of time in each of the two modes. (NEEA, No. 5, p. 3) NEEA commented that DOE should study pull-down conditions of blast chillers and blast freezers to ensure the test procedure represents actual usage. (*Id.*)

The CA IOUs commented that DOE should focus on self-contained blast chillers and freezers, stating that the ASHRAE 220 test method is geared toward this equipment configuration, and that this is the predominant configuration in terms of market share in food service applications. (CA IOUs, No. 10, p. 5)

DOE has tentatively determined that test procedures that account for the pull-down operation of blast chillers and blast freezers are appropriate. As discussed in section III.C.3.a, the primary function of blast chillers and blast freezers is the rapid cooling of hot food product and minimal storage duration rather than long-term storage duration. Consistent with comments from interested parties, DOE has considered the draft ASHRAE 220 standard as the basis for many of the test procedure proposals.

DOE has also reviewed the ISO 22042:2021 test standard. Many of the provisions in the ISO 22042:2021 method are similar to those included in the draft ASHRAE 220 (*e.g.*, ambient temperature, starting food load temperature, final blast

freezer temperature).DOE has tentatively determined that the provisions in draft ASHRAE 220 provide a more representative basis for testing (*e.g.*, blast chiller target temperature of 38 °F rather than 50 °F) and would limit test variability as compared to ISO 22042:2021 (*e.g.*, using a well-defined food simulator test load rather than actual food and defining door openings for pan loading).

DOE has also participated in EPA's specification review process to establish version 5.0 Eligibility Criteria for commercial refrigerators and freezers. EPA considered including blast chillers and blast freezers as part of the version 5.0 Eligibility Criteria,[24] but did not include them in the specification due to the lack of a standardized test procedure.

Consistent with the tentative scope of ASHRAE 220, DOE is proposing test procedures for self-contained commercial blast chillers and blast freezers that have a refrigerated volume of up to 500 ft^3. DOE is proposing to incorporate certain provisions from draft ASHRAE 220 and certain deviations, as discussed in the following sections. DOE understands that, to the extent feasible, ASHRAE 220 will likely harmonize with requirements included in ASHRAE 72-2018R. For this reason, DOE is proposing to refer to ASHRAE 72-2018R for certain test requirements rather than using the approach in the ongoing draft ASHRAE 220. The intent of these proposals is to harmonize with the eventual ASHRAE 220 final test standard approach.

[24] *See* the Version 5.0 Specification and Test Method Discussion Guide, December 2020, at *www.energystar.gov/sites/default/files/ENERGY%20STAR%20Commercial%20Refrigerators%20and%20Freezers%20V5.0%20Discussion%20Guide.pdf.*

To avoid confusion regarding testing of other CRE, DOE is also proposing to establish the test procedure for blast chillers and blast freezers as a new appendix D to subpart C of 10 CFR part 431. DOE is also proposing to refer to the proposed appendix D as the test procedure for blast chillers and blast freezers in 10 CFR 431.64.

DOE seeks comment on the proposal to establish test procedures for self-contained commercial blast chillers and blast freezers that have a refrigerated volume of up to 500 ft^3.

DOE seeks comment on the proposal to incorporate certain provisions from the draft ASHRAE 220 and certain deviations for the blast chillers and blast freezers test procedures.

Instruments

DOE reviewed the latest version of the draft ASHRAE 220 standard and compared it to ASHRAE 72-2018R, as shown in Table III.2, to determine appropriate instrument requirements for blast chiller and blast freezer testing.

Table III.2 - Instrumentation Requirements Comparison Between ASHRAE 220 and ASHRAE 72-2018R

	ASHRAE 220	ASHRAE 72-2018R
Calibration	Instruments shall be calibrated traceable to National Institute of Standards and Technology ("NIST") standards annually.	Measurements from the instruments shall be traceable to primary or secondary standards calibrated by NIST (or other rating standards). Instruments shall be recalibrated on regular intervals that do not exceed the intervals prescribed by the instrument manufacturer, and with an interval no longer than 1 year.
Temperature	Accuracy of temperature measurements shall be within ±1.4°F. Accuracy of	Required Accuracy: ±1.4°F. Temperature measurement methods and instruments shall

	temperature-difference measurements shall be within ±0.2°F. Temperature measurements not specified shall be made per ANSI/ASHRAE Standard 41.1.2	be applied and used in accordance with ASHRAE Standard 41.1-2020.
Time	Time measurements shall be made with an accuracy of ±0.5% of the time period being measured	Required Accuracy: ±0.5% of time period measured
Energy	Electrical energy measurements shall be made with instruments accurate to ±2% of the quantity measured.	Required Accuracy: must be measured with an integrating watt-hour meter with accuracy ± 2.0 % of the quantity measured and graduated to 0.01 kWh.
Electrical supply potential and supply frequency	None specified	Required Accuracy: ±2.0% of the quantity measured

Generally, ASHRAE 72-2018R has the same instrumentation requirements as draft ASHRAE 220. DOE understands that ASHRAE 220 intends to harmonize with ASHRAE 72-2018R to the extent possible to maintain consistent test requirements across similar equipment types. Because ASHRAE 72-2018R provides greater detail on the instrumentation requirements, and DOE expects that the final ASHRAE 220 standard will likely adopt the ASHRAE 72-2018R requirements, DOE is proposing to reference section 4 and the relevant portions of Appendix A of ASHRAE 72-2018R for blast chiller and blast freezer instrumentation requirements. ASHRAE 72-2018R provides additional requirements for instruments that are not necessary for testing blast chillers and blast freezers (*e.g.*, air velocity, radiant heat, dry-bulb temperature gradient, and test chamber illuminance). DOE is proposing to incorporate requirements only for instruments necessary to test blast chillers and blast freezers (*i.e.*, those listed in Table III.2).

DOE seeks comment on the proposal to reference section 4 and the relevant portions of Appendix A of ASHRAE 72-2018R for instrumentation requirements for the blast chiller and blast freezer test procedures.

Test Conditions

Blast chillers and blast freezers are typically intended for use only in commercial kitchens, as compared to other categories of CRE, which are typically used in either commercial kitchens or in customer-facing environments.

In the June 2021 RFI, DOE requested comment and supporting data on the typical ambient conditions experienced by blast chillers and blast freezers. 86 FR 31182, 31189.

NEEA commented that ASHRAE 220 is working to answer some of the questions posed by DOE, including establishing starting food temperatures, blast chiller temperatures, and ambient temperatures. (NEEA, No. 5, p. 3)

ASHRAE 220 specifies different test conditions for testing blast chillers and blast freezers compared to the current DOE CRE test procedures, as illustrated in Table III.3.

Table III.3 - Ambient Temperature and Humidity Test Conditions Comparison

	ASHRAE 220	**DOE's Current CRE Test Procedure**
Dry Bulb	Measured at point T_A; Average: 86.0°F ± 1.8°F Individual: 86.0°F ± 3.6°F	Measured at point T_A for open CRE and T_B for closed CRE; Average: 75.2°F±1.8°F Individual: 75.2°F±3.6°F

Humidity	No test condition specified	Wet Bulb measured at point T_A for open CRE and T_B for closed CRE; Average: 64.4°F±1.8°F Individual: 64.4°F±3.6°F

The dry-bulb is required to be measured in ASHRAE 220 at the same point (T_A) as specified in section 6.1 of ASHRAE 72-2018R. ASHRAE 220 does not specify the type of thermocouple to be used when taking dry-bulb measurements. ASHRAE 72-2018R specifies that the thermocouples used to measure dry-bulb temperatures shall be in thermal contact with the center of 1.6 ounces cylindrical brass slug with a diameter and height of 0.75 inches. The brass slugs shall be placed at least 0.50 inches from any heat-conducting surface.

DOE has tentatively determined that the test conditions specified in ASHRAE 220 are more representative of actual blast chiller and blast freezer operation as compared to the existing CRE test procedure conditions. As stated, blast chillers are typically only used in commercial kitchens, whereas other conventional CRE are used in a range of environments.

In response to the June 2021 RFI, the CA IOUs referenced a 2012 ASHRAE research project[25] benchmarking the thermal conditions in 100 commercial kitchens in the United States that found the average temperature in preparation areas ranged from 72 °F to 79 °F, while the average temperature in cooking areas ranged from 79 °F to 93 °F.

[25] ASHRAE RP-1469, "Thermal Comfort in Commercial Kitchens," Final Report, January 6, 2012, page 24.

(CA IOUs, No. 10, p. 2-3) The conditions specified in ASHRAE 220 are consistent with the commercial kitchen data in the ASHRAE report.

DOE recognizes that harmonizing test conditions across different CRE categories may provide users with measures of energy use that can be compared on a consistent basis. However, given the particular application of blast chillers and blast freezers in rapidly lowering the temperature of hot food products, it is not expected that other CRE would serve as a substitute for blast chillers and blast freezers (and vice versa). Moreover, as indicated by the 2012 ASHRAE report, the test conditions in the draft ASHRAE 220 are more representative for blast chillers and blast freezers than the test conditions applicable to CRE generally.

Because blast chillers and blast freezers experience different ambient conditions than other types of CRE, and because the proposed test procedures for blast chillers and blast freezers would use a different energy use and capacity metric, DOE is proposing to require the representative dry-bulb temperatures specified in the tentative ASHRAE 220 draft. DOE is also proposing to incorporate section 6.1 and Figure 6 of ASHRAE 72-2018R to specify the point T_A where the dry-bulb temperatures are to be measured and to specify the dry-bulb thermocouple setup.

DOE seeks comment on the proposal to require the dry-bulb temperatures specified in the tentative ASHRAE 220 draft and incorporate section 6.1 and Figure 6 of ASHRAE 72-2018R to specify the point T_A where the dry-bulb temperatures are to be

measured and the type of thermocouple to use when measuring dry-bulb in the blast chillers and blast freezers test procedures.

ASHRAE 220 specifies the same requirements for the power supply, voltage and frequency, as ASHRAE 72-2018R. Specifically, ASHRAE 220 specifies that the rated voltage be maintained at an average of ± 2.0 percent over the duration of the test and individual recorded voltages be within ± 4.0 percent of the rated voltage. ASHRAE 220 specifies that the rated frequency be maintained within ±1 percent. Because ASHRAE 72-2018R specifies the same requirements for voltage and frequency, DOE is proposing to incorporate the portions of Appendix A in ASHRAE 72-2018R, which specify the requirements for voltage and frequency.

DOE seeks comment on the proposal to incorporate the portions of Appendix A in ASHRAE 72-2018R which specify the requirements for voltage and frequency in the blast chillers and blast freezers test procedures.

ASHRAE 72-2018R specifies additional test conditions that ASHRAE 220 does not specify. These include requirements for air currents, radiant heat, dry-bulb temperature gradient, and test chamber illuminance. DOE expects that these requirements in ASHRAE 72-2018R are primarily intended to limit variability of testing for CRE without doors or with transparent doors. DOE is only aware of blast chillers and blast freezers with solid doors, and therefore has tentatively determined that the additional test conditions in ASHRAE 72-2018R are not necessary for blast chiller and blast freezer testing, consistent with the draft of ASHRAE 220.

DOE seeks comment on whether any additional test conditions are appropriate for blast chiller and blast freezer testing, including those specified in sections 6.2, 6.3, and Appendix A in ASHRAE 72-2018R.

Test Setup, Capacity, and Loading

The ASHRAE 220 draft specifies certain test unit setup instructions for components and accessories, electrical loads, condensate pan heaters and pumps, and crankcase heaters which are based on Sections 5.3, 5.3.1, 5.3.5, and 5.3.15 in ASHRAE 72-2018R. DOE notes that Sections 5.3 and 5.3.5 of ASHRAE 72-2018R contain minor differences from the draft ASHRAE 220. Section 5.3 of ASHRAE 72-2018R refers to installing all necessary components and accessories prior to loading the storage and display areas with test simulators and filler material, whereas ASHRAE 220 does not use test simulators and filler material. Section 5.3.5 of ASHRAE 72-2018R refers to a self-contained refrigerator instead of a blast chiller or blast freezer and does not specify that the condensate pan shall be emptied before testing (this instruction is provided in Section 7.2.3 of ASRHAE 72-2018R) and that if a condensate heater is used during the test, it shall be recorded.

ASHRAE 220 specifies that the manufacturer's recommendation on clearances shall be followed on all sides with a minimum of 3 feet on the door(s) opening sides. The current DOE CRE test procedures do not specify any clearance requirements. Section 5.2 and Appendix A of ASHRAE 72-2018R specify that there must be greater than or equal to 59.1 inches ± 1 inch of clearance from the front of the unit under test and a vertical partition or wall shall be located at the minimum clearance, ± 0.5 inches, as specified in

the installation instructions. Section 5.2 also provides that if the installation instructions do not provide a minimum clearance, the vertical partition or wall shall be located 4 ± 0.5 inches from the sides or rear of the cabinet and extend at least 12 ± 0.5 inches beyond each side of the cabinet from the floor to not less than 12 ± 0.5 inches above the top of the cabinet.

DOE has tentatively determined that because ASHRAE 72-2018R provides similar, equal, or greater detail on the installation and settings, clearance, and components and accessories requirements as compared to the draft of ASHRAE 220, the ASHRAE 72-2018R instructions are appropriate for DOE testing. DOE also understands that, to the extent feasible, ASHRAE 220 intends to harmonize with ASHRAE 72-2018R requirements, and therefore will likely adopt similar instructions in the final version of the standard. DOE is proposing to incorporate Sections 5.1, 5.2, 5.3 (including sub-Sections 5.3.1 to 5.3.17), and the relevant portions of Appendix A of ASHRAE 72-2018R for testing blast chillers and blast freezers with the following deviations:

- The term "refrigerator" shall instead refer to "blast chiller" or "blast freezer," as applicable.

- For Section 5.3 of ASHRAE 72-2018R, replace "all necessary components and accessories shall be installed prior to loading the storage and display areas with test simulators and filler material" with "all necessary components and accessories shall be installed prior to precooling the unit under test."

- Section 5.3.5 would be included with the additional requirement that the condensate pan be emptied before precooling the unit under test.

DOE seeks comment on the proposal to incorporate Sections 5.1, 5.2, 5.3 (including sub-sections 5.3.1 to 5.3.17), and the relevant portions of Appendix A of ASHRAE 72-2018R, with the proposed deviations, for the blast chillers and blast freezers test procedures.

Appendix A of ASHRAE 72-2018R specifies electrical measurements at the equipment terminals. ASHRAE 220 specifies the following electrical measurement locations: at the plug-in location for units with a standard wall plug, or at the terminal box for units that are hard wired to the building electrical system. Because the electrical measurement location in Appendix A of ASHRAE 72-2018R is similar to ASHRAE 220, DOE expects that the ASHRAE 72-2018R approach is the likely final approach to be used in the eventual final ASHRAE 220 standard. For that reason, DOE is proposing to incorporate the relevant portions of Appendix A of ASHRAE 72-2018R for the electrical measurement locations.

DOE seeks comment on the proposal to incorporate the relevant portions of Appendix A of ASHRAE 72-2018R for the electrical measurement locations for the blast chillers and blast freezers test procedures.

ASHRAE 220 provides instructions for measuring the gross refrigerated volume of blast chillers and blast freezers. The gross refrigerated volume is calculated by

multiplying the internal length, width, and height of the cabinet excluding panels and space occupied by the evaporator or evaporator fan. Appendix C of AHRI 1200-202X specifies instructions for determining the refrigerated volume of display merchandisers and storage cabinets. DOE has reviewed the instructions in AHRI 1200-202X for determining refrigerated volume and has initially determined that the instructions can be applied to blast chillers and blast freezers because of the similar construction of these CRE. Based on this initial determination, DOE is proposing to refer to AHRI 1200-202X for measuring the refrigerated volume of blast chillers and blast freezers.

DOE seeks comment on the proposal to reference AHRI 1200-202X for measuring the refrigerated volume of blast chillers and blast freezers.

ASHRAE 220 specifies that the standard product vessel shall be a 12 inch by 20 inch by 2.5 inch 22 gauge or heavier and 300 series stainless steel pan. ASHRAE 220 states that if the test unit is not capable of holding the standard product pan, the manufacturer's recommended pan size is used, conforming as closely as possible to the standard product load. Based on a review of blast chillers and blast freezers available on the market, DOE observed that all units are intended for use with food pans, and nearly all units available can accommodate the specified standard pan sizes. DOE has tentatively determined that the pans as specified in ASHRAE 220 are representative of typical use and is proposing to incorporate the standard product pan specifications included in the draft of ASHRAE 220.

DOE seeks comment on the proposal to incorporate the standard product pan specifications in ASHRAE 220 for the blast chillers and blast freezers test procedures.

ASHRAE 220 specifies that the manufacturer's recommended maximum 12 inch by 20 inch by 2.5 inch pan capacity should be used for testing. DOE has reviewed the ASHRAE 220 specifications and equipment available on the market. Based on DOE's review, additional specifications may be needed to determine how many standard product pans are used in the test unit. The number of standard product pans that would be used for testing is dependent on the specified product capacity of the test unit based on food weight. The ASHRAE 220 committee tentatively determined that having a uniform food simulator thickness across all standard product pans is important for repeatable and comparable results, manufacturer design parameters, and consistency with European blast chiller and blast freezer testing requirements[26]. The ASHRAE 220 committee tentatively concluded that a uniform food simulator thickness of 2 inches in the standard product pan (*i.e.*, filled to within 0.5 inch of the top of the pan) is appropriate. Based on this conclusion, the number of pans required for testing blast chillers and blast freezers would be determined by the number of standard product pans filled with the standard food simulator load to 2 inches deep that can fit in the blast chiller or blast freezer without exceeding the manufacturer's recommended capacity. Because this approach could potentially require the tested capacity to be smaller than the manufacturer's stated capacity, if the stated capacity is not evenly divisible by the number of pans, the ASHRAE 220 committee considered allowing for one additional pan that has a thickness

[26] *See* ISO 22042:2021

less than 2 inches which would make up the difference to meet the manufacturer's rated capacity but that this additional pan would not require temperature measurement. Based on the discussion from the ASHRAE 220 committee, DOE proposes that the number of pans required for testing blast chillers and blast freezers be determined by the number of standard product pans filled to 2 inches deep with food simulator product that can be loaded into the blast chiller or blast freezer without exceeding the manufacturer's stated food load capacity by weight, plus one additional standard product pan, if needed, to meet the manufacturer's stated food load capacity.

DOE seeks comment on the proposed method to determine the number of pans required for testing blast chillers and blast freezers.

ASHRAE 220 specifies that the tested product capacity is determined based on loading the test unit with the maximum number of pans with food product up to the manufacturer's recommended maximum food product weight capacity. The food product weight does not include the weight of the pans.

Consistent with the comment from the CA IOUs, the ASHRAE 220 committee determined that blast chiller and blast freezer capacity based on food product weight is relevant in addition to refrigerated volume because the throughput of food product by weight is the primary function provided to users, as compared to long-term refrigerated storage volume for typical CRE. Blast chillers and blast freezers with the same volume may have different pull-down capacities by weight depending on the design of the cooling system.

Based on participation in the ASHRAE 220 committee, DOE expects that manufacturers specify capacity by food weight based on the maximum food load that can be loaded into the blast chiller or blast freezer while meeting the performance requirement of NSF 7-2019. DOE has reviewed the ASHRAE 220 specifications and equipment available on the market and tentatively determines that additional specifications may be needed to determine the product capacity used during the test. DOE is proposing that when determining the product capacity, all manufacturer literature that is included with the unit would be reviewed, and the largest product capacity stated in the literature would be used. If the unit is able to operate as both a blast chiller and a blast freezer in different operating modes and the literature specifies different product capacities for blast chilling and blast freezing, the largest capacity stated for the respective operating mode during the test would be used.

If no product capacity is stated in the manufacturer literature, DOE is proposing that the product capacity be represented by the maximum number of 12 inch by 20 inch by 2.5 inch pans that can fit in the test unit with each pan filled 2 inches deep with product, consistent with the ASHRAE 220 approach, with capacity determined as the sum of the food weights within the individual pans loaded for testing. As discussed further in a subsequent section, DOE is proposing use of a food simulator. The tested capacity would not include the weight of the pans, temperature sensors, or wires. If upon testing a blast chiller or blast freezer with no stated product capacity is not capable of pulling down temperatures from 135 °F to 40 °F within a period of four hours with the load specified in the proposed test procedure, DOE proposes that one pan be removed until the unit achieves the specified pull-down operation.

To ensure repeatability of testing, DOE is proposing that the tested capacity (determined as the sum of the food weights for individual pans loaded for testing) be within ± 5 percent or ± 2 pounds of the rated capacity, whichever is less. DOE acknowledges that the actual weight of food simulator may be slightly different in each pan because each pan may not be loaded with food simulator to the exact same specified thickness. Specifying a tolerance on the overall tested capacity would ensure that the total food load by weight is consistent from test to test.

DOE seeks comment on the proposal to determine the tested product capacity for the blast chillers and blast freezers test procedures.

ASHRAE 220 specifies where to place the standard product pans in the blast chiller or blast freezer if a full load of pans is not needed to meet the manufacturer's stated capacity. ASHRAE 220 specifies that if there are fewer pans than there are rack spaces in the unit, the pans shall be placed evenly in the unit with top and bottom shelves occupied. If not all shelves are occupied by pans, the pan locations shall be recorded. The ASHRAE 220 committee has also discussed specifying that pans would be loaded without pans nesting on each other and without touching the top and the bottom of the cabinet. DOE has reviewed the ASHRAE 220 specifications, ASHRAE 220 committee discussions, and equipment available on the market. Based on DOE's review, additional specifications may be needed to determine where to place the standard product pans. DOE proposes that once the number of standard product pans needed for the test has been determined, the pans should be spaced evenly throughout each vertical column of rack positions in the test unit without the pans touching any other pans and without the pans

touching the top and the bottom of the cabinet. For test units that have an additional pan with a product thickness of less than 2 inches, DOE proposes to require placing the additional pan as close to the middle rack position as possible while maintaining an even distribution of all pans. DOE also proposes that if not all rack positions are occupied by pans, the pan locations shall be recorded.

DOE seeks comment on the proposed method for distributing the pans within the test unit's cabinet for testing blast chillers and blast freezers.

ASHRAE 220 specifies that if multiple pans are used per level (*i.e.*, pans can be loaded side-by-side at the same level), only one pan needs to be measured with product temperature sensors per level. ASHRAE 220 provides a figure illustrating an example for test units with multiple pans per level, indicating which pans would include thermocouples. In the figure, each level includes two side-by-side pans, and the thermocouple location is staggered such that it alternates between the left and right pan at each level, and such that each vertical column does not have two measured pans in sequential levels.

DOE has reviewed the draft ASHRAE 220 pan loading approach and has tentatively determined that it provides a representative measure of food load temperature within the blast chiller or blast freezer while limiting test burden. DOE acknowledges that food temperatures within the cabinet may vary depending on proximity to the evaporator or airflow pathway through the cabinet but expects that measuring one pan per level and staggering the measured pans would ensure a representative food temperature

average would be measured during testing. DOE has also initially determined that this approach would limit test burden by avoiding the need for every pan to include a thermocouple, thereby avoiding the setup of the thermocouple within the pan and the routing of additional thermocouple wires from inside the cabinet.

Based on the review of ASHRAE 220, DOE proposes to incorporate the ASHRAE 220 approach with additional instructions. DOE proposes that if multiple standard product pans are used per level, only one pan per level be measured with a temperature sensor. DOE proposes to specify that the pan measured should alternate vertical columns so that each vertical column does not have two measured pans in sequential levels and that if a test unit uses an additional pan that has a thickness less than 2 inches, this additional pan would not be measured for product temperature.

DOE seeks comment on the proposed method to determine which standard product pans would include temperature measurement sensors for the blast chillers and blast freezers test procedures.

ASHRAE 220 specifies measuring the product temperature in the geometric center of any measured pans and provides an example figure illustrating the temperature sensor location in a measured pan and, in particular, showing the unweighted thermocouple as being placed 5/8 inch above the bottom of the pan. ASHRAE 220 provides that temperature sensor leads must allow for the transfer of pans from the heating compartment to the test unit cabinet.

DOE proposes to incorporate this approach with additional instruction to specify explicitly details that are shown visually in the example figure in ASHRAE 220. DOE proposes that product temperature shall be measured in the geometric center of the product pan, 5/8 inches above the bottom of the pan, that the temperature sensor shall be unweighted, and that the temperature sensor leads shall be secured to the bottom of the pan while also allowing for the transfer of the pan from the heating source into the test unit's cabinet.

DOE seeks comment on the proposed method of measuring the product temperature in the measured pans for the blast chillers and blast freezers test procedures.

ASHRAE 220 specifies instructions to prepare the product medium mixture to be placed in the standard product pans as follows:

a) Determine the manufacturer's recommended maximum food product weight capacity.

b) Prepare a 20 percent by volume propylene glycol (1,2-Propanediol) mixture in water.

c) In each pan, pour the propylene glycol mixture over #20 mesh southern yellow pine sawdust to create a 22 percent to 78 percent by mass slurry. Mixture must be pre-portioned for each individual pan to avoid large batch component separation.

d) Mix until the sawdust becomes completely saturated and leave uncovered in the pan. The weight of the mixture shall correspond with the determined weight.

Record the weight of each pan, weight of the mixture, and number of pans to be loaded. Weight of the thermocouples shall be omitted.

Note: Acceptable Sawdust Specification Example: American Wood Fibers brand, #20 Mesh Pine Sawdust (50 lbs bags), Item # 30020205018

e) Verify that the pan thermocouple is fully submerged in the mixture, reposition the thermocouple in the geometric center of the mixture if it is not.

The ASHRAE 220 committee developed the food simulator specifications based on the food load specified in NSF 7-2019 for rapid pull-down refrigerators and freezers. Because this test load is already in use for this equipment, and because its heat transfer characteristics are similar to actual food loads, DOE has tentatively determined that the food simulator load specified in the ASHRAE 220 draft is representative for testing blast chillers and blast freezers.

DOE proposes to incorporate the ASHRAE 220 approach with additional specifications to ensure repeatability. As stated, each pan would be loaded to 2 inches of food load thickness (*i.e.*, depth) within the pan and an additional pan would be loaded as needed to meet the manufacturer's stated capacity. DOE is proposing that each pan shall be weighed prior to heating, before and after the food product simulator is added. A cumulative total of the product weight shall be calculated and the pans shall continue to be loaded with the product mixture until the cumulative total reaches the manufacturer's stated capacity (the total product weight shall be within ± 5 percent or ± 2 pounds of the manufacturer's stated capacity, whichever is less).

DOE seeks comment on the proposed method for preparing the product medium mixture to be placed in the standard product pans for the blast chillers and blast freezers test procedures.

Test Conduct

In response to the June 2021 RFI, DOE received a comment from the CA IOUs stating that test engineers at Southern California Edison's Foodservice Technology Center indicated that production kitchens that use blast chillers or blast freezers are often designed to maximize throughput of hot food products (usually cooked in combination ovens or rack ovens) through the blast chiller or blast freezer, and then once the food is cooled it is typically placed in standard refrigerators or freezers for long term storage. (CA IOUs, No. 10, p. 5)

The overall test approach in the ASHRAE 220 draft includes pre-cooling the blast chiller's or blast freezer's cabinet to a pre-set or controlled operating temperature, loading of hot food pans into the blast chiller or blast freezer, and pull-down of the hot food pans to the target temperature. The ASHRAE 220 committee also considered including an operating period in which the blast chiller or blast freezer would maintain the food load at the target temperature (*i.e.*, a "holding period"). However, consistent with the comment from the CA IOUs, the ASHRAE 220 committee determined that the primary function of the blast chiller or blast freezer is to pull-down hot food temperatures and that the prioritization of throughput through the blast chiller or blast freezer would result in less operation in holding periods. DOE has tentatively determined that the

ASHRAE 220 approach is appropriate for blast chiller and blast freezer testing and is proposing to only include pre-cooling and pull-down operation within the test.

DOE seeks comment on the proposal to include pre-cooling and pull-down operating in the blast chiller and blast freezer test procedure and to not include any holding periods during testing.

ASHRAE 220 specifies that all measurements shall be continuously recorded during the test in intervals no greater than 10 seconds. The current DOE CRE test procedures require that measurement intervals do not exceed three minutes and ASHRAE 72-2018R requires certain measurements at one-minute intervals. Because the blast chiller and blast freezer test procedure is not conducted at stable cabinet temperature conditions, as is the case for other CRE testing, DOE has tentatively determined that a shorter measurement interval is appropriate to accurately identify unit performance (*e.g.*, determining when all pans reach the target temperatures). Therefore, DOE proposes to incorporate the ASHRAE 220 approach requiring data acquisition at 10 second intervals.

DOE seeks comment on the proposed data recording rate for the blast chillers and blast freezers test procedures.

ASHRAE 220 specifies that data would be recorded once a steady-state condition is established. ASHRAE 220 specifies that the test unit stabilize at ambient temperatures for at least 24 hours before pre-cooling and that the prepared product be heated for a minimum of 8 hours in the standard product pans at the required temperature prior to

loading into the blast chiller or blast freezer. Consistent with these requirements, DOE proposes that the test unit stabilize at ambient temperatures for at least 24 hours, and then data acquisition would be recorded prior to the pre-cool period. For the prepared product in the standard product pans, DOE proposes that data acquisition begin prior to the minimum 8 hour heating period.

DOE seeks comment on the proposed data collection periods for the blast chillers and blast freezers test procedures.

ASHRAE 220 specifies a procedure for pre-cooling the test unit from ambient conditions prior to pull-down operation. The test unit is to remain in the required ambient conditions for at least 24 hours before pre-cooling. The test unit's pre-cooling cycle is used, if available. For test units with more than one pre-cool cycle, the cycle used is recorded. For units without a pre-cooling cycle, an empty blast cycle should be run in its entirety. During the pre-cool cycle, the test unit's sensing probe will remain in its default or holstered position. Pre-cool is deemed complete when the test unit's pre-cool notification reports. If the test unit does not have a pre-cool cycle or pre-cool completion notification, the pre-cool is deemed complete when the compressor first cycles off. The pre-cool data to be recorded is the selected cycle name, pre-cool duration, temperature, and energy consumed.

Because the main function of a blast chiller or blast freezer is to pull down the product temperature of hot food, DOE has tentatively determined that measuring performance during the pre-cool period is not necessary, other than to determine when

pre-cooling is complete. However, because pull-down testing is initiated after the completion of pre-cooling, operation during pre-cooling may impact pull-down performance. Based on DOE's review of ASHRAE 220, additional specifications regarding pre-cooling may be needed.

DOE proposes that the pre-cool cycle may be initiated on blast chillers and blast freezers once the test unit has been maintained at ambient temperatures without operating for at least 24 hours. Rather than selecting and recording any pre-cooling cycle, DOE is proposing that the fastest pre-cooling cycle be selected. DOE proposes to specify that the pre-cool cycle is complete when the test unit notifies the user that the pre-cool is complete, consistent with ASHRAE 220, but that if the test unit does not notify the user that the pre-cool cycle is complete, the pre-cool will be deemed complete when the test unit reaches 40°F or 2°F based on the test unit's sensing probe for blast chillers and blast freezers, respectively. DOE has tentatively determined that this approach would ensure a consistent starting point for pull-down testing from unit to unit rather than the first compressor off cycle.

For test units without any defined pre-cooling cycles, DOE is proposing that the fastest blast chilling or blast freezing cycle shall be run with an empty cabinet until the test unit reaches 40°F or 2°F based on the test unit's sensing probe. Consistent with ASHRAE 220, during the pre-cool cycle, the test unit's sensing probe will remain in its default or holstered position. The pre-cool test data to be recorded are the ambient conditions, pre-cool cycle selected, pre-cool duration, and final pre-cool cabinet temperature based on the test unit's sensing probe.

As stated, DOE is proposing that test procedures for blast chillers and blast freezers are to measure the energy consumed by the product temperature pull-down operation. Additionally, blast chillers and blast freezers may run multiple pull-down cycles consecutively without the need for individual pre-cooling cycles. However, DOE acknowledges that the energy consumed during the pre-cool period may be relevant to the overall energy consumption of blast chillers and blast freezers and requests comment on whether pre-cooling energy use should be measured and considered in the overall energy consumption metric for blast chillers and blast freezers.

DOE seeks comment on the proposed method to conduct the pre-cool cycle for the blast chillers and blast freezers test procedures.

ASHRAE 220 specifies instructions for loading the prepared standard product pans into the test unit. Measured standard product pans are maintained at an average temperature of 160.0 ± 1.8 °F and an individual pan temperature tolerance of 160 ± 10 °F for a minimum of 8 hours prior to being loaded into the test unit. Non-measured pans are also required to be heated for a minimum of 8 hours. The test unit door is opened for loading at 4 ± 1 minutes after the test unit completes its pre-cool cycle. ASHRAE 220 specifies that the door remain open to load all of the standard product pans for the entirety of the loading procedure. ASHRAE 220 further specifies that the door is open for 20 seconds per roll-in rack and 15 seconds per pan for roll-in and standard test units, respectively. The test unit's sensing probe is inserted into the geometric center of a standard product pan in the center level of the cabinet. If the center level has capacity for multiple pans, the probed pan should be furthest away from the evaporator. The probe

must not touch the bottom of the pan or be exposed to the air. The location of the pan with the probe is recorded. The factory probe is placed so that it does not interfere with the test thermocouple measurement. The door remains closed for the remainder of the test.

DOE proposes to adopt ASHRAE 220's approach with additional specifications and certain deviations to ensure consistent testing. DOE proposes that while maintaining the temperature of the measured standard product pans prior to loading into the blast chiller or blast freezer, the non-measured standard product pans shall be placed in alternating positions with the measured standard product pans in the heating device for a minimum of 8 hours prior to being loaded into the test unit to ensure consistent product temperatures. The test unit door would be opened for loading at the specified time in ASHRAE 220, but DOE is proposing to specify more precise values, *i.e.*, 4.0 ± 1.0 minutes. DOE is proposing that the total door open period for loading pans would have a tolerance of ± 5 seconds to account for different test lab operation. DOE is proposing that the door would be fully open, based on the definition of "fully open" in ASHRAE 72-2018R, for the duration specified in ASHRAE 220 to ensure test repeatability. DOE is proposing that the test unit's sensing probe would be inserted into the geometric center of the standard product pan approximately 1 inch deep in the product mixture at the median pan level in the test unit, which adds greater specificity for test repeatability. If the standard product pan at the median level is the additional pan with less than 2 inches of product thickness, DOE is proposing to specify that the closest pan or pan level that is farthest away from the evaporator fan would be used to insert the test unit's sensing probe, consistent with the ASHRAE 220 approach. DOE is proposing to add that the

product temperature sensor wiring not affect energy performance, consistent with section 5.4.9 of ASHRAE 72-2018R.

DOE seeks comment on the proposed method to load the prepared standard product pans into the test unit for the blast chillers and blast freezers test procedures.

In the June 2021 RFI, DOE requested comment and supporting data on the typical usage settings for blast chillers and blast freezers and how different set-point modes affect energy performance. 86 FR 31182, 31189. For units with multiple temperature settings within the refrigerator or freezer temperature range, DOE requested comment on which setting is appropriate for testing. *Id.* Additionally, for units with settings that affect the pull-down duration, DOE requested comment on whether the fastest or slowest setting (or any other setting if more than two settings are provided) should be used for testing. *Id.*

NEEA commented that ASHRAE 220 is working to answer some of the questions posed by DOE, including establishing starting food temperatures, blast chiller temperatures, and ambient temperatures. (NEEA, No. 5, p. 3)

ASHRAE 220 specifies instructions to operate the blast chilling or blast freezing cycle. A blast chilling or blast freezing cycle is selected for blast chilling and blast freezing tests, respectively. ASHRAE 220 specifies that the cycle selected should provide the most rapid product cooldown designed for the densest food product as stated in manufacturer literature. ASHRAE 220 provides that a manufacturer may provide

additional clarification on cycle selection. ASHRAE 220 specifies that the selected cycle name and settings are recorded.

ASHRAE 220 further specifies the following: Temperature and energy measurement starts once the first pan is loaded in the unit; the selected cycle continues until all individual measured pan temperatures are below the final temperatures of 40 °F and 2 °F for blast chilling and blast freezing tests, respectively; if the selected cycle program terminates prior to all product temperatures reaching below the test's prescribed final temperature, the standard product pans remain in the unit until it does so; if the temperature does not reach below the test's prescribed temperature after two additional hours, unit temperature settings are adjusted to achieve the desired final temperature; temperature and energy measurements end once the door is opened to remove the standard product pans; and energy consumption, temperature, and time is reported starting with the first pan loaded in the unit and ending with the final pan reaching the prescribed final temperature.

Based on DOE's review of ASHRAE 220, DOE has initially determined that additional specifications and certain deviations may be needed to improve test repeatability and reproducibility. Consistent with the integrated average temperature requirements from the current DOE CRE test procedures, DOE proposes that a blast chilling cycle with a target temperature of 38 °F and a blast freezing cycle with a target temperature of 0 °F be selected for blast chilling and blast freezing tests, respectively. Consistent with ASHRAE 220, the cycle selected would be the cycle with the most rapid product temperature pulldown that is designed for the densest food product, as stated in

the test unit's manufacturer literature. Ambient conditions and time measurements would be recorded from the pre-cool cycle. Product temperature measurements from the measured standard product pans would be recorded from the 8-hour period of heating prior to being loaded into the test unit to ensure that pull-down performance data is recorded. Voltage, frequency, and energy consumed would start to be recorded as soon as the test unit door is opened to load the standard product pans so that blast chiller and blast freezer tests are started at a consistent point across all tests. Once the test unit door is closed, the blast chilling or blast freezing cycle would be selected and initiated as soon as is practicable. The blast chilling or blast freezing cycle selected would be recorded. The blast chilling or blast freezing test period would continue from the door opening until all individual measured pan temperatures are at or below 40.0 °F or 2.0 °F for blast chiller and blast freezer tests, respectively, regardless of whether the selected cycle program has terminated. If all individual measured pan temperatures do not reach 40.0 °F or 2.0 °F for blast chiller and blast freezer tests, respectively, two hours after the selected cycle program has terminated, the test would be repeated and the target temperature would be lowered by 1 °F until all individual measured pan temperatures are at or below 40.0 °F or 2.0 °F for blast chiller and blast freezer tests, respectively, at the conclusion of the test. The duration of the blast chiller or blast freezer test would be recorded.

DOE seeks comment on the proposed method to conduct the blast chilling or blast freezing test.

Calculations

In response to the June 2021 RFI, the CA IOUs commented that the primary factors for energy use are the weight of the food to be chilled, starting temperature, and ending temperatures of the food; therefore, the CA IOUs suggested that DOE choose an energy use metric based on energy use per weight of food and degrees cooled (*i.e.*, the active pull-down mode). (CA IOUs, No. 10, p. 4)

ASHRAE 220 specifies calculations used to report the energy consumed during the test. The measured energy consumption is divided by the test product capacity in pounds, averaged for 3 repeated tests. DOE proposes to incorporate the ASHRAE 220 approach (and to specify that the measured energy consumption is reported in kilowatt-hours) except that only one test would be needed in order to limit test burden. ASHRAE test standards do not generally provide requirements for multiple tests, as sampling plans are typically established by the rating programs that reference the ASHRAE test standard. However, DOE already provides sampling plans for the determination of CRE represented energy or efficiency values at 10 CFR 429.42(a). Accordingly, DOE has initially determined that the three tests considered for the ASHRAE 220 standard are not necessary for representations, and DOE is not planning to incorporate ASHRAE's method of averaging over three tests.

DOE seeks comment on the proposed method for calculating the reported energy use metric for blast chillers and blast freezers.

4. Chef Bases and Griddle Stands

DOE defines "chef base or griddle stand" as CRE that is designed and marketed for the express purpose of having a griddle or other cooking appliance placed on top of it that is capable of reaching temperatures hot enough to cook food. 10 CFR 431.62.

As discussed in the April 2014 Final Rule, the explicit categorization of griddle stands covers equipment that experiences temperatures exceeding 200 °F. 79 FR 22277, 22282. As explained, this was to distinguish between equipment that experience cooking temperatures and equipment that experiences temperatures at which food is kept warm. *Id.* However, DOE notes that the current definition for chef bases and griddle stands does not specify a quantitative temperature and instead states "hot enough to cook food."

DOE stated in the April 2014 Final Rule that chef bases and griddle stands are able to be tested according to the DOE test procedure, but that their refrigeration systems require larger compressors to provide more cooling capacity per storage volume than equipment with compressors that are appropriately sized for conventional CRE and more typical room temperature conditions. 79 FR 22277, 22281-22282. However, the definition does not include specifications for the refrigeration systems to differentiate this equipment from typical CRE.

In the June 2021 RFI, DOE requested comment on whether the definition for chef bases and griddle stands should be modified to include a specific temperature requirement for cooking appliances placed on top of chef bases and griddle stands, or other such specification. 86 FR 31182, 31189. DOE requested feedback on quantifiable

characteristics of chef bases and griddle stands that differentiate this equipment from other CRE, including information on appropriate temperature ranges and refrigeration system characteristics that could be used to classify equipment as chef bases and griddle stands. *Id.*

In the June 2021 RFI, DOE also requested comment on whether modifications to the current CRE test procedure would be appropriate for testing chef bases and griddle stands to better represent real-world use conditions. *Id.* DOE specifically requested supporting data on the time per day that top-mounted cooking equipment is active, as well as typical temperatures of the cooking equipment when active, to gain an understanding of the magnitude of the resulting thermal loads. *Id.* DOE also requested comment on whether the existing DOE test procedure is appropriate for measuring the energy use of this equipment. *Id.*

True, Hoshizaki, NEEA, and the CA IOUs commented in support of using the ASHRAE 72-2018 test procedure for chef bases and griddle stands to prevent additional burden of a new test procedure. (True, No. 4, p. 15; Hoshizaki, No. 13, p. 3; NEEA, No. 5, p. 2; CA IOUs, No. 10, p. 1-2) The CA IOUs commented that utility programs for this equipment would benefit from uniform test procedures and definitions to document the rated energy performance for both baseline and efficient products. (CA IOUs, No. 10, p. 1-2) NEEA commented in support of collaboration with EPA to ensure market consistency. (NEEA, No. 5, p. 2)

Hoshizaki commented that the ASHRAE 72 committee should be given the chance to review whether a heat load should be added to the top of the units to represent heating equipment (*e.g.*, fryers, griddles, hot pads, *etc.*). (Hoshizaki, No. 13, p. 3) NEEA commented that an ASHRAE investigation added an electric griddle to the top of chef bases to emulate real world conditions; however, that version of ASHRAE 72 was abandoned when there was insufficient variation in the data to demonstrate the effectiveness of thermal breaks between the surface and refrigerated compartments beneath. (NEEA, No. 5, p. 2) The CA IOUs commented that PG&E and Southern California Edison ("SCE") commissioned and conducted testing including a griddle at 350 °F and a broiler at 600 °F to evaluate heat loads typically found near chef bases and found negligible impact on the daily energy consumption of the chef base.[27] (CA IOUs, No. 10, p. 2) The CA IOUs commented that the six door openings per day in ASHRAE 72-2018 may not be representative of field use and encouraged DOE to work with industry stakeholders to establish a more representative door opening schedule. (CA IOUs, No. 10, p. 2)

The Joint Commenters stated that preliminary EPA research found significant variation in energy performance between preparation tables and work top tables, which have similar designs to chef bases. (Joint Commenters, No. 8, p. 2) NEEA commented that SCE tested six different chef bases using ASHRAE 72-2014 without modification

[27] *See www.caetrm.com/media/reference-documents/ET15SCE1010_Chef_Bases_Report_final2.pdf*

and that results indicated wide variation in energy performance in the market, suggesting chef bases could be tested using ASHRAE 72-2014. (NEEA, No. 5, p. 2)

ITW commented that UL Standard 197, "Commercial Electric Cooking Appliances" generally covers the cooking appliances and does not refer to any minimum cooking or appliance surface temperature, such that DOE's definition appears correct. (ITW, No. 2, p. 8)

AHRI commented that chef bases and griddle stands are highly customizable, with the following characteristics that may differ from typical CRE: additional insulation below the high temperature surface, modified temperature operation for easily spoilable product, shortened operating windows for loading only during business hours, drawer configurations, and attributes for the high ambient conditions. (AHRI, No. 3, p. 15) AHRI commented that none of these characteristics are distinguishing features and can be custom built based on the end user's needs. (*Id.*)

True commented that DOE should not regulate food safety and should limit its regulations to energy consumption. (True, No. 4, p. 15) True commented that chef bases and griddle stands are known to operate with higher heat loads due to cook tops, grills, etc. (*Id.*) True commented that their reach-in equipment within the VCS.SC.M/L equipment classes (used to hold frozen fries or refrigerated meat, poultry, or fish) are commonly installed next to fryers and grills in hot kitchens, but that they perform ASHRAE 72-2018 for energy consumption and NSF 7-2019 for food safety and performance testing. (*Id.*)

AHRI commented that the current test procedure does not account for the high ambient conditions, added thermal load from the cook top, or customized operating windows. (AHRI, No. 3, p. 10) AHRI commented that the time per day that top mounted equipment is active varies based on the application (*e.g.*, breakfast diner operating a griddle during breakfast hours only versus a 24-hour diner using the grill continuously). (*Id.*)

The CA IOUs and Joint Commenters commented that DOE should establish higher ambient temperature and relative humidity conditions for evaluating the performance of chef bases. (CA IOUs, No. 10, p. 2-3; Joint Commenters, No. 8, p. 2) The CA IOUs recommended adopting conditions from ASTM F2143-16 or the emerging ASHRAE Standard 220, which have an ambient temperature of 86 °F ± 2 °F and relative humidity of 35 percent ± 5 percent. (CA IOUs, No. 10, p. 2-3) The CA IOUs commented that these elevated kitchen temperatures are supported by a 2012 ASHRAE research project benchmarking the thermal conditions in 100 commercial kitchens in the United States, which found that the average temperature in preparation areas ranged from 72 °F to 79 °F, while the average temperature in cooking areas ranged from 79 °F to 93 °F. (*Id.*) The CA IOUs commented that a 2014 PG&E study investigated refrigerated prep tables at eleven different sites in California, finding that the ambient temperatures over a two-week period ranged from 70 °F to 78 °F during a cold month in February and between 82 °F and 84 °F during a two-week period during a warmer fall season, and that both studies found consistently elevated ambient temperatures in kitchens compared to the existing 75 °F ambient temperature requirement in ASHRAE 72-2018. (*Id.*)

ITW and True commented that the test procedure should not change and would create an unnecessary burden. (ITW, No. 2, p. 8; True, No. 4, p. 16)

ITW commented that UL 197 Section 50.1.3, "Normal Temperature Test," assumes an ambient temperature of 77 °F, which is within the ASHRAE 72-2018 temperature specification, such that no change is needed. (ITW, No. 2, p. 8) ITW commented that a radiant panel could be added or held above (at a 4 foot to 6 foot clearance) the top surface to simulate a "worst case" cooking appliance, but that the panel would need to evenly raise the surface temperature to a maximum of 194 °F (see UL 197, Table 50.1). (*Id.*)

Since publication of the June 2021 RFI, EPA has published a Final Draft Version 5.0 Eligibility Criteria for the ENERGY STAR program for commercial refrigerators and freezers.[28] This final draft specification includes a definition for "chef base or griddle stand" consistent with DOE's current definition and would require testing according to the existing DOE test procedure in place for CRE.

DOE has considered whether additional detail regarding the characteristics of chef bases or griddle stands would better differentiate it from other CRE. As discussed, chef bases or griddle stands are designed for use with cooking equipment placed on top of the unit. Typical chef bases or griddle stands may include oversized refrigeration systems and additional cabinet insulation to ensure the unit can maintain cold storage

[28] For information on the Version 5.0 specification development, see *www.energystar.gov/products/spec/commercial_refrigerators_and_freezers_specification_version_5_0_pd*.

temperatures with the additional heat load from the cooking equipment. However, these characteristics may not be readily identifiable in a given chef base or griddle stand. For example, manufacturers may not offer CRE in the a different CRE equipment class with similar designs to any chef base or griddle stand, in which case there would not be a point of comparison available to determine whether the chef base or griddle stand includes more insulation or an oversized refrigeration system.

While EPA's Final Draft Version 5.0 Eligibility Criteria includes a definition of chef base or griddle stand consistent with DOE's definition, it also includes definitions for similar equipment types; *i.e.*, worktop and undercounter[29] CRE. Both of these definitions include a minimum height requirement of 32 inches. Chef bases or griddle stands have similar construction to worktop and undercounter equipment but are typically shorter to allow for installing cooking equipment above the refrigerated cabinet at a normal working height. Consistent with the ENERGY STAR definitions for worktop and undercounter, DOE is proposing to amend the definition for chef base or griddle stand to specify that the equipment has a maximum height of 32 inches, including any legs or casters.

DOE requests comment on the proposed amendment to the definition for chef base or griddle stand, which specifies a maximum height of 32 inches for this equipment.

[29] Undercounter: A vertical closed commercial refrigerator or freezer that has no surface intended for food preparation. The equipment is intended for installation under a separate counter or workspace. This equipment may have doors or drawers and shall have a minimum height of 32-inches, including legs or casters.
Worktop: A vertical closed commercial refrigerator or freezer that has a surface intended for food preparation that is incapable of supporting cooking equipment. This equipment may have doors or drawers and shall have a minimum height of 32-inches, including legs or casters.

DOE requests information on any other identifiable equipment characteristics that may differentiate chef bases and griddle stands from other similar CRE.

Regarding testing for chef bases or griddle stands, DOE has initially determined that the existing DOE test procedure provides an appropriate basis for measuring the energy consumption of this equipment. DOE recognizes that chef bases or griddle stands can be installed and used in ambient environments that are different from other CRE, but DOE proposes to test this equipment in the same conditions because DOE has tentatively determined that the additional heat loads of cooking equipment do not affect measured energy use. Additionally, this proposal would maintain a consistent testing basis for similar equipment. Specifically, testing chef bases or griddle stands according to the same test procedure as other CRE would allow end users to compare energy consumptions among chef bases or griddle stands and other currently covered equipment.

Additionally, DOE conducted testing similar to the PG&E and SCE testing to investigate whether cooking equipment operation would impact chef base or griddle stand energy use during typical operation, as illustrated in Table III.4. DOE tested chef base or griddle stand refrigerators and freezers to the current DOE CRE test procedure with and without an active griddle installed on top of the test unit. During the tests with an active griddle installed, the griddle was turned on three hours after the start of the defrost period and maintained a target griddle surface temperature of 185°F for 8 hours, concurrent with the door opening period. After the 8-hour period of griddle operation, the griddle was turned off for the remainder of the test.

Table III.4 - Chef Base or Griddle Stand Energy Consumption Comparison With and Without an Active Griddle

Test Unit	Refrigerated Volume (ft^3)	Energy Consumption With Griddle Installed (kWh/day)	Energy Consumption Without Griddle Installed (kWh/day)	Energy Consumption Difference
Refrigerator #1	5.21	0.97	0.96	-0.5%
Refrigerator #2	9.17	1.04	1.03	-0.5%
Refrigerator #3	9.72	1.59	1.58	-0.1%
Freezer #1	6.56	7.28	7.29	+0.2%
Freezer #2	11.31	8.58	8.70	+1.4%

*DOE tested an additional freezer that is not shown in the table due to inconsistent issues with the evaporator icing during testing.

Consistent with the findings in the PG&E and SCE report, DOE observed that chef bases or griddle stands consumed similar amounts of energy with and without cooking equipment operating above the unit. DOE has been unable to determine why Freezer #2 consumed slightly more energy without a griddle installed. For these reasons, DOE is proposing to maintain the existing CRE test procedure for testing chef bases or griddle stands (with the additional proposals as discussed in this NOPR). DOE has tentatively determined that this approach would allow for measuring energy consumption representative of typical use, provide a consistent basis for comparing energy consumption across similar equipment types, and would limit test burden.

DOE requests comment on its proposal to test chef bases and griddle stands according to the test procedure used for other CRE.

5. Mobile Refrigerated Cabinets

DOE does not currently define or specify test procedure provisions specific to other categories of refrigerated holding and serving equipment, such as certain mobile refrigerated cabinets. Specifically, mobile refrigerated cabinets chill the refrigerated compartment before being unplugged from power and taken to a remote location to hold

food products while maintaining cooling. Such equipment meets the definition of CRE as defined at 10 CFR 431.62; however, unlike typical CRE, mobile refrigerated cabinets are not continuously connected to a power supply. As discussed in the April 2014 Final Rule, DOE determined that such other categories of refrigerated holding and serving equipment meet the definition of CRE and could be subject to future test procedures and energy conservation standards. 79 FR 22277, 22281. To better distinguish mobile refrigerated cabinets from other defined categories of CRE, DOE is considering developing a definition for this equipment.

In the June 2021 RFI, DOE sought information on the design features and operating characteristics of mobile refrigerated cabinets that would differentiate this equipment from other CRE or buffet tables and preparation tables. 86 FR 31182, 31189. DOE also requested comment on appropriate test conditions (*e.g.*, temperature, moisture content) and conduct (*e.g.*, stabilization, door openings, duration connected and disconnected from power supply) for such equipment. 86 FR 31182, 31189-31190.

AHRI requested further clarification on what DOE considers to be a mobile refrigerated cabinet, stating that it is unclear how this product category differs from the others discussed in the previous rulemaking and the June 2021 RFI. (AHRI, No. 3, p. 11) The Joint Commenters commented that mobile refrigeration cabinets are often placed outdoors and often exposed to higher ambient temperatures than other CRE. (Joint Commenters, No. 8, p. 2)

The CA IOUs commented that these products should be referred to as "refrigerated storage lockers" and supported a method of test using a modified version of ASHRAE 72-2018. (CA IOUs, No. 10, p. 6-7) The CA IOUs commented that several petitions for test procedure waivers have been submitted by manufactures. The CA IOUs supported the door opening methodology granted in those waivers, asserting that an 8-second door opening cycle once every 2 hours for 10 hours seems more representative of real-world operation than door opening cycles once every 10 minutes for eight hours, as specified in ASHRAE 72-2018). (*Id.*)

The focus of the request for information regarding mobile cabinets was CRE that that typically operate without a continuous connection to a power supply. Examples of this equipment include refrigerated cabinets used to hold cold merchandise for vending outdoors during the day without connection to a power supply while outdoors, or storage cabinets to hold food at temperature while being delivered for service (*e.g.*, delivered to hospital rooms).

The CA IOUs' comment in response to the June 2021 RFI appears to refer to customer order storage cabinets, discussed further in section III.C.5 of this NOPR, and not mobile refrigerated cabinets. It is not clear whether the Joint Commenters also intended to refer to customer order storage cabinets or mobile refrigerated cabinets. DOE recognizes that mobile refrigerated cabinets can be used outdoors, as in the case of vending refrigerated merchandise, but are often used indoors, as in the case of refrigerated storage for food service.

Based on a review of mobile refrigerated cabinets available on the market, the operation and use of this equipment is subject to varied end-use applications, which may be specific to individual models. DOE did not identify data or information that would inform development of representative test conditions for such equipment. As such, DOE is not proposing to establish test procedures for mobile refrigerated cabinets in this NOPR.

To better distinguish mobile refrigerated cabinets from other defined categories of CRE, DOE proposes to add the following definition to 10 CFR 431.62 for mobile refrigerated cabinets:

A "mobile refrigerated cabinet" means commercial refrigeration equipment that is designed and marketed to operate only without a continuous power supply.

CRE that allow the user to choose whether to operate with or without a continuous power supply do not meet the definition of a mobile refrigerated cabinet.

Although DOE is not proposing to establish test procedure provisions specific to mobile refrigerated cabinets, CRE that do not meet the definition of a mobile refrigerated cabinet are subject to DOE's test procedure at appendix B and energy conservation standards under the applicable CRE equipment class.

DOE requests comment on the proposed definition for mobile refrigerated cabinet. DOE also requests comment on the proposal to not establish test procedures for mobile refrigerated cabinets.

6. Additional Covered Equipment

In the June 2021 RFI, DOE requested feedback on other CRE that may be available on the market and that may warrant separate equipment category definitions and test procedures. 86 FR 31182, 31190. Specifically, DOE sought information on the relevant equipment features and utilities that would require separate equipment categories, as well as the impact of those features and utilities on energy use and whether the current test procedure would provide results of those impacts. *Id.* DOE also requested any available information on potential definitions, test procedures, and usage data (specifically, how the typical daily energy use of the unique design compares to energy use of a unit of the most similar CRE equipment class) for these equipment categories. *Id.* DOE also requested comment on whether it should establish a definition for "other refrigerated holding and serving equipment" to clearly delineate equipment not currently subject to DOE's test procedure. *Id.* DOE sought feedback on an appropriate definition, and on the types of equipment it should cover. *Id.*

AHRI commented that there is not a need for additional equipment classes at this time. (AHRI, No. 3, p. 11)

AHRI and Hussmann commented that creating additional definitions for niche models not currently subject to the DOE test procedure would create confusion in the

regulated community that outweighs any potential benefits. (AHRI, No. 3, p. 11-12; Hussmann, No. 14, p. 12) AHRI and Hussmann commented that models outside the scope or unable to achieve the efficiency standards should use the test procedure waiver process, asserting that there will always be gaps between covered equipment and the list of "other refrigerated holding and serving equipment." (AHRI, No. 3, p. 11-12; Hussmann, No. 14, p. 12) True commented that the existing test procedure should be used for these additional equipment categories. (True, No. 4, p. 17)

AHRI and Hussmann commented that any alternate testing should be handled through waiver requests or specific supplemental instructions on a case-by-case basis. (AHRI, No. 3, p. 12; Hussmann, No. 14, p. 13)

DOE provided examples of potential CRE that may require additional test procedure provisions in the June 2021 RFI. 86 FR 31182, 31190. DOE has initially determined that additional test procedure provisions to account for what is likely unique equipment operation or usage are not needed at this time. The existing DOE test procedure is reasonably designed to produce test results which reflect energy efficiency and energy use of the CRE subject to the test procedure during a representative average use cycle, and is not be unduly burdensome to conduct. In that the test procedure provides a representative average use cycle, DOE is unable to account for every combination of operating conditions and usage without the resulting test procedures being unduly burdensome. If the test procedure cannot be conducted for certain equipment, or if the test procedure results in measures of energy consumption so unrepresentative of the equipment’s true energy consumption characteristics as to provide

materially inaccurate comparative data, manufacturers may petition DOE for a test procedure waiver under the provisions of 10 CFR 431.401. Section III.I of this NOPR discusses waivers currently in place for CRE, including for equipment with typical usage patterns different from the current test procedure approach.

D. Harmonization of Efficiency Standards and Testing with NSF 7-2019 Food Safety

NSF 7-2019 establishes minimum food protection and sanitation specifications for the materials, design, manufacture, and performance of commercial refrigerators and freezers and their related components. Section 2.3 of appendix B in the CRE test procedure provides that for CRE that is also tested in accordance with NSF test procedures (Type I and Type II),[30] integrated average temperatures and ambient conditions used for NSF testing may be used in place of the DOE-prescribed integrated average temperatures and ambient conditions provided they result in a more stringent test. To that end, the ambient temperature may be higher, but not lower than the DOE test condition; and the IAT may be lower, but not higher, than that measured at the DOE ambient test condition. *Id.* The test conditions, and possible different thermostat settings, under NSF 7-2019 may result in measured energy use that is more representative of average use in applications for which users prioritize food safety over energy efficiency. Permitting the use of the NSF 7-2019 test conditions may also reduce testing burden for manufacturers.

[30] Type I equipment is designed to operate in 75 °F ambient conditions and Type II equipment is designed to operate in 80 °F ambient conditions.

In the June 2021 RFI, DOE requested comment on ways in which the DOE test procedure may be modified to better harmonize with NSF 7-2019, if appropriate. 86 FR 31182, 31190. DOE specifically requested comment on potential test requirements related to food safety that could be specified to ensure that equipment is tested as it would operate in the field. *Id.*

ITW, AHRI, Arneg, and True commented that the DOE test procedure is appropriate and that test procedures changes are not needed to harmonize with NSF 7-2019. (ITW, No. 2, p. 9; AHRI, No. 3, p. 12; Arneg, No. 12, p. 2; True, No. 4, p. 18) ITW commented that the typical restaurant, kitchen, and dining area all have air conditioning set to temperatures lower than those specified in the ASHRAE 72-2018 standard, and that DOE should make no changes or introduce any new environmental conditions. (ITW, No. 2, p. 9) AHRI commented that NSF 7-2019 applies only to self-contained medium temperature units. (AHRI, No. 3, p. 12)

Hussmann commented that rather than referring to NSF 7-2019 (which only applies to SC.M units), Hussmann would support DOE standardizing testing for energy efficiency using product temperatures that better resemble the temperatures that a display case must run to preserve perishable food product for all equipment classes. (Hussmann, No. 14, p. 13-14)

DOE is not proposing any additional amendments to the test procedures to further reference or harmonize with NSF 7-2019 testing. The existing test procedure instructions in section 2.3 of appendix B allow for the use of NSF 7-2019 test data, subject to certain

requirements, to be used for DOE testing. DOE recognizes that NSF 7-2019 testing is not applicable or appropriate for all equipment types. For those equipment types, the DOE test procedure provides the required test instructions, including additional IAT rating temperatures, and reference to NSF 7-2019 is not needed. DOE maintains that the DOE test procedure (and proposed in this NOPR), by reference to AHRI 1200-202X and ASHRAE 72-2018R for conventional CRE, provides a measure of energy use of CRE during a representative average use cycle and is not unduly burdensome to conduct. The optional NSF 7-2019 test provides a means to further reduce test burden in certain instances, but it not required for DOE testing.

E. Dedicated Remote Condensing Units

DOE is aware of remote condensing CRE models for which specific dedicated condensing units are intended for use with specific refrigerated cases. For certain of these models, the remote condensing units are intended to be installed on or near the refrigerated case within the same conditioned space. For other models, the remote condensing units are intended to be installed outdoors, but the refrigerated case is intended to be used specifically with the designated remote condensing unit.

For this equipment, the combined refrigerated case and condensing unit refrigeration system would effectively operate as if it were a CRE with a self-contained condensing unit. Under the current DOE test procedure, remote CRE energy consumption is determined from the energy use of components in the refrigerated case plus a calculated compressor energy consumption based on the enthalpy change of refrigerant supplied to the case at specified conditions. The compressor energy use

calculation is based on typical reciprocating compressor energy efficiency ratios ("EERs") at a range of operating conditions. *See* Table 1 in AHRI 1200-2010. For CRE used with dedicated condensing units, the actual compressor used during normal operation is known (*i.e.,* the compressor in the dedicated condensing unit). Accordingly, testing the whole system using the same approach as required for a self-contained CRE may produce energy use results that are more representative of how this equipment actually operates in the field. Additionally, testing such a system as a complete system rather than using the test procedures for remote condensing units may be less burdensome because it would not require use of a test facility capable of maintaining the required liquid and suction line refrigerant conditions as currently required for testing remote CRE (*i.e.,* the refrigerant conditions consistent with the ASHRAE 72-2005 requirements and at the conditions necessary to maintain the appropriate case temperature for testing).

In the June 2021 RFI, DOE sought feedback on whether CRE with dedicated remote condensing units should be tested to evaluate the performance of the paired condensing unit and refrigerated case, rather than assuming a condensing unit EER as specified in the AHRI 1200 standards. 86 FR 31182, 31191. DOE also requested information on how to identify whether testing with a dedicated remote condensing unit is appropriate for a particular system (rather than the typical remote CRE testing under the existing approach). *Id.*

ITW commented that testing the paired condensing unit and refrigerated case is an excellent option or alternative. (ITW, No. 2, p. 9)

Arneg commented that display case manufacturers are not necessarily the same as the condensing unit manufacturers, and that condensing units and refrigerated cases are installed by a third party and there is no control over the installation, such that evaluating the performance of the paired unit would not be practical. (Arneg, No. 12, p. 2) Arneg commented that dedicated condensing units are selected based on the product temperature requirements, ambient temperature, elevation, and the distance between the display case and condensing unit. (Arneg, No. 12, p. 2)

AHRI and Hussmann commented that the use of refrigeration racks and condensing units are determined by application specific factors, and that there are no significant model characteristics that differentiate between whether the system should be used with a rack condensing system or a dedicated remote condensing unit. (AHRI, No. 3, p. 13; Hussmann, No. 14, p. 14) AHRI and Hussmann commented that most remote units are designed to accommodate either a condenser rack or dedicated condensing unit because units are dependent on user constraints, and manufacturers are not involved in the discussion (*i.e.*, distributors typically work with customers). (*Id.*) AHRI and Hussmann commented that multiple cases can often use a single condensing unit. (*Id.*)

AHRI and Hussmann requested further clarification from DOE on when a condensing unit would be considered specifically dedicated in order to further evaluate if there are unique situations where the outlined approach should be considered. (AHRI, No. 3, p. 13; Hussmann, No. 14, p. 14) AHRI and Hussmann do not believe the term "dedicated remote condensing unit" is applicable. (*Id.*)

The Joint Commenters stated that if DOE pursued the approach of testing complete systems only when a complete system is specified by the manufacturer, it could potentially create market distortions (*e.g.* a manufacturer of a display case who currently specifies a specific dedicated remote condensing unit may choose to discontinue that practice, depending on the implications for their equipment). (*Id.*)

NEEA commented that CRE models exist connected to remote multi-compressor rack systems and remote dedicated condensing units, and recommended that DOE test CRE with dedicated remote condensing units as self-contained units to enhance the representativeness of testing. (NEEA, No. 5, p. 6) NEEA commented that testing, instead of using the AHRI 1200-2013 EER table, would encourage increased efficiency of the entire unit and not default to assumptions about the remote equipment. (NEEA, No. 5, p. 6) NEEA commented that units designed and sold with a dedicated remote condensing unit may already experience increased test burden due to required changes at the testing facility to accommodate that CRE. (*Id.*) NEEA commented that in these instances, testing remote CRE with a dedicated condensing unit would be more representative of daily energy consumption, less burdensome to test, and increase the scope of products subject to efficiency standards. (*Id.*)

The CA IOUs commented in support of testing CRE dedicated remote condensing units together as a matched pair, asserting that it would be more representative of actual energy use as well as being comparable to self-contained units. (CA IOUs, No. 10, p. 7-8)

AHRI and Hussmann commented that they do not believe that strictly "dedicated" condensing units are applicable. (AHRI, No. 3, p. 13; Hussmann, No. 14, p. 15) AHRI and Hussmann commented that remote cases are already held to energy requirements and are paired with condensing units based on end-user requirements. (AHRI, No. 3, p. 13; Hussmann, No. 14, p. 15)

Arneg commented that the role of an application engineer is to do the performance comparison and make a professional judgement for the most practical solution, such that there is no need for standards for this process. (Arneg, No. 12, p. 2)

AHRI and Hussmann commented that dedicated remote condensing units should be further discussed at the industry test standard level. (AHRI, No. 3, p. 13-14; Hussmann, No. 14, p. 15) AHRI and Hussmann commented that some units may be designed as packaged pairs, when installation conditions differ, but that an end user may choose only one side of the system to pair with another manufacturer's condensing unit. (AHRI, No. 3, p. 13-14; Hussmann, No. 14, p. 15)

Through participation in the industry test standard committees to consider updates to AHRI 1200 and ASHRAE 72, DOE understands that remote CRE are most commonly installed with rack condensing systems and that installations with dedicated condensing units represent a very small portion of the remote CRE market. Additionally, DOE has not identified a method to determine whether a remote CRE unit would be installed with a dedicated condensing unit rather than a rack condensing system. DOE is not aware of any remote CRE that are capable of installations only with a dedicated remote

condensing unit (*i.e.*, DOE expects that all remote CRE may be installed with rack condensing systems).

DOE has tentatively determined that an amended test procedure to account for remote CRE installed with dedicated remote condensing units is not appropriate. While remote CRE can be installed with dedicated remote condensing units, the existing test procedure is representative of the most common installations (*i.e.*, installations with a rack condensing system) for remote CRE and therefore measures the energy use of this equipment during a representative average use cycle. Additionally, DOE has not identified any remote CRE capable of use only with dedicated remote condensing units, and therefore has tentatively determined that the existing test procedure is applicable to all remote CRE.

For remote CRE that can be installed with dedicated condensing units, manufacturers do not always specify dedicated remote condensing units to match with the remote cabinet. Having performance information for both the refrigerated cases and separate dedicated remote condensing units would allow users to compare the performance of both parts of the system when matched.

In the June 2021 RFI, DOE requested comment on whether, and if so how, users of CRE consider the energy performance of the system in instances in which a specific dedicated remote condensing unit is not identified for a refrigerated case. 86 FR 31182, 31191. DOE also requested comment on potential approaches to evaluate the energy

performance of dedicated remote condensing units independent of their use with specific refrigerated cases. *Id.*

Arneg commented that every condensing unit would have a specific EER based on design condition. (Arneg, No. 12, p. 2) AHRI and Hussmann commented that appropriate EER values can be obtained from the condensing unit manufacturer if the matched pair needs to be calculated separately from the specified condensing unit. (AHRI, No. 3, p. 13-14; Hussmann, No. 14, p. 15)

The Joint Commenters stated that manufacturers often do not specify a specific dedicated remote condensing unit for use with a specific refrigerated case and that it would be preferable to develop an approach to allow for independently measuring the performance of all dedicated remote condensing units, regardless of how they are sold. (Joint Commenters, No. 8, p. 3) The Joint Commenters stated that DOE should consider an approach for treating dedicated remote condensing units similar to the approach for walk-in coolers and freezers, which allows for rating both a matched pair (*i.e.*, unit cooler and dedicated remote condensing unit) and either a unit cooler or a dedicated remote condensing unit by itself (with assumptions for the performance of the other piece of equipment). (*Id.*) The Joint Commenters stated that this approach could be applied to CRE to allow for rating both a complete system (*e.g.*, display case and dedicated remote condensing unit) and either a display case or dedicated remote condensing unit by itself. (*Id.*)

The CA IOUs commented that DOE should consider using a test methodology similar to AHRI Standard 1250-2020 to serve as the starting point for developing a test method for dedicated remote condensing units, and specifically that the "Room Calorimeter Method" in AHRI 1250 could serve as a starting point with representative outdoor temperatures of 35 °F, 59 °F, and 95 °F. (*Id.*)

DOE is not aware of dedicated condensing units that are intended for use only with CRE. Many of the dedicated condensing units available for use with remote CRE are also used with other equipment and subject to DOE testing and energy conservation standards, such as walk-in coolers and walk-in freezers and automatic commercial ice makers. Because of the relatively small portion of the remote CRE market that is installed connected to a dedicated remote condensing unit, the applicability of other DOE test procedures and energy conservation standards to condensing units that may be used with CRE, and because DOE is not aware of any dedicated condensing units intended for use specifically with CRE, DOE is not proposing definitions or test procedures that would directly assess performance of CRE dedicated condensing units.

In summary, DOE is not proposing to amend the existing approach for testing remote CRE, which represents the performance of remote CRE as installed with a remote compressor rack condensing system.

DOE requests comment on its tentative determination to not propose amended test procedures for dedicated remote condensing units.

F. Test Procedure Clarifications and Modifications

1. Defrost Cycles

The test period requirements in ASHRAE 72-2005, incorporated by reference in the current CRE test procedure, and in ASHRAE 72-2018 require a 24-hour test period, which begins with a defrost after steady-state conditions are achieved.[31] Use of a fixed 24-hour test period can provide for a degree of variability in the measured energy consumption, depending on when additional defrost cycles occur after the initial defrost cycle. (*e.g.,* the test period may capture only a portion of a defrost cycle at the end of the test period rather than a complete number of defrost cycles). Typically, if multiple complete defrost cycles occur within the 24-hour period, the impact of capturing partial defrost cycles would be small. Similarly, if the defrost cycle duration is slightly greater than 24-hours, the impact of capturing a partial defrost cycle would be small. However, the impact may be more substantial if the defrost cycle duration is very long (*i.e.,* multiple days between defrost) or if the defrost cycle is slightly less than 24 hours (*i.e.,* the test period would capture two defrost occurrences but only one period of "normal" operation between defrosts). DOE also notes that ASHRAE 72-2005 does not have any specific provisions for CRE with variable defrost control schemes (*i.e.,* defrosts that may be triggered based on conditions or other parameters rather than only a timer) and does not account for CRE with no automatic defrost (*i.e.,* manual defrost).

[31] ASHRAE 72-2005 and ASHRAE 72-2018 define steady state as the condition in which the average temperature of all test simulators changes less than 0.4 °F from one 24-hour period or refrigeration cycle to the next.

DOE has addressed similar issues in the test procedures for consumer refrigeration products. The test procedures for those products apply a two-part test period (one period for steady-state operation and one period to capture events related to the defrost cycle) to account for defrost energy consumption for products with long defrost cycle durations or with variable defrost control. The energy use calculations then weight the performance from each test period based on the known compressor runtime between defrosts or based on a calculated average time between defrosts in field operation that is based on the control parameters for variable defrosts. *See* appendices A and B to subpart B of 10 CFR part 430.

Additionally, DOE has addressed testing of certain CRE models that do not have automatic defrost in a waiver granted to AHT published on October 30, 2018. 83 FR 54581 ("October 2018 Waiver"). For the basic models subject to the waiver, the test period begins after steady state conditions occur (instead of beginning with a defrost cycle) and the door-opening period begins 3 hours after the start of the test (instead of 3 hours after a defrost cycle). 83 FR 54581, 54583. DOE also granted AHT an interim waiver for testing certain models with defrost cycles longer than 24 hours. 82 FR 24330 (May 26, 2017; "May 2017 Interim Waiver")[32]. The interim waiver required that AHT test the specified models using a two-part test method similar to the method for consumer refrigerators, with the first part capturing normal compressor operation between defrosts, including an 8-hour period of door openings, and the second part capturing all operation

[32] On June 2, 2021, AHT sent a letter to DOE requesting that this interim waiver be withdrawn. See *www.regulations.gov/document/EERE-2017-BT-WAV-0027-0015*.

associated with a defrost, including any pre-cooling or temperature recovery following the defrost. 82 FR 24330, 24332-24333.

In the June 2021 RFI, DOE requested comment on the impact of the potential defrost cycle variability and whether the test period should be revised to minimize the effects of defrost cycle duration for certain equipment. 86 FR 31182, 31191. DOE additionally requested comment and supporting data on how incorporating a two-part test procedure may impact measured energy consumption, test burden, and repeatability and reproducibility. *Id.* Additionally, DOE requested information on the availability of equipment with variable defrost control and the control schemes employed in those models, if any are available. *Id.* DOE requested comment on whether the approach granted to AHT in the May 2017 Interim Waiver may better measure the representative energy use of CRE over complete defrost cycles compared to the current 24-hour test period. *Id.*

AHRI and Hussmann commented that the ASHRAE SSPC 72 committee has discussed defrost cycles and is considering changes to the test procedure to address variability in future revisions, and suggested that DOE bring this topic to the industry test standard discussions for further considerations. (AHRI, No. 3, p. 14; Hussmann, No. 14, p. 16)

True and ITW commented in support of the current DOE test procedure length of 24 hours, which they stated captures the defrosts by starting the test at the beginning of a defrost cycle such that all energy evaluations experience at least one defrost cycle. (True,

No. 4, p. 20; ITW, No. 2, p. 10) ITW commented that if DOE finds it necessary to restructure the test procedure, the evaluation period should be increased in steps of 24 hours, with the 8-hour door opening cycle repeating during each 24 hour period, to dilute any concerns of defrost variability and maintain a constant load per 24 hour period. (ITW, No. 2, p. 10)

The CA IOUs commented that defrost energy can represent a significant contribution to energy use of CRE and that equipment with frost build up on their refrigeration coils suffer from reduced efficiency compared to a clean coil. (CA IOUs, No. 8, p. 9)

For testing CRE with no automatic defrost, ASHRAE 72-2018R incorporates instructions for starting the test period and door openings that are consistent with those provided in the October 2018 Waiver (*i.e.*, the instructions do not require a defrost occurrence). Therefore, DOE's proposal to incorporate by reference ASHRAE 72-2018R would address this test issue.

For testing CRE with variable defrost, DOE has tentatively determined that the existing 24-hour test period represents typical operation during a day, including a period of door openings and a period of closed-door operation, and is not proposing any additional test requirements in this NOPR. Units with variable defrost controls may initiate more frequent defrosts in response to door openings, which is captured by the current test procedure.

The 24-hour test period specified in ASHRAE 72-2018 provides a representative basis for measuring energy consumption of most CRE, capturing the defrost occurrences and door opening periods expected for a 24-hour period. Most CRE include multiple defrosts during a 24-hour test period, and any incomplete defrost cycle captured in the test period does not significantly impact measured energy consumption. DOE is not proposing to amend the 24-hour test to require that the test procedure capture complete defrost cycles in situations where the defrost interval is less than 24 hours.

DOE has tentatively determined that for CRE with defrost cycles longer than 24 hours, the 24-hour test period would overestimate the actual average defrost energy contribution during a day. Therefore, DOE is proposing to allow the use of a two-part test for CRE with defrost cycles longer than 24 hours. DOE is proposing the two-part test approach, consistent with the approach in the May 2017 Interim Waiver, for such equipment—rather than extending the existing test period in 24-hour increments—in order to limit test burden. For the basic models addressed in the May 2017 Interim Waiver, testing in 24-hour increments would require three 24-hour periods (*e.g.*, the duration between defrosts is 3.5 days, and introducing a fourth 24-hour period would result in the test period capturing two defrosts). Additionally, the 24-hour increment approach would continue to overestimate energy consumption associated with defrosts, albeit to a lesser extent, for defrost intervals that are not exact multiples of 24 hours (as is the case with the basic models covered by the May 2017 Interim Waiver). The two-part test approach eliminates the need for multiple door opening periods and may allow for much shorter overall test durations while accounting for defrost occurrences based on actual defrost interval durations.

Also consistent with the May 2017 Interim Waiver, DOE is proposing that the two-part test would be optional because it would increase test duration compared to the existing approach (by requiring both a 24-hour test plus a defrost test), and manufacturers may determine that the existing test procedure may be more appropriate their models, even if the models incorporate defrost intervals longer than 24 hours.

Specifically, DOE is proposing to allow for testing equipment with defrost intervals greater than 24 hours using a two-part test in which the first part is a 24-hour period of stable operation, including door openings as specified in ASHRAE 72-2018R, but without any defrost operation. Stability for the first part of the test would be determined according to Section 7.5 in ASHRAE 72-2018R, by comparing temperatures determined during Test A and Test B (and a defrost may occur during the test alignment period, as defined in Section 7.4 of ASHRAE 72-2018R, between Test A and Test B). The second part of the test would capture a defrost cycle, including any pre-cooling and temperature recovery associated with a defrost. Rather than referencing the consumer refrigeration product test procedures (as done in the May 2017 Interim Waiver approach), DOE is proposing to require that the start and end of the test period be determined as the last time before and first time after a defrost occurrence, when the measured average simulator temperature (*i.e.*, the instantaneous average of all test simulator temperature measurements) is within 0.5 °F of the IAT as measured during the first part of the test. This would ensure that the defrost part of the test captures any pre-cooling operation and temperature recovery following a defrost while limiting the overall duration of the second part of the test.

The May 2017 Interim Waiver includes certain parameters specific to the models covered by the waiver, namely the duration between defrosts. DOE granted the interim waiver based on the minimum defrost interval possible for the equipment; *i.e.*, 3.5 days. To generalize the May 2017 Interim Waiver approach for other CRE models, DOE is proposing that the two-part calculation be applied based on the minimum duration between defrosts permitted by the unit's controls as shown in the following equation.

$$DEC = ET1 \times \frac{(1{,}440 - t_{NDI})}{1{,}440} + \frac{ET2}{t_{DC}}$$

$$t_{NDI} = \frac{t_{DI}}{t_{DC}}$$

Where DEC is the daily energy consumption in kWh/day; ET1 is the energy consumed during the first part of the test, in kWh/day; ET2 is the energy consumed during the second part of the test, in kWh; t_{NDI} is the normalized length of defrosting time per day, in minutes; t_{DI} is the length of time of the defrosting test period, in minutes; t_{DC} is the minimum time between defrost occurrences, in days; and 1,440 is a conversion factor, in minutes per day.

DOE recognizes that the two-part test approach could result in slightly less door-opening energy contribution as the first part of the test, with no defrost and 8 hours of door openings, would be combined with the defrost portion of the test by a calculation. To investigate this impact, DOE conducted testing on equipment with defrost intervals longer than 24 hours and compared results of the existing test procedure (24-hour test

period, starting with a defrost), the May 2017 Interim Waiver approach (two-part test, as proposed in this NOPR), and a full-duration approach (multiple 24-hour periods, each with door opening periods, through a complete defrost cycle) as illustrated in Table III.5.

Table III.5 The May 2017 Interim Waiver Approach Investigative Testing

HCT.SC.I	Total Display Area (ft^2)	Current DOE CRE Test Procedure (kWh/day)	May 2017 Interim Waiver Approach (kWh/day)	Full Defrost Cycle Duration Approach (kWh/day)
Unit #1	12.72	7.12	6.66	6.66
Unit #2	14.84	6.12	5.61	5.62

DOE's testing showed that the two-part waiver test approach provides an accurate representation of energy consumption when measured over a full defrost cycle (and therefore representative of average use). Additionally, the testing showed that the existing test procedure approach can overestimate measured energy use for CRE with defrost cycles longer than 24 hours.

Based on DOE's investigative testing, DOE has tentatively determined that the May 2017 Interim Waiver approach, and the approach proposed in this NOPR, is representative of a full defrost cycle duration approach for equipment with defrost intervals greater than 24 hours.

With regard to CRE models with multiple evaporators (and therefore, potentially multiple defrosts) connected to a single or multi-stage condensing unit, ASHRAE 72-2005 does not specify which evaporator should be used to determine the defrost cycle that initiates the test. Additionally, if the defrost cycles for multiple evaporators do not

activate at the same time during the test, ASHRAE 72-2005 does not specify which defrost cycle should be used to determine the start of the 24-hour test period. ASHRAE 72-2005 also does not explicitly address the treatment of defrost cycles for multi-compartment CRE models (*i.e.*, hybrid CRE) with different evaporator temperatures and defrost sequences.

In the June 2021 RFI, DOE requested information regarding the types of defrost systems that exist in CRE available on the market and how manufacturers currently select test periods for models with multiple evaporators with non-synchronous defrost cycles. 86 FR 31182, 31192. DOE requested comment on any potential modifications that could be made to the CRE test procedure in order to increase representativeness and provide additional detail for testing these units, including whether the two-part approach, as described earlier in this section, would be appropriate. *Id.*

AHRI and Hussmann commented that self-contained units with differing defrost systems would have no impact on the measured energy use. (AHRI, No. 3, p. 14; Hussmann, No. 14, p. 16) AHRI and Hussmann commented that remote hybrid systems, for which there could be a self-service case and a storage/service area with differing defrost systems, the two defrost systems would be tested to the current test procedure individually and would be required to meet the current DOE energy consumption requirements. (*Id.*) ITW commented the ASHRAE 72-2018 evaluation for hybrid equipment should start with the defrost cycle of the storage compartment experiencing the greatest time interval between defrosts. (ITW, No. 2, p. 10)

ITW commented that some controls may be able to interlock the initial defrost at the start of the energy evaluation with subsequent defrost cycles occurring at intervals determined by the control's operation strategy. (ITW, No. 2, p. 10) ITW suggested increasing the evaluation period from 24 to 48 hours (or longer) but keeping the evaluation process simple to eliminate errors and confusion. (*Id.*) AHRI and Hussmann commented that modifications are not necessary for this situation. (AHRI, No. 3, p. 14; Hussmann, No. 14, p. 16)

AHRI and Hussmann commented that if further clarification is needed, the discussion should be taken to the ASHRAE SSPC 72 committee. (AHRI, No. 3, p. 14; Hussmann, No. 14, p. 16)

As discussed earlier in this section, CRE with automatic defrost typically include multiple defrost occurrences per day. DOE expects that any multi-evaporator CRE with multiple unique defrost cycle durations would similarly defrost multiple times per day, and therefore no change to the existing test procedure is necessary. However, to ensure that the 24-hour test period captures a representative number of defrosts for each evaporator's defrost, DOE is proposing to specify that for CRE with multiple unique defrost intervals for multiple evaporators, the test period as specified in ASHRAE 72-2018R would start with a defrost occurrence for the evaporator defrost having the longest interval between defrosts.

DOE requests comment on the proposed approach to account for long duration defrost cycles using an optional two-part test procedure consistent with the existing

waiver approach granted for such models. DOE also requests comment on whether any additional provisions are necessary to account for different defrost operation or controls, and on DOE's proposed approach in which the test period would start with the defrost occurrence having the longest interval between defrosts.

2. Total Display Area

Section 3.2 of appendix B provides instructions regarding the measurement of TDA. That section specifies that TDA is the sum of the projected area(s) of visible product, expressed in square feet ("ft^2") (*i.e.*, portions through which product can be viewed from an angle normal, or perpendicular, to the transparent area).

For certain CRE configurations, merchandise is not necessarily located at an angle directly normal, or perpendicular, to the transparent area despite the transparent area being intended for customer viewing. For example, for service over counter ice-cream freezers, the ice cream containers may be placed within the chest portion of the refrigerated case, with a glass display panel on the front and glass rear doors located above the merchandise storage area. If the glass display areas are nearly vertical, the ice cream containers may be positioned low enough in the case that they are not at a viewing angle perpendicular to the glass. However, during typical use, customers would stand close enough to the display glass that the ice cream would be visible from other angles not perpendicular to the glass.

In the June 2021 RFI, DOE requested feedback on whether the TDA definition and test instructions should account for display areas in which the merchandise is not at a

location normal to the display surface. 86 FR 31182, 31192. If so, DOE requested information on how to define the revised display area. *Id.* DOE also requested comment on other CRE applications or configurations for which the TDA, as currently defined, may not adequately represent the display functionality of the equipment. *Id.*

Arneg commented that an amended TDA definition is needed because merchandise is not always at a location normal to the display, such as service over counter cases. (Arneg, No. 12, p. 2) True commented that TDA should not account for display areas in which the merchandise is not at a location normal to the display surface, and that the testing standard should only use the display visibility as defined in AHRI 1200-2013. (True, No. 4, p. 21)

AHRI and Hussmann asked DOE to further clarify the units being described by "display areas in which the merchandise is not at a location normal to the display surface," specifically, if DOE is referring to deli counter type cases with display areas outside the doors themselves. (AHRI, No. 3, p. 15; Hussmann, No. 14, p. 17)

DOE participated in the committee discussions to consider updates to AHRI 1200-2013. These discussions included TDA and whether any additional updates would be appropriate. The industry committee determined to maintain the existing definition and approach, which is based on the visibility of merchandise at a location normal to the display surface, but to include additional diagrams to clarify the determination of TDA. *See* Appendix D to AHRI 1200-202X. Figure 10 in AHRI 1200-202X appendix D shows a service over counter unit similar to the example described earlier in this section. The

food load is included only in the lowest portion of the refrigerated cabinet, and as a result, only portions of the transparent areas are considered for the TDA (*i.e.*, the portions through which the food load is visible at an angle normal to the transparent area).

Consistent with the updated version of AHRI 1200-202X, DOE is not proposing revisions to the current TDA. As discussed, DOE is proposing to incorporate by reference AHRI 1200-202X, which includes the new Appendix D to provide clarification on how to apply the current TDA approach to different CRE configurations.

DOE is aware that the current DOE test procedure includes conflicting instructions regarding the calculation of TDA for CRE with transparent and non-transparent areas over the length of the case. The instructions in section 3.1 of appendix B specify determining the length of the display area as the interior length of the CRE model, provided no more than 5 inches of that length consists of non-transparent material, or, for those cases with greater than 5 inches of non-transparent area, the length shall be determined as the projected linear dimension(s) of visible product plus 5 inches. Figures A3.4 and A3.5 of appendix B show a similar approach, but instead reference 10 percent of the total length as the threshold of non-transparent area rather than 5 inches. The captions for these figures reference 5 inches, consistent with section 3.1. The April 2014 Final Rule established these TDA provisions in appendix B. 79 FR 22277, 22300-22301. In the final rule, DOE stated that the 10-percent approach rather than the 5-inch approach would allow for more consistent application of the TDA requirements across CRE models. *Id*.

In addition, DOE incorrectly applied the 10-percent threshold approach as shown in Figures A3.4 and A3.5 of appendix B. As discussed, DOE intended to provide a consistent TDA approach for cases with transparent and non-transparent area. The equation for length shown in Figure A3.5 shows that length equals the total transparent dimension, multiplied by 1.10. As a result, the non-transparent area would represent 10 percent of the transparent dimension, not 10 percent of the total length. The correct application would have length equal to the transparent dimension divided by 0.9 – resulting in a non-transparent area representing 10 percent of the total length.

Section D.1.1.1 of AHRI 1200-202X appendix D includes correct equations regarding TDA and case length as intended in the April 2014 Final Rule. Specifically, AHRI 1200-202X applies the 10 percent threshold approach for non-transparent area and correctly calculates the length of the CRE for cases with non-transparent areas greater than 10 percent of the length of the case. As discussed, DOE is proposing to incorporate by reference AHRI 1200-202X, which would correct these errors regarding TDA calculations currently included in appendix B.

G. Alternative Refrigerants

DOE's current test procedure for remote condensing CRE requires the estimation of compressor EER from Table 1 of AHRI 1200-2010. The EER ratings in the table are based on performance of reciprocating compressors and were developed based on refrigerants that historically have been commonly used for CRE (*i.e.*, R-404A).

Certain remote CRE installations can use carbon dioxide ("CO_2") as the refrigerant; however, the existing remote CRE test procedure does not address the unique operation for these systems. For example, the current DOE test procedure requires an inlet refrigerant liquid temperature of 80 °F with a saturated liquid pressure corresponding to a condensing temperature of 89.6 °F to 120.2 80 °F. *See* ASHRAE 72-2005, Sections 4.3.2 and 4.3.3. CO_2 has a critical point of 87.8 °F and 1,070 pounds per square inch ("psi"), above which it is a supercritical fluid. Accordingly, CO_2 cannot be a liquid at the specified condensing temperature conditions (*i.e.*, it would either be a gas or supercritical fluid, depending on pressure). Additionally, CO_2 systems typically include multiple stages of compression and cooling, resulting in liquid supplied to the refrigerant cases at conditions not necessarily defined by the typical condensing unit conditions. DOE has recently granted a waiver for specific models of CRE to address CO_2 operating conditions for testing walk-in cooler and walk-in freezer unit coolers. 86 FR 14887 (March 19, 2021; "March 2021 Waiver"). The March 2021 Waiver requires for testing of the specified basic models liquid inlet saturation temperature and liquid inlet subcooling of 38 °F and 5 °F, respectively. 86 FR 14887, 14889. The March 2021 Waiver also maintains the existing compressor energy consumption determination based on an approach consistent with the CRE remote calculations using AHRI 1200-2010 (the walk-in requirements instead refer to the walk-ins rating standard, AHRI 1250-2009, which includes the same EER table as AHRI 1200-2010). *Id.*

In the June 2021 RFI, DOE requested information on the typical conditions for remote CRE intended for use with CO_2 refrigerant. 86 FR 31182, 31192. DOE requested comment and data on the applicability of the EER values in Table 1 of AHRI 1200-2010

to the typical compressor EERs for CO_2 refrigerant systems. *Id.* DOE also requested information and supporting data on whether the existing test procedure is appropriate for any other alternative refrigerants that may be used for remote CRE. *Id.* DOE requested feedback on whether the operating conditions specified in ASHRAE 72-2005 or the standardized EER values in Table 1 of AHRI 1200-2010 should be revised to account for operation with any other alternative refrigerants. *Id.* DOE also requested usage data regarding the range of refrigerants in the remote CRE market. *Id.*

Hussmann and AHRI commented that OEMs with CO_2 systems use the EER values in AHRI 1200-2013 to provide comparison of products and energy consumption based on typical operating conditions, and as the use of CO_2 systems evolve the industry test standard organizers will research whether changes are necessary to the EER tables. (Hussmann, No. 14, p. 17; AHRI, No. 3, p. 15) Regarding the use of other refrigerants, AHRI and Hussmann commented that the EER values in Table 1 of AHRI 1200-2013 are representative of use agnostic to the refrigerant because the values would vary little for specific alternative refrigerants. (AHRI, No. 3, p. 15; Hussmann, No. 14, p. 18) AHRI and Hussmann commented that AHRI 1200-202X provides additional clarifications to address the glide of the newer alternative refrigerants. (AHRI, No. 3, p. 15; Hussmann, No. 14, p. 18)

Arneg commented that DOE should wait for an update to ASHRAE 72 to address CO_2 because the ASHRAE 72 committee will be considering the issue of typical conditions for CO_2 remote CRE. (Arneg, No. 12, p. 2)

NEEA asserted that Table 1 of AHRI 1200-2013 is not representative of CO_2 refrigeration systems, and recommended that DOE adopt representative EER tables for natural refrigerants. (NEEA, No. 5, p. 5-6)

NEEA commented that DOE should review current test procedures to ensure applicability to CRE with natural refrigerants. (NEEA, No. 5, p. 5) NEEA commented that the American Innovation and Manufacturing Act would reduce the use of hydrofluorocarbons ("HFCs") by 85 percent by 2035, and that natural refrigerants such as CO_2 and propane (R-290) are already widely used in commercial refrigeration. (*Id.*)

NEEA commented that DOE should consider establishing test procedures that account for the unique operation and energy use of systems that use natural refrigerants, such as secondary refrigerant loops and trans critical booster systems typical of CO_2 based systems. (NEEA, No. 5, p. 5) NEEA commented that DOE could use documentation such as the National Renewable Energy Lab's ("NREL") Refrigeration Playbook[33] as a resource. (*Id.*) NEEA commented that ASHRAE has discussed technical challenges related to natural refrigerants and encouraged DOE to explore ASHRAE 15-2019 to determine appropriate testing considerations. (*Id.*) NEEA commented to refer to case studies suggesting that CO_2 refrigerants can increase the efficiency of CRE systems up to 27 percent. (*Id.*) NEEA commented that DOE's test procedures should reflect actual energy use, even in cases where energy usage increases. (*Id.*)

[33] NREL "Refrigeration Playbook: Natural Refrigerants. Selecting and Designing Energy Efficient Commercial Refrigeration Systems That Use Low Global Warming Potential Refrigerants"

For all remote CRE, the DOE test procedure requires measuring energy consumption of the refrigerated case and the heat gain of the refrigerant providing cooling to the remote case. AHRI 1200-2010 specifies a calculation of compressor energy consumption based on the heat gain measured for the test refrigerant. DOE is aware that manufacturers may specify the use of multiple refrigerants for a single remote CRE cabinet and that the current test procedure allows for consistent testing of such equipment regardless of refrigerant used for testing. As indicated by Hussmann and AHRI, manufacturers are already testing and rating systems that can use CO_2, likely by testing with non-CO_2 refrigerants under the existing test conditions, according to the existing approach, which references AHRI 1200-2010. DOE expects that any ratings for current CO_2 systems are based on testing with another refrigerant capable of maintaining the conditions specified in ASHRAE 72-2005.

Based on a review of CRE that are capable of using CO_2 refrigerant, DOE has observed that many of these models also may be installed for use with other refrigerants that can be tested under the existing approach. However, any remote CRE that are intended for use only with CO_2 refrigerant would not be able to be tested according to the current DOE test procedure due to the specified liquid conditions specified in ASHRAE 72-2005. To allow for testing remote CRE with CO_2 refrigerant, DOE is proposing to adopt alternate refrigerant conditions consistent with those granted in the March 2021 Waiver for walk-in cooler and walk-in freezer unit coolers with CO_2 refrigerant. DOE is proposing that for remote CRE tested with direct expansion CO_2, the liquid inlet saturation temperature be 38 °F with liquid inlet subcooling of 5 °F.

DOE research into the performance of different configurations of CO_2 booster systems indicates that enhanced CO_2 cycles can match conventional refrigerants in average efficiency. Even though the EER values included in AHRI 1200-202X for remote compressors were initially established for conventional refrigerants, DOE has tentatively determined that they are also appropriate for determining compressor energy consumption of CO_2 remote systems. DOE recognizes that the actual compressor energy consumption of a specific remote system will vary based on a number of parameters (ambient conditions, refrigerant conditions necessary for the remote cases, *etc*.), but has tentatively determined that the values included in AHRI 1200-202X are appropriate for determining the energy consumption of an average use cycle for all remote CRE as tested under the proposed test procedure.

In addition to CO_2, DOE has tentatively determined that the EER table in AHRI 1200-202X is appropriate for other alternative refrigerants. DOE similarly researched compressor EERs at a range of operating conditions for refrigerants other than R-404A, including R-407A, R-407F, and R-507A, and found the existing EERs to be representative based on expected operating conditions. Additionally, AHRI 1200-202X further improves the consistency of the EER approach by including additional instructions regarding the use of high-glide refrigerants, as discussed in section III.B.1.a of this NOPR. DOE is not proposing additional amendments to address alternative refrigerants other than CO_2 in this NOPR.

DOE requests comment on the proposed alternate refrigerant conditions to be used for testing remote CRE with CO_2 refrigerant. DOE requests comment on whether

any other aspects of the current test procedure require amendment to allow for testing with CO_2 or any other alternative refrigerants.

H. Certification of Compartment Volume

DOE's current test procedure incorporates by reference AHAM HRF-1-2008 to measure compartment volume. DOE acknowledges that manufacturers often use computer aided designs ("CAD") in designing their equipment. However, the current test procedure and certification provisions for CRE do not provide for using CAD drawings to determine compartment volume. Using the CAD as the basis for determining compartment volumes may be particularly helpful when the geometric designs of the CRE make physical measurements in accordance with AHAM HRF-1-2008 difficult. Currently, DOE's certification requirements in 10 CFR part 429 include provisions for certifying volume for basic models of consumer refrigeration products, commercial gas-fired and oil-fired instantaneous water heaters, and hot water supply boilers using CAD drawings. 10 CFR 429.72(c), (d), and (e).

In the June 2021 RFI, DOE requested comment on whether allowing manufacturers to certify compartment volumes for CRE basic models using CAD drawings would introduce any testing or certification issues. 86 FR 31182, 31192. DOE also requested information on the extent to which the use of CAD drawings may reduce manufacturer test burden. *Id.*

ITW, AHRI, Arneg, True, and Hussmann commented in support of using CAD drawings to ensure appropriate volume measurements and minimize any errors. (ITW,

No. 2, p. 11; AHRI, No. 3, p. 15; Arneg, No. 12, p. 2; True, No. 4, p. 22; Hussmann, No. 14, p. 18) AHRI and Hussmann commented that AHRI Standard 1200-202X has allowances for CAD drawings to illustrate volumes. (AHRI, No. 3, p. 15; Hussmann, No. 14, p. 18) Arneg commented that CRE cases can be manufactured to have curvature, such that the only accurate way of calculating volume would be to use CAD software. (Arneg, No. 12, p. 2) True commented that there should be a validation or verification process since this type of measurement depends on the CAD application user. (True, No. 4, p. 22)

DOE has tentatively determined that calculating volume according to CAD drawings would reduce manufacturer test burden and may allow for more accurate measurements of volume for complicated cabinet designs. DOE is proposing to adopt provisions in 10 CFR part 429 to allow for certifying volume for basic models of CRE using CAD drawings. To ensure that volumes determined based on CAD drawings are consistent with testing actual production models, DOE proposes certain enforcement provisions in section III.J of this NOPR.

I. Test Procedure Waivers

A person may seek a waiver from the test procedure requirements for a particular basic model of a type of covered equipment when the basic model for which the petition for waiver is submitted contains one or more design characteristics that: (1) Prevent testing according to the prescribed test procedure, or (2) cause the prescribed test procedures to evaluate the basic model in a manner so unrepresentative of its true energy

consumption characteristics as to provide materially inaccurate comparative data. 10 CFR 431.401(a)(1).

In addition to the test procedure waivers discussed, DOE has granted test procedures waivers to address certain CRE designed for specialized applications. Specifically, on September 12, 2018, DOE published a test procedure waiver for ITW for testing specified basic models of grocery and general merchandise system (*i.e.*, refrigerated storage allowing for order storage and customer pickup). 83 FR 46148 ("September 2018 Waiver"). The specified basic models have characteristics that include floating suction temperatures for individual compartments, different typical door-opening cycles, and a high-temperature "ambient" compartment. 83 FR 46148, 46149. DOE has similarly granted Hussmann an interim waiver for testing CRE intended for short-term storage and designed for loading and retrieving product a limited number of times per day. 86 FR 40548 (July 28, 2021; "July 2021 Interim Waiver").

In the June 2021 RFI, DOE requested feedback on whether the test procedure waiver approach required under the September 2018 Waiver, which includes the same door opening approach as required in the July 2021 Interim Waiver, is generally appropriate for testing basic models with these features. 86 FR 31182, 31193.

AHRI, Hussmann, and ITW commented that the test procedure waivers are appropriate for testing basic models of CRE addressed by the waivers. (AHRI, No. 3, p. 16; Hussmann, No. 14, p. 19; ITW, No. 2, p. 11) ITW commented that the basic models

outlined have little market penetration, availability, and appear to be single sourced, such that further effort is unwarranted. (ITW, No. 2, p. 11)

The CA IOUs commented that several petitions for test procedure waivers have been submitted by manufactures and support the door opening methodology granted in those waivers. The CA IOUs asserted that an 8-second door opening cycle once every two hours for 10 hours seems more representative of real-world operation than door opening cycles once every 10 minutes for eight hours in ASHRAE 72-2018). (CA IOUs, No. 10, p. 6-7)

The CA IOUs review of product data for these units found these units are designed to operate in outdoor conditions or have configurations designed for outdoor environments and referenced the ASHRAE standard for testing beverage vending machines, which includes a test condition at 90 °F and 65 percent relative humidity to account for outdoor installations. (CA IOUs, No. 10, p. 6-7)

DOE is proposing to adopt test procedure provisions to address the equipment characteristics at issue in the September 2018 Waiver and the July 2021 Interim Waiver. For both waiver cases, the subject basic models are intended for short-term storage of refrigerated merchandise and limited door opening cycles per day; *e.g.*, for holding customer orders and maintaining refrigerated temperatures until customer pickup. DOE understands that this equipment includes individual secured compartments that are accessible only to the customer for order retrieval – e.g., by providing the customer with a unique unlocking function to access the compartment. DOE also conducted a review of

the market of this type of equipment and found similar characteristics and features in currently available models (*e.g.,* contactless pick-up of customer orders using digital locks). Therefore, DOE is proposing to define this equipment as "customer order storage cabinets" to differentiate it from other CRE. DOE is proposing to define "customer order storage cabinets" as CRE that store customer orders and include individual, secured compartments with doors that are accessible to customers for order retrieval.

Consistent with the waiver and interim waiver, DOE is proposing that customer order storage cabinets be tested according to the conventional CRE test procedure, except that the door openings be conducted by opening each door to the fully open position for 8 seconds, once every 2 hours, for 6 door-opening cycles. DOE has tentatively determined that this proposed approach, which is consistent with the September 2018 Waiver and the July 2021 Interim Waiver, is representative of typical use of this equipment.

DOE requests comment on the proposed definition and term "customer order storage cabinet" to describe the equipment currently addressed in the September 2018 Waiver and the July 2021 Interim Waiver. DOE requests comment on the proposal to test such equipment with reduced door openings, consistent with the waiver and interim waiver approach.

In addition to the door opening cycles, the September 2018 Waiver specifies testing provisions for other characteristics of the specified basic models, including floating suction temperatures for individual compartments and the presence of a high-temperature "ambient" compartment. 83 FR 46148, 46149-46152.

To address the floating suction temperature aspect of the basic models subject to the September 2018 Waiver , DOE requires the use of an alternate test approach for testing and rating the equipment in a manner similar to the remote CRE test procedure. 83 FR 46148, 46151. Specifically, DOE requires that this equipment be tested using an inverse refrigeration load test (*i.e.*, a reverse heat leak method). *Id.* This test allows for determining the thermal load of the cabinet at the specified storage temperatures without requiring refrigerant to be supplied to the unit (as refrigerant is supplied from an integral condensing unit). The September 2018 Waiver specifies calculating energy consumption associated with the thermal load based on assumed EERs, consistent with those specified in AHRI 1200-2010. 83 FR 46148, 46151-46152. The calculations also account for component energy consumption and heat loads. *Id*. DOE is proposing to adopt this alternate test procedure for any customer order storage cabinets that supply refrigerant to multiple individual secured compartments and that allow the suction pressure from the evaporator in each individual secured compartment to float based on the temperature required to store the customer order in that individual secured compartment.

For the high-temperature "ambient" compartments in the basic models specified in the September 2018 Waiver, DOE requires that testing be based on a 75 °F storage temperature for these compartments and that the ambient compartment be treated as a medium temperature compartment at 75 °F. 83 FR 46148, 46150. The September 2018 Waiver also requires that all volume and energy consumption calculations be included within the medium temperature category and summed with other medium temperature compartment(s) calculations. *Id*. The September 2018 Waiver further requires that compartments that are convertible between ambient and refrigerator temperature ranges

be tested at the refrigerator temperature (38 °F) and that compartments that are convertible between refrigerator and freezer (0 °F) temperature ranges be tested at both temperatures. *Id*. DOE is proposing to adopt the existing waiver instructions for customer order storage cabinets that have at least one individual secured compartment that is not capable of maintaining an IAT below the ambient dry-bulb temperature (*i.e.*, the individual secured compartments may include refrigeration systems to ensure proper storage temperatures but are only intended to operate at an IAT of 75 °F ± 2 °F and not at a LAPT or the specified refrigerator or freezer temperatures). Additionally, with the proposed introduction of high-temperature refrigerators, as discussed in sections III.A.1 and III.B.1.b of this NOPR, DOE is proposing that such compartments would be treated as high-temperature refrigerators rather than refrigerators upon the compliance date of any new energy conservation standards for high-temperature refrigerators.

DOE requests comment on the additional proposed test procedure amendments that would allow for reverse heat leak testing of customer order storage cabinets with floating suction pressures for multiple different temperature compartments.

J. Enforcement Provisions

Subpart C of 10 CFR part 429 establishes enforcement provisions applicable to covered products and covered equipment, including CRE. Product-specific enforcement provisions are established in 10 CFR 429.134. Various provisions in 10 CFR 429.134 specify which ratings or measurements DOE will use to determine compliance with applicable energy or water conservation standards. Generally, DOE provides that the certified metric is used for enforcement purposes (*e.g.*, calculation of the applicable

energy conservation standard) if the average value measured during assessment and enforcement testing is within a specified percent of the rated value. Otherwise, the average measured value would be used.

Section 10 CFR 429.134 currently does not contain product-specific enforcement provisions for CRE. However, DOE does currently provide product-specific enforcement provisions for refrigerated bottled or canned beverage vending machines, specifying that the certified refrigerated volume will be considered valid only if the measurement(s) (either the measured refrigerated volume for a single unit sample or the average of the measured refrigerated volumes for a multiple unit sample) is within five percent of the certified refrigerated volume. 10 CFR 429.134(j)(1). The test procedure for measuring volume of beverage vending machines is consistent with the procedure required for CRE, and vending machines typically have volumes similar to those for CRE. Because of the same test methods and similar equipment sizes, DOE is proposing consistent product-specific enforcement provisions for CRE. Specifically, DOE proposes to add a new product-specific enforcement provision section stating that the certified volume for CRE will be considered valid only if the measurement(s) (either the measured volume for a single unit sample or the average of the measured volumes for a multiple unit sample) is within five percent of the certified volume; otherwise, the measured volume would be used as the basis for determining the applicable energy conservation standard.

DOE has also established product-specific enforcement provisions for transparent areas of beverage vending machines. 10 CFR 429.134(j)(2). However, display area is only used to determine equipment class for beverage vending machines and TDA is not a

metric used to determine applicable energy conservation standards. For consistency with the volume approach, DOE is proposing for CRE that the certified TDA for CRE will be considered valid only if the measurement(s) (either the measured TDA for a single unit sample or the average of the measured TDAs for a multiple unit sample) is within five percent of the certified TDA. If the certified TDA is found to not be valid, the measured TDA would be used to determine the applicable energy conservation standard.

DOE requests comment on the proposed product-specific enforcement provisions for CRE.

K. Lowest Application Product Temperature

Section 2.2 of appendix B specifies that if a unit is not able to be operated at the specified IAT, the unit is tested at the LAPT, which is defined in 10 CFR 431.62 as the lowest IAT at which a given basic model is capable of consistently operating (*i.e.*, maintaining so as to comply with the steady-state stabilization requirements specified in ASHRAE 72-2005 for the purposes of testing under the DOE test procedure). Section 2.2 of appendix B specifies that for units equipped with a thermostat, LAPT is the lowest thermostat setting; for remote condensing equipment without a thermostat or other means of controlling temperature at the case, the LAPT is the temperature achieved with the dew point temperature (as defined in AHRI Standard 1200-2010) set to 5 degrees colder than that required to maintain the manufacturer's lowest specified application temperature.

DOE's compliance certification database[34] lists all CRE models certified to DOE, including the LAPT used for rating each model, if applicable. Of the 28,478 single-compartment individual models included in the compliance certification database at the time of this analysis, 460 individual models are rated at LAPTs. Of these individual models, 77 are rated at LAPTs below the required test IAT. For example, multiple refrigerator models are rated at an IAT of 34 °F (instead of 38 °F ± 2 °F), and multiple freezer models are rated at an IAT of -7 °F (instead of 0 °F ± 2 °F).

DOE is proposing to maintain the current LAPT provisions and add an additional provision for testing CRE that are only capable of maintaining temperatures below the specified IAT (or for buffet tables or preparation tables, the average pan temperature of all measurements taken during the test) range. For these units, DOE proposes to test at the highest thermostat setting. This would allow for testing the CRE under the setting closest to the required IAT (or for buffet tables or preparation tables, the average pan temperature of all measurements taken during the test). DOE proposes to amend the definition of LAPT in 10 CFR 431.62 to the following:

"Lowest application product temperature" means the integrated average temperature (or for buffet tables or preparation tables, the average pan temperature of all measurements taken during the test) at which a given basic model is capable of consistently operating that is closest to the integrated average temperature (or for buffet

[34] Available at *www.regulations.doe.gov/certification-data*.

tables or preparation tables, the average pan temperature of all measurements taken during the test) specified for testing under the DOE test procedure.

For testing, DOE is proposing to specify that if a unit is not able to operate at the integrated average temperature specified for testing, or average pan temperature, as applicable, test the unit at the LAPT, as defined in § 431.62. DOE is proposing that for units equipped with a thermostat, LAPT is the lowest thermostat setting (for units that are only able to operate at temperatures above the specified integrated average temperature or average pan temperature) or the highest thermostat setting (for units that are only able to operate at temperatures below the specified integrated average temperature or average pan temperature). DOE is proposing that for remote condensing equipment without a thermostat or other means of controlling temperature at the case, the LAPT is the temperature achieved with the dew point temperature, or mid-point evaporator temperature for high-glide refrigerants (as defined in AHRI Standard 1200-202X), set to 5 degrees colder than that required to maintain the manufacturer's specified application temperature closest to the specified integrated average temperature or average pan temperature.

DOE has tentatively determined that this proposal would not affect current CRE ratings or testing costs because the models currently available on the market that would be tested under the newly proposed provision are already and testing and rating in accordance with the proposed approach.

L. Removal of Obsolete Provisions

The DOE test procedure in appendix B is required for testing CRE manufactured on or after March 28, 2017, and appendix A applies to CRE manufactured prior to that date. As such, appendix A is now obsolete for new units being manufactured. Therefore, DOE is proposing to remove appendix A. DOE is not proposing to redesignate appendix B as appendix A in order to avoid confusion regarding the appropriate version of the test procedure required for use.

Additionally, the title to appendix B is currently "Amended Uniform Test Method for the Measurement of Energy Consumption of Commercial Refrigerators, Freezers, and Refrigerator-Freezers." To avoid confusion with the other test procedure amendments proposed in this NOPR, DOE is proposing to amend the title to appendix B to remove the word "amended."

DOE is also proposing to remove outdated standards incorporated by reference in 10 CFR 431.63 that would no longer be referenced under the proposed test procedure. Specifically, DOE proposes to remove reference to ANSI/AHAM HRF-1-2004, AHAM HRF-1-2008, and ASHRAE 72-2005. DOE would maintain the listing of standards referenced in 10 CFR 431.66 ("Energy conservation standards and their effective dates") and would consider removing those referenced standards when proposing any amendments to that section of the CFR as part of any future amended energy conservation standards.

M. Additional Topics Raised in Comments from Interested Parties

In response to the June 2021 RFI, DOE received comments from interested parties on topics not raised in the RFI and not specifically related to the proposals presented in this NOPR. DOE summarizes and addresses these comments in the following sections.

1. Refrigerant Leakages and Life Cycle Performance

IGSD commented that the CRE test procedure should account for the energy performance impact of refrigerant leakages. (IGSD, No. 7, p. 1) IGSD commented that a typical supermarket refrigeration system has an average annual leak rate of 25 percent, according to the EPA. (*Id.*) IGSD commented that these leak rates must be known to accurately estimate the performance of CRE, since high leak rates result in undercharged refrigerant systems that significantly deteriorate energy efficiency. (*Id.*) IGSD asserted that this can result in up to 138 percent efficiency impact of annual energy consumption over a 15-year lifespan, increasing electricity use and electricity related emissions. (*Id.*) IGSD commented that use of leak detection and energy monitoring in one supermarket chain reduced electricity use by 23 million kWh per year. (*Id.*)

IGSD commented that DOE should account for the greenhouse gas emissions associated with refrigerant leaks and that large commercial refrigeration units using common refrigerants (e.g., R-404A) have lifetime emissions over 22,000 tonnes of CO_2 equivalent using 100-year GWPs and 35,000 tonnes using 20-year GWPs[35]. (IGSD, No.

[35] Values calculated using the California Air Resources Board's ("CARB") Refrigerant Calculator

7 at p. 2) IGSD commented that this inclusion would encourage the adoption of leak reduction strategies, thus improving energy efficiency and presents potential to capture large electricity savings and electricity-related GHG emissions. (*Id.*)

IGSD further commented that the CRE test procedure should inform the lifecycle energy and climate performance of regulated equipment as sustainable procurement practices are becoming more widespread and information on CRE energy and climate performance is increasingly in demand. (IGSD, No. 7, p. 2)

IGSD commented that in 2016, the International Institute for Refrigeration ("IIR") released guidelines to harmonize life-cycle climate performance ("LCCP") calculations for refrigeration systems and under these guidelines, emissions in LCCP assessments account for refrigerant charge, the average unit lifetimes, the annual leakage rates, and the end-of-life leakage rates, annual energy consumption, and the amount of CO_2 emitted per kWh. IGSD commented the test requirements in the AHRI 1320-2011 or AHRI 1200-2010 should be collected to inform LCCP assessments that can be made using the IIR guidelines by DOE and its partner laboratories. (*Id.*)

IGSD further commented that the CRE test procedure should inform refrigeration design requirements similar to those found in the European Union's Eco-Design Directive (Directive 2009/1255/EC), which recognizes the larger environmental impact of CRE, especially during servicing activities where refrigerant leakages are most likely to occur and should be developed in the US as well. (IGSD, No. 7 at p. 3)

As discussed previously in this NOPR, the DOE test procedure for remote CRE assesses the thermal load of a refrigerated unit and estimates the compressor energy consumption associated with that thermal load based on Table 1 in AHRI 1200-2010. Refrigerant leakage is an aspect of refrigeration system design outside of the individual CRE model performance. Refrigerant charging, leak mitigation, and the associated energy consumption impacts are aspects of the overall refrigeration system based on installation, rather than metrics that can be quantified for basic models of CRE.

DOE is not proposing to account for remote refrigerant leakages in its CRE test procedure. However, to the extent that refrigerant leakage could impact compressor efficiencies as specified in Table 1 in AHRI 1200-2010 and AHRI 1200-202X, DOE welcomes additional information on whether different EER values would better represent actual operation for remote CRE.

2. Refrigerant Collection for Remote Testing

King commented, regarding remote testing, that DOE should establish a listing for non-profit organization recollection and distribution of refrigerants used during applicable testing and for finalized system sealant. (King, No. 9, p. 1) Refrigerant recovery and recycling requirements are established by EPA,[36] not DOE. To the extent that third-party or manufacturer test facilities require the use of refrigerants to test remote

[36] See *www.epa.gov/section608/refrigerant-recovery-and-recycling-equipment-certification*.

CRE, it is the responsibility of the test facility to ensure proper use and collection of the refrigerants.

3. Energy Conservation Standards

In response to the June 2021 RFI, DOE received multiple comments from interested parties on topics related to the CRE test procedures, but more directly applicable to the consideration of new or amended energy conservation standards for CRE. Specifically, DOE received comments regarding topics related to energy conservation standards from the Joint Commenters, ITW, True, NEEA, AHRI, Hussmann, IGSD, CA IOUs, and Continental (Joint Commenters, No. 8, p. 1-2; ITW, No. 2, p. 1-6; True, No. 4, p. 3-23; NEEA, No. 5, p. 2-7; AHRI, No. 3, p. 3-15; Hussmann, No. 14, p. 5-10; IGSD, No. 7, p. 3; CA IOUs, No. 10, p. 3-9; Continental, No. 6, p. 2) DOE will consider those comments as part of any subsequent rulemaking document related to energy conservation standards for CRE.[37]

N. Sampling Plan

DOE's current certification requirements mandate reporting of the chilled or frozen compartment volume in cubic feet, the adjusted volume in cubic feet, or the TDA (as appropriate for the equipment class). 10 CFR 429.42(b)(2)(iii). However, the sampling plan requirements in 10 CFR 429.42(a) do not specify how to determine the represented value of volume or TDA for each basic model based on the test results from

[37] DOE has published a *Federal Register* notice undertaking an early assessment review for amended energy conservation standards for CRE to determine whether to amend applicable energy conservation standards for this equipment. 86 FR 37708 (July 16, 2021). Documents related to this action are available in docket ID EERE-2017-BT-STD-0007, available at *www.regulations.gov/docket/EERE-2017-BT-STD-0007*.

the sample of individual models tested. Similar to the requirements for other covered products and commercial equipment, DOE is proposing that any represented value of volume or TDA for the basic model be determined as the mean of the measured volumes or TDAs for the units in the test sample, based on the same tests used to determine the reported energy consumption. Although not currently specified in 10 CFR 429.42, DOE expects manufacturers are currently certifying CRE performance based on the tested volume and TDA. Therefore, this proposed amendment would clarify the certification requirements but not impose any additional burden on manufacturers.

DOE seeks comment on the proposed sampling plan for CRE volume and TDA.

O. Test Procedure Costs and Harmonization

1. Test Procedure Costs and Impact

In this NOPR, DOE proposes to amend the existing test procedure for CRE to:

1) Establish new definitions for high-temperature refrigerator, medium-temperature refrigerator, low-temperature freezer, and amend the definition for ice-cream freezer.
2) Incorporate by reference the most current versions of industry standards AHRI 1200, ASHRAE 72, and AHRI 1320-2011.
3) Establish definitions and test procedures for buffet tables and preparation tables.
4) Establish definitions and test procedures for blast chillers and blast freezers.
5) Amend the definition for chef base or griddle stand.

6) Specify alternate conditions for alternative refrigerants.

7) Allow for certification of compartment volumes based on CAD drawings.

8) Incorporate provisions for defrosts and customer order storage cabinets currently specified in waivers and interim waivers.

9) Adopt product-specific enforcement provisions.

10) Clarify use of the LAPT provisions.

11) Remove the obsolete test procedure in appendix A.

12) Specify a sampling plan for volume and TDA.

DOE has tentatively determined that the proposed amendments to the test procedure for CRE currently subject to testing would not impact testing costs and manufacturers would be able to rely on data generated under the current test procedure should any of these additional proposed amendments be finalized.

DOE is proposing to establish test procedures for additional categories of CRE not currently subject to the DOE test procedure: buffet tables or preparation tables, and blast chillers and blast freezers. If a manufacturer chooses to make representations of the energy consumption of this equipment, beginning 360 days after a final rule, were DOE to finalize the proposal, manufacturers would be required to test according to the proposed test procedure. (42 U.S.C. 6314(d)). DOE discusses the costs associated with testing this equipment, if a manufacturer chooses to make representations of the energy consumption, in the following paragraphs.

In a 2010 NOPR, DOE estimated CRE testing costs to be approximately $5,000 per unit. 75 FR 71596, 71607 (November 24, 2010). Based on testing at third-party test facilities, DOE has tentatively determined that $5,000 is still a representative CRE test cost based on the existing DOE test procedure. DOE has also tentatively determined that $5,000 is a representative per-test cost for the new test procedures proposed for the additional CRE categories (*i.e.*, buffet tables or preparation tables, blast chillers, and blast freezers).

For buffet tables and preparation tables, the overall test duration would be similar to the test duration for CRE currently subject to the test procedure. The test would be a 24-hour test and DOE is proposing stabilization requirements consistent with CRE currently subject to the test procedure. The proposed test setup would not require the use of test simulators or test filler materials loaded in any refrigerated compartments, but would require loading pans with distilled water and identifying the appropriate control setting to maintain the specified average temperatures. DOE expects the overall test burden associated with loading and determining appropriate control settings to be similar for testing buffet tables and preparation tables, as proposed, and other CRE currently subject to the test procedure. While DOE has not quantified the differences in test burden, DOE has initially determined that the test burden and duration for buffet and preparation tables is similar to CRE currently subject to the test procedure, and therefore the $5,000 per-test cost is appropriate.

For blast chillers and blast freezers, the overall duration of a test as proposed would be shorter than the 24-hour test period and stabilization period required for CRE

currently subject to the test procedure. As proposed, blast chiller and blast freezer testing would require the preparation of food simulator material, heating of that material to the specified temperature, loading of the heated test pans, and then conducting the test procedure as specified (DOE estimates approximately an 8-hour test duration per test). While DOE has not quantified the differences in test burden, DOE expects the increased test burden and decreased test burden to be comparable. Therefore, DOE has tentatively determined that $5,000 is a representative per-unit test cost for blast chillers and blast chillers, based on the test procedure proposed in this NOPR.

Under the proposed test procedures, were a manufacturer to choose to make representations of the energy consumption of buffet tables or preparation tables, blast chillers, or blast freezers beginning 360 days after a final rule, were DOE to finalize the proposal, manufacturers would be required to base such representations on the DOE test procedure. (42 U.S.C. 6314(d))

Based on a review of blast chillers and blast freezers available on the market, DOE has determined that manufacturers make no claims regarding the energy consumption of their models.

After establishing any test procedure for blast chillers and blast freezers, DOE expects that the manufacturers currently electing to make no claims regarding energy consumption would continue to do so. Therefore, DOE has tentatively determined that the proposed test procedure for blast chillers and blast freezers would not impact testing costs should the proposed test procedure be finalized.

Buffet tables and preparation tables are currently subject to test procedures under the California Code of Regulations. DOE observed that to the extent that buffet table and preparation table manufacturers make representations regarding the energy consumption of their models, they do so in accordance with the California Code of Regulations. EPCA prescribes that, if DOE amends a test procedure, all representations of energy efficiency and energy use, including those made on marketing materials and product labels, must be made in accordance with that amended test procedure, beginning 360 days after publication of such a test procedure final rule in the *Federal Register*. (42 U.S.C. 6314(d)(1)) Therefore, the manufacturers currently making representations of the energy consumption of buffet tables and preparation tables would be required to re-test according to the proposed test procedure beginning 360 days after the final rule, should DOE finalize the proposal, and may incur some re-testing costs associated with their buffet table and preparation table models.

For any manufacturers not currently making representations of the energy use of buffet tables or preparation tables, blast chillers, or blast freezers, testing according to the proposed test procedure would not be required (other than if making voluntary representations of energy consumption) until the compliance date of any energy conservation standards for that equipment, should DOE adopt such standards.

2. Harmonization with Industry Standards

DOE's established practice is to adopt relevant industry standards as DOE test procedures unless such methodology would be unduly burdensome to conduct or would not produce test results that reflect the energy efficiency, energy use, water use (as

specified in EPCA) or estimated operating costs of that product during a representative average use cycle. 10 CFR 431.4; Section 8(c) of appendix A 10 CFR part 430 subpart C. In cases where the industry standard does not meet EPCA statutory criteria for test procedures DOE will make modifications through the rulemaking process to these standards as the DOE test procedure.

The test procedures for CRE at 10 CFR 431.63 incorporates by reference AHRI 1200-2010 for definitions, test rating conditions, and calculations; ASHRAE 72-2005 for test conditions, equipment, measurements, and test conduct; and AHAM HRF-1-2008 for the volume measurement method.

The industry standards DOE proposes to incorporate by reference via amendments described in this notice are discussed in further detail in section **Error! Reference source not found.**. DOE requests comments on the benefits and burdens of the proposed updates and additions to industry standards referenced in the test procedure for CRE.

AHRI 1200-2010 has been updated to AHRI 1200-202X to provide additional direction regarding application of the standard and to provide volume measurement instructions (eliminating the need to reference AHAM HRF-1-2008). ASHRAE 72-2005 has similarly been updated in ASHRAE 72-2018R to reorganize the standard, provide updated setup instructions, revise the test sequence, and provide additional instructions for some test measurements. DOE has tentatively determined that these updates provide additional detail for testing but would otherwise not impact energy consumption

measurements compared to the current approach. DOE is also proposing to incorporate by refence an existing industry standard for testing buffet tables and preparation tables: ASTM F2143-16. This standard provides instructions regarding setup and test conduct. DOE is also aware of the CRE industry standard NSF/ANSI 7-2021,[38] which establishes minimum food protection and sanitation requirements for the materials, design, manufacture, construction, and performance of CRE and CRE components.

P. Compliance Date and Waivers

EPCA prescribes that, if DOE amends a test procedure, all representations of energy efficiency and energy use, including those made on marketing materials and product labels, must be made in accordance with that amended test procedure, beginning 360 days after publication of such a test procedure final rule in the *Federal Register*. (42 U.S.C. 6314(d)(1)) To the extent the modified test procedure proposed in this document is required only for the evaluation and issuance of updated efficiency standards, use of the modified test procedure, if finalized, would not be required until the compliance date of updated standards. 10 CFR 431.4; Section 8(d) of appendix A 10 CFR part 430 subpart C.

Upon the compliance date of test procedure provisions of an amended test procedure, should DOE issue a such an amendment, any waivers that had been previously issued and are in effect that pertain to issues addressed by such provisions are terminated.

[38] In response to the June 2021 RFI, interested parties commented in reference to NSF 7-2019. NSF 7-2021 was published after the June 2021 RFI comment period ended. DOE did not observe any changes from the 2019 to 2021 version that would impact the comments received or DOE's proposal to reference other industry standards rather than NSF 7-2019 or NSF 7-2021.

10 CFR 431.401(h)(3). Recipients of any such waivers would be required to test the products subject to the waiver according to the amended test procedure as of the compliance date of the amended test procedure. The amendments proposed in this document pertain to issues addressed by waivers and interim waivers granted to AHT (Case Nos. CR-006, 2017-007, 2020-023, 2020-025, 2022-001, and 2022-002), ITW (Case No. CR-007), and Hussmann (Case No. 2020-003). See sections III.F.1 and III.I of this NOPR for a discussion of the proposals to address the issues in the existing waivers and interim waivers. Were DOE to finalize the amendments pertaining to these waivers and interim waivers, at such time as testing were required according to the amended test procedure, the waivers and interim waivers granted to AHT, ITW, and Hussmann would terminate and they would be required to make representations based on the amended test procedure.

IV. Procedural Issues and Regulatory Review

A. Review Under Executive Orders 12866 and 13563

Executive Order ("E.O.")12866, "Regulatory Planning and Review," as supplemented and reaffirmed by E.O. 13563, "Improving Regulation and Regulatory Review, 76 FR 3821 (Jan. 21, 2011), requires agencies, to the extent permitted by law, to (1) propose or adopt a regulation only upon a reasoned determination that its benefits justify its costs (recognizing that some benefits and costs are difficult to quantify); (2) tailor regulations to impose the least burden on society, consistent with obtaining regulatory objectives, taking into account, among other things, and to the extent practicable, the costs of cumulative regulations; (3) select, in choosing among alternative

regulatory approaches, those approaches that maximize net benefits (including potential economic, environmental, public health and safety, and other advantages; distributive impacts; and equity); (4) to the extent feasible, specify performance objectives, rather than specifying the behavior or manner of compliance that regulated entities must adopt; and (5) identify and assess available alternatives to direct regulation, including providing economic incentives to encourage the desired behavior, such as user fees or marketable permits, or providing information upon which choices can be made by the public. DOE emphasizes as well that E.O. 13563 requires agencies to use the best available techniques to quantify anticipated present and future benefits and costs as accurately as possible. In its guidance, the Office of Information and Regulatory Affairs ("OIRA") in the Office of Management and Budget ("OMB") has emphasized that such techniques may include identifying changing future compliance costs that might result from technological innovation or anticipated behavioral changes. For the reasons stated in the preamble, this proposed regulatory action is consistent with these principles.

Section 6(a) of E.O. 12866 also requires agencies to submit "significant regulatory actions" to OIRA for review. OIRA has determined that this proposed regulatory action does not constitute a "significant regulatory action" under section 3(f) of E.O. 12866. Accordingly, this action was not submitted to OIRA for review under E.O. 12866.

B. Review Under the Regulatory Flexibility Act

The Regulatory Flexibility Act (5 U.S.C. 601 *et seq.*) requires preparation of an initial regulatory flexibility analysis ("IRFA") 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 (Aug. 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 website: *energy.gov/gc/office-general-counsel*.

DOE reviewed this proposed rule to amend the test procedures for CRE under the provisions of the Regulatory Flexibility Act and the policies and procedures published on February 19, 2003.

1. Description of Reasons Why Action Is Being Considered

DOE is proposing to amend the existing DOE test procedures for Commercial Refrigerators, Refrigerator-Freezers, and Freezers ("CRE"). EPCA, as amended,[39] requires that, at least once every 7 years, DOE evaluate test procedures for each type of covered equipment, including CRE, to determine whether amended test procedures would more accurately or fully comply with the requirements for the test procedures to not be

[39] All references to EPCA in this document refer to the statute as amended through Energy Act of 2020, Pub. L. 116-260 (Dec. 27, 2020)..

unduly burdensome to conduct and be reasonably designed to produce test results that reflect energy efficiency, energy use, and estimated operating costs during a representative average use cycle. (42 U.S.C. 6314(a)(1)) DOE is publishing this NOPR in satisfaction of the 7-year review requirement specified in EPCA. (42 U.S.C. 6314(a)(1)(A)(ii))

2. Objectives of, and Legal Basis for, Rule

With respect to CRE, EPCA requires DOE to use the test procedure determined by the Secretary to be generally accepted industry standard, or industry standards developed or recognized by American Society of Heating, Refrigerating and Air-Conditioning Engineers ("ASHRAE") or American National Standards Institute ("ANSI"), and the initial test procedures for self-contained CRE shall be the ASHRAE 117 test procedure that is in effect on January 1, 2005. (42 U.S.C. 6314(a)(6)(A)) Additionally, EPCA requires DOE to address whether to amend its test procedures if ASHRAE amends this standard. (42 U.S.C. 6314(a)(6)(E)–(F)) Finally, EPCA states if a test procedure other than the ASHRAE 117 test procedure is approved by ANSI, a review of the relative strengths and weaknesses of the new test procedure relative to the ASHRAE 117 test procedure and adopt one new test procedure for use in the standards program. (42 U.S.C. 6314(a)(6)(F)(i))[40]

[40] In 2005, ASHRAE combined Standard 72-1998, "Method of Testing Open Refrigerators," and Standard 117-2002 and published the test method as ASHRAE Standard 72-2005, "Method of Testing Commercial Refrigerators and Freezers," which was approved by ANSI on July 29, 2005.

EPCA also requires that, at least once every 7 years, DOE evaluate test procedures for each type of covered equipment, including CRE, to determine whether amended test procedures would more accurately or fully comply with the requirements for the test procedures to be reasonably designed to produce test results that reflect energy efficiency, energy use, and estimated operating costs during a representative average use cycle and not be unduly burdensome to conduct. (42 U.S.C. 6314(a)(1))

DOE is publishing this NOPR in satisfaction of the 7-year review requirement specified in EPCA. (42 U.S.C. 6314(a)(1)(A)(ii))

3. Description and Estimate of Small Entities Regulated

DOE uses the Small Business Administration ("SBA") small business size standards to determine whether manufacturers qualify as "small businesses," which are listed by the North American Industry Classification System ("NAICS").[41] The SBA considers a business entity to be small business if, together with its affiliates, it employs less than a threshold number of workers specified in 13 CFR part 121.

CRE manufacturers, who produce the equipment covered by this proposed rule, are classified under NAICS code 333415, "Air-conditioning and Warm Air Heating Equipment and Commercial and Industrial Refrigeration Equipment Manufacturing." The SBA sets a threshold of 1,250 employees or fewer for an entity to be considered a

[41] Available at: *www. sba.gov/document/support-table-size-standards*.

small business for this category. This employee threshold includes all employees in a business's parent company and any other subsidiaries.

DOE conducted a focused inquiry into manufacturers of equipment covered by this rulemaking. DOE accessed its Compliance Certification Database ("CCD"),[42] California Energy Commission's Modernized Appliance Efficiency Database System ("MAEDbS"),[43] and other public sources, including manufacturer websites, to create a list of companies that produce, manufacture, import, or private label the CRE covered by this rulemaking. DOE then consulted other publicly available data, such as manufacturer specifications and product literature, import/export logs (*e.g.*, bills of lading from Panjiva[44]), and basic model numbers, to identify original equipment manufacturers ("OEMs") of the equipment covered by this rulemaking. DOE further relied on public sources and subscription-based market research tools (*e.g.*, Dun & Bradstreet reports[45]) to determine company location, headcount, and annual revenue. DOE screened out companies that do not offer equipment covered by this proposed rulemaking, do not meet the SBA's definition of a "small business," or are foreign-owned and operated.

DOE initially identified 85 OEMs of CRE for the U.S. market. Of the 85 OEMs identified, DOE estimates that 30 qualify as small OEMs and are not foreign-owned and operated.

[42] DOE's CCD is available at *www.regulations.doe.gov/certification-data* (Last accessed January 26, 2022)
[43] California Energy Commission's MAEDbS is available at *cacertappliances.energy.ca.gov/Pages/Search/AdvancedSearch.aspx* (Last accessed January 26, 2022)
[44] Panjiva Supply Chain Intelligence is available at: *panjiva.com/import-export/United-States*
[45] The Dun & Bradstreet Hoovers subscription login is available online at *app.dnbhoovers.com/*

4. Description and Estimate of Compliance Requirements

In this NOPR, DOE proposes to amend the existing test procedure for CRE to:

1) Establish new definitions for high-temperature refrigerator, medium-temperature refrigerator, low-temperature freezer, and amend the definition for ice-cream freezer.
2) Incorporate by reference the most current versions of industry standards AHRI 1200, ASHRAE 72, and AHRI 1320-2011.
3) Establish definitions and test procedures for buffet tables and preparation tables.
4) Establish definitions and test procedures for blast chillers and blast freezers.
5) Amend the definition for chef base or griddle stand.
6) Specify alternate conditions for alternative refrigerants.
7) Allow for certification of compartment volumes based on computer aided design ("CAD") models.
8) Incorporate provisions for defrosts and customer order storage cabinets currently specified in waivers and interim waivers.
9) Adopt product-specific enforcement provisions.
10) Clarify use of the lowest application product temperature ("LAPT") provisions.
11) Remove the obsolete test procedure in appendix A.
12) Specify a sampling plan for volume and total display area ("TDA").

DOE has tentatively determined that the proposed amendments to the test procedure for CRE currently subject to testing would not increase third-party lab testing costs per unit relative to the current DOE test procedure, which DOE estimates to be $5,000. Furthermore, DOE has tentatively concluded that manufacturers would be able to rely on data generated under the current test procedure should any of these additional proposed amendments be finalized. Accordingly, DOE does not expect that manufacturers would be required to re-test or re-certify existing CRE models as a result of the proposals in this NOPR.

For the proposed new test procedures for additional categories of CRE not currently subject to testing according to the DOE test procedure (*i.e.*, buffet tables or preparation tables, blast chillers, or blast freezers), testing would not be required (other than making voluntary representations of energy consumption) until the compliance date of any energy conservation standards for equipment in these categories. DOE has initially determined that $5,000 is a representative per-unit test cost for blast chillers, blast freezers and buffet and preparation tables. Based on a review of commercially available blast chillers and blast freezers, DOE has determined that manufacturers make no claims regarding the energy consumption of their models. To the extent that buffet table and preparation table manufacturers make claims regarding the energy consumption of their models, DOE observed that they do so in accordance with the California Code of Regulations. The manufacturers currently making representations of the energy consumption of buffet tables and preparation tables would be required to test according to the proposed test procedure beginning 360 days after the final rule, should DOE finalize the proposal.

DOE reviewed California Energy Commission's MAEDbS and identified two small domestic OEMs currently making representations of the energy consumption of buffet table or preparation table models. According to MAEDbS, one small OEM makes claims regarding the energy consumption of 26 buffet table or preparation table models and the other small OEM makes claims regarding the energy consumption of 20 buffet table or preparation table models. Based on Dun & Bradstreet reports, both small OEMs have an estimated annual revenue of over $100 million. As previously discussed, DOE estimates a per-unit test cost of $5,000. Therefore, DOE estimates that the potential costs associated with re-testing would be minimal, accounting for approximately 0.1 percent of annual revenue for both small businesses.

DOE does not anticipate that the proposed test procedure amendments would result in increased testing costs for the vast majority of manufacturers, including small manufacturers. DOE estimates that two small businesses may incur some re-testing costs associated with their buffet table and preparation table models, should DOE adopt the proposed rule. However, DOE's research indicates these costs would account for approximately 0.1 percent of annual revenue for both small OEMs identified. Therefore, DOE tentatively concludes that the proposed rule would not have a significant impact on a substantial number of small entities.

DOE requests comment on its initial conclusion that the amendments detailed in this NOPR would not have a significant impact on a substantial number of small entities.

5. Identification of Duplication, Overlap, and Conflict with Other Rules and Regulations

DOE is not aware of any rules or regulations that duplicate, overlap, or conflict with the rule being considered in this action.

6. A Description of Significant Alternatives to the Rule

DOE does not expect that the proposals detailed in this NOPR will increase the test burden on manufacturers, including small businesses. Under EPCA, DOE is required to adopt generally accepted industry test standards, or industry test standards developed or recognized by the American Society of Heating, Refrigerating, and Air-Conditioning Engineers ("ASHRAE") or American National Standards Institute ("ANSI"). (42 U.S.C. 6314(a)(6)(A)(i)) It is also DOE's established practice to adopt relevant industry standards as DOE test procedures unless such methodology would be unduly burdensome to conduct or would not produce test results that reflect the energy efficiency, energy use, water use (as specified in EPCA) or estimated operating costs of that product during a representative average use cycle. 10 CFR 431.4; Section 8(c) of appendix A 10 CFR part 430 subpart C. DOE examined relevant industry test standards, and the Department incorporated these standards in the proposed test procedures whenever appropriate to reduce test burden to manufacturers. Specifically, this NOPR incorporates by reference the most current versions of industry standards AHRI 1200, ASHRAE 72, and AHRI 1320-2011.

Additionally, manufacturers subject to DOE's energy efficiency standards may apply to DOE's Office of Hearings and Appeals for exception relief under certain circumstances. Manufacturers should refer to 10 CFR part 1003 for additional details.

C. Review Under the Paperwork Reduction Act of 1995

Manufacturers of CRE must certify to DOE that their products comply with any applicable energy conservation standards. To certify compliance, manufacturers must first obtain test data for their products according to the DOE test procedures, 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 CRE. (*See generally* 10 CFR part 429.) The collection-of-information requirement for the 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 35 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.

DOE is not proposing to amend the certification or reporting requirements for CRE in this NOPR. Further, certification data will be required for buffet tables and preparation tables, and blast chillers and blast freezers; however, DOE is not proposing certification or reporting requirements for these categories of CRE in this NOPR. Instead, DOE may consider proposals to establish certification requirements and reporting for these equipment categories under a separate rulemaking regarding appliance and equipment certification. DOE will address changes to OMB Control Number 1910-1400 at that time, as necessary

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

In this NOPR, DOE proposes test procedure amendments that it expects will be used to develop and implement future energy conservation standards for CRE. 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. Specifically, DOE has determined that adopting test procedures for measuring energy efficiency of consumer products and industrial equipment is consistent with activities identified in 10 CFR part 1021, appendix A to subpart D, A5 and A6. 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 (Aug. 4, 1999) imposes certain requirements on 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 proposed rule and has 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 this proposed 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(d)) 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. 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 proposed 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 a proposed regulatory action 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)) The 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 proposed "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 small governments. On March 18, 1997, DOE published a statement of policy on its process for intergovernmental consultation under UMRA. 62 FR 12820; also available at

energy.gov/gc/office-general-counsel. DOE examined this proposed rule according to UMRA and its statement of policy and determined that the rule contains neither an intergovernmental mandate, nor a mandate that may result in the expenditure of $100 million or more in any year, so these requirements do not apply.

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 proposed 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

DOE has determined, under Executive Order 12630, "Governmental Actions and Interference with Constitutionally Protected Property Rights" 53 FR 8859 (March 18, 1988), that this proposed regulation 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 agencies to review most disseminations of information to the public under 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). Pursuant to

OMB Memorandum M-19-15, Improving Implementation of the Information Quality Act (April 24, 2019), DOE published updated guidelines which are available at *www.energy.gov/sites/prod/files/2019/12/f70/DOE%20Final%20Updated%20IQA%20Guidelines%20Dec%202019.pdf*. DOE has reviewed this proposed 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 OMB, a Statement of Energy Effects for any proposed significant energy action. A "significant energy action" is defined as any action by an agency that promulgated 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 proposed significant energy action, the agency must give a detailed statement of any adverse effects on energy supply, distribution, or use should the proposal be implemented, and of reasonable alternatives to the action and their expected benefits on energy supply, distribution, and use.

The proposed regulatory action to amend the test procedure for measuring the energy efficiency of CRE is not a significant regulatory action under Executive Order 12866. Moreover, 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.

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), DOE must comply with section 32 of the Federal Energy Administration Act of 1974, as amended by the Federal Energy Administration Authorization Act of 1977. (15 U.S.C. 788; "FEAA") Section 32 essentially provides in relevant part that, where a proposed rule authorizes or requires use of commercial standards, the notice of proposed rulemaking 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.

The proposed modifications to the test procedure for CRE would incorporate testing methods contained in certain sections of the following commercial standards: AHRI 1200-202X, AHRI 1320-2011, ASHRAE 72-2018R, and ASTM F2143-16. DOE has evaluated these standards and is unable to conclude whether they fully comply with the requirements of section 32(b) of the FEAA (*i.e.*, whether it was developed in a manner that fully provides for public participation, comment, and review.) DOE will consult with both the Attorney General and the Chairman of the FTC concerning the impact of these test procedures on competition, prior to prescribing a final rule.

M. Description of Materials Incorporated by Reference

In this NOPR, DOE proposes to incorporate by reference the test standard published by AHRI titled "Performance Rating of Commercial Refrigerated Display Merchandisers and Storage Cabinets." AHRI 1200-202X is an industry-accepted test procedure that provides rating instructs, calculations, and methods for CRE. The test procedure proposed in this NOPR references AHRI 1200-202X for specific rating instructions, calculations, and rating methods for CRE. AHRI 1200-202X is a draft version of standard AHRI 1200 that has not reached final publication, but the version discussed in this NOPR is available at *www.regulations.gov/docket/EERE-2017-BT-TP-0008*.

DOE also proposes to incorporate by reference the test standard published by AHRI titled "Performance Rating of Commercial Refrigerated Display Merchandisers and Storage Cabinets for Use With Secondary Refrigerants." AHRI 1320-2011 is an industry-accepted test procedure that provides rating instructs, calculations, and methods for CRE used with secondary coolants. The test procedure proposed in this NOPR references AHRI 1320-2011 regarding specific provisions regarding secondary coolants, but otherwise references AHRI 1200-202X as discussed. AHRI 1320-2011 is available at *ahri.net.org/search-standards*.

DOE also proposes to incorporate by reference the test standard published by ASHRAE titled "Method of Testing Open and Closed Commercial Refrigerators and Freezers." ASHRAE 72-2018R is an industry-accepted test procedure that provides setup, instrumentation, measurement, and test conduct instructions for testing CRE. The test

procedure proposed in this NOPR references ASHRAE 72-2018R as the basis for test setup and test conduct requirements. ASHRAE 72-2018R is a draft version of the standard that has not reached final publication, but the version discussed in this NOPR is available at *www.regulations.gov/docket/EERE-2017-BT-TP-0008*.

DOE also proposes to incorporate by reference the test standard published by ASTM titled "Standard Test Method for Performance of Refrigerated Buffet and Preparation Tables." ASTM F2143-16 is an industry-accepted test procedure that provides setup, instrumentation, conditions, measurement, and test conduct instructions for testing buffet tables and preparation tables. The test procedure proposed in this NOPR references ASTM F2143-16 as the basis for test setup and test conduct for buffet tables and preparation tables. Copies of ASTM F2143-16 can be purchased at *www.astm.org/f2143-16.html*.

V. Public Participation

A. Participation in the Webinar

The time and date for the webinar meeting are listed in the **DATES** section at the beginning of this document. Webinar registration information, participant instructions, and information about the capabilities available to webinar participants will be published at *www.regulations.gov/docket/EERE-2017-BT-TP-0008*. Participants are responsible for ensuring their systems are compatible with the webinar software.

B. Procedure for Submitting Prepared General Statements for Distribution

Any person who has an interest in the topics addressed in this notice, or who is representative of a group or class of persons that has an interest in these issues, may request an opportunity to make an oral presentation at the webinar. Such persons may submit to *ApplianceStandardsQuestions@ee.doe.gov*. Persons who wish to speak should include with their request a computer file in WordPerfect, Microsoft Word, PDF, or text (ASCII) file format that briefly describes the nature of their interest in this proposed rulemaking and the topics they wish to discuss. Such persons should also provide a daytime telephone number where they can be reached.

C. Conduct of the Webinar

DOE will designate a DOE official to preside at the webinar and may also use a professional facilitator to aid discussion. The meeting will not be a judicial or evidentiary-type public hearing, but DOE will conduct it in accordance with section 336 of EPCA (42 U.S.C. 6306). A court reporter will be present to record the proceedings and prepare a transcript. DOE reserves the right to schedule the order of presentations and to establish the procedures governing the conduct of the webinar. There shall not be discussion of proprietary information, costs or prices, market share, or other commercial matters regulated by U.S. anti-trust laws. After the webinar and until the end of the comment period, interested parties may submit further comments on the proceedings and any aspect of the proposed rulemaking.

The webinar will be conducted in an informal, conference style. DOE will present a general overview of the topics addressed in this proposed rulemaking, allow time for prepared general statements by participants, and encourage all interested parties to share their views on issues affecting this rulemaking. Each participant will be allowed to make a general statement (within time limits determined by DOE), before the discussion of specific topics. DOE will permit, as time permits, other participants to comment briefly on any general statements.

At the end of all prepared statements on a topic, DOE will permit participants to clarify their statements briefly. Participants should be prepared to answer questions by DOE and by other participants concerning these issues. DOE representatives may also ask questions of participants concerning other matters relevant to this proposed rulemaking. The official conducting the webinar/public meeting will accept additional comments or questions from those attending, as time permits. The presiding official will announce any further procedural rules or modification of the above procedures that may be needed for the proper conduct of the webinar.

A transcript of the webinar will be included in the docket, which can be viewed as described in the docket section at the beginning of this proposed rulemaking. In addition, any person may buy a copy of the transcript from the transcribing reporter.

D. Submission of Comments

DOE will accept comments, data, and information regarding this proposed rule no later than the date provided in the **DATES** section at the beginning of this proposed rule.[46] Interested parties may submit comments using any of the methods described in the **ADDRESSES** section at the beginning of this document.

Submitting comments via www.regulations.gov. The *www.regulations.gov* web page will require you to provide your name and contact information. Your contact information will be viewable to DOE Building Technologies staff only. Your contact information will not be publicly viewable except for your first and last names, organization name (if any), and submitter representative name (if any). If your comment is not processed properly because of technical difficulties, DOE will use this information to contact you. If DOE cannot read your comment due to technical difficulties and cannot contact you for clarification, DOE may not be able to consider your comment.

[46] DOE has historically provided a 75-day comment period for test procedure NOPRs pursuant to the North American Free Trade Agreement, U.S.-Canada-Mexico ("NAFTA"), Dec. 17, 1992, 32 I.L.M. 289 (1993); the North American Free Trade Agreement Implementation Act, Pub. L. 103-182, 107 Stat. 2057 (1993) (codified as amended at 10 U.S.C.A. 2576) (1993) ("NAFTA Implementation Act"); and Executive Order 12889, "Implementation of the North American Free Trade Agreement," 58 FR 69681 (Dec. 30, 1993). However, on July 1, 2020, the Agreement between the United States of America, the United Mexican States, and the United Canadian States ("USMCA"), Nov. 30, 2018, 134 Stat. 11 (*i.e.*, the successor to NAFTA), went into effect, and Congress's action in replacing NAFTA through the USMCA Implementation Act, 19 U.S.C. 4501 *et seq*. (2020), implies the repeal of E.O. 12889 and its 75-day comment period requirement for technical regulations. Thus, the controlling laws are EPCA and the USMCA Implementation Act. Consistent with EPCA's public comment period requirements for consumer products, the USMCA only requires a minimum comment period of 60 days. Consequently, DOE now provides a 60-day public comment period for test procedure NOPRs.

However, your contact information will be publicly viewable if you include it in the comment or in any documents attached to your comment. Any information that you do not want to be publicly viewable should not be included in your comment, nor in any document attached to your comment. Persons viewing comments will see only first and last names, organization names, correspondence containing comments, and any documents submitted with the comments.

Do not submit to *www.regulations.gov* information for which disclosure is restricted by statute, such as trade secrets and commercial or financial information (hereinafter referred to as Confidential Business Information ("CBI")). Comments submitted through *www.regulations.gov* cannot be claimed as CBI. Comments received through the website will waive any CBI claims for the information submitted. For information on submitting CBI, see the Confidential Business Information section.

DOE processes submissions made through *www.regulations.gov* before posting. Normally, comments will be posted within a few days of being submitted. However, if large volumes of comments are being processed simultaneously, your comment may not be viewable for up to several weeks. Please keep the comment tracking number that *www.regulations.gov* provides after you have successfully uploaded your comment.

Submitting comments via email. Comments and documents submitted via email also will be posted to *www.regulations.gov*. If you do not want your personal contact information to be publicly viewable, do not include it in your comment or any accompanying documents. Instead, provide your contact information on a cover letter.

Include your first and last names, email address, telephone number, and optional mailing address. The cover letter will not be publicly viewable as long as it does not include any comments

Include contact information each time you submit comments, data, documents, and other information to DOE. No faxes will be accepted.

Comments, data, and other information submitted to DOE electronically should be provided in PDF (preferred), Microsoft Word or Excel, WordPerfect, or text (ASCII) file format. Provide documents that are not secured, written in English and free of any defects or viruses. Documents should not contain special characters or any form of encryption and, if possible, they should carry the electronic signature of the author.

Campaign form letters. Please submit campaign form letters by the originating organization in batches of between 50 to 500 form letters per PDF or as one form letter with a list of supporters' names compiled into one or more PDFs. This reduces comment processing and posting time.

Confidential Business Information. Pursuant to 10 CFR 1004.11, any person submitting information that he or she believes to be confidential and exempt by law from public disclosure should submit via email two well-marked copies: one copy of the document marked confidential including all the information believed to be confidential, and one copy of the document marked non-confidential with the information believed to

be confidential deleted. DOE will make its own determination about the confidential status of the information and treat it according to its determination.

It is DOE's policy that all comments may be included in the public docket, without change and as received, including any personal information provided in the comments (except information deemed to be exempt from public disclosure).

E. Issues on Which DOE Seeks Comment

Although DOE welcomes comments on any aspect of this proposal, DOE is particularly interested in receiving comments and views of interested parties concerning the following issues:

1) DOE requests comment on the proposed amended definition of ice-cream freezer, and on whether any additional characteristics may better differentiate this equipment from other commercial freezers.
2) DOE requests comment on the proposed amended definition for ice-cream freezer and the proposed definition for low-temperature freezer.
3) DOE requests comment on the proposed definitions for high-temperature refrigerator and medium-temperature refrigerator, including whether the terms should be mutually exclusive or constructed such that equipment could be considered to meet both definitions.
4) DOE requests comment on the proposal to specify the requirements from the April 2014 Final Rule regarding basic models of CRE that operate in multiple equipment classes.

5) DOE requests comment on the proposal to incorporate by reference AHRI 1200-202X and on whether the use of the updated test method would impact CRE ratings based on the current DOE test procedure.
6) DOE requests comment on the proposal to incorporate by reference AHRI 1200-202X, including the new provisions regarding high glide refrigerants. DOE also requests information on whether any remote condensing CRE are currently tested and rated using high glide refrigerants and whether the proposed test procedure would impact the rated energy consumption for such models.
7) DOE requests comment on the proposal to adopt a rating point of 55 °F ± 2.0 °F for high-temperature refrigerators by adopting through reference certain provisions of AHRI 1200-202X.
8) DOE requests comment on its proposal to incorporate by reference ASHRAE 72-2018R, including on whether the updates included in the industry test standard would impact the measured energy consumption of any CRE currently available.
9) DOE requests comment on the proposed additional instructions regarding loading drawers. DOE requests information on whether the proposed approach is consistent with any future industry standard revisions to address this issue. DOE requests comment on whether other instructions for CRE with drawers should be revised (e.g., fully open definition for drawers) or if additional instructions are needed.

10) DOE requests comment on the proposal to incorporate by reference AHRI 1320-2011 for CRE used with secondary coolants, including the proposal to only reference the industry standard for provisions specific to secondary coolants and to otherwise reference AHRI 1200-202X, as proposed for other CRE.

11) DOE requests comment on the model regulation guidelines and on whether there are opportunities for DOE to harmonize its regulations with other regulations in place for CRE.

12) DOE requests comment on the proposed definition for buffet table or preparation table. DOE requests information on whether any additional definitions are necessary for the purposes of testing this equipment, or whether any additional equipment characteristics are necessary to differentiate this equipment from other categories of CRE.

13) DOE requests comment on its proposal to adopt through reference certain provisions of ASTM F2143-16 as the basis for testing buffet tables and preparation tables. DOE also seeks comment on the proposal to specify test procedures only for self-contained buffet tables and preparation tables, consistent with ASTM F2143-16.

14) DOE requests comment on the proposal for testing buffet tables and preparation tables with test conditions (*i.e.*, test chamber conditions, measurement location, and electric supply conditions) consistent with ASHRAE 72-2018R, with additional detail specific to buffet tables and preparation tables.

15) DOE requests comment on the proposal for testing buffet tables and preparation tables with test setup instructions consistent with ASHRAE 72-2018R rather than ASTM F2143-16.

16) DOE requests comment on the proposed test loads and temperature measurement locations for buffet tables and preparation tables – *i.e.*, distilled water in pans for the open-top refrigerated area and no load in any refrigerated compartment – consistent with the approach in ASTM F2143-16.

17) DOE requests comment on the proposal to account for defrosts when testing buffet tables and preparation tables, consistent with the approach in ASHRAE 72-2018R.

18) DOE requests comment on its proposal to require loading pans in the open-top refrigerated area and not moving them to a refrigerated compartment, if applicable, during testing.

19) DOE requests comment on the proposed 24-hour test period, which is consistent with the approach in ASTM F2143-16.

20) DOE requests comment on the proposed door and cover opening procedures, which are consistent with the approach specified in ASTM F2143-16. DOE requests data and information on representative usage of buffet tables and preparation tables, including door and cover openings.

21) DOE requests comment on the proposed stabilization approach for buffet table and preparation table testing, which would reference the approach specified in ASHRAE 72-2018R.

22) DOE requests comment on the proposed approach for testing buffet tables and preparation tables based on separate pan and compartment average temperatures. DOE also requests feedback on the proposed target temperature of 38 °F ± 2 °F for each average temperature.

23) DOE requests comment on the proposed capacity metrics of pan storage volume, compartment volume, and pan display area. DOE requests feedback on the proposed methods for measuring each and the extent to which these metrics are relevant capacity metrics for buffet tables and preparation tables.

24) DOE requests comment on the proposed product-specific enforcement provisions regarding how DOE would determine whether a model meets the pull-down temperature application definition. DOE also requests data and comment on whether the proposed product-specific enforcement provisions sufficiently differentiate pull-down temperature applications from holding temperature applications.

25) DOE seeks comment on the proposed definitions of "blast chiller" and "blast freezer."

26) DOE seeks comment on the proposal to establish test procedures for self-contained commercial blast chillers and blast freezers that have a refrigerated volume of up to 500 $ft^{3.}$

27) DOE seeks comment on the proposal to incorporate certain provisions from the draft ASHRAE 220 and certain deviations for the blast chillers and blast freezers test procedures.

28) DOE seeks comment on the proposal to reference section 4 and the relevant portions of Appendix A of ASHRAE 72-2018R for instrumentation requirements for the blast chiller and blast freezer test procedures.

29) DOE seeks comment on the proposal to require the dry-bulb temperatures specified in the tentative ASHRAE 220 draft and incorporate section 6.1 and Figure 6 of ASHRAE 72-2018R to specify the point T_A where the dry-bulb temperatures are to be measured and the type of thermocouple to use when measuring dry-bulb in the blast chillers and blast freezers test procedures.

30) DOE seeks comment on the proposal to incorporate the portions of Appendix A in ASHRAE 72-2018R which specify the requirements for voltage and frequency in the blast chillers and blast freezers test procedures.

31) DOE seeks comment on whether any additional test conditions are appropriate for blast chiller and blast freezer testing, including those specified in Sections 6.2, 6.3, and Appendix A in ASHRAE 72-2018R.

32) DOE seeks comment on the proposal to incorporate Sections 5.1, 5.2, 5.3 (including sub-sections 5.3.1 to 5.3.17), and the relevant portions of Appendix A of ASHRAE 72-2018R, with the proposed deviations, for the blast chillers and blast freezers test procedures.

33) DOE seeks comment on the proposal to incorporate the relevant portions of Appendix A of ASHRAE 72-2018R for the electrical measurement locations for the blast chillers and blast freezers test procedures.

34) DOE seeks comment on the proposal to reference AHRI 1200-202X for measuring the refrigerated volume of blast chillers and blast freezers.

35) DOE seeks comment on the proposal to incorporate the standard product pan specifications in ASHRAE 220 for the blast chillers and blast freezers test procedures.

36) DOE seeks comment on the proposed method to determine the number of pans required for testing blast chillers and blast freezers.

37) DOE seeks comment on the proposal to determine the tested product capacity for the blast chillers and blast freezers test procedures.

38) DOE seeks comment on the proposed method for distributing the pans within the test unit's cabinet for testing blast chillers and blast freezers.

39) DOE seeks comment on the proposed method to determine which standard product pans would include temperature measurement sensors for the blast chillers and blast freezers test procedures.

40) DOE seeks comment on the proposed method of measuring the product temperature in the measured pans for the blast chillers and blast freezers test procedures.

41) DOE seeks comment on the proposed method for preparing the product medium mixture to be placed in the standard product pans for the blast chillers and blast freezers test procedures.

42) DOE seeks comment on the proposal to include pre-cooling and pull-down operating in the blast chiller and blast freezer test procedure and to not include any holding periods during testing.

43) DOE seeks comment on the proposed data recording rate for the blast chillers and blast freezers test procedures.

44) DOE seeks comment on the proposed data collection periods for the blast chillers and blast freezers test procedures.

45) DOE seeks comment on the proposed method to conduct the pre-cool cycle for the blast chillers and blast freezers test procedures.

46) DOE seeks comment on the proposed method to load the prepared standard product pans into the test unit for the blast chillers and blast freezers test procedures.

47) DOE seeks comment on the proposed method to conduct the blast chilling or blast freezing test.

48) DOE requests comment on the proposed amendment to the definition for chef base or griddle stand, which specifies a maximum height of 32 inches for this equipment. DOE requests information on any other identifiable equipment characteristics that may differentiate chef bases and griddle stands from other similar CRE.

49) DOE requests comment on its proposal to test chef bases and griddle stands according to the test procedure used for other CRE.

50) DOE requests comment on the proposed definition for mobile refrigerated cabinet. DOE also requests comment on the proposal to not establish test procedures for mobile refrigerated cabinets.

51) DOE requests comment on its tentative determination to not propose amended test procedures for dedicated remote condensing units.

52) DOE requests comment on the proposed approach to account for long duration defrost cycles using an optional two-part test procedure consistent

with the existing waiver approach granted for such models. DOE also requests comment on whether any additional provisions are necessary to account for different defrost operation or controls, and on DOE's proposed approach in which the test period would start with the defrost occurrence having the longest interval between defrosts.

53) DOE requests comment on the proposed alternate refrigerant conditions to be used for testing remote CRE with CO_2 refrigerant. DOE requests comment on whether any other aspects of the current test procedure require amendment to allow for testing with CO_2 or any other alternative refrigerants.

54) DOE requests comment on the proposed definition and term "customer order storage cabinet" to describe the equipment currently addressed in the September 2018 Waiver and the July 2021 Interim Waiver. DOE requests comment on the proposal to test such equipment with reduced door openings, consistent with the waiver and interim waiver approach.

55) DOE requests comment on the additional proposed test procedure amendments that would allow for reverse heat leak testing of customer order storage cabinets with floating suction pressures for multiple different temperature compartments.

56) DOE requests comment on the proposed product-specific enforcement provisions for CRE.

57) DOE seeks comment on the proposed sampling plan for CRE volume and TDA.

58) DOE requests comment on its initial conclusion that the amendments detailed in this NOPR would not have a significant impact on a substantial number of small entities.

VI. Approval of the Office of the Secretary

The Secretary of Energy has approved publication of this proposed rule.

List of Subjects

10 CFR Part 429

Administrative practice and procedure, Confidential business information, Energy conservation, Household appliances, Imports, Intergovernmental relations, Reporting and recordkeeping requirements, Small businesses.

10 CFR Part 431

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

Signing Authority

This document of the Department of Energy was signed on June 15, 2022, by Kelly J. Speakes-Backman, Principal Deputy Assistant Secretary for Energy Efficiency and

Renewable Energy, pursuant to delegated authority from the Secretary of Energy. That document with the original signature and date is maintained by DOE. For administrative purposes only, and in compliance with requirements of the Office of the Federal Register, the undersigned DOE Federal Register Liaison Officer has been authorized to sign and submit the document in electronic format for publication, as an official document of the Department of Energy. This administrative process in no way alters the legal effect of this document upon publication in the *Federal Register*.

Signed in Washington, DC, on June 15, 2022.

X Kelly Speakes-Backman Digitally signed by Kelly Speakes-Backman Date: 2022.06.15 08:20:29 -04'00'

Kelly J. Speakes-Backman
Principal Deputy Assistant Secretary for
Energy Efficiency and Renewable Energy

For the reasons stated in the preamble, DOE is proposing to amend parts 429 and 431 of Chapter II 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; 28 U.S.C. 2461 note.

2. Section 429.42 is amended by adding paragraphs (a)(3) and (a)(4) to read as follows:

§429.42 Commercial refrigerators, freezers, and refrigerator-freezers.

(a) * * *

(3) *Represented value calculations.* The volume and total display area (TDA) of a basic model, as applicable, is the mean of the measured volumes and the mean of the measured TDAs, as applicable, for the tested units of the basic model, based on the same tests used to determine energy consumption.

(4) *Convertible equipment.* Each basic model of commercial refrigerator, freezer, or refrigerator-freezer that is capable of operating at integrated average temperatures that span the operating temperature range of multiple equipment classes, either by adjusting a thermostat for a basic model or by the marketed, designed, or intended operation for a basic model with a remote condensing unit but without a thermostat, must determine the represented values, which includes the certified ratings, either by testing, in conjunction

with the applicable sampling provisions, or by applying an AEDM to comply with the requirements necessary to certify to each equipment class that the basic model is capable of operating within.

(i) *Customer order storage cabinets.* For customer order storage cabinets that have individual secured compartments that are convertible between the ≥32 °F and <32 °F operating temperatures, the customer order storage cabinets must determine the represented values, which includes the certified ratings, either by testing, in conjunction with the applicable sampling provisions, or by applying an AEDM with all convertible compartments either as medium temperature refrigerators or all convertible compartments as low-temperature freezers, or at the lowest application product temperature for each equipment class as specified in §431.64 of this chapter, to comply with the requirements necessary to certify to each equipment class that the basic model is capable of operating within.

* * * * *

3. Section 429.72 is amended by adding paragraph (f) to read as follows:

§429.72 Alternative methods for determining non-energy ratings.

* * * * *

(f) *Commercial refrigerators, freezers, and refrigerator-freezers*. The volume of a basic model of a commercial refrigerator, refrigerator-freezer, or freezer may be determined by performing a calculation of the volume based upon computer-aided design (CAD) models of the basic model in lieu of physical measurements of a production unit of the basic model. If volume is determined by performing a calculation of volume based on CAD

drawings, any value of volume of the basic model reported to DOE in a certification of compliance in accordance with §429.42(b)(2)(iii) must be calculated using the CAD-derived volume(s) and the applicable provisions in the test procedures in 10 CFR part 431.64 for measuring volume.

4. Section 429.134 is amended by adding paragraphs (s) and (t) to read as follows:

§429.134 Product-specific enforcement provisions.

* * * * *

(s) Reserved.

(t) *Commercial refrigerators, freezers, and refrigerator-freezers*--(1) *Verification of volume.* The volume will be measured pursuant to the test requirements of 10 CFR part 431 for each unit tested. The results of the measurement(s) will be averaged and compared to the value of the certified volume of the basic model. The certified volume will be considered valid only if the average measured volume is within five percent of the certified volume.

(i) If the certified volume is found to be valid, the certified volume will be used as the basis for determining the maximum daily energy consumption allowed for the basic model.

(ii) If the certified volume is found to be invalid, the average measured volume of the units in the sample will be used as the basis for determining the maximum daily energy consumption allowed for the basic model.

(2) *Verification of total display area.* The total display area will be measured pursuant to the test requirements of 10 CFR part 431 for each unit tested. The results of the

measurement(s) will be averaged and compared to the value of the certified total display area of the basic model. The certified total display area will be considered valid only if the average measured total display area is within five percent of the certified total display area.

(i) If the certified total display area is found to be valid, the certified total display area will be used as the basis for determining the maximum daily energy consumption allowed for the basic model.

(ii) If the certified total display area is found to be invalid, the average measured total display area of the units in the sample will be used as the basis for determining the maximum daily energy consumption allowed for the basic model.

(3) *Determination of pull-down temperature application.* A classification of a basic model as pull-down temperature application will be considered valid only if a model meets the definition of pull-down temperature application specified in §431.62 of this chapter as follows.

(i) 12-ounce beverage can temperatures will be measured for 12-ounce beverage cans loaded at the locations within the commercial refrigerator that are as close as possible to the locations that would be measured by test simulators according to the test procedure for commercial refrigerators specified in §431.64 of this chapter.

(ii) The commercial refrigerator will be operated at ambient conditions consistent with those specified for commercial refrigerators in §431.64 of this chapter and at the control setting necessary to achieve a stable integrated average temperature of 38 °F, prior to loading.

(iii) 12-ounce beverage cans to be fully loaded into the commercial refrigerator (with and without temperature measurements) will be maintained at 90 °F ± 2 °F based on the average measured 12-ounce beverage can temperatures prior to loading into the commercial refrigerator.

(iv) The duration of pull-down (which must be 12 hours or less) will be determined starting from closing the commercial refrigerator door after completing the 12-ounce beverage can loading until the integrated average temperature reaches 38 °F ± 2 °F.

(v) An average stable temperature of 38 °F will be determined by operating the commercial refrigerator for an additional 12 hours after initially reaching 38 °F ± 2 °F with no changes to control settings, and determining an integrated average temperature of 38 °F ± 2 °F at the end of the 12 hour stability period.

PART 431 -- ENERGY EFFICIENCY PROGRAM FOR CERTAIN COMMERCIAL AND INDUSTRIAL EQUIPMENT

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

Authority: 42 U.S.C. 6291–6317; 28 U.S.C. 2461 note.

6. Section 431.62 is revised to read as follows:

§431.62 Definitions concerning commercial refrigerators, freezers and refrigerator-freezers.

Air-curtain angle means:

(1) For equipment without doors and without a discharge air grille or discharge air honeycomb, the angle between a vertical line extended down from the highest point on the manufacturer's recommended load limit line and the load limit line itself, when the equipment is viewed in cross-section; and

(2) For all other equipment without doors, the angle formed between a vertical line and the straight line drawn by connecting the point at the inside edge of the discharge air opening with the point at the inside edge of the return air opening, when the equipment is viewed in cross-section.

Basic model means all commercial refrigeration equipment manufactured by one manufacturer within a single equipment class, having the same primary energy source, and that have essentially identical electrical, physical, and functional characteristics that affect energy consumption.

Blast chiller means commercial refrigeration equipment, other than a blast freezer, that is capable of the rapid temperature pull-down of hot food products from 135 °F to 40 °F within a period of four hours, when measured according to the test procedure at appendix D to subpart C of part 431.

Blast freezer means commercial refrigeration equipment that is capable of the rapid temperature pull-down of hot food products from 135 °F to 40 °F within a period of four hours and capable of achieving a final product temperature of less than 32 °F, when measured according to the test procedure at appendix D to subpart C of part 431.

Buffet table or preparation table means a commercial refrigerator with an open-top refrigerated area, that may or may not include a lid, for displaying or storing merchandise and other perishable materials in pans or other removable containers for customer self-service or food production and assembly. The unit may or may not be equipped with a refrigerated storage compartment underneath the pans or other removable containers that is not thermally separated from the open-top refrigerated area.

Chef base or griddle stand means commercial refrigeration equipment that has a maximum height of 32 inches, including any legs or casters, and that is designed and marketed for the express purpose of having a griddle or other cooking appliance placed on top of it that is capable of reaching temperatures hot enough to cook food.

Closed solid means equipment with doors, and in which more than 75 percent of the outer surface area of all doors on a unit are not transparent.

Closed transparent means equipment with doors, and in which 25 percent or more of the outer surface area of all doors on the unit are transparent.

Commercial freezer means a unit of commercial refrigeration equipment in which all refrigerated compartments in the unit are capable of operating below 32 °F (±2 °F).

Commercial hybrid means a unit of commercial refrigeration equipment:

(1) That consists of two or more thermally separated refrigerated compartments that are in two or more different equipment families, and

(2) That is sold as a single unit.

Commercial refrigerator means a unit of commercial refrigeration equipment in which all refrigerated compartments in the unit are capable of operating at or above 32 °F (±2 °F).

Commercial refrigerator-freezer means a unit of commercial refrigeration equipment consisting of two or more refrigerated compartments where at least one refrigerated compartment is capable of operating at or above 32 °F (±2 °F) and at least one refrigerated compartment is capable of operating below 32 °F (±2 °F).

Commercial refrigerator, freezer, and refrigerator-freezer means refrigeration equipment that -

(1) Is not a consumer product (as defined in §430.2);

(2) Is not designed and marketed exclusively for medical, scientific, or research purposes;

(3) Operates at a chilled, frozen, combination chilled and frozen, or variable temperature;

(4) Displays or stores merchandise and other perishable materials horizontally, semi-vertically, or vertically;

(5) Has transparent or solid doors, sliding or hinged doors, a combination of hinged, sliding, transparent, or solid doors, or no doors;

(6) Is designed for pull-down temperature applications or holding temperature applications; and

(7) Is connected to a self-contained condensing unit or to a remote condensing unit.

Customer order storage cabinet means a commercial refrigerator, freezer, or refrigerator-freezer that stores customer orders and includes individual, secured compartments with doors that are accessible to customers for order retrieval.

Door means a movable panel that separates the interior volume of a unit of commercial refrigeration equipment from the ambient environment and is designed to facilitate access to the refrigerated space for the purpose of loading and unloading product. This includes hinged doors, sliding doors, and drawers. This does not include night curtains.

Door angle means:

(1) For equipment with flat doors, the angle between a vertical line and the line formed by the plane of the door, when the equipment is viewed in cross-section; and

(2) For equipment with curved doors, the angle formed between a vertical line and the straight line drawn by connecting the top and bottom points where the display area glass joins the cabinet, when the equipment is viewed in cross-section.

High-temperature refrigerator means a commercial refrigerator that is not capable of operating with an integrated average temperature as low as 38.0 °F (±2.0 °F).

Holding temperature application means a use of commercial refrigeration equipment other than a pull-down temperature application, except a blast chiller or freezer.

Horizontal Closed means equipment with hinged or sliding doors and a door angle greater than or equal to 45°.

Horizontal Open means equipment without doors and an air-curtain angle greater than or equal to 80° from the vertical.

Ice-cream freezer means:

(1) Prior to the compliance date(s) of any amended energy conservation standard(s) for ice-cream freezers, a commercial freezer that is designed to operate at or below −5.0 °F (±2.0 °F) and that the manufacturer designs, markets, or intends for the storing, displaying, or dispensing of frozen desserts; or

(2) Upon the compliance date(s) of any amended energy conservation standard(s) for ice-cream freezers, a commercial freezer that is designed for an operating temperature at or below −15.0 °F (±2.0 °F) and that the manufacturer designs, markets, or intends for the storing, displaying, or dispensing of frozen desserts.

Integrated average temperature means the average temperature of all test package measurements taken during the test.

Lighting occupancy sensor means a device which uses passive infrared, ultrasonic, or other motion-sensing technology to automatically turn off or dim lights within the equipment when no motion is detected in the sensor's coverage area for a certain preset period of time.

Lowest application product temperature means the integrated average temperature (or for buffet tables or preparation tables, the average pan temperature of all measurements taken during the test) at which a given basic model is capable of consistently operating that is closest to the integrated average temperature (or for buffet tables or preparation tables, the average pan temperature of all measurements taken during the test) specified for testing under the DOE test procedure.

Low-temperature freezer means a commercial freezer that is not an ice-cream freezer.

Medium-temperature refrigerator means a commercial refrigerator that is capable of operating with an integrated average temperature of 38.0 °F (±2 °F), or lower.

Mobile refrigerated cabinet means commercial refrigeration equipment that is designed and marketed to operate only without a continuous power supply.

Night curtain means a device which is temporarily deployed to decrease air exchange and heat transfer between the refrigerated case and the surrounding environment.

Operating temperature means the range of integrated average temperatures at which a self-contained commercial refrigeration unit or remote-condensing commercial refrigeration unit with a thermostat is capable of operating or, in the case of a remote-condensing commercial refrigeration unit without a thermostat, the range of integrated average temperatures at which the unit is marketed, designed, or intended to operate.

Pull-down temperature application means a commercial refrigerator with doors that, when fully loaded with 12 ounce beverage cans at 90 degrees F, can cool those beverages to an average stable temperature of 38 degrees F in 12 hours or less.

Rating temperature means the integrated average temperature a unit must maintain during testing (i.e., either as listed in the table at §431.66(d)(1) or the lowest application product temperature).

Remote condensing unit means a factory-made assembly of refrigerating components designed to compress and liquefy a specific refrigerant that is remotely located from the refrigerated equipment and consists of 1 or more refrigerant compressors, refrigerant condensers, condenser fans and motors, and factory supplied accessories.

Scheduled lighting control means a device which automatically shuts off or dims the lighting in a display case at scheduled times throughout the day.

Self-contained condensing unit means a factory-made assembly of refrigerating components designed to compress and liquefy a specific refrigerant that is an integral part of the refrigerated equipment and consists of 1 or more refrigerant compressors, refrigerant condensers, condenser fans and motors, and factory supplied accessories.

Semivertical Open means equipment without doors and an air-curtain angle greater than or equal to 10° and less than 80° from the vertical.

Service over counter means equipment that has sliding or hinged doors in the back intended for use by sales personnel, with glass or other transparent material in the front for displaying merchandise, and that has a height not greater than 66 inches and is intended to serve as a counter for transactions between sales personnel and customers.

Test package means a packaged material that is used as a standard product temperature-measuring device.

Transparent means greater than or equal to 45 percent light transmittance, as determined in accordance with the ASTM Standard E 1084-86 (Reapproved 2009), (incorporated by reference, see §431.63) at normal incidence and in the intended direction of viewing.

Vertical Closed means equipment with hinged or sliding doors and a door angle less than 45°.

Vertical Open means equipment without doors and an air-curtain angle greater than or equal to 0° and less than 10° from the vertical.

Wedge case means a commercial refrigerator, freezer, or refrigerator-freezer that forms the transition between two regularly shaped display cases.

7. Section 431.63 is amended by:

a. Revising paragraphs (a), (c)(1), (c)(2), and (d)(1); and

b. Adding paragraphs (c)(3), (c)(4), and (e)(2).

The revisions and additions read as follows:

§431.63 Materials incorporated by reference.

(a) Certain material is incorporated by reference into this subpart with the approval of the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR part 51. To enforce any edition other than that specified in this section, the U.S. Department of Energy (DOE) must publish a document in the *Federal Register* and the material must be available to the public. All approved material is available for inspection at DOE and at the National Archives and Records Administration (NARA). Contact DOE at: the U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, Building Technologies Program, Sixth Floor, 950 L'Enfant Plaza SW, Washington, DC

20024, (202)-586-9127, *Buildings@ee.doe.gov*, *https://www.energy.gov/eere/buildings/building-technologies-office.* For information on the availability of this material at NARA, email: *fr.inspection@nara.gov*, or go to: *www.archives.gov/federal-register/cfr/ibr-locations.html.* The material may be obtained from the following sources:

(c) * * *

(1) ARI Standard 1200-2006, Performance Rating of Commercial Refrigerated Display Merchandisers and Storage Cabinets, 2006, IBR approved for §431.66.

(2) AHRI Standard 1200 (I-P)-2010 ("AHRI Standard 1200 (I-P)-2010"), 2010 Standard for Performance Rating of Commercial Refrigerated Display Merchandisers and Storage Cabinets, 2010, IBR approved for §431.66.

(3) AHRI Standard 1200-202X ("AHRI Standard 1200-202X"), "202X Standard for Performance Rating of Commercial Refrigerated Display Merchandisers and Storage Cabinets," 2021, IBR approved for appendices B, C, and D to subpart C.

(4) AHRI Standard 1320 (I-P), ("AHRI Standard 1320-2011") "2011 Standard for Performance Rating of Commercial Refrigerated Display Merchandisers and Storage Cabinets for Use With Secondary Refrigerants," 2011, IBR approved for appendix B to subpart C.

(d) * * *

(1) ASHRAE Standard 72-2018R (ASHRAE 72-2018R), "Method of Testing Open and Closed Commercial Refrigerators and Freezers," Copyright 2021, IBR approved for appendices B, C, and D to subpart C.

(2) [Reserved]

(e) * * *

(2) ASTM F2143-16, "Standard Test Method for Performance of Refrigerated Buffet and Preparation Tables," approved May 1, 2016, IBR approved for appendix C to subpart C.

8. Section 431.64 is revised to read as follows:

§431.64 Uniform test method for the measurement of energy consumption of commercial refrigerators, freezers, and refrigerator-freezers.

(a) *Scope*. This section provides the test procedures for measuring, pursuant to EPCA, the energy consumption or energy efficiency for a given equipment category of commercial refrigerators, freezers, and refrigerator-freezers.

(b) *Testing and calculations*. (1) Determine the daily energy consumption and volume or total display area of each covered commercial refrigerator, freezer, or refrigerator-freezer by conducting the appropriate test procedure set forth below in appendix B, to this subpart. The daily energy consumption of commercial refrigeration equipment shall be

calculated using raw measured values and the final test results shall be reported in increments of 0.01 kWh/day.

(2) Determine the daily energy consumption and pan storage volume, pan display area, and refrigerated volume of each buffet table or preparation table by conducting the appropriate test procedure set forth below in appendix C to this subpart. The daily energy consumption shall be calculated using raw measured values and the final test results shall be recorded in increments of 0.01 kWh/day.

(3) Determine the energy consumption per weight of product and product capacity of each blast chiller and blast freezer by conducting the appropriate test procedure set forth below in appendix D to this subpart. The energy consumption per weight of product shall be calculated using raw measured values and the final test results shall be recorded in increments of 0.01 kWh/lb.

Appendix A [Removed and Reserved]

9. Remove and reserve Appendix A to subpart C of part 431.

10. Appendix B to subpart C of part 431 is revised to read as follows:

Appendix B to Subpart C of Part 431 - Uniform Test Method for the Measurement of Energy Consumption of Commercial Refrigerators, Freezers, and Refrigerator-Freezers

Note: Prior to [insert date 360 days after publication of final rule], any representations, including for certification of compliance, made with respect to the energy use or efficiency of commercial refrigeration equipment, except for buffet tables or preparation tables, blast chillers, blast freezers, or mobile refrigerated cabinets, must be made in accordance with the results of testing pursuant to this appendix that was in place on January 1, 2022. On and after [insert date 360 days after publication of final rule], any representations, including for certification of compliance, made with respect to the energy use or efficiency of commercial refrigeration equipment, except for buffet tables or preparation tables, blast chillers, blast freezers, or mobile refrigerated cabinets, must be made in accordance with the results of testing pursuant to this appendix.

The test procedure for equipment cooled only by secondary coolants in section 1.1.3 of this appendix is not required for use until the compliance date(s) of any amended energy conservation standard(s) for such commercial refrigeration equipment.

High-temperature refrigerators must be tested as medium-temperature refrigerators according to section 2.1.3 of this appendix based on the lowest application product temperature until the compliance date(s) of any amended energy conservation standard(s) established for high-temperature refrigerators. On and after the compliance date(s) of such energy conservation standard(s), high-temperature refrigerators must be tested pursuant to this appendix.

0. Incorporation by Reference

DOE incorporated by reference in §431.63 the entire standard for AHRI Standard 1200-202X"); AHRI Standard 1320-2011; and ASHRAE 72-2018R. However, only enumerated provisions of those documents are applicable to this appendix as follows:

A. AHRI Standard 1200-202X

i. Section 3, "Definitions," Section 4, "Test Requirements," and Section 7, "Symbols and Subscripts" as referenced in section 1.1 of this appendix.

ii. Section 6, "Rating Requirements for Self-contained Commercial Refrigerated Display Merchandisers and Storage Cabinets" as referenced in section 1.1.1 of this appendix.

iii. Section 5, "Rating Requirements for Remote Commercial Refrigerated Display Merchandisers and Storage Cabinets" as referenced in section 1.1.2 of this appendix.

iv. Appendix C, "Commercial Refrigerated Display Merchandiser and Storage Cabinet Refrigerated Volume Calculation – Normative" as referenced in section 3.1 of this appendix.

B. AHRI 1320-2011

i. Sections 5.2.7 and 5.2.8 as referenced in section 1.1.3 of this appendix.

1. Test Procedure

1.1. Determination of Daily Energy Consumption. Determine the daily energy consumption of each covered commercial refrigerator, freezer, or refrigerator-freezer by conducting the test procedure set forth in the AHRI Standard 1200-202X, Section 3, "Definitions," Section 4, "Test Requirements," and Section 7, "Symbols and Subscripts". References to ASHRAE Standard 72 refer to ASHRAE 72-2018R.

1.1.1. For each commercial refrigerator, freezer, or refrigerator-freezer with a self-contained condensing unit, also use AHRI Standard 1200-202X, Section 6, “Rating Requirements for Self-contained Commercial Refrigerated Display Merchandisers and Storage Cabinets.”

1.1.2. For each commercial refrigerator, freezer, or refrigerator-freezer with a remote condensing unit, also use AHRI Standard 1200-202X, Section 5, “Rating Requirements for Remote Commercial Refrigerated Display Merchandisers and Storage Cabinets.”

1.1.3. For each commercial refrigerator, freezer, or refrigerator-freezer used with a secondary coolant, test according to section 1.1.2 of this appendix, except in place of the equations for CDEC and CEC in Sections 5.2 and 5.2.1 of AHRI 1200-202X, respectively, apply the following equations:

$$CDEC = CEC + [FEC + LEC + AEC + DEC + PEC]^* + CPEC$$

$$CEC = [(Q_{rt} + Q_{CP}) \cdot (t - t_{dt})] / (EER \cdot 1000)$$

Where CPEC and Q_{CP} are as specified in Sections 5.2.7 and 5.2.8 of AHRI Standard 1320-2011 and EER is determined based on a temperature that is 6.0 °F lower than the secondary coolant cabinet inlet temperature.

1.2. Methodology for Determining Applicability of Transparent Door Equipment Families. To determine if a door for a given model of commercial refrigeration equipment is transparent: (1) Calculate the outer door surface area including frames and

mullions; (2) calculate the transparent surface area within the outer door surface area excluding frames and mullions; (3) calculate the ratio of (2) to (1) for each of the outer doors; and (4) the ratio for the transparent surface area of all outer doors must be greater than 0.25 to qualify as a transparent equipment family.

1.3. Drawers. Drawers shall be treated as identical to doors when conducting the DOE test procedure. Commercial refrigeration equipment with drawers shall be configured with Gastronorm food service pans, installed per the manufacturer's instructions to the maximum size pan configuration specified. The net usable volume where test simulators are not required shall be filled with filler material so that between 60% and 80% of the net usable volume is uniformly occupied by filler material. Packing of test simulators and filler packages shall be in accordance with the requirements for commercial refrigerators without shelves, as specified in Section 5.4.4 of ASHRAE 72-2018R. Specifically, the net usable volume is the storage volume of the pans up to the top edge of the pan. Test simulators shall be placed at the corner locations of each pan. For any pans not wide or deep enough to allow for test simulators at each corner (*i.e.*, not enough space to have test simulators side-by-side), center the test simulators along the pan edge in that dimension. For any pans not tall enough to allow for test simulators at the top and bottom at each location (*i.e.*, the pan is not tall enough to allow for two test simulators to be stacked within the height of the pan), load a test simulator only at the top edge of the pan in each required location.

1.4. Long-time Automatic Defrost. For commercial refrigeration equipment not capable of operating with defrost intervals of 24 hours or less, testing may be conducted using a two-part test method.

1.4.1. First Part of Test. The first part of the test shall be a 24-hour test starting in steady-state conditions and including eight hours of door opening (according to ASHRAE Standard 72-2018R). The energy consumed in this test, ET1, shall be recorded.

1.4.2. Second Part of Test. The second part of the test shall be a defrost cycle, including any operation associated with a defrost. The start and end of the test period be determined as the last time before and first time after a defrost occurrence when the measured average simulator temperature (*i.e.*, the instantaneous average of all test simulator temperature measurements) is within 0.5 °F of the IAT as measured during the first part of the test. The energy consumed in this test, ET2, and duration, t_{DI}, shall be recorded.

1.4.3. Daily Energy Consumption. Based on the measured energy consumption in these two tests, the daily energy consumption (DEC) in kWh shall be calculated as:

$$DEC = ET1 \times \frac{(1{,}440 - t_{NDI)}}{1{,}440} + \frac{ET2}{t_{DC}}$$

$$t_{NDI} = \frac{t_{DI}}{t_{DC}}$$

Where:

DEC = daily energy consumption, in kWh;

ET 1 = energy consumed during the first part of the test, in kWh;

ET 2 = energy consumed during the second part of the test, in kWh;

t_{NDI} = normalized length of defrosting time per day, in minutes;

t_{DI} = length of time of defrosting test period, in minutes;

t_{DC} = minimum time between defrost occurrences, in days; and
1440 = conversion factor, minutes per day.

1.5. Customer Order Storage Cabinets. Customer order storage cabinets shall conduct door openings according to ASHRAE Standard 72-2018R, except that each door shall be opened to the fully open position for 8 seconds, once every 2 hours, for 6 door-opening cycles.

1.5.1. Ambient Compartments. For customer order storage cabinets that have at least one individual secured compartment that is not capable of maintaining an integrated average temperature below the ambient dry-bulb temperature, the individual secured compartment(s) at ambient dry-bulb temperature shall be categorized as a high-temperature refrigerator compartment for the purpose of testing and rating. All volume, total display area, and energy consumption calculations shall be included within the high-temperature refrigerator category and summed with other high-temperature refrigerator category compartment(s) calculations.

1.5.2. Convertible Compartments. For customer order storage cabinets that have individual secured compartments that are convertible between the ambient dry-bulb temperature and the ≥32 °F operating temperature, the convertible compartment shall be tested as a medium-temperature refrigerator compartment or at the lowest application product temperature as specified in section 2.2. of this appendix.

1.5.3. Inverse Refrigeration Load Test. For customer order storage cabinets that supply refrigerant to multiple individual secured compartments and that allow the suction pressure from the evaporator in each individual secured compartment to float based on the temperature required to store the customer order in that individual secured

compartment, test according to section 1.1.2 of this appendix, except that energy (heat) loss shall be allowed at a rate and ΔT equivalent to the energy gains of a standard refrigerated cabinet as specified in sections 1.5.3.1-1.5.3.3 of this appendix.

1.5.3.1. Anti-sweat door heaters. Anti-sweat door heaters shall be de-energized for the inverse refrigeration load test specified in section 1.5.3. of this appendix.

1.5.3.2. Integrated Average Temperature. For medium-temperature refrigerator compartments, the integrated average temperature shall be 112.4 °F ± 2.0 °F. For low-temperature freezer compartments, the integrated average temperature shall be 150.4 °F ± 2.0 °F. For ambient compartments, the integrated average temperature shall be 75.4 °F ± 2.0 °F.

1.5.3.3. Daily Energy Consumption. Determine the calculated daily energy consumption (CDEC) and the EER based on AHRI Standard 1200-202X, Section 5, "Rating Requirements for Remote Commercial Refrigerated Display Merchandisers and Storage Cabinets," except that the compressor energy consumption (CEC) shall be calculated by applying the following equations:

$$CEC = \frac{[(Q \times t) + ML + (FEC + AEC + DEC) \times 3.412]}{EER \times 1000}$$

$$Q = \frac{W_{in} \times 3.412}{t}$$

$$ML = N_d \times (A_e + A_m)$$

$$A_e = [(H_a - H_c) - (H_t - H_a)] \times m_a$$

$$A_m = C_{p,liner} \times W_{liner} \times \Delta T_{liner}$$

Where:

CEC = compressor energy consumption, kWh per day;

Q = inverse refrigeration load (does not include waste heat from auxiliary components and moisture infiltration), in BTU per h;

t = test duration, in h;

ML = moisture load impacts, BTU per day;

FEC = evaporator fan motor(s) energy consumption, Wh per day;

AEC = anti-condensate heater(s) energy consumption, Wh per day;

DEC = defrost heater(s) energy consumption, Wh per day;

3.412 = conversion factor, BTU per Wh;

EER = energy efficiency ratio, BTU per Wh;

1000 = conversion factor, W per kW;

W_{in} = energy input measured over the test period for all energized components (heaters, controls, and fans) located in the refrigerated compartments, in Wh;

N_d = number of door openings during test, unitless;

A_e = enthalpy adjustment, BTU per day;

A_m = moisture/frost accumulation, BTU per day;

H_a = ambient air enthalpy, BTU per pound;

H_c = compartment air enthalpy based on air conditions during cold operation (*e.g.*, 0 °F dry bulb/-20 °F dew point for freezer compartment, 38 °F dry bulb/20 °F dew point for refrigerator compartment, 75 °F dry bulb/20 °F dew point for ambient compartment), BTU per pound;

H_t = compartment air enthalpy during heat leak test based on dew point being equal to ambient air dew point, BTU per pound;

m_a = mass of compartment air exchanged (30% of total compartment volume) based density of air during cold operation, pounds;

$C_{p,liner}$ = specific heat of liner material, BTU per °F per pound;

W_{liner} = weight of all liner parts, pounds; and

ΔT_{liner} = maximum temperature rise of all liner parts (*e.g.*, 4.5 °F, 2.5 °F, and 1 °F for freezer, refrigerator, and ambient compartments, respectively), °F.

2. Test Conditions

2.1. Integrated Average Temperatures. Conduct the testing required in section 1 of this appendix, and determine the daily energy consumption at the applicable integrated average temperature as follows:

2.1.1. Ice-cream Freezers. Test ice-cream freezers and ice-cream freezer compartments to the integrated average temperature specified in Section 3.14.1, “Ice Cream Applications” of AHRI Standard 1200-202X .

2.1.2. Low-temperature Freezers. Test low-temperature freezers and low-temperature freezer compartments to the integrated average temperature specified in Section 3.14.2, “Low Temperature Applications” of AHRI Standard 1200-202X.

2.1.3. Medium-temperature Refrigerators. Test medium-temperature refrigerators and medium-temperature refrigerator compartments to the integrated average temperature specified in Section 3.14.3, “Medium Temperature Applications” of AHRI Standard 1200-202X.

2.1.4. High-temperature Refrigerators. Test high-temperature refrigerators and high-temperature refrigerator compartments to the integrated average temperature specified in section 3.14.4, “High Temperature Applications” of AHRI Standard 1200-202X .

2.2. Lowest Application Product Temperature. If a unit of commercial refrigeration equipment is not able to be operated at the integrated average temperature specified in paragraph 2.1 of this appendix, test the unit at the lowest application product temperature (LAPT), as defined in §431.62. For units equipped with a thermostat, LAPT is the lowest thermostat setting (for units that are only able to operate at temperatures above the specified test temperature) or the highest thermostat setting (for units that are only able to

operate at temperatures below the specified test temperature). For remote condensing equipment without a thermostat or other means of controlling temperature at the case, the lowest application product temperature is the temperature achieved with the dew point temperature or mid-point evaporator temperature (as defined in AHRI Standard 1200-202X) set to 5 degrees colder than that required to maintain the manufacturer's specified application temperature that is closest to the specified integrated average temperature.

2.3. Testing at NSF Test Conditions. For commercial refrigeration equipment that is also tested in accordance with NSF test procedures (Type I and Type II), integrated average temperatures and ambient conditions used for NSF testing may be used in place of the DOE-prescribed integrated average temperatures and ambient conditions provided they result in a more stringent test. That is, the measured daily energy consumption of the same unit, when tested at the rating temperatures and/or ambient conditions specified in the DOE test procedure, must be lower than or equal to the measured daily energy consumption of the unit when tested with the rating temperatures or ambient conditions used for NSF testing. The integrated average temperature measured during the test may be lower than the range specified by the DOE applicable temperature specification provided in paragraph 2.1 of this appendix, but may not exceed the upper value of the specified range. Ambient temperatures and/or humidity values may be higher than those specified in the DOE test procedure.

2.4. Remote Condensing with Direct Expansion Carbon Dioxide. For remote condensing commercial refrigeration equipment used with direct expansion carbon dioxide

refrigerant, instead of the liquid refrigerant conditions specified in appendix A to ASHRAE 72-2018R, the liquid inlet saturation temperature shall be 38 °F with liquid inlet subcooling of 5 °F.

3. Volume and Total Display Area

3.1. Determination of Volume. Determine the volume of a commercial refrigerator, freezer, and refrigerator-freezer using the method set forth in AHRI Standard 1200-202X, appendix C, "Commercial Refrigerated Display Merchandiser and Storage Cabinet Refrigerated Volume Calculation – Normative."

3.2. Determination of Total Display Area. Determine the total display area of a commercial refrigerator, freezer, and refrigerator-freezer using the method set forth in AHRI Standard 1200-202X, section 3.18 and appendix C, "Commercial Refrigerated Display Merchandiser and Storage Cabinet Total Display Area (TDA) Calculation – Normative."

11. Appendix C to subpart C of part 431 is added to read as follows:

Appendix C to Subpart C of Part 431 - Uniform Test Method for the Measurement of Energy Consumption of Buffet Tables or Preparation Tables

Note: After [date 360 days following publication of final rule], any representations, including for compliance certification purposes, made with respect to the energy consumption of a buffet table or preparation table must be made in accordance with the results of testing pursuant to this appendix. .

0. Incorporation by Reference

DOE incorporated by reference in §431.63 the entire standard for AHRI Standard 1200-202X, ASHRAE 72-2018R, and ASTM F2143-16. However, only enumerated provisions of those documents are applicable to this appendix as specified.

1. Test Procedure

1.1. Determination of Daily Energy Consumption. Determine the daily energy consumption of each buffet table or preparation table with a self-contained condensing unit by conducting the test procedure set forth in ASTM F2143-16, section 3, "Terminology," section 6.1, "Analytical Balance Scale," section 6.2, "Pans," Section 7, "Reagents and Materials," section 9, "Preparation of Apparatus" (only section 9.6), section 10.1, "General" (only section 10.1.1), section 10.2, "Pan Thermocouple Placement," section 10.5, "Test" (only sections 10.5.5 and 10.5.6), section 11.4, "Energy Consumption" (only section 11.4.1), and section 11.5, "Production Capacity", with additional instructions as described in the following sections.

1.2. Test Conditions. Ambient conditions and instrumentation for testing shall be as specified in the "Chamber conditions" and "Electricity supply and consumption of unit under test and components metered separately" portions of Appendix A to ASHRAE 72-2018R and measured according to Section 6.1 of ASHRAE 72-2018R and the specifications in Appendix A of ASHRAE 72-2018R. The "highest point" of the buffet table or preparation table shall be determined as the highest point of the open-top refrigerated area of the buffet table or preparation table, without including the height of

any lids or covers. The geometric center of the buffet table or preparation table is: for buffet tables or preparation tables without refrigerated compartments, the geometric center of the top surface of the open-top refrigerated area; and for buffet tables or preparation tables with refrigerated compartments, the geometric center of the door opening area for the refrigerated compartment.

1.3. Test Setup. Install the buffet table or preparation table according to Sections 5.1, 5.2, and 5.3 of ASHRAE 72-2018R.

1.4. Test Load.

1.4.1. Pan Loading. Fill pans with distilled water to within 0.5 inches of the top edge of the pan. For pans that are not configured in a horizontal orientation, only the lowest side of the pan is filled to within 0.5 inches of the top edge of the pan with distilled water.

1.4.2. Refrigerated Compartments. Measure the temperature of any refrigerated compartment(s) as specified in Section 9.6 of ASTM F2143-16. The thermocouples for measuring compartment air temperature shall be in thermal contact with the center of a 1.6-oz (45-g) cylindrical brass slug with a diameter and height of 0.75 in. The brass slugs shall be placed at least 0.5 in from any heat-conducting surface.

1.5. Stabilization and Test Period. Prepare the unit for testing and conduct two test periods to determine stability according to Sections 7.1 through 7.5 of ASHRAE 72-2018R, excluding sections 7.2.1, 7.2.2, 7.3.1, 7.3.2, 7.3.3, and 7.3.4. The preparation

period under Section 7.2 of ASHRAE 72-2018R includes loading the test unit pans with distilled water and adjusting the controls to maintain the desired performance.

1.5.1. Test Periods A and B. Conduct two test periods, A and B, as specified in Section 7.3 of ASHRAE 72-2018R (excluding sections 7.3.1, 7.3.2, 7.3.3, and 7.3.4). The 24-hour test periods shall begin with an 8 hour active period as specified in Section 10.5.5 of ASTM F2143-16. Following the active period, the remaining 16 hours of the test period shall be a standby period with the pans remaining in place, any pan covers in the closed position, and with no additional door openings.

1.5.2. Stability. Average pan temperatures shall be used to determine stability, as specified in Section 7.5 of ASHRAE 72-2018R, rather than average test simulator temperatures.

1.5.3. Data Recording. For each test period, record data as specified in Section 10.1.1 of ASTM F2143-16, except record wet-bulb temperature rather than relative humidity. Rather than voltage, current, and power as specified in Section 10.1.1 of ASTM F2143-16, record the electrical supply potential and frequency and energy consumption as specified in Appendix A of ASHRAE 72-2018R.

1.6. Target Temperatures.

1.6.1. Average Pan Temperature. The average of all pan temperature measurements during the test period shall be 38 °F ± 2 °F. If the unit under test is not able to be operated at this average temperature range, test the unit at the lowest application product temperature (LAPT), as defined in §431.62. For units equipped with a thermostat, LAPT is the lowest thermostat setting (for units that are only able to operate at temperatures

above the specified test temperature) or the highest thermostat setting (for units that are only able to operate at temperatures below the specified test temperature).

1.6.2. Average Compartment Temperature. The average of all compartment temperature measurements during the test period shall be 38 °F ± 2 °F. If the unit under test is not capable of maintaining both average pan temperature and average compartment temperature within the specified range, the average compartment temperature shall be the average temperature necessary to maintain average pan temperature within the specified range. If the unit is tested at the LAPT for the average pan temperature, as described in section 1.6.1 of this appendix, the average compartment temperature is the average of all compartment temperature measurements at that control setting.

2. Capacity Metrics.

2.1. Pan Volume. Determine pan volume according to Section 11.5 of ASTM F2143-16.

2.2. Refrigerated Volume. Determine the volume of any refrigerated compartments according to section 3.17 and Appendix C of AHRI 1200-202X . The refrigerated volume excludes the volume occupied by pans loaded in the open-top display area for testing.

2.3. Pan Display Area. Determine the pan display area based on the total surface area of water in the test pans when filled to within 0.5 inches of the top edge of the pan, or for test pans that are not configured in a horizontal orientation, when the lowest side of the pan is filled to within 0.5 inches of the top edge of the pan with water.

12. Appendix D to subpart D of part 431 is added to read as follows:

Appendix D to Subpart C of Part 431 - Uniform Test Method for the Measurement of Energy Consumption of Blast Chillers or Blast Freezers

Note: After [insert date 360 days after publication of a final rule], any representations, including for compliance certification purposes, made with respect to the energy use or efficiency of blast chillers or blast freezers, must be made in accordance with the results of testing pursuant to this appendix.

0. Incorporation by reference.

DOE incorporated by reference in §431.63 the entire standard for AHRI Standard 1200-202X ("AHRI Standard 1200-202X"); and ASHRAE 72-2018R. However, only enumerated provisions of those documents are applicable to this appendix as follows:

A. AHRI Standard 1200-202X

i. Appendix C, "Commercial Refrigerated Display Merchandiser and Storage Cabinet Refrigerated Volume Calculation – Normative," as referenced in section 1.1.1. of this appendix.

B. ASHRAE 72-2018R

i. Section 4, "Instruments," as referenced in section 1.2. of this appendix.

ii. Section 5, "Preparation of Unit Under Test," (except section 5.4, "Loading of Test Simulators and Filler Material") as referenced in section 1.2. of this appendix.

iii. Section 6.1, "Ambient Temperature and Humidity," as referenced in sections 1.2. and 1.4. of this appendix.

iv. Figure 6, "Location of Ambient Temperature Indicators," as referenced in sections 1.2. and 1.4. of this appendix.

v. Normative Appendix A, “Measurement Locations, Tolerances, Accuracies, and Other Characteristics,” (only the measured quantities specified in section 1.2.1. of this appendix) as referenced in sections 1.2. and 1.4. of this appendix.

1. Test Procedures

1.1. Scope. This section provides the test procedures for measuring the energy consumption in kilowatt-hours per pound (kWh/lb) for self-contained commercial blast chillers and blast freezers that have a refrigerated volume of up to 500 ft^3.

1.1.1. Determination of Refrigerated Volume. Determine the refrigerated volume of a self-contained commercial blast chiller or blast freezer using the method set forth in AHRI Standard 1200-202X, Appendix C, “Commercial Refrigerated Display Merchandiser and Storage Cabinet Refrigerated Volume Calculation – Normative.”

1.2. Determination of Energy Consumption. Determine the energy consumption of each covered blast chiller or blast freezer by conducting the test procedure set forth in ASHRAE 72-2018R, Section 4, “Instruments,” Section 5, “Preparation of Unit Under Test,” (except Section 5.4, “Loading of Test Simulators and Filler Material”) Section 6.1, “Ambient Temperature and Humidity,” Figure 6, “Location of Ambient Temperature Indicators,” and normative Appendix A, “Measurement Locations, Tolerances, Accuracies, and Other Characteristics,” (only the measured quantities specified in section 1.2.1. of this appendix) as well as the requirements of this appendix.

1.2.1. Measured Quantities in Normative Appendix A of ASHRAE 72-2018R. The following measured quantities shall be in accordance with the specifications of normative Appendix A of ASHRAE 72-2018R: dry bulb temperature (except for deviations

specified in section 1.3 and 1.4. of this appendix), electrical supply frequency, electrical supply potential, energy consumed (except for deviations specified in section 1.3. of this appendix), extent of non-perforated surface beyond edges of unit under test, front clearance, rear or side clearance, and time measurements.

1.2.2. Additional Specifications for ASHRAE 72-2018R. The term “refrigerator” used in ASHRAE 72-2018R shall instead refer to “blast chiller” or “blast freezer,” as applicable. In Section 5.3 of ASHRAE 72-2018R, the phrase “all necessary components and accessories shall be installed prior to loading the storage and display areas with test simulators and filler material” shall be replaced with “all necessary components and accessories shall be installed prior to precooling the unit under test”. Section 5.3.5 shall also require that, prior to precooling the unit under test, the condensate pan shall be dry.

1.3. Data Recording Measurement Intervals. Measurements shall be continuously recorded during the test in intervals no greater than 10 seconds.

1.4. Test Conditions. The required test conditions shall have dry bulb temperature values according to Table D.1 when measured at point A in figure 6 of ASHRAE 72-2018R and according to Section 6.1 of ASHRAE 72-2018R.

Table D.1 Test Condition Values and Tolerances

Test Condition	Value	Tolerance
Dry Bulb	86.0°F	Average over test period: ± 1.8°F Individual measurements: ± 3.6°F

1.5. Product Pan. The product pan shall be a 12 inch by 20 inch by 2.5 inch, 22 gauge or heavier, and 300 series stainless steel pan. If the blast chiller or blast freezer is not capable of holding the 12 inch by 20 inch by 2.5 inch product pan dimensions, the

manufacturer's recommended pan size shall be used, conforming as closely as possible to the 12 inch by 20 inch by 2.5 inch pan dimensions.

1.6. Product Temperature Measurement. The product temperature shall be measured in the geometric center of the measured product pans using an unweighted thermocouple placed 5/8 of an inch above the bottom of the measured product pan. The thermocouple leads shall be secured to the bottom of the measured product pan while also allowing for the transfer of the measured product pan from the heating source into the blast chiller's or blast freezer's cabinet.

1.7. Product Preparation. The product shall be made for each product pan and shall be loaded to 2 inches of product thickness (i.e., depth) within the product pan unless an additional product pan with a product thickness of less than 2 inches is needed to meet the product capacity determined in section 2.1 of this appendix. A 20 percent by volume propylene glycol (1,2-Propanediol) mixture in water shall be prepared. In each product pan, pour the propylene glycol mixture over #20 mesh southern yellow pine sawdust to create a 22 percent to 78 percent by mass slurry. An example of an acceptable sawdust specification is the American Wood Fibers brand, #20 Mesh Pine Sawdust. Mix until the sawdust becomes completely saturated and leave uncovered in the product pan. Verify that the product pan thermocouple is fully submerged in the product mixture and reposition the product pan thermocouple to the requirements of section 1.6. of this appendix if the product pan thermocouple is incorrectly positioned after mixing. Each product pan shall be weighed before and after the food product simulator is added and prior to heating the product. The weight of the product shall not include the weight of the pans, thermocouples, or wires. A cumulative total of the product weight shall be

calculated and the product pans shall continue to be loaded with the product mixture until the cumulative total reaches, but not exceeds, the product capacity determined in section 2.1 of this appendix with a tolerance of ± 5 percent or ± 2 pounds, whichever is less. The cumulative total weight of product, the weight of product in each individual pan, and the number of pans shall be recorded.

1.8. Product Pan Heating. Measured product pans shall be maintained at an average temperature of 160.0 °F ± 1.8 °F and individual pan temperatures shall be maintained at 160 °F ± 10 °F for a minimum of 8 hours prior to being loaded into the blast chiller or blast freezer. Non-measured product pans shall also be heated for a minimum of 8 hours prior to being loaded into the blast chiller or blast freezer and the non-measured product pans shall be placed in alternating positions with the measured product pans in the heating device. Data acquisition for the temperature of the measured product pans and time measurements shall begin to be recorded prior to the minimum of 8 hours heating period.

1.9. Product Pan Distribution. The product pans shall be spaced evenly throughout each vertical column of rack positions in the blast chiller or blast freezer without the product pans touching any other product pans and without the product pans touching the top and the bottom of the blast chiller or blast freezer cabinet. For blast chillers or blast freezers that have an additional product pan with a product thickness of less than 2 inches, the additional product pan shall be placed as close to the middle rack position as possible while maintaining an even distribution of all product pans. If not all rack positions are occupied by product pans, the product pan locations shall be recorded.

1.10. Measured Product Pans. If multiple product pans are required per level of the blast chiller or blast freezer (i.e., product pans can be loaded side-by-side at the same level), only the product temperature of one product pan per level shall be measured and the product pans measured should alternate vertical columns of the blast chiller or blast freezer cabinet so that each vertical column does not have two measured product pans on sequential levels. If a blast chiller or blast freezer requires an additional product pan with a thickness less than 2 inches, the additional product pan shall not be measured for product temperature.

1.11. Stabilization. The blast chiller or blast freezer shall stabilize at the test conditions specified in section 1.4. of this appendix for at least 24 hours without operating.

1.12. Pre-cool Cycle. Data acquisition for the test condition temperatures specified in section 1.4. of this appendix and time measurements shall begin to be recorded prior to the pre-cool cycle. The pre-cool cycle shall be initiated on a blast chiller or blast freezer once the stabilization specified in section 1.11. of this appendix is complete. The fastest pre-cool cycle shall be selected. The pre-cool cycle shall be complete when the blast chiller or blast freezer notifies the user that the pre-cool is complete. If the blast chiller or blast freezer does not notify the user that the pre-cool cycle is complete, the pre-cool cycle shall be deemed complete when the blast chiller or blast freezer reaches 40°F or 2°F based on the blast chiller's or blast freezer's sensing probe for blast chillers and blast freezers, respectively. For blast chillers or blast freezers without any defined pre-cool cycles, the fastest blast chilling or blast freezing cycle shall be run with an empty cabinet until the blast chiller or blast freezer reaches 40°F or 2°F based on the blast chiller's or blast freezer's sensing probe. During the pre-cool cycle, the blast chiller's or blast

freezer's sensing probe shall remain in its default or holstered position. The pre-cool test data to be recorded are the test condition temperatures specified in section 1.4. of this appendix, pre-cool cycle selected, pre-cool duration, and final pre-cool cabinet temperature based on the blast chiller's or blast freezer's sensing probe.

1.13. Loading. The blast chiller or blast freezer door shall be fully open to an angle of not less than 75 degrees for loading at 4.0 ± 1.0 minutes after the blast chiller or blast freezer completes the pre-cool cycle as specified in section 1.12 of this appendix. The door shall remain open to load all of the product pans for the entirety of the loading procedure. The door shall remain open for 20 seconds per roll-in rack and 15 seconds per product pan for roll-in and standard blast chillers or blast freezers, respectively. The total door open period shall have a tolerance of ± 5 seconds. The blast chiller's or blast freezer's sensing probe shall be inserted into the geometric center of a product pan approximately 1 inch deep in the product mixture at the median pan level in the blast chiller or blast freezer. If the product pan at the median level is the additional product pan with less than 2 inches of product thickness, the closest product pan or product pan level that is farthest away from the evaporator fan shall be used to insert the blast chiller's or blast freezer's sensing probe. If the median pan level has capacity for multiple product pans, the probed product pan shall be the furthest away from the evaporator. The sensing probe shall not touch the bottom of the product pan or be exposed to the air. The location of the product pan with the sensing probe shall be recorded. The sensing probe shall be placed so that there is no interference with the product pan thermocouple. The product pan thermocouple wiring shall not affect the energy performance of the blast chiller or blast freezer. The door shall remain closed for the remainder of the test.

1.14. Blast Chilling or Blast Freezing Cycle. Determine the blast chilling or blast freezing cycle that will conduct the most rapid product temperature pulldown that is designed for the densest food product, as stated in the blast chiller's or blast freezer's manufacturer literature. A blast chilling cycle shall have a target temperature of 38.0 °F and a blast freezing cycle shall have a target temperature of 0.0 °F. The test condition temperatures specified in section 1.4. of this appendix and the time measurements shall continue to be recorded from the pre-cool cycle. Measured product pan temperatures shall continue to be recorded from the minimum of 8-hour period of heating prior to the loading of the product pans into the blast chiller or blast freezer. Electrical supply frequency, electrical supply potential, and energy consumed shall start to be recorded as soon as the blast chiller or blast freezer door is opened to load the product pans. Once the blast chiller or blast freezer door is closed, the blast chilling cycle or blast freezing cycle shall be selected and initiated as soon as is practicable. The blast chilling cycle or blast freezing cycle selected shall be recorded. The blast chilling or blast freezing test period shall continue from the door opening until all individual measured pan temperatures are at or below 40.0 °F or 2.0 °F for blast chiller and blast freezer tests, respectively, regardless of whether the selected cycle program has terminated. If all individual measured pan temperatures do not reach 40.0 °F or 2.0 °F for blast chiller and blast freezer tests, respectively, two hours after the selected cycle program has terminated, the test shall be repeated with the target temperature lowered by 1.0 °F until all individual measured pan temperatures are at or below 40.0 °F or 2.0 °F for blast chiller and blast freezer tests, respectively, at the conclusion of the test. The duration of the blast chiller or blast freezer test shall be recorded.

1.15. Calculations. The measured energy consumption determined in section 1.14. of this appendix shall be reported in kilowatt-hours and shall be divided by the cumulative total weight of product determined in section 1.7. of this appendix in pounds.

2. Capacity Metric.

2.1. Product Capacity. Determine the product capacity by reviewing all manufacturer literature that is included with the blast chiller or blast freezer. The largest product capacity by weight that is stated in the manufacturer literature shall be the product capacity. If the blast chiller or blast freezer is able to operate as both a blast chiller and a blast freezer when set to different operating modes by the user and the manufacturer literature specifies different product capacities for blast chilling and blast freezing, the largest capacity by weight stated for the respective operating mode shall be the product capacity. If no product capacity is stated in the manufacturer literature, the product capacity shall be the product capacity that fills the maximum number of 12 inch by 20 inch by 2.5 inch pans that can be loaded into the blast chiller or blast freezer according to section 1.7. of this appendix. If the blast chiller or blast freezer with no product capacity stated in the manufacturer literature is not capable of meeting the definition of a blast chiller or blast freezer according to 10 CFR 431.62 upon testing according to section 1 of this appendix, one 12 inch by 20 inch by 2.5 inch pan shall be removed from the blast chiller or blast freezer until the definition of a blast chiller or blast freezer is met according to 10 CFR 431.62 when testing according to section 1 of this appendix.