DEPARTMENT OF ENERGY

[Case Number 2020-010; EERE-2020-BT-WAV-0026]

Energy Conservation Program: Notification of Petition for Waiver of Hussmann Corporation from the Department of Energy Walk-in Coolers and Walk-in Freezers Test Procedure and Notice of Grant of Interim Waiver

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

ACTION: Notification of petition for waiver and grant of an interim waiver; request for comments.

SUMMARY: This document announces receipt of and publishes a petition for waiver and interim waiver from Hussmann Corporation ("Hussmann"), which seeks a waiver for specified carbon dioxide ("CO2") direct expansion unit cooler basic models from the U.S. Department of Energy ("DOE") test procedure used to determine the efficiency of walk-in cooler and walk-in freezer refrigeration systems. DOE also gives notice of an Interim Waiver Order that requires Hussmann to test and rate the specified CO2 direct expansion unit cooler basic models in accordance with the alternate test procedure set forth in the Interim Waiver Order. DOE solicits comments, data, and information concerning Hussmann's petition and its suggested alternate test procedure so as to inform DOE's final decision on Hussmann's waiver request.

DATES: The Interim Waiver Order is effective on **[INSERT DATE OF PUBLICATION IN THE *FEDERAL REGISTER*]**. Written comments and information will be accepted on or before **[INSERT DATE 30 DAYS AFTER DATE OF PUBLICATION IN THE *FEDERAL REGISTER*]**.

ADDRESSES: Interested persons are encouraged to submit comments using the Federal eRulemaking Portal at *http://www.regulations.gov*. Alternatively, interested persons may submit comments, identified by case number "2020-010", and Docket number "EERE-2020-BT-WAV-0026," by any of the following methods:

- *Federal eRulemaking Portal*: *http://www.regulations.gov*. Follow the instructions for submitting comments.
- *E-mail*: *HussmannWICF2020WAV0026@ee.doe.gov.* Include Case No. 2020-010 in the subject line of the message.
- *Postal Mail*: Appliance and Equipment Standards Program, U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, Building Technologies Office, Mail Stop EE-5B, Petition for Waiver Case No. 2020-010, 1000 Independence Avenue, SW., Washington, DC 20585-0121. If possible, please submit all items on a compact disc ("CD"), in which case it is not necessary to include printed copies.
- *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 telefacsimilies ("faxes") will be accepted. For detailed instructions on submitting comments and additional information on this process, see the "**SUPPLEMENTARY INFORMATION**" section of this document.

Docket: The docket, which includes *Federal Register* notices, comments, and other supporting documents/materials, is available for review at *http://www.regulations.gov*. All documents in the docket are listed in the *http://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 *http://www.regulations.gov/docket?D=EERE-2020-BT-WAV-0026*. The docket web page contains instruction on how to access all documents, including public comments, in the docket. See the "**SUPPLEMENTARY INFORMATION**" section for information on how to submit comments through *http://www.regulations.gov*.

FOR FURTHER INFORMATION CONTACT:

Ms. Lucy deButts, U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, Building Technologies Office, Mail Stop EE-5B, 1000 Independence Avenue, SW., Washington, DC 20585-0121. E-mail: *AS_Waiver_Request@ee.doe.gov*.

Mr. Michael Kido, U.S. Department of Energy, Office of the General Counsel, Mail Stop GC-33, Forrestal Building, 1000 Independence Avenue, SW., Washington, DC 20585-0103. Telephone: (202) 586-8145. E-mail: *Michael.Kido@hq.doe.gov*.

SUPPLEMENTARY INFORMATION:

DOE is publishing Hussmann's petition for waiver in its entirety in appendix A to this document, pursuant to 10 CFR 431.401(b)(1)(iv)[1]. DOE invites all interested parties to submit in writing by [**INSERT DATE 30 DAYS AFTER DATE OF PUBLICATION IN THE *FEDERAL REGISTER***], comments and information on all aspects of the petition, including the alternate test procedure. Pursuant to 10 CFR 431.401(d), any person submitting written comments to DOE must also send a copy of such comments to the petitioner. The contact

[1] The petition did not identify any of the information contained therein as confidential business information.

information for the petitioner is Ronald Shebik, ron.shebik@hussmann.com, 12999 St. Charles Rock Road, Bridgeton, MO 63044.

Submitting comments via http://www.regulations.gov. The *http://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.

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. If this instruction is followed, 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 *http://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 *http://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 *http://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 *http://www.regulations.gov* provides after you have successfully uploaded your comment.

Submitting comments via email, hand delivery/courier, or postal mail. Comments and documents submitted via email, hand delivery/courier, or postal mail also will be posted to *http://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. If you submit via postal mail or hand delivery/courier, please provide all items on a CD, if feasible, in which case it is not necessary to submit printed copies. Faxes will not 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. According 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, postal mail, or hand delivery/courier 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. Submit these documents via email or on a CD, if feasible. 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).

Case Number 2020-010

Interim Waiver Order

I. Background and Authority

The Energy Policy and Conservation Act, as amended ("EPCA"),[2] authorizes the U.S. Department of Energy ("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[3] of EPCA (42 U.S.C. 6311-6316, as codified), added by the National Energy Conservation Policy Act, Public Law 95-619, sec. 441 (Nov. 9, 1978), established the Energy Conservation Program for Certain Industrial Equipment, which sets forth a variety of provisions designed to improve the energy efficiency for certain types of industrial equipment. Through amendments brought about by the Energy Independence and Security Act of 2007, Pub. L. 110-140, sec. 312 (Dec. 19, 2007), this equipment includes walk-in cooler and walk-in freezer (collectively, "walk-in") refrigeration systems**,** the focus of this document (42 U.S.C. 6311(1)(G)).

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 include definitions (42 U.S.C. 6311), energy conservation standards (42 U.S.C. 6313), test procedures (42 U.S.C. 6314), labeling provisions (42 U.S.C. 6315), and the authority to require information and reports from manufacturers (42 U.S.C. 6316).

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

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[2] All references to EPCA in this document refer to the statute as amended through America's Water Infrastructure Act of 2018, Public Law 115-270 (Oct. 23, 2018).

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

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 covered equipment complies with relevant standards promulgated under EPCA. (42 U.S.C. 6316(a); 42 U.S.C. 6295(s))

Under 42 U.S.C. 6314, EPCA sets forth the criteria and procedures DOE is required to 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 the energy efficiency, energy use or estimated annual operating cost 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)). The test procedure for walk-in refrigeration systems is contained in the Code of Federal Regulations ("CFR") at 10 CFR part 431, subpart R, appendix C, *Uniform Test Method for the Measurement of Net Capacity and AWEF of Walk-In Cooler and Walk-In Freezer Refrigeration Systems* ("Appendix C").

Under 10 CFR 431.401, any interested person may submit a petition for waiver from DOE's test procedure requirements. DOE will grant a waiver from the test procedure requirements if DOE determines either that the basic model for which the waiver was requested contains a design characteristic that prevents testing of the basic model according to the prescribed test procedures, or that the prescribed test procedures 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(f)(2). A petitioner must include in its petition any alternate test procedures known to the petitioner to evaluate the performance of the equipment type in a manner representative of the energy consumption characteristics of the basic

model. 10 CFR 431.401(b)(1)(iii). DOE may grant the waiver subject to conditions, including adherence to alternate test procedures specified by DOE. 10 CFR 431.401(f)(2).

As soon as practicable after the granting of any waiver, DOE will publish in the *Federal Register* a notice of proposed rulemaking to amend its regulations so as to eliminate any need for the continuation of such waiver. 10 CFR 431.401(l). As soon thereafter as practicable, DOE will publish in the *Federal Register* a final rule to that effect. *Id*.

The waiver process also provides that DOE may grant an interim waiver if it appears likely that the underlying petition for waiver will be granted and/or if DOE determines that it would be desirable for public policy reasons to grant immediate relief pending a determination on the underlying petition for waiver. 10 CFR 431.401(e)(2). Within one year of issuance of an interim waiver, DOE will either: (i) publish in the *Federal Register* a determination on the petition for waiver; or (ii) publish in the *Federal Register* a new or amended test procedure that addresses the issues presented in the waiver. 10 CFR 431.401(h)(1).

When DOE amends the test procedure to address the issues presented in a waiver, the waiver will automatically terminate on the date on which use of that test procedure is required to demonstrate compliance. 10 CFR 431.401(h)(2).

II. Hussmann's Petition for Waiver and Interim Waiver

On July 16, 2020, Hussmann filed a petition for waiver and interim waiver from the test procedure for walk-in refrigeration systems set forth at 10 CFR part 431, subpart R, appendix C (Hussmann, No. 1 at p. 1[4]). Hussmann also included Appendix I to their petition with

[4] A notation in the form "Hussmann, No.1" identifies a written submission: (1) made by Hussmann; and (2) recorded in document number 1 that is filed in the docket of this petition for waiver (Docket No. EERE-2020-BT-WAV-0026) and available at *http://www.regulations.gov/docket?D=EERE-2020-BT-WAV-0026*.

clarifications and responses to two questions posed to Hussmann by DOE regarding their CO2 direct expansion unit cooler subject basic models (Hussmann, No. 1 at p. 7-8). Hussmann claims that the test conditions described in Table 15 and Table 16 of the Air-Conditioning, Heating, and Refrigeration Institute ("AHRI") Standard 1250-2009, *Standard for Performance Rating of Walk-In Coolers and Freezers* ("AHRI 1250-2009") (for walk-in refrigerator unit coolers and freezer unit coolers tested alone, respectively), as incorporated by Appendix C with modification, cannot be achieved by the specified basic models and are not consistent with operation of Hussmann's CO2 direct expansion unit coolers. Hussmann stated that CO2 has a critical temperature of 87.8 ˚F[5], and thus the required liquid inlet saturation temperature of 105 ˚F and the required liquid inlet subcooling temperature of 9 ˚F required in DOE's test procedure are not achievable, and that the test conditions should be more consistent with typical operating conditions for a transcritical CO2 booster system (Hussmann, No. 1 at p.3).

The statements made by Hussmann reference the difference in thermodynamic properties between CO2 and other refrigerants. At modest pressures (i.e. below the critical point), many substances transition from a solid to a liquid to a gas as temperature increases. For example, a pure substance like water transitions from liquid to steam at a specific temperature, e.g. 212 ˚F, at atmospheric pressure. As heat is added during a liquid to gas transition, the temperature remains constant and the substance coexists as both liquid and vapor. Continuing to add heat converts more of the liquid to vapor at a constant temperature. The reverse occurs when heat is removed. However, the transition temperature depends on the pressure – the higher the pressure, the higher the transition temperature. This is a key principle in refrigeration systems, which operate at two pressure levels associated with two temperatures. A refrigerant absorbs heat when

[5] The test procedure specifies the unit cooler refrigerant inlet condition in terms of a saturation temperature (the temperature at which it completes the condensation process in a condenser) and the subcooling temperature (additional reduction in temperature lower than the specified saturation temperature). For CO2, the critical temperature above which there cannot exist separate liquid and gas phases is below the saturation condition specified in the test procedure, hence the specified condition cannot be achieved.

it is at a low temperature and pressure, converting to gas and cooling the surrounding space. At high temperature and pressure, the refrigerant transitions to a liquid while releasing heat to the environment. A compressor is used to raise the low-pressure gas to a high pressure, and a throttle (pressure reduction device) is used to reduce the pressure once the refrigerant has been fully liquefied (condensed) at high pressure.

All refrigerants have a "critical pressure" and an associated "critical temperature" above which liquid and vapor phases cannot coexist. Above this critical point, the refrigerant will be a gas and its temperature will increase or decrease as heat is added or removed. For all conventional refrigerants, the critical pressure is so high that it is never exceeded in typical refrigeration cycles. For example, R404A is a common refrigerant used in refrigeration systems that has a critical pressure of 540.8 psia[6] with an associated critical temperature of 161.7 ˚F. However, CO2 behaves differently, with a critical pressure of 1,072 psia associated with a much lower critical temperature of 87.8 ˚F. The refrigerant temperature must be somewhat higher than the ambient temperature in order to reject refrigeration cycle heat to the ambient environment. Ambient temperatures greater than 87.8 °F are common and the performance of many refrigeration and air conditioning systems are tested using a 95 ˚F ambient temperature, as indicated by the A test condition in AHRI 1250-2009 Section 5. At temperatures greater than the critical temperature, the CO2 refrigerant is in a supercritical state (i.e. a condition with pressure above the critical temperature) and heat is transferred to the environment. Since useful cooling is provided below the critical temperature, CO2 cycles are said to be transcritical.

The transcritical nature of CO2 generally requires more complex refrigeration cycle design to approach the efficiency of traditional refrigerants (i.e., R404A, R407A, R448A, etc.)

[6] Absolute pressure is the pressure measured relative to a complete vacuum; "psia" represents the absolute pressure in pounds per square inch.

during operation in high temperature conditions. To increase efficiency and prevent overheating, transcritical booster systems introduce (or use) multiple stages of compression and intercooling. CO2 is cooled in the gas cooler of a transcritical booster system, then expands through a high-pressure control valve and is delivered to a subcritical-pressure flash tank. In the flash tank, the refrigerant is in the subcritical phase and the liquid and vapor phases can be separated. A unit cooler in a CO2 booster system would be supplied with liquid refrigerant from the flash tank via expansion valves where the refrigerant is evaporated. The evaporated refrigerant is subsequently compressed up to gas cooler pressure to complete the cycle (Hussmann, No. 5).

Hussmann also requests an interim waiver from the existing DOE test procedure. DOE will grant an interim waiver if it appears likely that the petition for waiver will be granted, and/or if DOE determines that it would be desirable for public policy reasons to grant immediate relief pending a determination of the petition for waiver. *See* 10 CFR 431.401(e)(2).

Based on the assertions in the petition, absent an interim waiver, the prescribed test procedure is not appropriate for Hussmann's CO2 direct expansion unit coolers and the test conditions are not achievable, since CO2 refrigerant has a critical temperature of 87.8 °F and the current DOE test procedure calls for a liquid inlet saturation temperature of 105°F. The inability to achieve test conditions for the stated basic models would result in economic hardship from loss of sales stemming from the inability of the DOE test procedure to address the operating conditions of Hussmann's equipment.

III Requested Alternate Test Procedure

EPCA requires that manufacturers use the applicable DOE test procedures when making representations about the energy consumption and energy consumption costs of covered equipment (42 U.S.C. 6314(d)). Consistency is important when making representations about

the energy efficiency of equipment, including when demonstrating compliance with applicable DOE energy conservation standards. Pursuant to 10 CFR 431.401, and after consideration of public comments on the petition, DOE may establish in a subsequent Decision and Order an alternate test procedure for the basic models addressed by the Interim Waiver Order.

Hussmann seeks to test and rate specific CO2 direct expansion unit cooler basic models with modifications to the DOE test procedure. Hussmann's suggested approach specifies using modified liquid inlet saturation and liquid inlet subcooling temperatures of 38˚F and 5˚F, respectively, for both walk-in refrigerator unit coolers and walk-in freezer unit coolers. Additionally, Hussmann recommends that because the subject units are used in transcritical CO2 booster systems, the calculations in AHRI 1250-2009 section 7.9 should be used to determine the Annual Walk-in Efficiency Factor ("AWEF") and net capacity for unit coolers matched to parallel rack systems as required under the DOE test procedure. This section of AHRI 1250-2009 is prescribed by the DOE test procedure for determining AWEF for all unit coolers tested alone (see 10 CFR part 431, subpart R, appendix C, section 3.3.1). Finally, Hussmann also suggested that AHRI 1250-2009 Table 17 (EER [Energy Efficiency Ratio] for Remote Commercial Refrigerated Display Merchandisers and Storage Cabinets) should be used to determine EER values and power consumption for the subject CO2 direct expansion unit cooler systems as required under the DOE test procedure.

IV. Interim Waiver Order

DOE has reviewed Hussmann's application, its suggested testing approach, industry materials regarding CO2 transcritical booster systems, and Hussmann's consumer-facing materials, including websites and product specification sheets for the basic models listed in Hussmann's petition. Based on this review, the suggested testing approach appears to allow for the accurate measurement of energy efficiency of the specified basic models, while alleviating

the testing issues associated with Hussmann's implementation of walk-in cooler and walk-in freezer testing for these basic models. Review of the CO2 refrigeration market confirms that the test conditions of the testing approach suggested by Hussmann would be representative for operation of a unit cooler used in a transcritical CO2 booster system. CO2 that is cooled in the gas cooler of a transcritical booster system expands through a high-pressure control valve that delivers CO2 to a subcritical-pressure flash tank, where liquid and vapor phases of the refrigerant are separated. The liquid is then split and the unit coolers receive the refrigerant at the same condition, consistent with the use of the same liquid inlet saturation temperature for both the medium- and low-temperature systems in Hussmann's suggested test approach. Calculations on other external CO2 refrigeration system designs in the market indicate that the 38 °F liquid unit cooler inlet saturation temperature suggested by Hussmann is representative of CO2 booster systems (Hussmann, No.5). Regarding use of the EER values in AHRI 1250-2009 Table 17 to determine the representative compressor power consumption for CO2 unit cooler systems, research into the performance of different configurations of CO2 booster systems shows that enhanced CO2 cycles (like those used in transcritical booster systems) can match conventional refrigerants in average annual efficiency (Hussmann, No. 2). The findings from this research, along with the other collective factors previously noted, justifies the use of the EER values in AHRI 1250-2009 Table 17 for determining the power consumption for CO2 booster system evaporators, despite these EER values being initially established for systems using conventional refrigerants. Consequently, DOE has determined that Hussmann's petition for waiver likely will be granted. Furthermore, DOE has determined that it is desirable for public policy reasons to grant Hussmann immediate relief pending a determination of the petition for waiver.

For the reasons stated, it is **ORDERED** that:

(1) Hussmann must test and rate the following CO2 direct expansion unit cooler basic models with the alternate test procedure set forth in paragraph (2).

Basic Models for Which a Waiver is Requested:

Manufacturer	Brand	Basic Model
Hussmann	Krack	KRD***-***C***
Hussmann	Krack	G*D***-***C***
Hussmann	Krack	LHD***-***C***
Hussmann	Krack	MKD***-***C***

(2) The Hussmann basic models identified in paragraph (1) of this Interim Waiver Order shall be tested according to the test procedure for walk-in cooler and walk-in freezer refrigeration systems prescribed by DOE at 10 CFR part 431, subpart R, appendix C ("Appendix C"), except that the liquid inlet saturation temperature test condition and liquid inlet subcooling temperature test condition shall be modified to 38˚F and 5˚F, respectively, for both walk-in refrigerator unit coolers and walk-in freezer unit coolers, as detailed below. All other requirements of Appendix C and DOE's regulations remain applicable.

In Appendix C, under section 3.1**.** *General modifications: Test Conditions and Tolerances,* revise section 3.1.5., to read as follows:

3.1.5. Tables 15 and 16 shall be modified to read as follows:

TABLE 15—REFRIGERATOR UNIT COOLER

Test description	Unit cooler air entering dry-bulb, °F	Unit cooler air entering relative humidity, %	Saturated suction temp, °F	Liquid inlet saturation temp, °F	Liquid inlet subcooling temp, °F	Compressor capacity	Test objective

Off Cycle Fan Power	35	<50	—	—	—	Compressor Off	Measure fan input power during compressor off cycle.
Refrigeration Capacity Suction A	35	<50	25	38	5	Compressor On	Determine Net Refrigeration Capacity of Unit Cooler.

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

TABLE 16—FREEZER UNIT COOLER

Test description	Unit cooler air entering dry-bulb, °F	Unit cooler air entering relative humidity, %	Saturated suction temp, °F	Liquid inlet saturation temp, °F	Liquid inlet subcooling temp, °F	Compressor capacity	Test objective
Off Cycle Fan Power	−10	<50	—	—	—	Compressor Off	Measure fan input power during compressor off cycle.
Refrigeration Capacity Suction A	−10	<50	−20	38	5	Compressor On	Determine Net Refrigeration Capacity of Unit Cooler.
Defrost	−10	Various	—	—	—	Compressor Off	Test according to Appendix C Section C11.

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

(3) *Representations*. Hussmann may not make representations about the energy efficiency of a basic model listed in paragraph (1) of this Interim Waiver Order for compliance, marketing, or other purposes unless the basic model has been tested in accordance with the provisions set forth

in this alternate test procedure and such representations fairly disclose the results of such testing.

(4) This Interim Waiver Order shall remain in effect according to the provisions of 10 CFR 431.401.

(5) This Interim Waiver Order is issued on the condition that the statements and representations provided by Hussmann are valid. If Hussmann makes any modifications to the controls or configurations of a basic model subject to this Interim Waiver Order, such modifications will render the waiver invalid with respect to that basic model, and Hussmann will either be required to use the current Federal test method or submit a new application for a test procedure waiver. DOE may rescind or modify this waiver at any time if it determines the factual basis underlying the petition for the Interim Waiver Order is incorrect, or the results from the alternate test procedure are unrepresentative of the basic model's true energy consumption characteristics. 10 CFR 431.401(k)(1). Likewise, Hussmann may request that DOE rescind or modify the Interim Waiver Order if Hussmann discovers an error in the information provided to DOE as part of its petition, determines that the interim waiver is no longer needed, or for other appropriate reasons. 10 CFR 431.401(k)(2).

(6) Issuance of this Interim Waiver Order does not release Hussmann from the applicable requirements set forth at 10 CFR part 429.

DOE makes decisions on waivers and interim waivers for only those basic models specifically set out in the petition, not future models that may be manufactured by the petitioner. Hussmann may submit a new or amended petition for waiver and request for grant of interim waiver, as appropriate, for additional basic models of CO2 direct expansion unit coolers. Alternatively, if appropriate, Hussmann may request that DOE extend the scope of a waiver or

an interim waiver to include additional basic models employing the same technology as the basic model(s) set forth in the original petition consistent with 10 CFR 431.401(g).

Signing Authority

This document of the Department of Energy was signed on December 28, 2020, by Daniel R Simmons, 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 December 29, 2020.

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Treena V. Garrett
Federal Register Liaison Officer,
U.S. Department of Energy

Appendix A

HUSSMANN®

Hussmann Corporation
12999 St. Charles Rock Road
Bridgeton, MO 63044
Office (314) 291-2000 Fax (314) 298-4756 www.hussmann.com

July 16, 2020

John Cymbalsky
U.S. Department of Energy
Building Technologies Office
Test Procedure Waiver
1000 Independence Avenue SW
Mailstop EE-5B
Washington, DC 20585-0121

Re: Hussmann Corporation Petition for Waiver and Interim Waiver of Test Procedures for Refrigeration Systems for Walk- In Coolers and Freezers

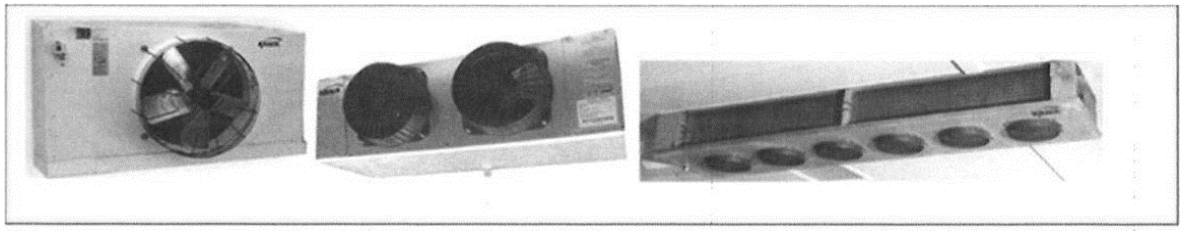
Dear Mr. Cymbalsky:

Hussmann Corporation submits this Petition for Waiver and application for an Interim Waiver from DOE test procedure. Pursuant to provisions described in 10 CFR 431.401 for the following product on the grounds that "the basic model contains one or more design characteristics that prevent testing of the basic model according to the prescribed test procedures."

Basic Models for Which a Waiver is Requested

Manufacturer	Brand	Basic Model
Hussmann	Krack	KRD***-***C***
Hussmann	Krack	G*D***-***C***
Hussmann	Krack	LHD***-***C***
Hussmann	Krack	MKD***-***C***

CO2 Direct Expansion Unit Coolers in Medium and Low Temperature



The design Characteristics Constituting the Grounds for Petition

- Appendix C to Subpart R of Part 431 — "Uniform Test Method for the Measurement of Net Capacity and AWEF of Walk-in Cooler and Walk-in Freezer Refrigeration Systems" specifies that unit coolers tested alone must use the test procedures described in AHRI Standard 12502009. Tables 15 and 16 of AHRI 1250-2009 are as follows:

Table 15—Refrigerator Unit Cooler

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

Table 16—Freezer Unit Cooler

Test description	Unit cooler air entering dry-bulb °F	Unit cooler air entering relative humidity,	Saturated suction temp, °F	Liquid inlet saturation temp, °F	Liquid inlet subcooling temp, °F	Compressor capacity	Test objective

		%					
Off Cycle Fan Power	-10	<50	--	--	—	Compressor Off	Measure fan input power during compressor off cycle.
Refrigeration Capacity Suction A	-10	<50	-20	105	9	Compressor On	Determine Net Refrigeration Capacity of Unit Cooler.
Refrigeration Capacity Suction B	-10	<50	-26	105	9	Compressor On	Determine Net Refrigeration Capacity of Unit Cooler.
Defrost	-10	Various	--	--	--	Compressor Off	Test according to Appendix C Section C11.

- Tables 15 and 16 do not apply when CO2 is used as a refrigerant. CO2 refrigerant has a critical temperature of 87.8^0 F. Because of this property of CO2, the liquid inlet saturation temperature of 105^0 F and the liquid inlet subcooling temperature of 9^0 F as specified in Table 15 and Table 16 are not achievable.

Specific Requirements Sought to Be Waived

The current test procedure is not achievable when CO2 is used for these covered products. Hussmann is petitioning for a waiver to adjust Liquid inlet saturation temperature and Liquid inlet subcooling temp aligned to be in line with typical CO2 systems. This will allow direct expansion unit coolers to be tested. See Appendix I within this document for an example of a typical multi-stage transcritical CO2 system documenting supplied/ requested liquid temperatures.

Proposed Alternate Test Procedure

1. Utilize the test procedure as outlined in Appendix C to Subpart R of Part 431 — "Uniform Test Method for the Measurement of Net Capacity and AWEF of Walk-in Cooler and Walk-in Freezer Refrigeration Systems" with reference to AHRI 1250-2009 and modify Tables 15 and 16 for CO2 liquid inlet saturation temperature and liquid inlet subcooling temperature as noted below.
2. In addition, per Appendix C to Subpart R of 431 use the calculations in AHRI 1250 section 7.9 (Walk-in Unit Cooler Match to Parallel Rack System.) to

determine AWEF and net capacity for unit coolers matched to parallel rack systems.

Proposed CO2 Direct Expansion Unit Cooler Test Conditions

Test description	Unit cooler air entering dry-bulb, °F	Unit cooler air entering relative humidity, %	Saturated suction temp, °F	Liquid inlet saturation temp, °F	Liquid inlet subcooling temp, °F	Compressor capacity	Test objective
Off Cycle Fan Power	35	<50	—	—	—	Compressor Off	Measure fan input power during compressor off cycle.
Refrigeration Capacity Suction A	35	<50	25	38	5	Compressor On	Determine Net Refrigeration Capacity of Unit Cooler.
Refrigeration Capacity Suction B	35	<50	20	38	5	Compressor On	Determine Net Refrigeration Capacity of Unit Cooler.

Proposed CO2 Direct Expansion Freezer Test Conditions

Test description	Unit cooler air entering dry-bulb, °F	Unit cooler air entering relative humidity, %	Saturated suction temp, °F	Liquid inlet saturation temp, °F	Liquid inlet subcooling temp, °F	Compressor capacity	Test objective
Off Cycle Fan Power	−10	<50	—	—	—	Compressor Off	Measure fan input power during compressor off cycle.
Refrigeration Capacity Suction A	−10	<50	−20	38	5	Compressor On	Determine Net Refrigeration Capacity of Unit Cooler.
Refrigeration Capacity Suction B	−10	<50	−26	38	5	Compressor On	Determine Net Refrigeration

							Capacity of Unit Cooler.
Defrost	−10	Various	—	—	—	Compressor Off	Test according to Appendix C Section C11.

List of Manufacturers of all Other Basic Models Marketed in the United States and Known to the Petitioner to Incorporate Similar Design Characteristics

Manufacturer: Heatcraft (Bohn, Larkin, Chandler)
Manufacturer: HTPG (Kramer, Witt, Russell)
Manufacturer: Guntner
Manufacturer: RefPlus
Manufacturer: KeepRite
Manufacturer: Can Coil

Success of The Application for Petition for Waiver

Hussmann Corporation also petitions for an Interim Waiver for the Basic Models listed on page 1 based on the merits of the proposed alternate test procedure, which represents actual application operating conditions. With the alternate test procedure, Hussmann's calculations will accurately represent the energy consumption of CO2 direct expansion unit coolers. Therefore, we believe the likelihood for petition for waiver to be granted is high. A grant of the interim waiver will ensure that Hussmann can continue to support users of CO2 Unit Coolers for Medium and Low Temperature applications.

Economic Hardships and Competitive Disadvantages
Key national customers have already transitioned over from HFCs to CO2 applications. Without this exception and a grant of this petition, Hussmann Corporation will not be able to supply the existing customers with the unit coolers they need to service both existing and new stores and supermarkets. In anticipation of new environmental regulations from States such as California many regional customers are beginning to transition to CO2 to comply with those regulation. Since California will be requiring new stores to utilize CO2, the absence of a favorable determination on this application will mean that our customers will not be able to open new stores in the California market. As a result, this can lead to significant revenue loss from sales and loss of employment both within Hussmann and its customers, therefore affecting the overall market.

Conclusion
Hussmann Corporation petitions DOE to grant the use of the Alternate Test Procedure and an Interim Waiver from DOE's current requirement to test CO2 direct expansion unit coolers.

Sincerely,
/s/

Wilson Mwaura
Compliance Engineer

Appendix I [to petition]- Clarification to proposed alternate test procedure.

1. The suggested unit cooler inlet conditions suggest that the CO2 unit coolers would be used in systems with multistage CO2 or cascade refrigeration systems. Please provide any information that confirms that this is consistent with the representative installation scenario for them.
   - Because of the physical properties of CO2, the refrigerant must be below 86.7°F to be a liquid to feed expansion valves. Transcritical CO2 systems are designed to use an intermediate pressure flash tank to reduce the temperature of the CO2 to supply the expansion valves. Typically operating at 550 psig and 37.8°F, the flash tank separates liquid to supply the evaporators from the gas which will be returned to the compressor for recompression. Reference typical basic system design information from Bitzer software below. Cascade systems supply CO2 to the evaporators and use a second refrigeration system to condense the CO2 at the lowest evaporating temperature required by the medium temperature systems, typically 20°F.[7]

2. The waiver petition does not mention the EER values that are used in the test procedure calculations. Please provide information regarding the overall performance of representative CO2 system installations that confirms that the current EER values, developed for single- compression-stage air-cooled refrigeration using R-404A or similar refrigerant, are representative.

   - The petition now references AHRI 1250 2009 section 7.9 which includes Table 17 for the EER values. The EER table is a representative set of values for rack systems and is not refrigerant specific nor is the AHRI 1250-2009 test procedure refrigerant specific. Utilizing these values will result in a consistent determination of the performance of the unit coolers.

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[7] A screenshot provided by Hussmann of data to support the assertions made in this response is made available for ease in reading the contained information at *http://www.regulations.gov/document?D=EERE-2020-BT-WAV-0026* (Docket No. EERE-2020-BT-WAV-0026).