[6450-01-P]

DEPARTMENT OF ENERGY

10 CFR Part 431

[EERE–2019–BT–TP–0041]

RIN 1904-AE57

Energy Conservation Program: Test Procedure for Commercial Warm Air Furnaces

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

ACTION: Request for information.

SUMMARY: The U.S. Department of Energy (DOE) is initiating a data collection process through this request for information (RFI) to consider whether to amend DOE's test procedure for commercial warm air furnaces, in large part by updating references to the most recent versions of the relevant industry test standards. DOE also seeks information on any additional topics that may assist with DOE's decision whether to conduct a future test procedure rulemaking, including whether amended test procedures would more accurately or fully comply with the requirement that they be reasonably designed to produce test results that measure energy efficiency of commercial warm air furnaces during a representative average use cycle, and not be unduly burdensome to conduct. DOE welcomes written comments from the public on any subject within the scope of this document (including topics not raised in this RFI), as well as the submission of data and other relevant information.

DATES: Written comments and information are requested and 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*. Follow the instructions for submitting comments. Alternatively, interested persons may submit comments, identified by docket number EERE–2019–BT–TP–0041 and/or RIN 1904-AE57, by any of the following methods:

1. *Federal eRulemaking Portal*: *http://www.regulations.gov*. Follow the instructions for submitting comments.
2. *E-mail*: to *Furnaces2019TP0041@ee.doe.gov*. Include docket number EERE–2019–BT–TP–0041 and/or RIN 1904-AE57 in the subject line of the message.
3. *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.
4. *Hand Delivery/Courier*: Appliance and Equipment Standards Program, U.S. Department of Energy, Building Technologies Office, 950 L'Enfant Plaza, SW., Suite 600, 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 section III of this document.

Docket: The docket for this activity, 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 webpage can be found at: *https://www1.eere.energy.gov/buildings/appliance_standards/standards.aspx?productid=49&action=viewlive*. The docket webpage contains instructions on how to access all documents, including public comments, in the docket. See section III of this RFI for information on how to submit comments through *http://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-5B, 1000 Independence Avenue, SW., Washington, DC, 20585-0121. Telephone: (202) 287-1943. E-mail: *ApplianceStandardsQuestions@ee.doe.gov*.

Mr. Eric Stas, U.S. Department of Energy, Office of the General Counsel, GC-33, 1000 Independence Avenue, SW., Washington, DC, 20585-0121. Telephone: (202) 586-5827. E-mail: *Eric.Stas@hq.doe.gov*.

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

SUPPLEMENTARY INFORMATION:

Table of Contents

I. Introduction

Commercial warm air furnaces 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)(J)) DOE's test procedures for commercial warm air furnaces are prescribed at Title 10 of the Code of Federal Regulations (CFR) section 431.76 (10 CFR 431.76). The following sections discuss DOE's authority to establish and amend test procedures for commercial warm air furnaces, as well as relevant background information regarding DOE's consideration of test procedures for this equipment.

A. Authority and Background

The Energy Policy and Conservation Act, as amended (EPCA)[1], among other things, 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, Public Law 94-163 (42 U.S.C. 6311-6317, as codified), added by Public Law 95-619, Title IV, §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 commercial warm air furnaces, which are the subject of this RFI. (42 U.S.C. 6311(1)(J))

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

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), 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).

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 (b); 42 U.S.C. 6297) DOE may, however, grant waivers of Federal preemption in limited circumstances for particular State laws or regulations, in accordance with the procedures and other provisions of EPCA. (42 U.S.C. 6316(b)(2)(D); 42 U.S.C. 6297)

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(b); 42 U.S.C. 6296), and (2) making representations about the efficiency of that equipment (42 U.S.C. 6314(d)). Similarly, DOE uses these test procedures to determine whether the equipment complies with relevant standards promulgated under EPCA.

Under 42 U.S.C. 6314, the statute 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))

If DOE determines that a test procedure amendment is warranted, it must publish proposed test procedures in the Federal Register and offer the public an opportunity to present oral and written comments on them. (42 U.S.C. 6314(b))

EPCA requires that the test procedures for commercial warm air furnaces be those generally accepted industry testing procedures or rating procedures developed or recognized by the Air-Conditioning, Heating, and Refrigeration Institute (AHRI) or by the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE), as referenced in ASHRAE Standard 90.1, "Energy Standard for Buildings Except Low-Rise Residential Buildings" (ASHRAE Standard 90.1). (42 U.S.C. 6314(a)(4)(A)) If such an industry test procedure or rating procedure is amended, DOE must amend its test procedure to be consistent with the amended industry test procedure or rating procedure, unless DOE determines, by rule published in the *Federal Register* and supported by clear and convincing evidence, that the amended test procedure would not meet the requirements in 42 U.S.C. 6314(a)(2) and (3) related to representative use and test burden, in which case DOE may establish an amended test procedure that does satisfy those statutory provisions. (42 U.S.C. 6314(a)(4)(B) and (C))

In addition, the Energy Independence and Security Act of 2007 (EISA 2007), Public Law 110-140, amended EPCA to require that, at least once every 7 years, DOE evaluate test procedures for each type of covered equipment, including commercial warm air furnaces that are the subject of this RFI, 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. (42 U.S.C. 6314(a)(1)(A)(ii))

DOE is publishing this RFI to collect data and information to inform its decision in satisfaction of its statutory requirements.

B. Rulemaking History

DOE's current test procedure for commercial warm air furnaces is codified at 10 CFR 431.76. It incorporates by reference at 10 CFR 431.75 certain sections of two industry standards for testing gas-fired commercial warm air furnaces: American National Standards Institute (ANSI) Z21.47-2012, "Standard for Gas-fired Central

Furnaces" (ANSI Z21.47-2012), which is used for all types of gas-fired commercial warm air furnaces; and ANSI/American Society of Heating, Refrigeration, and Air-conditioning Engineers (ASHRAE) Standard 103-2007, "Method of Testing for Annual Fuel Utilization Efficiency of Residential Central Furnaces and Boilers," which is specifically for testing condensing gas-fired commercial warm air furnaces. For oil-fired commercial warm air furnaces, the test procedure also incorporates by reference certain sections of two industry standards: Underwriters Laboratories (UL) standard UL 727-2006 "Standard for Safety Oil-Fired Central Furnaces" (UL 727-2006)[3], and Hydronics Institute Division of AHRI (HI) BTS-2000 "Method to Determine Efficiency of Commercial Space Heating Boilers" (HI BTS-2000).

DOE first codified a test procedure for commercial warm air furnaces in a final rule published on October 21, 2004. 69 FR 61916 (October 2004 final rule). For gas-fired commercial warm air furnaces, the October 2004 final rule incorporated by reference the most up-to-date industry test procedure referenced in ASHRAE 90.1 at the time, which was ANSI Z21.47-1998, "Gas-Fired Central Furnaces." 69 FR 61916, 61917, 61940 (Oct. 21, 2004). DOE also incorporated by reference certain provisions from ANSI/ASHRAE Standard 103-1993, "Method of Testing for Annual Fuel Utilization Efficiency of Residential Central Furnaces and Boilers," for calculating the effect of condensing operation on efficiency. *Id.* For oil-fired commercial warm air

[3] UL 727-1994 is also incorporated by reference in 10 CFR 431.75; however, the test method specified in 10 CFR 431.76 only references UL-2006. Both UL 727-1994 and UL 727-2006 were incorporated by reference in 10 CFR 431.75 as part of the May 2012 final rule because prior to the compliance date of May 13, 2013, either version of the UL 727 could be used. 77 FR 28928, 28987 (May 16, 2012).

furnaces, the October 2004 final rule incorporated by reference UL Standard 727-1994 "Standard for Safety Oil-Fired Central Furnaces" (UL 727-1994), which was the most up to date version of the UL 727 test procedure at the time. *Id*. DOE determined that UL 727-1994 did not provide a procedure for calculating the percent flue loss of the furnace, which is necessary in calculating the thermal efficiency. 69 FR 61916, 61920 (Oct. 21, 2004). Therefore, DOE also incorporated by reference provisions from HI BTS-2000, "Method to Determine Efficiency of Commercial Space Heating Boilers," to calculate the flue loss for oil-fired commercial warm air furnaces. 69 FR 61916, 61917, 61940 (Oct. 21, 2004).

DOE further amended the test procedure for commercial warm air furnaces in a final rule published on May 16, 2012 (May 2012 final rule), which updated the test procedure to incorporate by reference the latest versions of the industry standards at the time, as referenced in ASHRAE Standard 90.1-2010 (*i.e.*, ANSI Z21.47-2006 and UL 727-2006 for gas-fired and oil-fired commercial warm air furnaces, respectively)[4]. 77 FR 28928, 28987. In the May 2012 final rule, DOE determined that the changes in the updated test procedures for gas-fired and oil-fired commercial warm air furnaces did not substantially impact the measurement of energy efficiency and should be adopted to comply with the provisions set forth in EPCA. 77 FR 28928, 28944 (May 16, 2012).

[4] Compliance with the updated industry test procedures that were incorporated by reference was required beginning on May 13, 2013, before which time, the previous or updated versions of the industry test procedures incorporated by reference could be used. 77 FR 28928, 28935 (May 16, 2012).

DOE most recently amended the test procedure for commercial warm air furnaces in a final rule published on July 17, 2015, which updated the test procedure for gas-fired commercial warm air furnaces to incorporate by reference the latest version of the industry standard available at the time, ANSI Z21.47-2012. 80 FR 42614 (July 2015 final rule). More specifically, DOE determined in the July 2015 final rule that the specific changes between ANSI Z21.47-2006 and ANSI Z21.47-2012 did not include any updates in the sections referenced by the DOE test procedure that would impact the test method, and, therefore, adopted the updated industry standard as required by EPCA. 80 FR 42614, 42620, 42663 (July 17, 2015). At the time of the July 2015 final rule, UL 727-2006 was still the most recent version of that standard and referenced in ASHRAE 90.1-2013, so DOE did not amend its test procedure for oil-fired commercial warm air furnaces. The July 2015 final rule also updated to the most recent version of ANSI/ASHRAE 103 at the time (*i.e.*, ANSI/ASHRAE 103-2007). *Id.*

II. Request for Information

In the following sections, DOE has identified a variety of issues on which it seeks input to aid in the development of the technical and economic analyses regarding whether amended test procedures for commercial warm air furnaces would be warranted. More specifically, DOE seeks to determine whether to update the references in the commercial warm air furnace test procedure to the most recent versions of the incorporated industry standards, or whether such an update would not meet the requirements in EPCA that test procedures: (1) be reasonably designed to produce test results which reflect energy efficiency, energy use, and estimated operating costs of a type of industrial equipment (or

class thereof) during a representative average use cycle; and (2) not be unduly burdensome to conduct. (42 U.S.C. 6314(a)(2) and (4)(B)) DOE is also requesting comment on any opportunities to streamline and simplify testing requirements for commercial warm air furnaces.

Further, the Department recently published an RFI regarding test procedures across the full range of consumer products and industrial equipment that fall under its regulatory authority pursuant to EPCA. 84 FR 9721 (March 18, 2019). In that RFI, DOE noted that, over time, many of DOE's test procedures have been amended to account for products' and equipment's increased functionality and modes of operation. DOE's intent in issuing that RFI was to gather information to ensure that the inclusion of measurement provisions in its test procedures associated with such increased functionality has not inadvertently compromised the measurement of representative average use cycles or periods of use, and made some test procedures unnecessarily burdensome. Although the comment period on the March 2019 RFI has since closed, DOE seeks comment on this issue as it specifically pertains to the test procedure for commercial warm air furnaces, which are the subject of this current RFI.

DOE seeks comment on whether there have been changes in product testing methodology or new products on the market since the last test procedure update that may create the need to make amendments to the test procedure for commercial warm air furnaces. Specifically, DOE seeks data and information that could enable the agency to propose that the current test procedure produces results that are representative of an average use cycle for the product and is not unduly burdensome to conduct, and,

therefore, does not need amendment. DOE also seeks information on whether an existing private sector-developed test procedure would produce such results and should be adopted by DOE rather than DOE establishing its own test procedure, either entirely or by adopting only certain provisions of one or more private sector-developed tests.

Additionally, DOE welcomes comments on other issues relevant to the conduct of this process that may not be specifically identified elsewhere in this document. In particular, DOE notes that under section 1 of Executive Order 13771, "Reducing Regulation and Controlling Regulatory Costs," Executive Branch agencies such as DOE are directed to manage the costs associated with the imposition of expenditures required to comply with Federal regulations. *See* 82 FR 9339 (Feb. 3, 2017). Consistent with that Executive Order, DOE encourages the public to provide input on measures DOE could take to lower the cost of its test procedure regulations applicable to commercial warm air furnaces consistent with the requirements of EPCA.

A. Scope and Definitions

This RFI covers commercial warm air furnaces. EPCA defines "warm air furnace" as a self-contained oil- or gas-fired furnace designed to supply heated air through ducts to spaces that require it and includes combination warm air furnace/electric air conditioning units but does not include unit heaters and duct furnaces. (42 U.S.C. 6311(11)(A)) EPCA established energy conservation standards for commercial warm air furnaces with a capacity at or above 225,000 Btu/h. (42 U.S.C. 6313(a)(4)(A)-(B)) DOE codified the statutory definition of "warm air furnace" at 10 CFR 431.72. Additionally, based on the EPCA-established energy conservation standards, DOE established a

definition of "commercial warm air furnace" as a warm air furnace that is industrial equipment, and that has a capacity (rated maximum input) of 225,000 Btu/h or more. *Id.* Additionally, the scope of the test procedure for commercial warm air furnaces is "commercial warm air furnaces with a rated maximum input of 225,000 Btu per hour or more." 10 CFR 431.76(a).

B. Test Procedure

DOE uses thermal efficiency as the metric for measuring the energy efficiency of commercial warm air furnaces. 10 CFR 431.76 (in which "thermal efficiency" is abbreviated as "TE"). Thermal efficiency is defined and calculated as 100 percent minus the percent flue loss, as determined using the test procedures described in 10 CFR 431.76 and 10 CFR 431.72. The test procedure for commercial warm air furnaces includes provisions for testing steady-state efficiency.[5] The test procedure also specifies the test set-ups for gas-fired and oil-fired commercial warm air furnaces, through reference to certain sections of ANSI Z21.47[6] and UL 727-2006 for gas and oil furnaces, respectively. 10 CFR 431.76(c)(1) and (2), respectively. The test set-up for oil-fired commercial warm air furnaces also includes a reference to HI BTS-2000 for conducting a fuel oil analysis during test setup. 10 CFR 431.76(c)(2). In addition, the test procedure includes

[5] Test measurements are taken once steady-state (or equilibrium) operation has been achieved, as indicated by temperature changes in the flue gas of not more than ± 5°F (± 3°C) between readings 15 minutes apart. *See* paragraph (c)(1) of 10 CFR 431.76, which references the requirements of section 2.39 of ANSI Z21.47-2012, for gas-fired commercial furnaces, and paragraph (c)(2) of 10 CFR 431.76, which specifies steady-state conditions for oil-fired furnaces.

[6] As noted, the current commercial warm air furnace test procedure references the 2012 version of ANSI Z21.47. 10 CFR 431.75(b)(1).

requirements for measuring the carbon dioxide (CO_2) in the flue of oil-fired furnaces during testing,[7] and for measuring the condensate of condensing gas-fired commercial warm air furnaces.[8] 10 CFR 431.76(d)(1) and (2), respectively. The procedure for measuring condensate of condensing gas-fired furnaces references certain provisions of ANSI/ASHRAE 103.[9] 10 CFR 431.76(d)(2). Finally, the test procedure includes provisions for calculating thermal efficiency, which reference certain provisions of ANSI Z21.47 (for gas-fired warm air furnaces), certain provisions of HI BTS-2000 (for oil-fired commercial warm air furnaces), and certain provisions of ASHRAE 103 (for condensing gas-fired commercial warm air furnaces). 10 CFR 431.76(e)-(f).

1. Updates to Industry Standards

Since publication of the July 2015 final rule, updated versions of the industry test procedures that are incorporated by reference have been published. An updated version of UL 727 was published on January 31, 2018 (UL 727-2018). An updated version of ANSI Z21.47 was published by the CSA Group[10] in November 2016 (ANSI Z21.47-2016). An updated version of ANSI/ASHRAE 103 was published in 2017 (ANSI/ASHRAE 103-2017). HI BTS-2000 was initially developed by the Hydronics Institute of the Gas Appliance Manufacturers Association (GAMA). In 2008, GAMA

[7] The CO_2 concentration is one of the measurements used to calculate the loss in dry flue gases, which is summed with the loss due to moisture to calculate the flue loss. Flue loss is subtracted from 100 to calculate thermal efficiency.
[8] The condensate measurement is used to calculate the latent heat gain from the condensation of the water vapor in the flue gas, and the heat loss due to the hot condensate flowing down the drain, as specified in sections 11.3.7.1 and 11.3.7.2 of ASHRAE 103-2007. These values are used to adjust the thermal efficiency to account for condensing operation.
[9] As noted, the current commercial warm air furnace test procedure references the 2007 version of ASHRAE 103. 10 CFR 431.75(c)(1).
[10] ANSI Z21.47 is published by the CSA Group, and is synonymous with CSA 2.3-2016.

merged with the Air-Conditioning and Refrigeration Institute (ARI) to form the Air-Conditioning, Heating, and Refrigeration Institute (AHRI). After merging, AHRI was responsible for the HI BTS-2000 standard. In 2015, AHRI renamed the standard as AHRI 1500 (AHRI 1500-2015) and a made number of changes that are discussed in section II.B.1.d of this document.

As discussed, EPCA requires that when the relevant industry standards are amended, DOE must update its test procedure to be consistent with the amended industry test procedure, unless DOE determines, by rule published in the *Federal Register* and supported by clear and convincing evidence, that the amended test procedure would not meet the requirements in 42 U.S.C. 6314(a)(2) and (3) related to representative use and test burden. (42 U.S.C. 6314(a)(4)(B) and (C)) Having been triggered under this provision of EPCA, DOE is evaluating the updated industry standards and whether an amended Federal test procedure that references the updated industry standards would be reasonably designed to produce test results which reflect the energy efficiency of commercial warm air furnaces during a representative average use cycle, and not be unduly burdensome to conduct. (Because DOE is also obligated under EPCA to conduct a comprehensive review of its test procedures for covered industrial equipment at least once every seven years (42 U.S.C. 6314(a)(1)), the Department is also entertaining comments and recommendations for changes to any other aspect of the commercial warm air furnaces test procedure. See section II.C of this document for further details.)

a. UL 727

The commercial warm air furnaces test method at 10 CFR 431.76 requires use of those procedures contained in UL 727-2006 that are relevant to the steady-state efficiency measurement (*i.e.*, sections 1 through 3; 37 through 42 (except for sections 40.4 and 40.6.2 through 40.6.7); 43.2; and 44 through 46). DOE has performed an initial review of the differences between UL 727-2006 and UL 727-2018 and notes that much of the test standard did not change when it was updated from UL 727-2006 to UL 727-2018. DOE identified only two updates that may affect the test procedure—one related to thermocouple tolerance and the other related to building code references in the scope section. These updates are discussed in detail in the proceeding paragraphs. In addition to the updates DOE has identified, DOE is seeking comment on whether any other changes or updates made in UL 727-2018 would impact the sections referenced by DOE, and whether DOE should adopt those updates.

Issue 1: DOE seeks comment regarding the differences between the sections of UL 727-2006 and UL 727-2018 that are relevant to the DOE test procedure. Specifically, DOE seeks comment on whether any other differences would impact the representativeness or test burden of the DOE commercial warm air furnaces test procedure, if adopted.

Thermocouple Tolerance

Section 40.6.1 of UL 727-2018, which pertains to temperature measurements using potentiometers and thermocouples, has different language from UL 727-2006 and

incorporates different ANSI references. Specifically, UL 727-2006 requires that the thermocouple wire conform to the requirements specified in the Initial Calibration Tolerances for Thermocouples table (*i.e.*, Table 8) in International Society of Automation (ISA) standard MC96.1, "Temperature-Measurement Thermocouples" (ANSI/ISA MC96.1). In contrast, UL 727-2018 states that the thermocouple wire must conform to the requirements specified in the Tolerance on Initial Values of Electromagnetic Force (EMF) Versus Temperature tables (*i.e.*, Tables 1-3) in ANSI/American Society for Testing and Materials (ASTM) standard E230/E230M, "Standard Specification and Temperature-Electromotive Force (emf) Tables for Standardized Thermocouples," (ANSI/ASTM E230/E230M). The thermocouple requirements in each standard are only applicable to the range of temperatures associated with the specified types of thermocouple. Based on an initial review of ANSI/ASTM E230/E230M, the temperature ranges to which the requirements apply differ from the temperature ranges specified in MC96.1 for certain thermocouple wires. ANSI/ASTM E230/E230M also specifies temperature ranges and requirements for thermocouple types C, N, and mineral-insulated metal-sheathed E type, which are not include in ANSI/ISA MC96.1. Furthermore, tolerances on initial values of EMF versus temperature for extension wires and compensating extension wires in ANSI/ASTM E230/E230M (*i.e.*, Tables 2 and 3) have been added to the requirements specified by section 40.6.1 of UL 727-2018.

Issue 2: DOE seeks comment on whether the additions and changes to thermocouple and thermocouple extension wire requirements would impact the representativeness of the measured test results or test burden of the DOE commercial warm air furnaces test procedure, if adopted.

Issue 3: DOE seeks comment on why section 40.6.1 in UL Standard 727 was changed from referencing ANSI/ISA MC96.1 in UL 727-2006, to ANSI/ASTM E230/E230M in UL 727-2018. DOE requests input on the perceived benefits and/or drawbacks of such change.

Building Code References in Scope Section

DOE notes that the language for the scope of the UL 727-2018 test standard has been changed in section 1.3, as compared to UL 727-2006. Section 1.3 in UL 727-2006 references the National Fire Protection Association (NFPA) Standard for Installation of Oil-Burning Equipment, NFPA 31, and codes such as the Building Officials Code Administrators International (BOCA) National Mechanical Code, the State Building Code Council (SBCC) Standard Mechanical Code, and the International Association of Plumbing and Mechanical Officials (IAPMO) Uniform Mechanical Code for requirements for the installation and use of oil-burning equipment which are to be utilized in conjunction with the standard. In contrast, section 1.3 of UL 727-2018 references the National Fire Protection Association Standard for Installation of Oil-Burning Equipment, NFPA 31, the International Mechanical Code, and the Uniform Mechanical Code for the requirements for installation and use.

DOE defines the scope for the testing of commercial warm air furnaces in 10 CFR 431.76(a), which is independent from the scope defined by UL-727-2006 (*i.e.*, the scope of the DOE test procedure is dictated by the scope provision at 10 CFR 431.76(a)). Although DOE references the scope (Section 1) of UL 727-2006 in its test provisions at 10 CFR 431.76(c)(2), only the procedures within UL 727-2006 that are pertinent to the

measurement of the steady-state efficiency are to be included in the DOE test procedure. 10 CFR 431.76 (b). Therefore, any provisions within the scope of UL 727-2006 that do not relate to the measurement of the steady-state efficiency do not apply to the DOE test procedure.

Issue 4: DOE seeks comment on whether there is a need to identify more specifically the provisions of UL 727-2006 that apply to the DOE test procedure.

b. ANSI Z21.47

The test method in 10 CFR 431.76 for gas-fired commercial warm air furnaces requires use of procedures contained in ANSI Z21.47-2012 that are relevant to the steady-state efficiency measurement (*i.e.*, sections 1.1, 2.1 through 2.6, 2.39, and 4.2.1 of ANSI Z21.47-2012). 10 CFR 431.76(c)(1). DOE notes that the majority of the test standard did not change when it was updated from ANSI Z21.47-2012 to ANSI Z21.47-2016. The revisions that were made were mostly editorial in nature, including moving section 2 in ANSI Z21.47-2012 to section 5 in ANSI Z21.47-2016, among other structural changes. In reviewing the two versions of the standard, DOE identified one apparent typographical error, which is discussed subsequently.

Issue 5: DOE seeks comment regarding any differences between Z21.47-2012 and Z21.47-2016 that are relevant to the DOE test procedure. For any relevant differences other than those already identified by DOE, DOE seeks comment on how such changes or updates would impact the representativeness of measurements and the test burden of the DOE commercial warm air furnaces test procedure, if adopted.

Typographical Error

Section 2.3.2(c) of ANSI Z21.47-2012 and the corresponding section 5.3.2(c) of ANSI Z21.47-2016 provide installation requirements for horizontal furnaces. Section 5.3.2(c)(iii) of ANSI Z21.47-2016 appears to contain a typographical error by referencing "Figure 4, Enclosure types for alcove and closet installation tests for horizontal furnaces." Rather, the title of Figure 4 in ANSI Z21.47-2016 is "Enclosure types for alcove and closet installation tests for up-flow and down-flow furnaces," and as titled, Figure 4 applies only to up-flow and down-flow furnaces. The applicable reference in section 5.3.2(c)(iii) of ANSI Z21.47-2016 should be to Figure 5, "Enclosed types for alcove and closet installation tests for horizontal furnaces."

Issue 6: DOE seeks comment on whether section 5.3.2(c)(iii) of ANSI Z21.47-2016 should refer to Figure 5 in the test procedure, rather than Figure 4.

c. ANSI/ASHRAE 103

DOE's test procedure for gas-fired condensing commercial warm air furnaces references sections 7.2.2.4, 7.8, 9.2, 11.3.7.1 and 11.3.7.2 of ANSI/ASHRAE Standard 103-2007. 10 CFR 431.76. DOE did not identify any substantive changes in the sections currently referenced by the DOE test procedure in the update from ANSI/ASHRAE 103-2007 to ANSI/ASHRAE 103-2017, but DOE seeks further comment on this issue.

Issue 7: DOE seeks comment as to whether any of the differences between sections 7.2.2.4, 7.8, 9.2, 11.3.7.1 and 11.3.7.2 of ANSI/ASHRAE 103-2007 and ANSI/ASHRAE

103-2017 are relevant to the DOE test procedure, and if so, how such differences would impact the representativeness of measurements and the associated impact on test burden of the DOE commercial warm air furnaces test procedure, if adopted.

d. HI BTS-2000

DOE's test procedure for oil-fired commercial warm air furnaces references sections of HI BTS-2000 that are relevant to the fuel oil analysis and calculating percent flue loss (*i.e.*, sections 8.2.2, 11.1.4, 11.1.5, and 11.1.6.2). 10 CFR 431.76(c)(2) and (e)(2), DOE identified two substantive changes in the sections referenced by the DOE test procedure in the update from HI BTS-2000 to AHRI 1500-2015 regarding fuel oil analysis and calculation of flue loss. These updates are discussed in detail in the following paragraphs. In addition to the updates DOE has identified, DOE seeks comment on whether any other differences between BTS-2000 and AHRI 1500-2015 would impact the sections referenced by DOE, and if DOE should adopt those updates and why.

Issue 8: DOE seeks comment regarding whether any of the differences between sections 8.2.2, 11.1.4, 11.1.5, and 11.1.6.2 of HI BTS-2000 and AHRI 1500-2015 are relevant to the DOE test procedure, and if so, how such differences would impact the representativeness of measurements and the associated test burden of the DOE commercial warm air furnaces test procedure, if adopted.

Fuel Oil Analysis Requirements

DOE's test procedure for oil-fired commercial warm air furnaces includes fuel oil analysis requirements (10 CFR 431.76(c)(2)) which reference section 8.2.2 of BTS-2000. Section C3.2.1.1 of ANSI/AHRI 1500-2015 (previously section 8.2.2 of BTS-2000) specifies different fuel oil analysis requirements (*i.e.*, heating value analyzed per ASTM D240-09[11] or ASTM D4809-09a[12], hydrogen and carbon content analyzed per ASTM D5291-10[13], and density and American Petroleum Institute (API) gravity analyzed per ASTM D396-14a[14]) than are required in section 8.2.2 of BTS-2000 (*i.e.*, heat value, hydrogen and carbon content, density and API gravity analyzed per ASTM D396-90[15]).

Issue 9: DOE seeks comment on the fuel oil analysis requirements in AHRI 1500-2015 and BTS-2000. Specifically, DOE seeks comment regarding whether the differences between the two would yield different results during testing and the merits of potentially adopting the fuel oil analysis requirement of AHRI 1500-2015.

Issue 10: DOE seeks comment on whether adopting AHRI 1500-2015 would add or reduce burden to the current testing requirements of the DOE commercial warm air furnaces test procedure.

---

[11]ASTM D240-09, "Standard Test Method for Heat of Combustion of Liquid Hydrocarbon Fuels by Bomb Calorimeter" (ASTM D240-09).
[12]ASTM D4809-09a, "Standard Test Method For Heat Of Combustion Of Liquid Hydrocarbon Fuels By Bomb Calorimeter (Precision Method)" (ASTM D4809-09a).
[13]ASTM D5291-10, "Standard Test Methods for Instrumental Determination of Carbon, Hydrogen, and Nitrogen in Petroleum Products and Lubricants" (ASTM D5291-10).
[14]ASTM D396-14a, "Standard Specification for Fuel Oils" (ASTM D396-14a).
[15]ASTM D396-90, "Standard Specification for Fuel Oils" (ASTM D396-90).

Calculation of CO_2 in Flue Gas Losses

Section 11.1.4 of BTS-2000 requires that the CO_2 value used in the calculation of the dry flue gas loss for oil must be the measured CO_2. In addition, the DOE test procedure in 10 CFR 431.76(d) requires that CO_2 must be measured. Section C7.2.4 of AHRI 1500 (previously Section 11.1.4 in BTS-2000) includes the option to calculate CO_2 using the measured O_2 value instead of directly measuring the CO_2 value.

Issue 11: DOE seeks comment on whether the option to calculate CO_2 in AHRI 1500-2015 yields different testing results compared to using the measured value, as required by the current DOE test method for commercial warm air furnaces.

Issue 12: DOE also seeks comment on whether it should adopt provisions within AHRI 1500-2015 that allow for measuring O_2 and calculating CO_2 therefrom (instead of measuring CO_2) with respect to the flue loss calculation, as well as the rationale.

2. Thermal Efficiency

As previously stated, the energy efficiency metric for commercial warm air furnaces is thermal efficiency. Thermal efficiency for a commercial warm air furnace is defined and calculated as 100 percent minus the percent flue loss determined using the test procedures described in 10 CFR 431.76. 10 CFR 431.72. A test method and calculations for determining the jacket loss percentage (*i.e.*, the hourly heat loss through the jacket divided by the hourly input and multiplied by 100) are included in section 2.39 of ANSI Z21.47-2012 (and the corresponding section 5.40 of ANSI Z21.47-2016), but

the jacket loss percentage is not included in the equation used to calculate thermal efficiency.[16]

Issue 13: DOE seeks comment on whether jacket loss should be accounted for in the calculation of thermal efficiency. Specifically, DOE seeks information and data on whether and to what extent inclusion of jacket loss would provide results that would more appropriately reflect energy efficiency during a representative average use cycle. DOE also requests information and data as to the test burden that would be associated with potential inclusion of jacket loss as part of the DOE commercial warm air furnaces test procedure.

3. Input Rate Tolerance

DOE's test procedure for gas-fired commercial warm air furnaces references the test method in ANSI Z21.47, which requires that the test be conducted at normal inlet pressure and at 100 percent of normal input rate (*i.e.*, the maximum hourly Btu input rating specified by the manufacturer). 10 CFR 431.76(c)(1). DOE notes that no tolerance is provided on the input rate, so when taken literally, this provision could be interpreted to require that the firing rate be exactly 100 percent of the nominal input rate. DOE further notes that other types of fossil-fuel-fired equipment such as commercial packaged boilers, commercial water heaters, residential water heaters, residential furnaces, and residential boilers require the input rate during testing to be within ±2

[16] Although the jacket loss is not used in the calculation of thermal efficiency, section 2.39 of ANSI Z21.47-2012 and section 5.40 of ANSI Z21.47-2016 require a maximum jacket loss of 1.5 percent for any furnace not covered by "Federal Energy Acts" (*i.e.*, not regulated by DOE). Therefore, the 1.5 percent jacket loss requirement is not included as part of the DOE test procedure.

percent of the nameplate input rate. DOE seeks comment on whether a tolerance on input rate is necessary for gas-fired commercial warm air furnaces, and if so, what tolerance would be appropriate.

Issue 14: DOE seeks comment on whether industry uses a tolerance when testing to ANSI Z21.47, and if so, what tolerance is used. DOE requests comment on whether a tolerance should be specified for the input rate during testing of gas-fired commercial warm air furnaces, and if so, what tolerance would be appropriate.

4. Flue Temperature Measurement in Models with Multiple Vent Hoods

Section 2.16 of ANSI Z21.47-2012 and section 5.16 of ANSI Z21.47-2016 both state that the flue gas temperatures shall be measured in the vent pipe using nine individual thermocouples placed in specific locations. DOE notes that neither DOE's test procedure nor the ANSI Z21.47 test procedure specifies how to perform the flue temperature measurement if a unit has multiple vent hoods. DOE is aware of models on the market with two vent hoods through which combustion exhaust gases exit.

Issue 15: DOE seeks comment on how testing of commercial warm air furnaces with more than one vent hood are currently tested and whether it should consider adding provisions in the DOE test procedures to address measuring the flue gas temperature of a unit with multiple vent hoods. If so, DOE seeks comment on how best to measure flue gas temperature in such units.

5. Flue Temperature Measurement in Models with Vent Space Limitations

Section 2.16 of ANSI Z21.47-2012 and section 5.16 of ANSI Z21.47-2016 both state that the flue gas temperatures shall be measured in the vent pipe using nine individual thermocouples placed in specific locations; however, these sections do not provide guidance on how to measure the flue gas temperature if the vent size constrains the space where the thermocouples are to be placed. Specifically, a vent may be so small (if, for example, a unit has multiple vents) that it is not practical to place all nine thermocouples as instructed in sections 2.16 and 5.16 of ANSI Z21.47-2012 and ANSI Z21.47-2016 respectively. During testing of one unit, DOE found that placing more than four thermocouples in a particularly small vent hood was not practical due to space limitations.

Issue 16: DOE seeks comment on how testing of commercial warm air furnaces with vent size constraints are currently tested and whether it should consider adding provisions in the DOE test procedures to address measuring the flue gas temperature when space limitations preclude the use of nine thermocouples. If so, DOE seeks comment on how best to measure flue gas temperature in such units.

6. Electrical Consumption

Currently, the DOE test procedure for commercial warm air furnaces does not include any measurement of electrical consumption in its determination of the efficiency of commercial warm air furnaces, including electrical consumption of blowers/fans, controls, or other auxiliary electrical consumption. To the extent that commercial warm

air furnaces are typically part of a single package that also includes air conditioning equipment, and the test method and metric for commercial air-conditioning equipment (*i.e.*, integrated energy efficiency ratio (IEER)) accounts for the electrical consumption of the blower, the blower consumption has not been included in the commercial furnaces test method. However, any auxiliary electrical consumption associated only with the furnace operation when heating is not accounted for in any metric. DOE seeks comment on whether including the electrical consumption of a commercial warm air furnace (*i.e.*, the blower and/or auxiliary electrical energy use due to, for example, controls or an inducer fan) as part of DOE's efficiency metric would be appropriate.

Issue 17: DOE seeks comment on whether DOE should consider including the electrical consumption of commercial warm air furnaces in the commercial warm air furnace efficiency metric or test procedure, including the merits and burdens of such approach. If so, DOE seeks comment on which components' electrical consumption would be appropriate to include, noting that the electrical consumption of the commercial warm air furnace blower is typically factored into other commercial equipment efficiency metrics and test procedures.

C. Other Test Procedure Topics

In addition to the issues identified earlier in this document, DOE welcomes comment on any other aspect of the existing test procedures for commercial warm air furnaces. As noted, DOE recently issued an RFI to seek more information on whether its test procedures are reasonably designed, as required by EPCA, to produce results that measure the energy use or efficiency of a product during a representative average use

cycle or period of use. 84 FR 9721 (March 18, 2019). DOE seeks comment on this issue as it specifically pertains to the test procedure for the commercial warm air furnaces that are the subject of this current RFI.

As noted above, DOE also requests comments on whether potential amendments based on the issues discussed would result in a test procedure that is unduly burdensome to conduct, particularly in light of any new products on the market since the last test procedure update. If commenters believe that any such potential amendments, if adopted, would result in a procedure that is, in fact, unduly burdensome to conduct, DOE seeks information on whether an existing private sector-developed test procedure would be more appropriate or other avenues for reducing the identified burdens while advancing improvements to the commercial warm air furnaces test procedure. DOE also requests comment on the benefits and burdens of adopting, without modification, any industry/voluntary consensus-based or other appropriate test procedure.

Additionally, DOE requests comment on whether the existing test procedures limit a manufacturer's ability to provide additional features to purchasers of commercial warm air furnaces. DOE particularly seeks information on how the test procedures could be amended to reduce the cost of new or additional features and make it more likely that such features are included on commercial warm air furnaces, while still meeting the requirements of EPCA.

DOE also requests comments on the impact of any potential amendments to the existing test procedures on manufacturers, including small businesses.

Finally, DOE recently published an RFI on the emerging smart technology appliance and equipment market. 83 FR 46886 (Sept. 17, 2018). In that RFI, DOE sought information to better understand market trends and issues in the emerging market for appliances and commercial equipment that incorporate smart technology. DOE's intent in issuing the RFI was to ensure that DOE did not inadvertently impede such innovation in fulfilling its statutory obligations in setting efficiency standards for covered products and equipment. DOE seeks comments, data, and information on the issues presented in the RFI as they may be applicable to the commercial warm air furnaces that are the subject of this RFI.

III. Submission of Comments

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 matters addressed in this notice and on other matters relevant to DOE's consideration of amended test procedures for commercial warm air furnaces. These comments and information will aid in the development of a test procedure NOPR for commercial warm air furnaces, if DOE determines that amended test procedures may be appropriate for this equipment. After the close of the comment period, DOE will review the public comments received and may begin collecting data and conducting the analyses discussed in this RFI.

Submitting comments via *http://www.regulations.gov*. The *http://www.regulations.gov* webpage requires 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. 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 in 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. No telefacsimiles (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, 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).

DOE considers public participation to be a very important part of the process for developing test procedures and energy conservation standards. DOE actively encourages the participation and interaction of the public during the comment period in each stage of this process. Interactions with and between members of the public provide a balanced discussion of the issues and assist DOE in the process. Anyone who wishes to be added to the DOE mailing list to receive future notices and information about this process

should contact Appliance and Equipment Standards Program staff at (202) 287-1445 or via e-mail at *ApplianceStandardsQuestions@ee.doe.gov*.

Signed in Washington, D.C., on

February 21, 2020.

Alexander N. Fitzsimmons
Deputy Assistant Secretary for Energy Efficiency
Energy Efficiency and Renewable Energy