DEPARTMENT OF ENERGY

10 CFR Parts 429 and 430

[Docket No. EERE–2014–BT–TP–0014]

RIN 1904–AD22

Energy Conservation Program: Test Procedures for Portable Air Conditioners

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

ACTION: Final rule.

SUMMARY: On February 25, 2015, the U.S. Department of Energy (DOE) published a notice of proposed rulemaking (NOPR), in which it proposed to establish test procedures for portable air conditioners (ACs) to determine capacities and energy efficiency metrics for portable ACs. On November 27, 2015, DOE published a supplemental notice of proposed rulemaking (SNOPR) to revise the proposal by modifying the cooling and heating mode test requirements, introducing the seasonally adjusted cooling capacity (SACC) and a revised combined energy efficiency ratio (CEER), and clarifying several aspects of test setup. The proposed test procedure serves as the basis for this action. DOE is issuing a final rule to establish a new test procedure for portable ACs in a new appendix. The new test procedure in appendix CC will be used to determine the SACC and CEER for portable ACs that are subject to the adopted test procedure. The test procedure is based on industry standards, with several modifications to ensure the test procedure is representative of typical use and to improve accuracy and repeatability while minimizing test burden.

DATES: The effective date of this rule is July 1, 2016. The final rule changes will be mandatory for representations of energy use or efficiency on or after November 28, 2016. The incorporation by reference of certain publications listed in this rule was approved by the Director of the Federal Register as of July 1, 2016.

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

A link to the docket Web page can be found at *http://www.regulations.gov/#!docketDetail;D=EERE-2014-BT-TP-0014*. This Web page will contain a link to the docket for this document on the *www.regulations.gov* site. The *www.regulations.gov* Web page will contain simple instructions on how to access all documents, including public comments, in the docket.

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

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SUPPLEMENTARY INFORMATION: This final rule incorporates by reference the following industry standard into 10 CFR parts 429 and 430:

American National Standards Institute (ANSI)/Association of Home Appliance Manufacturers (AHAM) PAC–1–2015, Portable Air Conditioners, June 19, 2015.

Copies of ANSI/AHAM PAC–1–2015 can be obtained from the Association of Home Appliance Manufacturers, 1111 19th Street NW., Suite 402, Washington, DC 20036, 202–872–5955, or by going to *https://www.aham.org/ht/d/Store/*.

This final rule also incorporates by reference the following industry standards into 10 CFR part 430:

ANSI/American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE) Standard 37–2009, (''ASHRAE Standard 37–2009''), Methods of Testing for Rating Electrically Driven Unitary Air-Conditioning and Heat Pump Equipment, ANSI approved June 25, 2009.

International Electrotechnical Commission (IEC) 62301 (''IEC 62301''), Household electrical appliances—Measurement of standby power, (Edition 2.0, 2011–01).

Copies of ANSI/ASHRAE Standard 37–2009 can be obtained from the American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc., Publication Sales, 1791 Tullie Circle NE., Atlanta, GA 30329, 800–527–4723 or 404–636–8400, or go to *http://www.ashrae.org*.

Copies of IEC 62301 can be obtained from the IEC at *https://webstore.iec.ch/* and also from the American National Standards Institute, 25 W. 43rd Street, 4th Floor, New York, NY 10036, (212) 642–4900, or go to *http://webstore.ansi.org*.

See section IV.N of this rulemaking for a further discussion of these standards.

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I. Authority and Background

Portable air conditioners (portable ACs) are a type of heating, cooling, and air-conditioning equipment, for which the U.S. Department of Energy (DOE) is establishing test procedures, subject to the requirements of 42 U.S.C. 6293(b)(1)(B). DOE is considering energy conservation standards for portable ACs in a concurrent rulemaking. The following sections discuss DOE's authority to establish test procedures for portable ACs and relevant background information detailing the history of the portable AC test procedure rulemaking.

A. Authority

Title III of the Energy Policy and Conservation Act of 1975 (42 U.S.C. 6291, *et seq.;* ''EPCA'' or, ''the Act'') [1] sets forth various provisions designed to improve energy efficiency. Part B [2] of title III establishes the ''Energy Conservation Program for Consumer Products Other Than Automobiles,'' which covers consumer products and certain commercial products (hereinafter referred to as ''covered products''). EPCA authorizes DOE to establish technologically feasible, economically justified energy conservation standards for covered products or equipment that would be likely to result in significant national energy savings. (42 U.S.C. 6295(o)(2)(B)(i)(I)–(VII)) In addition to specifying a list of covered consumer and industrial products, EPCA contains provisions that enable the Secretary of Energy to classify additional types of consumer products as covered products. (42 U.S.C. 6292(a)(20)) For a given product to be classified as a covered product, the Secretary must determine that:

(1) Classifying the product as a covered product is necessary for the purposes of EPCA; and

(2) The average annual per-household energy use by products of each type is likely to exceed 100 kilowatt-hours (kWh) per year. (42 U.S.C. 6292(b)(1))

Under EPCA, the energy conservation program consists essentially of four parts: (1) Testing, (2) labeling, (3) Federal energy conservation standards, and (4) certification and enforcement procedures. The testing requirements consist of test procedures that manufacturers of covered products must use as the basis for: (1) Certifying to DOE that their products comply with the applicable energy conservation standards adopted under EPCA, and (2) making representations about the efficiency of those products. Similarly, DOE must use these test procedures to determine whether the products comply with any relevant standards promulgated under EPCA.

Under 42 U.S.C. 6293, EPCA sets forth the criteria and procedures DOE must follow when prescribing or amending test procedures for covered products. EPCA provides in relevant part that any test procedures prescribed or amended under this section shall be reasonably designed to produce test results that measure energy efficiency, energy use or estimated annual operating cost of a covered product during a representative average use cycle or period of use and shall not be unduly burdensome to conduct. (42 U.S.C. 6293(b)(3)) In addition, if DOE determines that a test procedure should be prescribed or amended, it must publish proposed test procedures and offer the public an opportunity to present oral and written comments on them. (42 U.S.C. 6293(b)(2))

B. Background

There are currently no DOE test procedures or energy conservation standards for portable ACs. On July 5, 2013, DOE issued a notice of proposed determination (NOPD) of coverage (hereinafter referred to as the ''July 2013 NOPD''), in which DOE announced that it tentatively determined that portable ACs meet the criteria under 42 U.S.C. 6292(b)(1) to be classified as a covered product. 78 FR 40403. In a final determination of coverage published in the **Federal Register** on April 18, 2016 (the April 2016 Coverage Determination), DOE classified portable ACs as covered consumer products under EPCA. 81 FR 22514.

Concurrently, DOE has initiated rulemaking processes to establish test procedures and energy conservation standards for portable ACs. DOE initiated this test procedure rulemaking with a notice of data availability (NODA), published on May 9, 2014 (hereinafter referred to as the ''May 2014 NODA''). 79 FR 26639 (May 9, 2014). In the May 2014 NODA, DOE addressed comments received in response to the June 2013 NOPD, and specifically recognized those comments that supported the development of a DOE test procedure for portable ACs to provide consistency and clarity for representations of energy use of these products. DOE evaluated available industry test procedures to determine whether such methodologies would be suitable for incorporation in a future DOE test procedure. To support development of a standardized DOE test procedure for portable ACs, DOE conducted testing on a range of portable ACs to determine typical cooling capacities and cooling energy efficiencies based on the existing industry test methods and other modified approaches for portable ACs. DOE presented the results of this testing for public review and comment in the May 2014 NODA. 79 FR 26639, 26640 (May 9, 2014).

On February 25, 2015, DOE published in the **Federal Register** a notice of proposed rulemaking (NOPR) (hereinafter referred to as the ''February 2015 NOPR''), in which it addressed comments received in response to the July 2013 NOPD that were not previously addressed in the May 2014 NODA, and proposed test procedures for single-duct and dual-duct portable ACs that would provide a means of determining efficiency in various operating modes, including cooling mode, heating mode, off-cycle mode, standby mode, and off mode. 80 FR 10211. For cooling mode and heating mode, DOE proposed test procedures based on the then-current industry-accepted test procedure, AHAM PAC–1–2014, ''Portable Air Conditioners,'' with additional provisions to account for heat transferred to the indoor conditioned space from the case, ducts, and any infiltration air from unconditioned spaces. DOE also proposed various clarifications for cooling mode and heating mode testing, including: (1) Test duct configuration; (2) instructions for condensate collection; (3) control settings for operating mode, fan speed, temperature set point, and louver oscillation; (4) clarification of test condition tolerances; and (5) unit placement within the test chamber. For off-cycle mode, DOE proposed a test procedure that would measure energy use when the ambient dry-bulb temperature is at or below the setpoint. DOE also identified relevant low-power modes, proposed definitions for inactive mode and off mode, and proposed test procedures to determine representative energy consumption for these modes. *Id.*

In the February 2015 NOPR, DOE proposed to use a combined energy efficiency ratio (CEER) metric for representing the overall energy efficiency of single-duct and dual-duct portable ACs. The CEER metric would

[1] All references to EPCA refer to the statute as amended through the Energy Efficiency Improvement Act of 2015, Public Law 114–11 (April 30, 2015).

[2] For editorial reasons, upon codification in the U.S. Code, Part B was re-designated Part A.

represent energy use in all available operating modes. DOE also proposed a cooling mode-specific CEER for units that do not provide a heating function to provide a basis for comparing performance with other cooling products such as room ACs. In addition, DOE proposed separate energy efficiency ratio (EER) metrics for determining energy efficiency in cooling mode and heating mode only. 80 FR 10211, 10234–10235 (Feb. 25, 2015). In response to the February 2015 NOPR, DOE received comments during a public meeting, in which DOE presented the proposals, as well as in eight written comments from interested parties. DOE has addressed these comments in the subsequent rulemaking publications discussed below, including this final rule.

On November 17, 2015, DOE published in the **Federal Register** a supplemental notice of proposed rulemaking (SNOPR) (hereinafter referred to as the ''November 2015 SNOPR), in which DOE proposed additions and clarifications to its proposed portable AC test procedure. The additions and clarifications included: (1) Minor revisions to the indoor and outdoor cooling mode test conditions; (2) an additional test condition for cooling mode testing; (3) updated infiltration air and capacity calculations to account for the second cooling mode test condition, in the form of new condition-specific adjusted cooling capacities (ACC_{95} and ACC_{83}) and the newly introduced seasonally adjusted cooling capacity (SACC); (4) removal of the measurement of case heat transfer; (5) a clarification of test unit placement within the test chamber; (6) removal of the heating mode test procedure; (7) a revision to the CEER calculation to reflect the two cooling mode test conditions and removal of heating mode testing; (8) a clarification of the active mode test duration; and (9) additional technical corrections and clarifications. Other than the specific amendments newly proposed in the SNOPR, DOE continued to propose the general test procedure originally included in the February 2015 NOPR. 80 FR 74020 (Nov. 17, 2015). In response to the November 2015 SNOPR, DOE received four written comments from interested parties. In the relevant sections of this final rule, DOE presents those comments, DOE's responses, and any applicable modifications to DOE's test procedure.

DOE also recently initiated a separate rulemaking to consider establishing energy conservation standards for portable ACs. DOE received additional test procedure-related comments during the preliminary analysis stage of this concurrent energy conservation standards rulemaking and addresses those comments in this final rule. Any new standards would be based on the same efficiency metrics derived from the test procedure that DOE is establishing in this final rule.

II. Synopsis of the Final Rule

DOE has reviewed its analysis and comments received in response to the November 2015 SNOPR, and has concluded that the proposals contained therein, including proposals that remained unchanged from the February 2015 NOPR, warrant adoption of a new test procedure for single-duct and dual-duct portable ACs except as follows: (1) Adopting a lower value for the duct convection heat transfer coefficient; (2) slightly revising the proposed definitions of ''single-duct portable air conditioner'' and ''dual-duct portable air conditioner'' and withdrawing the proposed definition for ''spot cooler;'' (3) requiring that any single-duct or dual-duct portable ACs that may be configured in both single-duct and dual-duct configurations must be tested in both configurations; and (4) incorporating clarifying edits to the duct installation instructions and duct surface area calculation. DOE is codifying the new test procedure at 10 CFR part 430, subpart B, appendix CC, to contain provisions for measuring the energy consumption of single-duct and dual-duct portable ACs in active, standby, and off modes. In addition, in this final rule, DOE establishes provisions for certification, compliance, and enforcement for portable ACs in 10 CFR part 429. Specifically, these amendments add new section 10 CFR 429.62 with requirements for determining SACC and CEER for a basic model.

III. Discussion

In this test procedure final rule, DOE is adopting definitions, test procedures, and certification and enforcement requirements for portable ACs. These provisions will be incorporated into relevant sections of parts 429 and 430 of Title 10 of the CFR, as specified in Table III.1. The definitions discussed and established in this final rule include various operating modes (cooling mode, off-cycle mode, standby mode, inactive mode, and off mode), duct configurations (single-duct and dual-duct), and performance metrics (seasonally adjusted cooling capacity and combined energy efficiency ratio). The test procedures established in this final rule provide a measure of portable AC performance under representative operating modes and conditions, which are discussed further in this final rule. DOE further establishes test sampling requirements.

TABLE III.1—SUMMARY OF FINAL RULE PROVISIONS, THEIR LOCATION WITHIN THE CODE OF FEDERAL REGULATIONS, AND THE APPLICABLE PREAMBLE DISCUSSION

CFR Location	Topics	Summary of provisions	Applicable preamble discussion
10 CFR 429.62	Sampling Plan	Minimum number of portable ACs to be tested to rate a portable AC basic model.	Section III.J.
10 CFR 430.2	Definitions	Definitions pertinent to categorizing and testing of portable ACs.	Section III.A.
10 CFR 429.4 and 10 CFR 430.3.	Incorporation by Reference	Description of industry standards incorporated by reference in the DOE test procedure.	Section IV.N.
10 CFR 430.23(dd) and Appendix CC to Subpart B.	Test Procedure	Instructions for determining the SACC and CEER for applicable portable ACs.	Sections III.C, III.F, III.G, and III.H.

The Pacific Gas and Electric Company (PG&E), Southern California Gas Company (SCGC), Southern California Edison (SCE), and San Diego Gas and Electric Company (SDG&E) (hereinafter the ''California Investor-Owned Utilities (IOUs)''), the National Association of Manufacturers (NAM), and AHAM supported DOE's rulemakings to establish energy conservations standards and test procedures for portable ACs. AHAM further stated that the test procedure should include repeatable and reproducible measures that are representative of actual consumer use, but not unduly burdensome to conduct. (California IOUs, No. 20 at p. 1; NAM, No. 17 at p. 1; AHAM, No. 18 at p. 1; AHAM, No. 23 at pp. 1–2) [3]

A. Covered Products and Configurations

In the April 2016 Coverage Determination, DOE established the definition of a portable AC as a portable encased assembly, other than a packaged terminal air conditioner, room air conditioner, or dehumidifier, that delivers cooled, conditioned air to an enclosed space, and is powered by single-phase electric current. The definition also states that a portable AC includes a source of refrigeration and may include additional means for air circulation and heating. 81 FR 22514, 22516, 22519, 22520 (April 18, 2016). This definition encompasses several categories and configurations of portable ACs. For the purposes of specifying the appropriate test method(s) and, potentially, energy conservation standards for these different categories and configurations of portable ACs, DOE is adopting specific definitions for ''single-duct portable air conditioner'' and ''dual-duct portable air conditioner,'' and clarifying the test method for convertible products. DOE discusses these definitions and test provisions, including any comments received related to them, in section III.A.1 and section III.A.2 of this rule.

1. Configuration Definitions

In the February 2015 NOPR, DOE identified three general categories of portable ACs, distinguished by duct configuration and associated handling of condenser air flow. Accordingly, DOE proposed definitions for these three configurations: ''single-duct portable air conditioners,'' ''dual-duct portable air conditioners,'' and ''spot coolers.'' 80 FR 10211, 10214–10216 (Feb. 25, 2015). The various ducting configurations are discussed in more detail in the following sections.

a. Single-Duct and Dual-Duct Portable ACs

DOE proposed in the February 2015 NOPR to define a single-duct portable AC as a portable AC that draws all of the condenser inlet air from the conditioned space without the means of a duct, and discharges the condenser outlet air outside the conditioned space through a single duct. 80 FR 10211, 10215–10216 (Feb. 25, 2015). DOE also proposed a definition of a dual-duct portable AC as a portable AC that draws some or all of the condenser inlet air from outside the conditioned space through a duct, and may draw additional condenser inlet air from the conditioned space. DOE further defined a dual-duct portable AC as discharging the condenser outlet air outside the conditioned space by means of a separate duct. *Id.* at 10216. The portable AC configuration definitions proposed in the February 2015 NOPR were the basis for the development of the concurrent energy conservation standards rulemaking preliminary analysis, published on February 27, 2015 (February 2015 Preliminary Analysis). DOE also maintained these proposed definitions in the November 2015 SNOPR.

In response to the February 2015 Preliminary Analysis, DENSO Products and Services Americas, Inc. (DENSO) expressed concern that the terminology for a dual-duct configuration could be potentially misleading. (DENSO, Standards Preliminary Analysis, No. 13 at p. 9) [4] DOE notes that the definition of a dual-duct portable AC requires ducts at both the condenser inlet and outlet. This definition would exclude other portable AC configurations with two ducts, such as portable ACs equipped with inlet and outlet ducts on the evaporator side, but without ducts at the condenser inlet and outlet. However, DOE is aware that some manufacturers may sell these portable ACs (defined as ''spot coolers'' in the February 2015 NOPR and November 2015 SNOPR) with optional inlet and/or outlet ducts for the condenser side. Therefore, DOE considered whether these products with the optional duct(s) installed could be considered single-duct or dual-duct portable ACs. DOE reviewed product specifications, manufacturer information, and available accessories for spot coolers. DOE observed that the optional ducting accessories for these products are typically available in a range of sizes and configurations, which precludes DOE from determining a representative ducted setup for testing. See section III.A.1.b of this preamble for further discussion of the testing concerns for spot coolers with optional ducting.

DOE also revisited the product specifications and manufacturer information for the products it had considered single-duct and dual-duct portable ACs in the February 2015 Preliminary Analysis. DOE observed that all single-duct and dual-duct portable ACs include similar ducting configurations that include adjustable window mounting brackets for the condenser ducts. DOE determined that single-duct and dual-duct portable ACs implement an adjustable window mounting bracket to maintain portability and flexibility for users to install these products in multiple locations while exhausting condenser air outside through the most common available spaces—windows of varying sizes. DOE also notes that it found no spot coolers that have an adjustable window mounting bracket with the optional duct accessories. DOE identified the presence of an adjustable window mounting bracket as a primary feature of single-duct and dual-duct portable ACs. The corresponding consistency in installation enabled the development of a test procedure that yields energy use results representative of real-world use. As discussed in section III.A.1.b of this preamble, portable ACs without adjustable window mounting brackets for condenser ducts (*e.g.,* spot coolers) may be installed and used in a variety of applications and are not addressed by this test procedure. DOE, therefore, establishes in this final rule the following single-duct portable AC and dual-duct portable AC definitions in 10 CFR 430.2, which include the requirement for an adjustable window bracket.

Single-duct portable air conditioner means a portable air conditioner that draws all of the condenser inlet air from the conditioned space without the means of a duct, and discharges the condenser outlet air outside the conditioned space through a single duct attached to an adjustable window bracket.

Dual-duct portable air conditioner means a portable air conditioner that draws some or all of the condenser inlet air from outside the conditioned space through a duct attached to an adjustable window bracket, may draw additional

[3] A notation in the form ''California IOUs, No. 20 at p. 1'' identifies a written comment: (1) Made by the Pacific Gas and Electric Company, Southern California Gas Company, Southern California Edison, and San Diego Gas and Electric Company (''the California IOUs''); (2) recorded in document number 20 that is filed in the docket of this test procedure rulemaking (Docket No. EERE–2014–BT–TP–0014) and available for review at *www.regulations.gov*; and (3) which appears on page 1 of document number 20.

[4] A notation in the form ''DENSO, Preliminary Analysis, No. 13 at p. 9'' identifies a written comment: (1) Made by DENSO Products and Services Americas, Inc.; (2) recorded in document number 13 that is filed in the docket of the concurrent energy conservation standards rulemaking (Docket No. EERE–2013–BT–STD–0013) and available for review at *www.regulations.gov*; and (3) which appears on page 9 of document number 13.

condenser inlet air from the conditioned space, and discharges the condenser outlet air outside the conditioned space by means of a separate duct attached to an adjustable window bracket.

In reviewing the February 2015 NOPR proposal, DOE noted that the terms ''single-duct portable air conditioner'' and ''dual-duct portable air conditioner'' are used in provisions of the DOE regulations outside of the test procedure that will be codified at appendix CC to part 430 of Title 10 of the CFR. For example, the terms are used in the general test procedure instructions to be codified at 10 CFR 430.23(dd). Therefore, to ensure the appropriate scope of applicability for the single-duct and dual-duct portable AC definitions, DOE is codifying these definitions at 10 CFR 430.2.

b. Other Portable ACs

In the February 2015 NOPR, DOE described ''spot coolers'' as portable ACs that have no ducting on the condenser side and may utilize small directional ducts on the evaporator exhaust. DOE noted that typical applications for spot coolers are those that require cooling in one localized zone and can tolerate exhaust heat outside of this zone. These applications are typically larger spaces with harsh conditions, and spot coolers are therefore generally more robust in construction than their single-duct and dual-duct portable AC counterparts. As such, DOE proposed defining a spot cooler as a portable AC that draws condenser inlet air from and discharges condenser outlet air to the conditioned space, and draws evaporator inlet air from and discharges evaporator outlet air to a localized zone within the conditioned space. In the February 2015 NOPR, DOE did not propose testing provisions for measuring the energy performance of spot coolers because these products do not provide net cooling to the conditioned space, and because they incorporate different design features and usage patterns than single-duct and dual-duct portable ACs. 80 FR 10211, 10213, 10214–10215 (Feb. 25, 2015).

In response to the February 2015 Preliminary Analysis, DENSO commented that a spot cooler with optional ducts on either the condenser or evaporator side should still be classified as a spot cooler rather than a single-duct or dual-duct portable AC. (DENSO, Standards Preliminary Analysis, No. 13 at pp. 1–2)

DOE agrees that a portable AC with no ducts on the condenser side, but with ducts on the evaporator side, would not be considered a single-duct or dual-duct portable AC because the portable AC would not be able to reject heat from the condenser to the ambient air through a window to space outside that in which the unit is located (*i.e.,* the conditioned space), as is required by the single-duct and dual-duct portable AC definitions. Ducts optionally attached to the evaporator side would simply direct the delivery of the cooling air to a specific zone within the conditioned space.

Optional ducts that may be attached to spot coolers on the condenser side vary significantly in purpose and design from those accompanying single-duct and dual-duct portable ACs (*i.e.,* spot cooler condensers are not typically intended to be ducted through a window by means of an adjustable mounting bracket, but instead may be ducted through the ceiling or to a specific location within or outside the conditioned space by typically longer and larger-diameter ducts). Under the definitions established in this final rule for single-duct and dual-duct portable ACs, a portable AC with optional ducts on the condenser side that do not attach to an adjustable window mounting bracket would not classify the product as a single-duct or dual-duct portable AC.

The California IOUs urged DOE to adopt test procedures and consider future performance standards for spot coolers under DOE's proposed definitions. The California IOUs noted that 321 of the 427 spot cooler models in the California Energy Commission (CEC) Appliance Efficiency Database have cooling capacities below 14,000 British thermal units per hour (Btu/hr), and assumed this distribution is an indicator of widespread market availability of products below 14,000 Btu/hr. The California IOUs further commented that, should DOE decide not to adopt test procedures for spot coolers, DOE should define spot coolers as a non-covered product in order to avoid coverage for a category of equipment without establishing any standards, thereby preempting any state regulations. (California IOUs, No. 20 at pp. 1–2; California IOUs, No. 24 at p. 4) In this final rule, DOE maintains the approach proposed in the February 2015 NOPR to not establish test procedures for spot coolers because they do not provide net cooling to the conditioned space and they incorporate different design features and usage patterns than single-duct and dual-duct portable ACs. Additionally, due to the significant variability in operating conditions and installation configurations (including the variety of optional accessories) for spot coolers with optional condenser ducting attached, DOE does not have information to determine appropriate test setup and testing conditions to measure spot cooler energy use in a representative test procedure. Therefore, DOE is establishing testing requirements for only single-duct and dual-duct portable ACs at this time, as discussed in section III.A.1.a of this preamble.

Upon review of the spot cooler entries in the CEC Appliance Efficiency Database,[5] DOE concludes that a number of listed products would meet DOE's definitions of single-duct or dual-duct portable ACs. Such single-duct or dual-duct portable ACs would be covered by the test procedures adopted in this final rule. DOE also notes that, because spot coolers meet the definition of a portable AC as established by the April 2016 Coverage Determination, they are covered products under EPCA.

The Appliance Standards Awareness Project (ASAP), Alliance to Save Energy (ASE), American Council for an Energy-Efficient Economy (ACEEE), National Consumer Law Center (NCLC), Natural Resources Defense Council (NRDC), and Northwest Energy Efficiency Alliance (NEEA) (hereinafter the ''NOPR Joint Commenters'') and the California IOUs, expressed concern, in response to the February 2015 NOPR, that products not intended to be used as spot coolers could meet the definition of spot cooler and thereby avoid having to comply with portable AC standards. (NOPR Joint Commenters, No. 19 at p. 2; California IOUs, No. 20 at p. 2) In response to the concern raised by the NOPR Joint Commenters and California IOUs, DOE does not expect that manufacturers would begin selling products in spot cooler configurations due to the consumer utility impacts of exhausting the hot condenser air within the conditioned space.

NAM urged DOE to exclude commercial portable ACs[6] from the portable AC test procedure due to the unique construction and limited energy use of these niche products. Oceanaire and NAM explained that commercial portable ACs are primarily used to address temporary or short-term extreme conditions (elevated temperature, humidity, and corrosive surroundings). These commenters stated that commercial portable AC environmental conditions vary more significantly than those in consumer households, and therefore, claimed that

[5] The CEC Appliance Efficiency Database is accessible at *https://cacertappliances.energy.ca.gov/Pages/ApplianceSearch.aspx.*

[6] DOE expects that ''commercial portable ACs,'' as discussed by NAM and Oceanaire, likely refers to spot coolers. This determination was based on reviewing their overall comments and Oceanaire's product availability.

a single ambient test condition would not accurately reflect commercial portable AC performance. (Oceanaire, No. 10 at pp. 2–3; NAM, No. 17 at pp. 2–3) DOE established a definition and coverage for portable ACs in the April 2016 Coverage Determination. 81 FR 22514, 22516–22517, 22519–22520 (April 18, 2016). This definition requires that a portable AC operate on single-phase electric current, which DOE expects would exclude those products intended only for use in industrial applications. Any products that meet the portable AC definition are subject to the test procedures in this final rule, if applicable, and would be subject to any energy conservation standards should DOE establish them. As discussed earlier in this section, DOE is establishing test procedures only for single-duct and dual-duct portable ACs in this final rule. Accordingly, any portable ACs that meet the single-duct and dual-duct portable AC definitions are required to be tested according to appendix CC. Although DOE has identified portable AC configurations other than single-duct and dual-duct portable ACs, DOE is not establishing test procedures for such portable ACs in this final rule because it has not identified testing provisions that would be representative of operation during typical use. Further, because the test procedures established in this final rule apply only to single-duct and dual-duct portable ACs as discussed previously in this rule, DOE is not establishing the spot cooler definition proposed in the February 2015 NOPR and November 2015 SNOPR, as DOE has determined that it is not necessary for purposes of testing or product classification.

In conclusion, DOE is establishing, in this final rule, definitions for single-duct and dual-duct portable ACs. As noted in section III.A.1.a of this final rule, DOE is codifying these definitions at 10 CFR 430.2, rather than appendix CC, to reflect their applicability to the entirety of DOE's portable AC regulations, not only the test methods contained in appendix CC.

2. Convertible Products

DOE recognizes that some single-duct or dual-duct portable ACs may provide the consumer with the option to operate the unit as either a single-duct or dual-duct portable AC. If a product is distributed in commerce in both configurations, the different configurations represent different ''basic models'' within DOE's regulatory framework and the product must be rated and certified in both configurations. If a single-duct or dual-duct portable AC is offered with options for single-ducting and dual-ducting, such a unit would be required to be tested as a single-duct portable AC and a dual-duct portable AC. To the extent DOE establishes energy conservation standards for single-duct and dual-duct portable ACs, a single-duct or dual-duct portable AC distributed in commerce with multiple duct configurations would also be required to comply with any energy conservation standards applicable to those configurations. DOE notes that DOE's definition of ''distributed in commerce'' includes any representations made on manufacturer Web sites or in marketing literature, including optional accessories, regardless of the configuration in which the model is typically sold. That is, if a single-duct or dual-duct portable AC is advertised as capable of operating in both a single-duct and dual-duct configuration, that model would meet DOE's definitions of both single-duct and dual-duct portable ACs and, therefore, would be required to be tested and certified under both configurations.

This approach is similar to how DOE has treated other types of covered products and equipment, including dehumidifiers. In the recent dehumidifier test procedure final rule, DOE explained that products that meet the definitions for both portable and whole-home dehumidifiers as produced by the manufacturer, exclusive of any third-party modifications, must be tested in both configurations and comply with any applicable energy conservations standards for each configuration. 80 FR 45802, 45806 (July 31, 2015). Therefore, under this final rule, single-duct and dual-duct portable ACs that are distributed in commerce with multiple duct configuration options must be tested in each applicable configuration and the performance in each tested configuration must comply with any applicable energy conservation standards.

B. Active Mode

In the February 2015 NOPR, DOE proposed to define ''active mode'' as a mode in which the portable AC is connected to a mains power source, has been activated, and is performing the main functions of cooling or heating the conditioned space, circulating air through activation of its fan or blower without activation of the refrigeration system, or defrosting the refrigerant coil. 80 FR 10211, 10216 (Feb. 25, 2015). In the November 2015 SNOPR, DOE determined that the existing statutory definition of ''active mode'' was sufficient for purposes of the portable AC test procedure and therefore no longer proposed a separate definition of ''active mode'' for portable ACs. 80 FR 74020, 74022 (Nov. 27, 2015).

AHAM agreed with DOE's proposal to remove the expanded definition for active mode from the test procedure. (AHAM, No. 23 at p. 2) DOE maintains the November 2015 SNOPR proposal and does not establish a separate definition of ''active mode'' for portable ACs in this final rule.

C. Cooling Mode

1. General Test Approach

In the November 2015 SNOPR, DOE proposed a test procedure with provisions for measuring portable AC energy use in cooling mode that would be based on the current version of AHAM PAC–1, ANSI/AHAM PAC–1–2015. The general test method in ANSI/AHAM PAC–1–2015 measures cooling capacity and EER based on an air enthalpy approach that measures the air flow rate, dry-bulb temperature, and water vapor content of air at the inlet and outlet of the portable AC when it is installed in a test chamber at specified indoor ambient conditions and the ducts are connected to a second chamber at specified outdoor ambient conditions. DOE noted in the November 2015 SNOPR that AHAM issued this new version of PAC–1 in 2015, with no changes in language from the 2014 version. Therefore, although DOE previously proposed in the February 2015 NOPR to adopt a test procedure for portable ACs that would be based on AHAM PAC–1–2014, DOE proposed in the November 2015 SNOPR to reference the identical updated version, ANSI/AHAM PAC–1–2015, in the proposed DOE portable AC test procedure in order to reference the most current industry version. 80 FR 74020, 74023 (Nov. 27, 2015).

AHAM supported the updated reference to ANSI/AHAM PAC–1–2015, confirming that the two versions are identical and noting that ANSI/AHAM PAC–1–2015 was a re-publication under ANSI requirements. (AHAM, No. 23 at p. 2)

DOE maintains the November 2015 SNOPR proposal and establishes ANSI/AHAM PAC–1–2015 as the basis for the DOE portable AC test procedure in this final rule.

DOE determined, however, in the February 2015 NOPR and November 2015 SNOPR that the results from ANSI/AHAM PAC–1–2015 tests do not fully account for operational factors that contribute to an apparent reduction of cooling capacity in the field, namely air infiltration from outside the conditioned space and heat transfer through the ducts and product case. DOE observed that infiltration from outside the conditioned space occurs due to the negative pressure induced as condenser air is exhausted outside the conditioned space. Although this effect is most pronounced for single-duct units, which draw all of their condenser air from with the conditioned space, dual-duct units also typically draw a portion of their condenser air from the conditioned space, which creates a negative pressure in the conditioned space, leading to infiltration air from unconditioned spaces (*e.g.,* outdoors, attics, and crawlspaces). Accordingly, DOE proposed in the February 2015 NOPR numerical calculations that would adjust the measured cooling capacity by subtracting the sensible and latent heat transfer of infiltration air at the outdoor conditions, as well as measured duct and case heat transfer. 80 FR 10211, 10223–10227 (Feb. 25, 2015); 80 FR 74020, 74026–74030 (Nov. 27, 2015). DOE received multiple comments regarding these proposed adjustments. Comments relating to the incorporation of infiltration air adjustments are discussed in this section, while those pertaining to duct and case heat transfer are discussed later in section III.C.5 and section III.C.6 of this final rule.

Related to an adjustment for infiltration, ASAP supported incorporating the effects of infiltration air in the measure of cooling capacity. (ASAP, Public Meeting Transcript, No. 13 at p. 44) Conversely, AHAM and De' Longhi Appliances s.r.l. (De' Longhi) opposed DOE's proposal to apply a numerical adjustment for infiltration air to the results of ANSI/AHAM PAC–1–2015 testing. They indicated that it is not possible to identify or incorporate realistic infiltration air field conditions in a test procedure. AHAM suggested that factors such as home construction, floorplan, insulation, and leakage are all variables that affect the impact of infiltration air and are outside the control of the manufacturing process. According to AHAM, unlike duct heat transfer and leakage loss which can be controlled and, to some extent, standardized, air infiltration cannot be standardized without assumptions to analyze the variables. Additionally, AHAM urged DOE to obtain portable AC-specific data to support its proposed test procedure. (AHAM, No. 23 at pp. 1–3; De' Longhi, No. 25 at p. 1)

Data presented in the February 2015 NOPR demonstrated that the net cooling of portable ACs is generally significantly lower than the air enthalpy measurements in ANSI/AHAM PAC–1–2015 would suggest, primarily due to the effects of air infiltration. Therefore, DOE determined that the use of ANSI/AHAM PAC–1–2015 alone would not accurately represent portable AC performance. Further, DOE's testing results indicated that varying air flow rates and heat losses among different portable ACs would preclude a fixed translation factor that could be applied to the results of ANSI/AHAM PAC–1–2015 to account for the impact of air infiltration. 80 FR 10211, 10221 (Feb. 25, 2015). DOE requested additional portable AC usage data from interested parties in both the February 2015 NOPR and November 2015 SNOPR and received no specific information that would impact DOE's proposals. DOE further notes, as discussed in section I.A of this final rule, that in accordance with EPCA, a test procedure must be designed to produce test results that measure energy efficiency during a representative average period of use. (42 U.S.C. 6293(b)(3)) Consequently, a DOE test procedure need not predict performance under every application, but rather under reasonably representative conditions applied consistently across all products. Therefore, DOE maintains its determination that the effects of infiltration air must be accounted for in the portable AC test procedure it establishes in this final rule, as it represents the performance of portable ACs under their typical installations and applications.

De' Longhi expressed concern that modifying the AHAM PAC–1–2014 method to account for infiltration air would disproportionately impact single-duct portable AC performance and subsequently cause the removal of such products from the market. De' Longhi asserted that single-duct portable ACs provide a unique consumer utility, allowing for easy installation, lighter weights, smaller dimensions, and the corresponding ability to easily move the equipment from room to room. According to De' Longhi, overall energy consumption may be reduced by using single-duct portable ACs because no room is conditioned unnecessarily. Therefore, De' Longhi did not agree with the proposal to modify the cooling capacity equation in AHAM PAC–1–2014 to address the effects of infiltration air. De' Longhi further noted that a certain amount of fresh air (make up air) is always required for proper ventilation. For residential occupancies, one to two air changes per hour are recommended. So the effect of air ventilation should be considered also, in general, for all air conditioning categories or it should be discounted for portable ACs. (De' Longhi, Public Meeting Transcript, No. 13 at pp. 13–15, 40; De' Longhi, No. 16 at pp. 1–3)

In response to De' Longhi's concerns regarding disproportionate impacts on single-duct portable ACs when infiltration air is accounted for, DOE notes that DOE's test procedure must provide an accurate representation of portable AC energy consumption during an average cycle of use. As noted previously, single-duct portable ACs typically generate higher rates of infiltration air than comparable dual-duct units, and such infiltration affects the capacity and efficiency. Therefore, DOE believes it is appropriate to address the impacts of infiltration air in the SACC and CEER, as this represents expected installation and performance.

However, as discussed further in section III.C.2, section III.C.3, and III.H of this final rule, the rating conditions and SACC calculation proposed in the November 2015 SNOPR mitigate De' Longhi's concerns. DOE recognizes that the impact of infiltration on portable AC performance is test-condition dependent and, thus, more extreme outdoor test conditions (*i.e.,* elevated temperature and humidity) emphasize any infiltration-related performance differences. The rating conditions and weighting factors proposed in the November 2015 SNOPR, and adopted in this final rule (see section III.C.2.a and section III.C.3 of this final rule), represent more moderate conditions than those proposed in the February 2015 NOPR. Therefore, the performance impact of infiltration air heat transfer on all portable AC configurations is less extreme. In consideration of the changes in test conditions and performance calculations since the February 2015 NOPR and the test procedure established in this final rule, DOE expects that single-duct portable AC performance is significantly less impacted by infiltration air.

Friedrich stated that the test procedure requires both rooms to be within 6 percent of the measured cooling or heating capacity, and therefore, because the rooms are balanced and there is a minor amount of pressure differential between both rooms, there is no need to take into account the infiltrated air. (Friedrich, Public Meeting Transcript, No. 13 at pp. 44–45) DOE infers that Friedrich's comment references Section 7.2 of ANSI/ASHRAE Standard 37–2009, ''Methods of Testing for Rating Electrically Driven Unitary Air-Conditioning and Heat Pump Equipment'' (ANSI/ASHRAE Standard 37–2009), which specifies that two simultaneous tests be conducted to determine the capacity of products rated at less than 135,000 Btu/h, and Section 10.1.2 of that standard which specifies that the results of these tests must agree within 6 percent. However, these sections of ANSI/ASHRAE Standard 37–2009 are not referenced in ANSI/AHAM PAC–1–2015, nor were they referenced in the proposed DOE test procedure in the February 2015 NOPR or November 2015 SNOPR. Therefore, Friedrich's comment does not apply to the DOE portable AC test procedure. In this final rule, DOE maintains that the initial measured cooling capacity prior to other adjustments be based on the indoor cooling capacity, as described in Section 7.3 of ANSI/ASHRAE Standard 37–2009 and referenced in Section 7.1.b of ANSI/AHAM PAC–1–2015.

2. Rating Conditions

a. Test Chamber Temperatures

In the February 2015 NOPR, DOE proposed the following standard rating conditions for cooling mode testing, adopting the conditions in Table 3, ''Standard Rating Conditions,'' in ANSI/AHAM PAC–1–2015, shown in Table III.2, where Test Configuration 3 applies to dual-duct units and Test Configuration 5 applies to single-duct units.[7] 80 FR 10211, 10226 (Feb. 25, 2015).

TABLE III.2—STANDARD RATING CONDITIONS—COOLING MODE—NOPR PROPOSAL

Test configuration	Evaporator inlet air, °F (°C)		Condenser inlet air, °F (°C)	
	Dry bulb	Wet bulb	Dry bulb	Wet bulb
3 (Dual-Duct)	80.6 (27)	66.2 (19)	95 (35)	75.2 (24)
5 (Single-Duct)	80.6 (27)	66.2 (19)	80.6 (27)	66.2 (19)

In response to the February 2015 NOPR, DENSO suggested that the relative humidity conditions differed significantly between the 2009 and 2014 versions of AHAM PAC–1 and that the test conditions should be expressed in whole degrees. Based on DENSO's comment, in the November 2015 SNOPR, DOE examined the relative impact of the varying latent heat differential between the indoor (evaporator) and outdoor (condenser) conditions in the February 2015 NOPR proposal and in AHAM PAC–1–2009, which specified slightly different temperatures in rounded °F.[8] DOE estimated that the change in test conditions from the 2009 to the 2015 version of AHAM PAC–1, proposed in the February 2015 NOPR, would decrease cooling capacity by 5–10 percent, an amount which DOE considered to be significant. DOE further noted that, although the test conditions in ANSI/AHAM PAC–1–2015 are harmonized with those in Canadian Standards Association (CSA) C370–2013 and ANSI/ASHRAE Standard 128–2011, they do not align with the test conditions in the DOE test procedures for other cooling products, particularly room ACs and central ACs. Therefore, to maintain consistency with the DOE test procedures of other cooling products, DOE proposed in the November 2015 SNOPR to revise the test conditions proposed in the February 2015 NOPR to align with the test conditions in AHAM PAC–1–2009. Namely, DOE proposed in the November 2015 SNOPR to specify indoor test conditions of 80 °F dry-bulb and 67 °F wet-bulb temperature, and a set of outdoor test conditions of 95 °F dry-bulb and 75 °F wet-bulb temperature. 80 FR 74020, 74024 (Nov. 27, 2015).

In the November 2015 SNOPR, DOE also proposed to include a second cooling mode test condition for dual-duct units at outdoor test conditions. Specifically, DOE proposed to reflect both the high-temperature conditions when cooling is most needed and the weighted-average temperature and humidity observed during the hottest 750 hours (the hours during which DOE expects portable ACs to operate in cooling mode) by testing using both the 95 °F dry-bulb and 75 °F wet-bulb temperature test condition and a second 83 °F dry-bulb temperature and 67.5 °F wet-bulb temperature test condition. For single-duct units, as both the evaporator inlet and condenser inlet air conditions are based on the indoor air condition, the air enthalpy test is not affected by the outdoor air conditions. The effects of any infiltration air are then calculated rather than tested directly. Accordingly, DOE proposed to maintain the same air enthalpy test for single-duct units. In addition to the infiltration air impacts assuming 95 °F dry-bulb and 75.2 °F wet-bulb temperature outdoor air, DOE proposed a second set of numerical calculations for adjusted cooling capacity (ACC) at the specific test conditions, and updated calculations for SACC and CEER based on the two proposed infiltration air conditions. (See section III.C.2.c of this rulemaking for discussion of the numerical adjustments by means of infiltration air calculations.) This approach was designed to minimize testing burden for single-duct portable ACs. Table III.3 shows the complete set of cooling mode rating conditions that DOE proposed for portable ACs in the November 2015 SNOPR. 80 FR 74020, 74026 (Nov. 27, 2015).

TABLE III.3—STANDARD RATING CONDITIONS—COOLING MODE—SNOPR PROPOSAL

Test configuration	Evaporator inlet air, °F (°C)		Condenser inlet air, °F (°C)	
	Dry bulb	Wet bulb	Dry bulb	Wet bulb
3 (Dual-Duct, Condition A)	80 (26.7)	67 (19.4)	95 (35)	75 (23.9)
3 (Dual-Duct, Condition B)	80 (26.7)	67 (19.4)	83 (28.3)	67.5 (19.7)
5 (Single-Duct)	80 (26.7)	67 (19.4)	80 (26.7)	67 (19.4)

[7] Additional information regarding the operating and test configurations can be found in Table 2 and Figure 1 of ANSI/AHAM PAC–1–2015.

[8] AHAM PAC–1–2009 prescribed evaporator inlet (indoor) conditions of 80 °F dry-bulb and 67 °F wet-bulb temperature, and condenser inlet (outdoor) conditions of 95 °F dry-bulb and 75 °F wet-bulb temperature.

AHAM agreed with DOE's assessment of the impact on cooling capacity and measured efficiency due to small changes in the test conditions between the 2009 and 2015 versions of AHAM PAC–1 and therefore supported DOE's proposal to revise the single-duct and the dual-duct (Condition A) test chamber conditions to be consistent with those in AHAM PAC–1–2009. AHAM also supported the proposal to conduct two tests for dual-duct units and noted that the increase in test burden is necessary in order to more accurately measure cooling capacity. (AHAM, No. 23 at pp. 2, 4)

NAM challenged DOE's assertion that portable ACs are used during the hottest 750 hours of the cooling season, suggesting that consumers often use portable ACs during the transition periods before and after summer to cool only a certain room or rooms prior to activating their central cooling or heating and that a temperature representing the hottest times of the cooling season is not representative of consumer use. (NAM, No. 17 at p. 2) DENSO stated that during the off season, the unit would be unplugged. (DENSO, No. 14 at p. 3)

In response to NAM's comment that portable ACs are often used during seasonal transition periods rather than during the hottest 750 hours of the cooling season and therefore test conditions based on the hottest times of the cooling season are not representative of consumer use, DOE notes that, as discussed in the February 2015 NOPR, in developing the representative rating conditions for portable ACs, DOE's view was that the room AC annual operating hours and test conditions presented in the most recent test procedure NOPR (hereinafter the ''room AC test procedure NOPR'') [9] were an appropriate proxy for portable ACs. DOE made this determination based on the many similarities between room ACs and portable ACs in design, cost, functionality, consumer utility, and applications. In the room AC test procedure in 10 CFR 430.23(f) and appendix F to subpart B of 10 CFR part 430, cooling mode is allotted 750 hours and testing is conducted at 95 °F, a high-temperature outdoor test condition during which cooling is most needed. Based on DOE's approach that the annual operating hours for room AC cooling was a reasonable proxy for portable AC cooling, DOE determined in the February 2015 NOPR that the portable AC cooling mode also should be allotted the hottest 750 hours during the cooling season. DOE requested information regarding this determination of cooling mode operating hours in the February 2015 NOPR and the November 2015 SNOPR. 80 FR 10211, 10235, 10242–10243 (Feb. 25, 2015); 80 FR 740202, 74032 (Nov. 27, 2015). No data regarding portable AC annual operating hours were provided to controvert DOE's approach in response to either the February 2015 NOPR or the November 2015 SNOPR.

DOE further notes that portable ACs may be used in spaces within the home that typically have no alternate conditioning equipment, such as new additions, attics, garages, and basements. In those locations, DOE expects portable ACs would be used as the primary conditioning equipment as central cooling is not typically utilized or available. Due to commonality with room AC use and variability in installation location, which suggests portable ACs are likely used as the primary mode of cooling for some applications, DOE maintains its determination that portable AC cooling mode use is most likely to occur during the hottest 750 hours during the cooling season, and has used this determination in establishing the test conditions for portable ACs in this final rule.

ASAP, ASE, and NEEA (hereinafter the ''SNOPR Joint Commenters'') and the California IOUs commented that with multiple test conditions, the proposed test procedure for portable ACs would not be comparable with the DOE test procedure for room ACs. These commenters suggested that any weight given to a different test condition (*e.g.,* the 83 °F outdoor dry-bulb temperature) would result in discrepancies in rated performance that would not allow for accurate comparison between the two similar and competing products. They asserted that the portable AC metric should be comparable with the room AC metric in order to achieve consistency with labeling and consumer expectations of equipment that provides similar utility. The SNOPR Joint Commenters and California IOUs supported a single test condition that reflects energy outputs during peak times when the equipment is most needed, as electric utilities are shifting towards peak-demand pricing. This single test condition would be the same as the current test procedure for room ACs, with an outdoor dry-bulb temperature of 95 °F, which these commenters believe best reflects peak usage. Because a seasonal adjustment inherently does not reflect peak performance, the SNOPR Joint Commenters and the California IOUs asserted that it would potentially underestimate peak portable AC energy use. The SNOPR Joint Commenters and the California IOUs further claimed that it is in the best interest of consumers that portable ACs function as anticipated in warmer temperatures. (SNOPR Joint Commenters, No. 22 at p. 1; California IOUs, No. 24 at p. 2)

In developing a test procedure for portable ACs, DOE is required, under 42 U.S.C. 6293(b)(3), to determine performance under common operating conditions to provide relevant information to the consumer and to measure energy efficiency during a representative period of use. DOE recognizes the value in measuring performance at peak operating conditions, as the performance of portable ACs will vary as a non-linear function of outdoor air temperature, such that a single rating at one outdoor test condition to represent the expected average operating condition may not capture the increased energy consumption at peak outdoor air temperatures and, therefore, would not accurately predict performance over an average cycle of use. DOE therefore concludes that capturing the performance at the peak operating conditions, in light of the variability expected within the cooling season, is necessary. As such, DOE's test procedure as established in this final rule captures performance at both the peak, high-temperature operating condition (95 °F dry-bulb and 75 °F wet-bulb temperature test condition) and the expected average operating condition (83 °F dry-bulb temperature and 67.5 °F wet-bulb temperature test condition) during the cooling season, and with weighting factors applied to the two conditions, collectively represent portable AC operating conditions during the cooling season.

As discussed in section III.C.3 of this final rule, the single CEER metric provides a representative measure of overall portable AC performance that accounts for the variability in performance during the cooling season. DOE did not receive comment on the proposed indoor air condition (evaporator inlet air); therefore, DOE is maintaining the indoor conditions as proposed in the November 2015 SNOPR.

In sum, DOE establishes standard rating conditions in this final rule that are identical with those proposed in the November 2015 SNOPR and summarized in Table III.3. DOE also clarifies that for the purposes of the cooling mode test procedure established in this final rule, evaporator inlet air is considered the ''indoor air'' of the conditioned space and (for dual-duct portable ACs) condenser inlet air is

[9] See 73 FR 74639 (Dec. 9, 2008).

considered the ''outdoor air'' outside of the conditioned space. DOE agrees that comparative ratings between room ACs and portable ACs is desirable and will consider whether rating conditions representative of room AC usage should be adjusted when it conducts a rulemaking for its room AC test procedures.

b. Infiltration Air Conditions

DOE proposed in the November 2015 SNOPR a numerical adjustment to the cooling capacity measured under ANSI/AHAM PAC–1–2015 using, in part, the heat transfer from infiltration air at the outdoor conditions (condenser inlet air) specified in Table III.3 for Test Configuration 3. 80 FR 74020, 74024–74026 (Nov. 27, 2015).

The SNOPR Joint Commenters supported using infiltration air conditions equivalent to the outdoor test condition. According to the SNOPR Joint Commenters, all infiltration air is ultimately coming from the outdoors, and in many cases, the bulk of the infiltration air may be coming directly from outdoors due to leaks through the window where the portable AC is installed. Although they agree that the temperature of infiltration air coming from sources other than the window bracket could be either higher or lower than the outdoor air temperature, they believe that portable ACs should not derive a *de facto* benefit by being rated at a lower infiltration air temperature achieved via the energy consumption of other air conditioning equipment. (SNOPR Joint Commenters, No. 22 at p. 2)

AHAM and NAM stated that air temperature and humidity vary for different field installations and among different rooms within a home. Therefore, they do not believe there is a representative infiltration air condition under which to test portable ACs with considerations for infiltration air heat transfer. (AHAM, No. 18 at p. 3; NAM, No. 17 at p. 2) Nonetheless, AHAM and De' Longhi stated that, should DOE include provisions in the test procedure to account for infiltration air effects despite their objections, DOE must select a representative test temperature for that infiltration air. (AHAM, No. 18 at p. 1; De' Longhi, No. 25 at p. 1) De' Longhi suggested that DOE's analysis is inconsistent by considering both a national average condition (the 83 °F dry-bulb temperature) and a weighted average of the 83 °F and 95 °F dry-bulb temperature conditions when considering a representative temperature for the infiltration air. (De' Longhi, No. 25 at p. 2)

DOE agrees with AHAM and NAM that, in practice, the infiltration air conditions are variable depending on the specifics of installation, time of use, and other parameters. It is therefore necessary to identify testing conditions that best represent the typical range of parameters without being unduly burdensome to conduct. In specifying an appropriate test condition for the infiltration air, DOE maintains its assertion that infiltration air conditions are best represented by the outdoor air conditions. As discussed in the November 2015 SNOPR, DOE's research indicated that infiltration air flow rates are significant and represent a substantial percentage of the evaporator air flow rates for both single-duct and dual-duct portable ACs. These infiltration air flow rates are primarily due to the net negative pressure within the conditioned space due to portable AC operation. Additionally, certain units may have poor sealing in and around the window-mounting apparatus. The lack of sealing at the mounting point was supported by research conducted for room ACs within similar window installations and observation of portable AC installation equipment supplied by manufacturers. 80 FR 74020, 74025–74026 (Nov. 27, 2015). Thus, available information points to infiltration air predominantly entering the conditioned space directly from outside the window, and DOE maintains that assertion in specifying the infiltration-related test provisions for portable ACs adopted in this final rule with the conditions listed in Table III.3. Additionally, for the reasons discussed in section III.C.2.a of this final rule, DOE establishes that both the 83 °F and 95 °F dry-bulb temperatures and associated wet-bulb temperatures are representative outdoor conditions to include in the test procedure.

DENSO commented that if the effects of infiltration air are considered, they should be included on an annual basis, in which case the infiltration will lead to net cooling during the majority of the year when the infiltration air will be cooler than the temperature of the conditioned space. (DENSO, No. 14 at p. 2) However, as noted previously, DENSO also stated that during the off season, the unit would be unplugged. (DENSO, No. 14 at p. 3)

As discussed previously in section III.C.2 of this final rule, DOE expects that portable ACs operate during the hottest 750 hours of the cooling season based on annual operating hours determined by DOE for its room AC test procedure. DOE does not have information to suggest that the number of cooling season operating hours for portable ACs is significantly different than the average number of operating hours for room ACs, as they provide a similar consumer utility and serve similar applications. However, as suggested by DENSO, DOE expects that portable ACs would be unplugged outside of their operation during the cooling season. Therefore, DOE does not expect infiltration air associated with portable AC operation to occur outside of the cooling season.

To further address DENSO's comment regarding infiltration air and portable AC operation during the year, DOE presents the following field-metered study for portable ACs that suggests typical portable AC operation occurs only during the cooling season. In research conducted by Burke, *et al.,* using field-metered data for a sample of 19 single-duct and dual-duct portable ACs (hereinafter referred to as the Burke Portable AC Study),[10] an annual energy use model was developed which included an estimate of the percentage of time that a typical portable AC spends in cooling mode as a function of the outdoor temperature. The linear equation, based on outdoor dry-bulb temperature in °F for residential sites, is expressed as:

$$\%\ \mathit{Time\ in\ Cooling\ Mode} = 0.005 \times \mathit{Outdoor\ Temperature} - 0.2909$$

Based on this equation, a portable AC would, on average, operate in cooling mode approximately four to five times more often when the outdoor temperatures are at the rating conditions of 83 °F and 95 °F (12 percent and 18 percent of the time, respectively) than when outdoor temperatures are 65 °F or lower, which are conditions more likely to be experienced outside of the cooling season. For portable ACs installed in commercial sites, the percentage of time spent in cooling mode is even higher, as indicated by the following linear equation from the Burke Portable AC Study:

$$\%\ \mathit{Time\ in\ Cooling\ Mode} = 0.0193 \times \mathit{Outdoor\ Temperature} - 0.9382$$

When outdoor conditions are 83 °F and 95 °F, a portable AC in a commercial location would be expected to spend 66 percent and 90 percent of the time in cooling mode, respectively, versus 32 percent or less when outdoor temperatures are no more than 65 °F.

Therefore, because portable ACs operate a significantly greater percentage of the time in cooling mode

[10] T. Burke, et al., ''Using Field-Metered Data to Quantify Annual Energy Use of Portable Air Conditioners,'' Lawrence Berkeley National Laboratory, Report No. LBNL–6868E-Rev (December 2014). Available at *https://publications.lbl.gov/islandora/object/ir%3A6868E-Rev.*

when outdoor temperatures are those associated with the rating conditions, which are derived from climate data during the cooling season, than when outdoor temperatures are more consistent with time periods outside the cooling season, DOE did not consider year-round operation when evaluating the impacts of infiltration air on portable AC cooling capacity. Furthermore, due to their portability and ease of installation, DOE expects the majority of portable ACs are likely to be installed only during the cooling season rather than year-round, thereby avoiding the infiltration of air cooler than the conditioned space. For these reasons, DOE concludes that the condenser inlet air (outdoor) rating conditions specified for Test Configuration 3 (Conditions A and B) are appropriate temperatures to use in applying the numerical adjustment to account for air infiltration effects.

c. Infiltration Air Calculations

As discussed in section III.C.2.b of this final rule, DOE proposed in the November 2015 SNOPR a numerical adjustment to the cooling capacity measured under ANSI/AHAM PAC–1–2015 using, in part, the heat transfer from infiltration air at the outdoor conditions. In the November 2015 SNOPR, DOE proposed to calculate the sensible and latent heat components of infiltration air using the nominal test chamber and infiltration air conditions, as:

$$Q_s = \dot{m} \times 60 \times [(c_{p\_da} \times (T_{ia} - T_{indoor})) + (c_{p\_wv} \times (\omega_{ia} \times T_{ia} - \omega_{indoor} \times T_{indoor}))]$$

Where:

Q_s is the sensible heat added to the room by infiltration air, in Btu/h;
$\dot{m}$ is the dry air mass flow rate of infiltration air for a single-duct or dual-duct unit, in pounds per minute (lb/m);
c_{p_da} is the specific heat of dry air, 0.24 Btu per pound per degree Fahrenheit (Btu/lb_m-°F).
c_{p_wv} is the specific heat of water vapor, 0.444 Btu/lb_m-°F.
T_{indoor} is the indoor chamber dry-bulb temperature, 80 °F.
T_{ia} is the infiltration air dry-bulb temperature, 95 °F.
ω_{ia} is the humidity ratio of the infiltration air, 0.0141 pounds of water per pounds of dry air (lb_w/lb_{da}).
ω_{indoor} is the humidity ratio of the indoor chamber air, 0.0112 lb_w/lb_{da}.
60 is the conversion factor from minutes to hours.

$$Q_l = \dot{m} \times 60 \times H_{fg} \times (\omega_{ia} - \omega_{indoor})$$

Where:

Q_l is the latent heat added to the room by infiltration air, in Btu/h.
$\dot{m}$ is the mass flow rate of infiltration air for a single-duct or dual-duct duct unit, in lb/m.
H_{fg} is the latent heat of vaporization for water vapor, 1061 Btu/lb_m.
ω_{ia} is the humidity ratio of the infiltration air, 0.0141 lb_w/lb_{da}.
ω_{indoor} is the humidity ratio of the indoor chamber air, 0.0112 lb_w/lb_{da}.
60 is the conversion factor from minutes to hours.

The sensible and latent heat components of infiltration air are added, and this sum is subtracted from the measured indoor-side cooling capacity to provide a representative measure of net cooling capacity provided to the conditioned space. DOE received no comments on the sensible and latent heat components of infiltration air equations using the nominal test chamber and infiltration air conditions, and maintains these equations in this final rule.

3. Seasonally Adjusted Cooling Capacity

In the November 2015 SNOPR, DOE proposed to apply weighting factors of 20 percent and 80 percent to the adjusted capacities from the two proposed conditions of 95 °F and 83 °F, respectively. These weighting factors were developed using an analytical approach based upon 2012 hourly climate data from the National Climatic Data Center (NCDC) of the National Oceanic and Atmospheric Administration (NOAA), collected at weather stations in 44 representative states, and data from the 2009 edition of the *Residential Energy Consumption Survey* (*RECS*),[11] and estimating the percentage of portable AC operating hours that would be associated with each rating condition. DOE allocated the number of annual hours with temperatures that ranged from 80 °F (the indoor test condition) to 89 °F (a temperature mid-way between the two rating conditions) to the 83 °F rating condition. Similarly, the hours in which the ambient temperature was greater than 89 °F were assigned to the 95 °F rating condition. DOE then performed a geographical weighted averaging using data from *RECS* to determine weighting factors of 19.7 percent and 80.3 percent, respectively, for the 95 °F and 83 °F rating conditions. DOE proposed in the November 2015 SNOPR to apply rounded weighting factors of 20 percent and 80 percent to the results of its testing at 95 °F and 83 °F, respectively. The calculation for this ''seasonally adjusted cooling capacity'' (SACC), based on the cooling capacities measured at each rating condition and adjusted for the effect of infiltration air and duct heat transfer (the ''adjusted cooling capacity'' (ACC)), was proposed in the November 2015 SNOPR according to the following equation.

$$SACC = (ACC_{95} \times 0.2) + (ACC_{83} \times 0.8)$$

Where:

SACC is the seasonally adjusted cooling capacity, in Btu/h.
ACC_{95} and ACC_{83} are the adjusted cooling capacities calculated at the 95 °F and 83 °F dry-bulb outdoor conditions, in Btu/h, respectively.
0.2 is the weighting factor for ACC_{95}.
0.8 is the weighting factor for ACC_{83}.

The California IOUs stated that the proposed weighting for these test conditions implies that portable ACs are four times more likely to be used when outdoor conditions are 83 °F versus 95 °F, the reverse of what they claim is expected. The California IOUs and SNOPR Joint Commenters expect consumers to primarily operate portable ACs during the hottest times, and stated that the test procedure should only measure performance at 95 °F without the weighting proposed in the November 2015 SNOPR. The California IOUs expressed concern that the 83 °F rating condition is not representative of actual use, and therefore objected to the 80-percent weighting of the results at that test condition in the calculations of SACC and CEER as proposed in the November 2015 SNOPR. The California IOUs urged DOE to base the portable AC test procedure and performance metrics on the single outdoor temperature of 95 °F. (California IOUs, No. 24 at p. 2; SNOPR Joint Commenters, No. 22 at p. 1)

AHAM and De' Longhi disagreed with DOE's approach to assign a temperature greater than 89 °F to the 95 °F rating condition. They noted that Table 16 of the ANSI/Air-Conditioning, Heating, and Refrigeration Institute (AHRI) Standard 210/240, ''Performance Rating of Unitary Air-Conditioning and Air-Source Heat Pump Equipment'' (ANSI/AHRI Standard 210/240), provides the distribution of fractional hours within a cooling season, and shows that temperatures greater than 95 °F account for only about 2 percent of the cooling season. Because these data are more granular than *RECS* data, AHAM and De' Longhi suggested that DOE apply weighting factors of 98 percent to the 83 °F condition and 2 percent to the 95 °F condition in the SACC and CEER equations, which De' Longhi noted would still correspond to a weighted-average temperature higher than DOE's estimated national-average dry-bulb temperature of 83 °F. (AHAM, No. 23 at pp. 3–4; De' Longhi, No. 25 at p. 2)

For the reasons discussed in section III.C.2.a of this rulemaking, DOE has

[11] *RECS* data are available online at *http://www.eia.gov/consumption/residential/data/2009/* ''*www.eia.gov/consumption/residential/data/2009/*.

concluded based on research of typical ambient temperature conditions, expected geographical distribution, and annual usage of portable ACs that the 83 °F and 95 °F outdoor rating conditions are representative rating conditions. DOE notes that the analysis presented in the November 2015 SNOPR utilizes *RECS* data to determine the geographical distribution of the number of hours at the two test conditions within the cooling season. Although ANSI/AHRI Standard 210/240 provides a fractional distribution of hours in the cooling season, that single distribution is not necessarily appropriate for states in which *RECS* data suggest portable ACs are typically used. Furthermore, DOE believes it is appropriate to assign all hours at temperatures above 89 °F to the 95 °F test condition as the measured performance of the equipment varies incrementally between 83 °F and 95 °F and the performance measured at the 95 °F test condition is more representative of equipment performance for temperatures between 89 °F and 95 °F (*e.g.,* 90 °F) than the measured performance at the 83 °F rating condition. Because the threshold temperature of 89 °F evenly divides the temperature range that DOE apportions between the two rating conditions, DOE maintains that the weighting values proposed in the November 2015 SNOPR, based on the climate analysis and *RECS* data for geographical weighting of the distribution of temperature hours within the cooling season, are representative of the SACC during typical periods of operation. Therefore, DOE is adopting, in this final rule, weights of 80 percent and 20 percent for the ACCs determined based on the 83 °F and 95 °F rating conditions, respectively, as proposed in the November 2015 SNOPR.

4. Test Duration

In the November 2015 SNOPR, DOE noted that ANSI/AHAM PAC–1–2015 specifies testing in accordance with certain sections of ANSI/ASHRAE Standard 37–2009, but does not explicitly specify the test duration required when conducting portable AC active mode testing. DOE therefore proposed that the active mode test duration be determined in accordance with Section 8.7 of ANSI/ASHRAE Standard 37–2009.[12] 80 FR 74020, 74027 (Nov. 27, 2015).

AHAM agreed with the proposal to aid in standardizing the test procedure and reducing variation in the results. In addition to Section 8.7 of ANSI/ASHRAE Standard 37–2009, AHAM suggested including Section 7.1.2 from ANSI/AHAM PAC–1–2015 that clarifies the test period adjustments necessary for portable ACs with a condensate pump. AHAM believes that referencing these sections will maximize accuracy, repeatability, and reproducibility of a DOE portable AC test procedure. (AHAM, No. 23 at pp. 4–5) In response to AHAM's suggestion, DOE notes that section 3.1.1.3 of the DOE test procedure proposed in the November 2015 SNOPR provides direction on conducting the test for units with different condensate collection and removal capabilities. In that section, DOE prescribed specific test requirements for units tested with condensate pumps and stated that section 7.1.2 of ANSI/AHAM PAC–1–2015 should be used for units tested with a condensate pump that do not have an auto-evaporative feature or gravity drain and for which the manufacturer has not specified the use of an included condensate pump during cooling mode operation. These test provisions are discussed in more detail in section III.C.8 of this final rule.

In this final rule, DOE adopts the November 2015 SNOPR proposals regarding the active mode test duration period.

5. Duct Heat Transfer and Leakage

a. Duct Heat Transfer Impacts

In the February 2015 NOPR, DOE presented its determination that duct heat losses and air leakage are non-negligible effects, and proposed to account for heat transferred from the duct surface to the conditioned space in the portable AC test procedure. DOE proposed that four equally spaced thermocouples be adhered to the side of the length of the condenser exhaust duct for single-duct units and the condenser inlet and exhaust ducts for dual-duct units. DOE proposed to determine the duct heat transfer for each duct from the average duct surface temperature as measured by the four thermocouples, a convection heat transfer coefficient of 4 Btu/h per square foot per °F (Btu/h-ft^2-°F), and the calculated duct surface area based on the test setup. 80 FR 10211, 10227 (Feb. 25, 2015).

In the November 2015 SNOPR, DOE found that the exhaust and intake duct surface heat transfer impacts were sufficiently significant to warrant the added test burdens associated with measuring and incorporating duct heat transfer impacts into the overall seasonally adjusted cooling capacity. 80 FR 74020, 74028 (Nov. 27, 2015).

AHAM and the SNOPR Joint Commenters agreed with DOE's proposal that duct heat transfer and losses need to be addressed as the duct heat transfer impacts are substantial and vary significantly among units. The SNOPR Joint Commenters supported incorporating duct heat transfer impacts in the test procedure to better reflect actual cooling capacity and efficiency of portable ACs and to encourage manufacturers to reduce duct heat transfer. (AHAM, No. 23 at p. 5; SNOPR Joint Commenters, No. 22 at p. 6)

In this final rule, DOE adopts the proposal in the November 2015 SNOPR and establishes that the duct heat transfer impacts be measured and incorporated into the overall SACC.

b. Convection Coefficient

In the November 2015 SNOPR, DOE maintained the overall heat transfer convection coefficient of 4 Btu/h-ft^2-°F for calculating duct heat losses originally proposed in the February 2015 NOPR. DOE explained that the *2013 ASHRAE Handbook—Fundamentals*[13] (hereinafter the *ASHRAE Handbook*) provides typical convection coefficient values for various types of assemblies in buildings. The proposed convection coefficient of 4 Btu/h-ft^2-°F was based on typical free convection coefficients, ranging from 0.22 to 1.63 Btu/h-ft^2-°F, and typical forced convection coefficients, between 4.00 and 6.00 Btu/h-ft^2-°F, depending upon the air speed. DOE determined that the air speeds discussed in the *ASHRAE Handbook* would be similar to the air speeds over the portable AC duct(s) due to air circulation within the conditioned space.

In support of the November 2015 SNOPR, DOE re-examined the data it obtained from testing a sample of four single-duct and two dual-duct portable ACs for the May 2014 NODA to determine the duct heat transfer convection coefficient for each unit. The calculated heat transfer convection coefficients based on DOE's testing ranged from 1.70 Btu/h-ft^2-°F to a high of 5.26 Btu/h-ft^2-°F, with an average of 3.13 Btu/h-ft^2-°F. In the November 2015 SNOPR, DOE noted that, although the average heat transfer coefficient calculated from DOE's test results was

[12] Section 8.7 of ANSI/ASHRAE Standard 37–2009 requires a steady-state period during which performance is consistent with the test tolerances specified in Table 2 of ANSI/ASHRAE Standard 37–2009 before cooling capacity test data are recorded. Data used in evaluating cooling capacity is then recorded at equal intervals that span five minutes or less until readings over a period of one-half hour are within the tolerances prescribed in section 9.2 of ANSI/ASHRAE Standard 37–2009.

[13] *ASHRAE Handbook—Fundamentals. American Society of Heating, Refrigerating, and Air-Conditioning Engineers,* Atlanta, GA. 2013.

slightly lower than the value proposed in the February 2015 NOPR, the proposed value of 4 Btu/h-ft²-°F was within the range of values measured during DOE's testing and was appropriate based on the lower end of the range of typical convection coefficients in the *ASHRAE Handbook.* In the November 2015 SNOPR, DOE also noted the significant variation in individual results due to different duct types, installation configurations, forced convection air flow patterns, and other factors; therefore, it is possible that DOE's test results do not represent the full range of possible heat loss coefficient values. DOE believed that the measured duct losses reported in the November 2015 SNOPR confirmed that the original value proposed in the February 2015 NOPR was sufficiently representative of typical duct losses and proposed to maintain the original duct heat transfer proposal from the February 2015 NOPR, including the convection heat transfer coefficient of 4 Btu/h-ft²-°F. 80 FR 74020, 74029 (Nov. 27, 2015).

AHAM and De' Longhi stated that the average measured convection heat transfer coefficient in Table III.4 of the November 2015 SNOPR was 3.13 Btu/h-ft²-°F, which according to AHAM was based on values of the heat transfer coefficient ranging from a low of 2.11 Btu/h-ft²-°F to a high of 4.10 Btu/h-ft²-°F. AHAM asserted that the test data did not validate the value proposed in the February 2015 NOPR and therefore, AHAM suggested that, unless additional data supported a different value for the heat transfer coefficient, DOE adopt a rounded average value of 3 Btu/h-ft²-°F. De' Longhi similarly recommended that DOE use a value of 3 Btu/h-ft²-°F for the duct convection heat transfer coefficient. (AHAM, No. 23 at p. 5; De' Longhi, No. 25 at p. 2)

DOE notes that the value for the convection heat transfer coefficient proposed in the November 2015 SNOPR was based on standard industry handbook values under reasonably representative air flow conditions and was generally confirmed based on consideration of test data from DOE's sample of portable ACs. However, following additional consideration, DOE recognizes that the typical industry handbook convection coefficient values may not represent the variation of test conditions and range of convection coefficients applicable to portable AC ducts. As noted above, for both single-duct and dual-duct portable ACs in DOE's test sample, the duct heat transfer coefficients ranged from 1.70 to 5.26 Btu/h-ft²-°F, as listed in Table III.4 of the November 2015 SNOPR, with an average value of approximately 3.1 Btu/h-ft²-°F. 80 FR 74020, 74029 (Nov. 27, 2015).

After considering the AHAM and De' Longhi comments and reviewing the test data presented in the November 2015 SNOPR, DOE has concluded that its test data provide the best indication of the appropriate convection heat transfer coefficient for portable AC ducts. Therefore, DOE concludes that the most representative value of the convection heat transfer coefficient would be a rounded average of its measured values, and in this final rule establishes the convection heat transfer coefficient as 3 Btu/h-ft²-°F.

c. Duct Surface Area Measurements

In the February 2015 NOPR, DOE proposed that the duct surface area be calculated using the outer duct diameter and extended length of the duct while under test. 80 FR 10211, 10227 (Feb. 25, 2015). In response to comments suggesting that the ducts have corrugated surfaces and there is likely a high uncertainty in measuring the duct surface area, DOE reassessed the duct surface area calculations and concluded in the November 2015 SNOPR that any uncertainty or variability in duct surface area measurements would not have a significant impact on test repeatability and reproducibility and maintained the surface area measurement as proposed in the February 2015 NOPR. 80 FR 74020, 74029 (Nov. 27, 2015).

DOE received no comments regarding uncertainty of duct surface area measurements in response to the November 2015 SNOPR proposals, and therefore maintains and establishes in this final rule that the duct surface area be calculated using the measured outer duct diameter and extended length of the duct while under test. However, DOE clarifies in the calculation of the duct surface area that the outer diameter of the duct includes any manufacturer-supplied insulation. See section III.C.7 of this final rule for further discussion regarding setup and installations instructions for such insulation.

6. Case Heat Transfer

In the February 2015 NOPR, DOE proposed that case heat transfer be determined using a method similar to the approach proposed for duct heat transfer. DOE proposed that the surface area and average temperature of each side of the case be measured to determine the overall heat transferred from the portable AC case to the conditioned space, which would be used to adjust the cooling capacity and efficiency. DOE noted that the case heat transfer methodology would impose additional test burden, but determined that the burdens were likely outweighed by the benefit of addressing the heat transfer effects of all internal heating components. 80 FR 10211, 10227–10229 (Feb. 25, 2015).

In the November 2015 SNOPR, DOE investigated the effects of case heat transfer as a percentage of the overall cooling capacity and determined, based on test data, that the case heat transfer was, on average, 1.76 percent of the AHAM PAC–1–2009 cooling capacity, with a maximum of 6.53 percent. Because the total case heat transfer impact was, on average, less than 2 percent of the cooling capacity without adjustments for infiltration air and heat transfer effects, DOE determined it had minimal impact on the cooling capacity and therefore proposed to remove the provisions for determining case heat transfer from the portable AC test procedure proposed in the February 2015 NOPR. 80 FR 74020, 74030 (Nov. 27, 2015).

AHAM supported DOE's proposal to remove consideration of case heat transfer from the test procedure due to the minimal impact on cooling capacity. (AHAM, No. 23 at p. 5)

The SNOPR Joint Commenters noted that despite the relatively low average impact of case heat transfer on the AHAM PAC–1–2009 cooling capacity, the impact ranged from 0 percent to 6.5 percent. The SNOPR Joint Commenters also noted that the ''Modified AHAM'' cooling capacity reported in the February 2015 NOPR, which accounted for air infiltration, case, and duct heat transfer, is significantly lower than the AHAM PAC–1–2009 cooling capacity. Therefore, the impact of case heat transfer as a percentage of adjusted cooling capacity as measured by the DOE test procedure proposed in the February 2015 NOPR, which accounts for air infiltration and other heat transfer effects, would be larger than the impact as a percentage of the AHAM PAC–1–2009 cooling capacity. Accordingly, the SNOPR Joint Commenters urged DOE to retain the measurement of case heat transfer in the portable AC test procedure. (SNOPR Joint Commenters, No. 22 at pp. 2–3) DOE notes that the ''Modified AHAM'' values presented in the February 2015 NOPR are only reflective of performance and infiltration air at the 95 °F test condition. DOE subsequently conducted additional analysis to determine the overall impact of case heat transfer on the SACC as determined based on the two test conditions proposed in the November 2015 SNOPR and adopted in this final rule (see section III.C.2 of this final rule). DOE found that the overall impact of case heat transfer on the

SACC, which includes adjustments for infiltration air and duct heat transfer at the two test conditions, ranged from 0 percent to 9.1 percent with an average impact of 2.12 percent. DOE maintains, therefore, that the case heat transfer typically would have a minimal impact on SACC, and that any slight improvement in the accuracy of the SACC metric by including it would not warrant the added burden associated with the case heat transfer measurements. DOE also observed that the range of case heat transfer impacts varied despite products in the test sample including similar amounts of case insulation and similar case designs. DOE expects that thermocouple placement in relation to internal components (*e.g.,* compressor and condenser placement) may introduce variability in the case heat transfer results. For these reasons, DOE is not including a measurement of case heat transfer in the portable AC test procedure established in this final rule.

The California IOUs opposed elimination of the case heat transfer measurement because they believe manufacturers may produce leakier, less-insulated cases in order to reduce the duct heat transfer, which is measured in the test procedure and impacts performance. They urged DOE to require measurement of the case surface temperature in the portable AC test procedure to incentivize manufacturers to design units with better-insulated cases. The California IOUS further noted that the heating effects of the case and duct are inter-dependent. (California IOUs, No. 24 at p. 4) DOE recognizes that case and duct heat transfer are related and that manufacturers are able to make design tradeoffs between duct heat transfer and localized heat transfer through the case. However, DOE notes that the units in DOE's test sample had similar case insulation, and does not expect manufacturers to significantly adjust construction of their products because greater leakage and reduced insulation would also increase noise and case surface temperatures, potentially reducing customer satisfaction.

7. Test Setup and Unit Placement

In the February 2015 NOPR, DOE proposed that for all portable AC configurations, there must be no less than 6 feet between the evaporator inlet and any chamber wall surface, and for single-duct units, there must be no less than 6 feet between the condenser inlet surface and any other wall surface. Additionally, DOE proposed that there be no less than 3 feet between the other surfaces of the portable AC with no air inlet or exhaust (other than the bottom of the unit) and any wall surfaces. 80 FR 10211, 10229–10230 (Feb. 25, 2015). In the November 2015 SNOPR, DOE modified that proposal, and further clarified that there shall be no less than 3 feet between any test chamber wall and any surface on the portable AC (other than the bottom surface), except the surface or surfaces that have a duct attachment, as prescribed by the ANSI/AHAM PAC–1–2015 test setup requirements. 80 FR 74020, 74030 (Nov. 27, 2015).

AHAM agreed with DOE's proposal that the test unit and all ducting components, as supplied by the manufacturer, be set up and installed in accordance with manufacturer instructions. AHAM stated, however, that certain sections of ANSI/AHAM PAC–1–2015 include appropriate requirements for unit placement in the test chamber and suggested that DOE change the unit placement requirements to reference the setup requirements in ANSI/AHAM PAC–1–2015. (AHAM, No. 23 at p. 6; AHAM, No. 18 at pp. 5–6) As discussed in the February 2015 NOPR and the November 2015 SNOPR, although Section 7.3.7, ''Condenser (heat rejection) arrangement,'' of ANSI/AHAM PAC–1–2015 includes test unit placement instructions in reference to the surface of the portable AC that includes the duct attachments, by means of specifying the distance from the test unit to the test chamber partition wall, it does not provide placement instructions in relation to the other surfaces of the test unit. Therefore, in this final rule, DOE maintains the proposals from the November 2015 SNOPR that the test unit placement be such that there is no less than 3 feet between any test chamber wall and any surface on the portable AC (other than the bottom surface), except that placement of the surface or surfaces that have a duct attachment shall be as prescribed by Section 7.3.7 of ANSI/AHAM PAC–1–2015. DOE notes that this specification is consistent with the requirements of ANSI/AHAM PAC–1–2015 and serves only to add specificity to the placement of the unit with respect to the other surfaces that do not have a duct attachment, which is not specified by ANSI/AHAM PAC–1–2015.

AHAM commented that DOE's duct setup and duct temperature measurement instructions do not account for any sealing or insulation materials that may be provided by the manufacturer. Therefore, AHAM suggested language to add in the installation instructions proposed in the November 2015 SNOPR that would address sealing and insulation materials in the duct setup and duct temperature measurement instructions. DOE's proposed duct setup and temperature measurement requirements presented in the November 2015 SNOPR with AHAM's suggested additions to the proposed text, denoted in bold text, are:

3.1.1.1 Duct Setup. Use ducting components provided by the manufacturer, including, where provided by the manufacturer, **sealing, insulation,** ducts, connectors for attaching the duct(s) to the test unit, and window mounting fixtures. Do not apply additional sealing or insulation.

3.1.1.6 Duct temperature measurements. Measure the surface temperatures of each duct using four equally spaced thermocouples per duct, adhered to the outer surface of the entire length of the duct. Temperature measurements must have an error no greater than ±0.5 °F over the range being measured. **Insulation and sealing provided by the manufacturer must be installed prior to measurement.**

(AHAM, No. 23 at p. 6)

De' Longhi suggested similar modifications to the installation instructions proposed in the November 2015 SNOPR to address manufacturer-provided sealing and insulation materials in the duct setup and duct temperature measurement instructions. (De' Longhi, No. 25 at p. 2)

DOE agrees that any duct insulation or mounting sealant provided by the manufacturer should be installed according to manufacturer instructions, and that duct temperature measurements should be made with any such insulation or sealant in place. However, DOE believes it is necessary to clarify in the specification of duct temperature measurements that the measurements should occur on the outer surface of the entire duct, which would be the outer surface of the insulation, if provided by the manufacturer. DOE therefore establishes the following modified duct setup and duct temperature measurement instructions in this final rule, clarifying AHAM's and De' Longhi's suggested language for the duct temperature measurements.

3.1.1.1 Duct Setup. Use ducting components provided by the manufacturer, including, where provided by the manufacturer, ducts, connectors for attaching the duct(s) to the test unit, sealing, insulation, and window mounting fixtures. Do not apply additional sealing or insulation.

3.1.1.6 Duct temperature measurements. Install any insulation and sealing provided by the manufacturer. Then adhere four equally spaced thermocouples per duct to the outer surface of the entire length of the duct. Measure the surface temperatures of each duct. Temperature measurements must have an error no greater than ±0.5 °F over the range being measured.

8. Condensate Collection

In the February 2015 NOPR, DOE proposed that portable ACs undergoing cooling mode testing would be configured in accordance with manufacturer installation and setup instructions unless otherwise specified in the DOE test procedure. In addition, DOE proposed that, where available and as instructed by the manufacturer, the auto-evaporation feature would be utilized for condensate removal during cooling mode testing. DOE proposed that, if no auto-evaporative feature is available, the gravity drain would be used. DOE further proposed that, if no auto-evaporative feature or gravity drain is available, and a condensate pump is included, or if the manufacturer specifies the use of an included condensate pump during cooling mode operation, then the portable AC would be tested with the condensate pump enabled. For these units, DOE also proposed to require the use of Section 7.1.2 of AHAM PAC–1–2014 if the pump cycles on and off. 80 FR 10211, 10229 (Feb. 25, 2015).

AHAM agreed that, for portable ACs both with and without means for auto-evaporation to remove the collected condensate, an internal pump to collect condensate should be used only if it is specified by the manufacturer for use during typical cooling operation. (AHAM, No. 18 at p. 6) DENSO agreed that the test procedure should specify the form of condensate disposal recommended by the manufacturer. (DENSO, No. 14 at p. 2) Therefore, DOE adopts in this final rule the test setup instructions relating directly to condensate collection proposed in the February 2015 NOPR.

9. Control Settings

In the February 2015 NOPR, DOE proposed that when conducting the cooling mode and heating mode tests (the latter of which was removed from consideration in the November 2015 SNOPR), the fan be set at the maximum speed if the fan speed is user adjustable and the temperature controls be set to the lowest or highest available values, respectively. These control settings represent the settings a consumer would select to achieve the primary function of the portable AC, which is to cool or heat the desired space as quickly as possible and then to maintain these conditions. 80 FR 10211, 10229 (Feb. 25, 2015).

AHAM and DENSO agreed with DOE's proposed control settings for fan speed and cooling and heating mode temperature controls. (AHAM, No. 18 at p. 6; DENSO, No. 14 at pp. 2–3) DOE maintains the February 2015 NOPR proposal in this final rule to set the fan speed to the maximum speed and the thermostat to the lowest setting during cooling mode testing. As noted earlier in this section and discussed in more detail in section III.D of this final rule, in the November 2015 SNOPR, DOE removed heating mode testing from its proposal; and, therefore, the February 2015 NOPR proposal regarding configuration of controls during heating mode is no longer relevant.

In the February 2015 NOPR, DOE proposed that all portable AC testing be conducted with any louver oscillation feature disabled and the louvers fully open and positioned parallel to the air flow to provide maximum air flow and capacity. If the louvers oscillate by default with no option to disable the feature, testing would proceed with the louver oscillation enabled, without altering the unit construction or programming. 80 FR 10211, 10229 (Feb. 25, 2015).

AHAM and DENSO agreed with DOE's proposed clarification that all portable AC performance testing be conducted with the maximum louver opening and, where applicable, with the louver oscillation feature disabled throughout testing. (AHAM, No. 18 at p. 6; DENSO, No. 14 at pp. 2–3) DOE adopts in this final rule the proposals in the February 2015 NOPR regarding the louver positioning and oscillating feature settings.

10. Electrical Supply

In the February 2015 NOPR, DOE proposed that for active mode testing, the input standard voltage be maintained at 115 V ±1 percent and that the electrical supply be set to the nameplate listed rated frequency, maintained within ±1 percent. 80 FR 10211, 10230 (Feb. 25, 2015).

AHAM supported DOE's proposed input voltage and frequency standard. (AHAM, No. 18 at p. 7) DOE adopts in this final rule the February 2015 NOPR proposals regarding the input standard voltage and frequency settings.

11. Power Factor

The California IOUs recommended that DOE require testing and reporting of portable AC power factor [14] under the proposed test procedure, as this would allow DOE to better assess minimum power factor requirements and related consumer benefits in a future rulemaking. The California IOUs believe that improving power factor may yield significant societal benefits through cost savings for electric utility customers, improved grid efficiency, and reduced greenhouse gases. The California IOUs noted that the CEC currently requires reporting of power factor for a variety of appliances including fluorescent lamp ballasts, residential portable light-emitting diode (LED) luminaires, televisions, and large battery charger systems, and specifies minimum power factor requirements for portable LED luminaires and large battery charger systems. (California IOUs, Standards Preliminary Analysis, No. 15 at p. 4; California IOUs, No. 20 at pt. 2)

Based on limited power factor data on four test units, DOE observed average power factors of 0.978, 0.971, 0.987, and 0.95 with all cooling mode components operating. Because the power factors are consistently near 1, DOE's information suggests there is no significant difference between the power drawn by a portable AC and the apparent power supplied to the unit. DOE expects that the metrics established in this final rule accurately reflect the energy consumption of portable ACs, and that the burdens of measuring and reporting power factor would outweigh any potential benefits of this information. Therefore, DOE is not establishing requirements for measuring and reporting power factor in this final rule.

12. Test Condition Tolerances

In the February 2015 NOPR, DOE proposed a more stringent tolerance for the evaporator inlet dry-bulb temperature when testing single-duct portable ACs compared to the tolerance specified for dry-bulb temperature in Table 2b of ANSI/ASHRAE Standard 37–2009. The proposed tolerance is consistent with the evaporator inlet wet-bulb temperature tolerance; *i.e.,* individual values must remain within a range of 1.0 °F, with the average of all measured values within 0.3 °F of the nominal value. Specifically, DOE proposed that the condenser inlet dry-bulb temperature would be maintained within the test tolerance as specified in Table 2b of ANSI/ASHRAE Standard 37–2009. This tolerance modification ensured that all test laboratories first maintain the evaporator inlet test

[14] The power factor of an alternating current electrical power system is defined as the ratio of the real power flowing to the load to the apparent power in the circuit. A load with a low power factor draws more electrical current than a load with a high power factor for the same amount of useful power transferred. The higher currents associated with low power factor increase the amount of energy lost in the electricity distribution system.

conditions and then ensure that condenser inlet conditions satisfy the tolerance requirements. 80 FR 10211, 10226 (Feb. 25, 2015).

AHAM agreed with DOE's proposed tolerance for the evaporator inlet dry-bulb within a range of 1.0 °F with an average difference of 0.3 °F. (AHAM, No. 18 at p. 5) Therefore, in this final rule, DOE adopts this tolerance specification in appendix CC.

D. Heating Mode

In the February 2015 NOPR, DOE proposed a definition for heating mode and proposed a heating mode test procedure that was based on AHAM PAC–1–2014 with comparable adjustments as were considered for cooling mode, except at lower temperature ambient conditions. 80 FR 10211, 10230–10231 (Feb. 25, 2015). DOE received comments in response to the February 2015 NOPR proposals, and, based on those comments, in the November 2015 SNOPR, DOE removed the heating mode test provisions from the proposed DOE portable AC test procedure, including the definition of heating mode and calculations for heating mode-specific and total combined energy efficiency ratio. DOE concluded that the combined energy efficiency ratio, CEER, which represents energy efficiency in cooling mode, off-cycle mode, standby mode, and off mode, would capture representative performance of portable ACs because they are primarily used as cooling products. 80 FR 74020, 74031 (Nov. 27, 2015).

AHAM supported DOE's proposal to remove the heating mode metric from the test procedure, as it is consistent with AHAM's position that heating is not the main consumer utility and that there is no adequate data on consumer usage to demonstrate a benefit that would justify the burden of testing in this mode. (AHAM, No. 23 at pp. 5–6)

The California IOUs commented that heating mode is a significant operating mode for portable ACs and should be included in the test procedure in order to accurately reflect the actual usage of the equipment. The California IOUs noted that heating mode may work in conjunction with cooling mode, as seen in products with an ''auto mode'' that automatically selects heating or cooling mode using a thermostat to maintain the set temperature. They further noted that DOE's annual operating hour estimates for heating mode suggested that the heating season is longer than the cooling season and would therefore provide more opportunity for heating mode operation. The California IOUs concluded that cooling and heating functions are both primary modes, unlike dehumidification mode and others omitted from the test procedure. The California IOUs believe that including heating mode testing would not disproportionately increase test burden. The California IOUs proposed that DOE define a separate efficiency ratio, $CEER_{HM}$, similar to the cooling mode metric proposed in the February 2015 NOPR, $CEER_{CM}$, and that units with a heating mode would then be rated with a separate metric for heating capacity. The California IOUs believe that this would mitigate potential confusion with a blended metric and consumers would be effectively informed of independent performance in cooling and heating modes. (California IOUs, No. 24 at p. 3)

DOE notes that although some portable ACs offer an ''auto mode'' that allows for both cooling and heating mode operation depending upon the ambient temperature, available data suggest that portable ACs are not used for heating purposes for a substantial amount of time. In the Burke Portable AC Study, the 19 metered test units were determined to operate solely in cooling mode, fan mode, or off/standby mode, even for an example test site where monthly average outdoor temperatures ranged from 59.8 °F to 71.5 °F. Input from manufacturers during confidential interviews confirmed the conclusion that any heating function for portable ACs is infrequently used, and no further substantiation was provided by the California IOUs to support their assertion that heating mode is a significant operating mode. DOE concludes that doubling the active mode testing time and correspondingly increasing test burden is not justified. Therefore, DOE maintains the November 2015 SNOPR proposal and does not establish a heating mode test or efficiency metric in this final rule. As stated in the November 2015 SNOPR, DOE will continue to evaluate the need for a representative heating mode test procedure for portable ACs and may consider including a test for heating mode in a future test procedure rulemaking.

E. Air Circulation Mode

In the February 2015 NOPR, DOE proposed to not measure energy consumption in, or allocate annual operating hours to, air circulation mode due to lack of usage information for this consumer-initiated air circulation feature. 80 FR 10211, 10216, 10236 (Feb. 25, 2015).

AHAM and DENSO agreed with DOE's proposal to not include a measurement for air circulation mode. (AHAM, Public Meeting Transcript, No. 13 at p. 64; DENSO, No. 14 at p. 3)

DOE adopts in this final rule the February 2015 NOPR proposals to not measure or allocate annual operating hours to air circulation mode.

F. Off-Cycle Mode

In the February 2015 NOPR, DOE proposed a definition for off-cycle mode and further proposed that off-cycle mode energy use be measured according to a test beginning 5 minutes after the completion of the cooling mode test and ending after a period of 2 hours. DOE also proposed that the electrical supply be the same as specified for cooling mode (see section III.C.10 of this final rule) and that this measurement be made using the same power meter specified for standby mode and off mode. DOE further proposed that for units with adjustable fan speed settings, the fan remain set at the maximum speed during off-cycle mode testing. 80 FR 10211, 10232 (Feb. 25, 2015).

AHAM opposed the proposed measurement of off-cycle mode energy use, suggesting that DOE did not provide sufficient portable AC-specific usage data to support the inclusion of off-cycle mode and estimate the burden associated with testing. Specifically, AHAM expressed concern that DOE based the proposed definition and testing provisions for portable ACs on a recent dehumidifier test procedure rulemaking because the two products do not have the same consumer usage. AHAM suggested that portable ACs have fewer standby operating hours than dehumidifiers and that off-cycle mode will contribute a negligible amount of energy use. (AHAM, No. 18 at p. 8)

Because portable ACs have a similar off-cycle mode to dehumidifiers, DOE used the dehumidifier test procedure as a starting point for the development of the portable AC definitions and test procedure. DOE notes that for dehumidifiers and portable ACs, off-cycle mode is a mode automatically entered when the dehumidifier humidity setpoint or portable AC temperature setpoint is reached. Therefore, although the consumer usage of these products affects the time spent in off-cycle mode by means of the humidity or temperature setpoint selection, off-cycle mode hours are also a function of the unit capacity, room size, and ambient heat or humidity load. Therefore, there is no basis for concluding that the dehumidifier provisions for testing off-cycle mode are any less applicable to portable ACs than they are for dehumidifiers. Further, because off-cycle mode is performed immediately following active mode, there are no necessary test setup adjustments and the only burden associated with off-cycle mode is test time, during which no technician input is necessary. Therefore, DOE believes the incremental test burden associated with testing off-cycle mode energy consumption is low. DOE discusses the burden associated with the adopted portable AC test procedure in detail in section IV.B of this final rule.

DENSO noted that other similar products, such as room ACs, generally operate the fans only when the compressor operates, possibly with a short delay-off at the end of the compressor cycle. In addition, DENSO commented that it does not believe that the fan would be operating at the maximum speed unless the compressor is running. DENSO commented, therefore, that off-cycle mode testing should be conducted under representative operating conditions, and that the fan control setting should be in accordance with manufacturer's instructions. (DENSO, No. 14 at p. 3)

In development of the portable AC test procedure, DOE reviewed other test procedures for similar products. With respect to DENSO's comment, DOE recognizes that there may be benefits associated with running the fan for a short period of time following a compressor cycle, such as for defrosting and drying coils and providing additional cooling to the room, and therefore maintains the provisions in this final rule which specify that the off-cycle mode test procedure begin 5 minutes following the end of a compressor on cycle. Because consumers are unlikely to readjust control settings, including fan speed, between cooling mode and off-cycle mode and manufacturers may automatically adjust fan speed during off-cycle mode regardless of the user control settings, DOE is specifying that no control settings other than temperature setpoint are to be manually changed between cooling mode testing and the subsequent off-cycle mode testing in the appendix CC established in this final rule.

G. Standby Mode and Off Mode

1. Mode Definitions

In the February 2015 NOPR, DOE proposed definitions for standby mode and off mode, as well as methods to measure standby mode and off mode energy consumption for portable ACs. DOE also proposed to consider the power consumption in inactive mode, defined as a standby mode, as representative of delay-start mode and to include the operating hours for delay-start mode in the estimate for inactive mode operating hours for the purposes of calculating a combined metric. Further detail on each of these modes and the proposal to include the delay-start mode hours in the estimate for inactive mode operating hours can be found in the February 2015 NOPR. 80 FR 10211, 10233 (Feb. 25, 2015).

AHAM agreed with DOE's proposed definitions of standby mode and also agreed with DOE's proposal to incorporate delay start into inactive mode. (AHAM, No. 18 at p. 9)

In this final rule, DOE establishes in appendix CC the standby mode, inactive mode, and off mode definitions proposed in the February 2015 NOPR, and also maintains the determination that the power consumption in inactive mode is representative of delay-start mode and thus does not require measurement of delay-start mode power consumption.

2. Determination of Standby Mode and Off Mode Power Consumption

In the February 2015 NOPR, DOE proposed to specify testing and conditions for measuring standby mode and off power consumption according to International Electrotechnical Commission (IEC) Standard 62301, ''Household electrical appliances—Measurement of standby power,'' Publication 62301, Edition 2.0 (2011–01) (hereinafter referred to as ''IEC Standard 62301'') in accordance with EPCA. DOE proposed that the power consumption in inactive mode be measured, and that the annual hours assigned to that power measurement would be the sum of annual hours for inactive mode and bucket-full mode,[15] based on a determination of commonality in power consumption in inactive and bucket-full modes. DOE additionally proposed that the test room ambient air temperatures for standby mode and off mode testing would be specified in accordance with IEC Standard 62301. 80 FR 10211, 10233–10234 (Feb. 25, 2015).

AHAM agreed with each of these proposals. (AHAM, No. 18 at p. 9) In this final rule, DOE establishes the February 2015 NOPR proposals regarding the determination of standby mode and off mode power consumption, the test room ambient temperature during testing, and the assignment of power consumption and operating hours for inactive mode and bucket-full mode.

[15] In the February 2015 NOPR, DOE described bucket-full mode as a standby mode in which the condensate level in the internal collection container reaches a manufacturer-specified threshold or the collection container is removed; any cooling, heating, or air-circulation functions are disabled; and an indication is provided to the consumer that the container is full.

H. Energy Efficiency Metrics

1. Annual Operating Mode Hours

As initially presented in the February 2015 NOPR, DOE developed estimates of portable AC annual operating mode hours for cooling mode, heating mode, off-cycle mode, and inactive or off mode. In the November 2015 SNOPR, DOE removed consideration of heating mode and updated the proposed annual operating hours for the remaining modes based on the ''Cooling Only'' scenario presented in the February 2015 NOPR as follows in Table III.4:

TABLE III.4—SNOPR PROPOSED ANNUAL OPERATING HOURS BY MODE

Modes	Operating hours
Cooling Mode	750
Off-Cycle Mode	880
Inactive or Off Mode	1,355

More information on the development of these annual hours for each operating mode can be found in the February 2015 NOPR. 80 FR 10211, 10235–10237 (Feb. 25, 2015).

AHAM opposed DOE's reliance on room AC data to determine annual operating hours for portable ACs. According to AHAM, although portable ACs and room ACs are similar, they have inherent differences in installation and use patterns. AHAM urged DOE to obtain portable AC-specific consumer usage data to demonstrate that portable AC and room AC use are comparable to validate the annual operating hour proposals. (AHAM, No. 23 at pp. 6–7)

In response to AHAM's concern regarding the lack of portable AC-specific data, DOE notes that the utility of portable ACs and room ACs are similar, in that they serve similar applications and are similar in technologies, cost, and functionality. Therefore, DOE believes that it is reasonable to assume that usage patterns of portable ACs and room ACs will also be similar. DOE requested data and information regarding consumer usage of portable ACs in both the February 2015 NOPR and the November 2015 SNOPR. DOE notes that no additional information or data were provided by AHAM or any other party regarding portable AC usage patterns. Therefore, in the absence of additional consumer usage data from any available sources, DOE continues to utilize the most relevant consumer use data available for portable ACs and establishes in appendix CC the annual operating mode hours in Table III.4.

2. CEER Calculation

In the November 2015 SNOPR, DOE proposed to revise the CEER metric calculation that was proposed in the February 2015 NOPR to reflect the elimination of heating mode and the addition of a second set of testing conditions for dual-duct units. DOE proposed that the updated CEER calculation, which would use the same weighting factors as were developed for SACC, would be determined as:

$$CEER_{SD} = \left[\frac{(ACC_{95} \times 0.2 + ACC_{83} \times 0.8)}{\left(\frac{AEC_{SD} + AEC_T}{k \times t}\right)}\right]$$

$$CEER_{DD} = \left[\frac{ACC_{95}}{\left(\frac{AEC_{95} + AEC_T}{k \times t}\right)}\right] \times 0.2 + \left[\frac{ACC_{83}}{\left(\frac{AEC_{83} + AEC_T}{k \times t}\right)}\right] \times 0.8$$

Where:

$CEER_{SD}$ and $CEER_{DD}$ are the combined energy efficiency ratios for single-duct and dual duct units, respectively, in British thermal units per watt-hour (Btu/Wh).

ACC_{95} and ACC_{83} are the adjusted cooling capacities at the 95 °F and 83 °F dry-bulb outdoor conditions, respectively, in Btu/h.

AEC_{SD} is the annual energy consumption in cooling mode for single-duct units, in kWh/year.

AEC_{95} is the annual energy consumption in cooling mode for dual-duct units, assuming all cooling mode hours would be at the 95 °F dry-bulb outdoor conditions, in kWh/year.

AEC_{83} is the annual energy consumption in cooling mode for dual-duct units, assuming all cooling mode hours would be at the 83 °F dry-bulb outdoor conditions, in kWh/year.

AEC_T is the total annual energy consumption attributed to all modes except cooling, in kWh/year.

t is the number of cooling mode hours per year, 750.

k is 0.001 kWh/Wh conversion factor for watt-hours to kilowatt-hours.

0.2 is the weighting factor for the 95 °F dry-bulb outdoor condition test.

0.8 is the weighting factor for the 83 °F dry-bulb outdoor condition test.

80 FR 74020, 74032 (Nov. 27, 2015).

The California IOUs supported the proposed test procedure and CEER calculations with the ACC metric, which accounts for the impact of infiltration air due to the draw of condenser air flow from the conditioned space as well as duct and case heat transfer effects. (California IOUs, No. 20 at p. 1)

AHAM opposed the proposed CEER equations as proposed in the February 2015 NOPR, commenting that the equations should be modified to remove the considerations for air infiltration and duct and case heat transfer effects. (AHAM, No. 18 at p. 10)

For the reasons discussed previously in this preamble, DOE is including air infiltration and duct heat transfer effects in its measurement of portable AC performance, but is not including case heat transfer effects (see section III.C.2.c, section III.C.5, and section III.C.6 of this final rule, respectively). DOE maintains the proposals from the November 2015 SNOPR, and establishes the above CEER calculations in this final rule.

3. Annual Operating Costs

In the February 2015 NOPR, DOE proposed that the annual energy consumption in cooling mode, AEC_{cm}, and the total annual energy consumption in all modes except cooling and heating, AEC_T, would be utilized in calculating the estimated annual operating cost. The sum of the two annual energy consumption metrics would then be multiplied by a representative average unit cost of electrical energy in dollars per kilowatt-hour as provided by the Secretary to obtain the estimated annual operating cost. 80 FR 10211, 10234 (Feb. 25, 2015). DOE maintained this proposal in the November 2015 SNOPR with slight modifications to address multiple cooling mode test conditions and to remove reference to heating mode. DOE received no comments from interested parties in response to either proposal. Therefore, in the absence of any comments and to support a potential portable AC labeling program should the Federal Trade Commission (FTC) establish such a program similar to that for room ACs, DOE adopts in this final rule the annual operating cost calculations that were proposed in the November 2015 SNOPR.

I. Compliance With Other Energy Policy and Conservation Act Requirements

1. Test Burden

EPCA requires that any test procedures prescribed or amended be reasonably designed to produce test results which measure energy efficiency, energy use, or estimated annual operating cost of a covered product during a representative average use cycle or period of use and not be unduly burdensome to conduct. (42 U.S.C. 6293(b)(3)) In the February 2015 NOPR, DOE concluded that establishing a test procedure to measure the energy consumption of single-duct and dual-duct portable ACs in active mode, standby mode, and off mode would produce the required test results and would not be unduly burdensome to conduct. This determination was driven by the many similarities between the necessary testing equipment and facilities for portable ACs and other products, the performance of which is currently certified through a DOE test procedure. Therefore, DOE tentatively concluded that manufacturers would not be required to make significant investment in test facilities and new equipment. 80 FR 10211, 10238 (Feb. 25, 2015)

In the November 2015 SNOPR, DOE proposed modifications to the test procedure proposed in the February 2015 NOPR, and noted that those modifications to the portable AC test procedures would not significantly increase the overall test burden compared to the test procedure proposed in the February 2015 NOPR and may instead reduce the overall test burden. 80 FR 74020, 74032–74033 (Nov. 27, 2015).

Because no substantive changes were made between the November 2015 SNOPR and this final rule, DOE maintains its determination from the November 2015 SNOPR that the portable AC test procedure established in this final rule would produce test results that measure energy consumption during representative use and would not be unduly burdensome to conduct.

2. Potential Incorporation of International Electrotechnical Commission Standard 62087

Under 42 U.S.C. 6295(gg)(2)(A), EPCA directs DOE to consider IEC Standard 62087 when amending test procedures for covered products to include standby mode and off mode power measurements. DOE reviewed IEC Standard 62087, ''Methods of measurement for the power consumption of audio, video, and related equipment'' (Edition 3.0 2011–04), and has determined that it would not be applicable to measuring power consumption of electrical appliances such as portable ACs. Therefore, DOE determined that referencing IEC Standards 62087 is not appropriate for the test procedure established in this final rule.

J. Sampling Plan and Rounding Requirements

In the February 2015 NOPR, DOE proposed sampling plan and rounding requirements for portable ACs to enable manufacturers to make representations of energy consumption or efficiency metrics, which would be included in the proposed 10 CFR 429.62. For the sampling plan, DOE proposed general sampling requirements for selecting units to be tested and provided direction regarding a sufficient sample size. DOE also proposed a method to determine a representative value for measures of energy consumption, that all calculations be performed with the unrounded measured values, and that the reported cooling or heating capacity be rounded in accordance with Table 1 of AHAM PAC–1–2014, now referenced as ANSI/AHAM PAC–1–2015 as discussed in section III.C.1 of this final rule. DOE further proposed that all energy efficiency metrics be rounded to the nearest 0.1 Btu/Wh. 80 FR 10211, 10237–10238 (Feb. 25, 2015).

In the November 2015 SNOPR, DOE removed reference to the eliminated cooling energy efficiency ratio and heating energy efficiency ratio and replaced cooling mode capacity and heating mode capacity with SACC in the proposed sampling plan and rounding requirements in 10 CFR part 429. The rated SACC would be based on the test sample mean, rounded as appropriate. DOE also clarified that the representative CEER for a basic model would be calculated based on statistical sampling provisions, which account for manufacturing and testing variability in product certification and compliance, rather than be determined as the mean value among tested units. Under these requirements, manufacturers would rate CEER based on the lower of the sample mean or the lower 95-percent confidence limit of the true mean divided by 0.90. 80 FR 74020, 74032 (Nov. 27, 2015). The confidence limit and derating factor proposed are consistent with those applied to other refrigeration-based consumer products, such as dehumidifiers and refrigerators, as DOE believes product variability and measurement repeatability associated with the measurements proposed for rating portable ACs are similar to those for the other consumer products.

DOE received no comments in response to the sampling plan and rounding requirements proposed in either the February 2015 NOPR or the November 2015 SNOPR, and therefore maintains the proposals from the November 2015 SNOPR to establish a new section 10 CFR 429.62 in this final rule that specifies the sampling and rounding requirements for CEER and SACC for portable ACs.

DOE also notes that certification requirements for portable ACs, which would also be located at 10 CFR 429.62(b), would be considered in the concurrent energy conservation standards rulemaking, as certification is not required for any equipment until and unless energy conservation standards are established.

K. General Comments

De' Longhi stated that a round robin test would be necessary to compare the results of different laboratories on the same units and ensure the validity of the test procedure. (De' Longhi, No. 16 at p. 4) DOE invited manufacturers and other interested parties to submit testing data on its various proposals, and did not receive any results pertaining to its proposals.

AHAM stated that it supports energy conservation standards and test procedures for portable ACs, and requested that DOE finalize the test procedure prior to publishing a proposed rule for portable AC standards. (AHAM, No. 18 at p. 2) In issuing this final rule, DOE is completing its rulemaking to establish a new test procedure for portable ACs. DOE is continuing to consider portable AC energy conservation standards in a concurrent rulemaking.

IV. Procedural Issues and Regulatory Review

A. Review Under Executive Order 12866

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

B. Review Under the Regulatory Flexibility Act

The Regulatory Flexibility Act (5 U.S.C. 601 *et seq.*) requires preparation of an initial regulatory flexibility analysis (IRFA) for any rule that by law must be proposed for public comment and a final regulatory flexibility analysis (FRFA) for any such rule that an agency adopts as a final rule, unless the agency certifies that the rule, if promulgated, will not have a significant economic impact on a substantial number of small entities. A regulatory flexibility analysis examines the impact of the rule on small entities and considers alternative ways of reducing negative effects. As required by Executive Order 13272, ''Proper Consideration of Small Entities in Agency Rulemaking,'' 67 FR 53461 (Aug. 16, 2002), DOE published procedures and policies on February 19, 2003, to ensure that the potential impacts of its rules on small entities are properly considered during the DOE rulemaking process. 68 FR 7990. DOE has made its procedures and policies available on the Office of the General Counsel's Web site: *http://energy.gov/gc/office-general-counsel*.

DOE reviewed this final rule under the provisions of the Regulatory Flexibility Act and the procedures and policies published on February 19, 2003. This final rule establishes test procedures to measure the energy consumption of single-duct and dual-duct portable ACs in active modes, standby modes, and off mode. DOE has concluded that the rule would not have a significant impact on a substantial number of small entities. The factual basis for this certification is as follows:

The Small Business Administration (SBA) considers a business entity to be small business, if, together with its affiliates, it employs less than a threshold number of workers specified in 13 CFR part 121. These size standards and codes are established by the North American Industry Classification System (NAICS). The threshold number for NAICS classification code 333415, ''Air-Conditioning and Warm Air Heating Equipment and Commercial and Industrial Refrigeration Equipment Manufacturing,'' which includes manufacturers of portable ACs, is 1,250 employees.

As discussed in the February 2015 NOPR, DOE surveyed the AHAM member directory to identify manufacturers of portable ACs. DOE also consulted publicly available data, purchased company reports from vendors such as Dun and Bradstreet, and contacted manufacturers, where needed, to determine if the number of manufacturers with manufacturing facilities located within the United States that meet the SBA's definition of a ''small business manufacturing facility.''

In the February 2015 NOPR, DOE estimated that there was one small business that may manufacture single-duct or dual-duct portable ACs and would be subject to the test procedure proposed in the February 2015 NOPR. After the February 2015 NOPR was published, DOE determined that the small business does not currently produce single-duct or dual-duct portable ACs. DOE, therefore, tentatively concluded and certified in the November 2015 SNOPR that the proposed rule would not have a significant economic impact on a substantial number of small entities, since none could be identified that manufactured products subject to the test procedure proposed in the November 2015 SNOPR. Since the publication of the November 2015 SNOPR, DOE did not discover any small businesses that currently manufacturer single-duct or dual-duct portable ACs, and therefore, concludes that the test procedure established in this final rule would not have a significant impact on a substantial number of small entities. On this basis, DOE has determined that the preparation of an FRFA is not warranted and has submitted a certification and supporting statement of factual basis to the Chief Counsel for Advocacy of the Small Business Administration for review under 5 U.S.C. 605(b).

DOE notes that, in response to the February 2015 NOPR, Oceanaire and NAM commented that the cost of testing and certification for commercial portable ACs would significantly impact their businesses (or manufacturers that they represent). These commenters estimated that approximately 15,000 large capacity commercial portable ACs (rated capacities up to 65,000 Btu/h) are manufactured annually. Oceanaire and NAM suggested that their niche industry utilizes specialized designs, often carrying 45 to 50 basic models and other custom designs for costumers with models typically manufactured in quantities of 10 or less annually. Oceanaire asserted that a certification program with third-party verification and compliance to the DOE statistical sampling protocol would exceed $1 million per year per company, severely limiting their ability to create unique products for customers. Oceanaire and NAM both suggested that the financial and resource impacts would ultimately force commercial portable AC manufacturers out of business. DENSO agreed, suggesting that the testing, reporting, and record-keeping associated with maintaining compliance with any DOE energy conservation standards would be substantial and place disproportionate burden on commercial portable AC manufacturers. (Oceanaire, No. 10 at pp. 1–2; NAM, No. 17 at p. 3; DENSO, No. 14 at p. 4)

Over the course of this rulemaking and the concurrent standards rulemaking for portable ACs, DOE has sought and carefully considered inputs received from interested parties regarding test burdens and associated impacts on all portable AC manufacturers affected by the rulemakings, including any small entities. Furthermore, DOE established a definition of a ''portable air conditioner'' in the April 2106 Coverage Determination for portable ACs (81 FR 22514, 22516, 22519–22520 (April 18, 2016)) that clarifies the characteristics and operation of this consumer product. The requirement that the product operate on single-phase electric current would exclude from coverage many of the high-capacity products to which Oceanaire and NAM referred. Additionally, any products that meet the portable AC definition as established in the coverage determination and that do not meet the definitions for single-duct portable AC or dual-duct portable AC are not required to be tested under the provisions established in this final rule. Although Oceanaire, NAM, and DENSO may manufacture products that meet the portable AC definition (or represent such manufacturers), DOE has determined that these niche manufacturers do not produce products that meet the single-duct or dual-duct definitions. Therefore, as discussed earlier in this section, DOE has not identified any small businesses that manufacture the single-duct and dual-duct portable ACs that would be affected by this final rule.

Furthermore, DOE evaluated the impact of the test procedure established in this final rule, should any small business manufacturers of single-duct or dual-duct portable ACs be identified in the future. This final rule adopts the proposals in the November 2015 SNOPR with minor additional modifications discussed previously in this final rule, though none of the modifications impact test burden. Therefore, the analysis regarding small business impacts conducted in the November 2015 SNOPR applies for the test procedure established in this final rule. The November 2015 SNOPR proposed modifications to the February 2015 NOPR, and DOE determined that those modifications were likely to reduce overall test burden with respect to the proposals in the February 2015 NOPR. In the February 2015 NOPR, DOE concluded that the costs associated with its proposals were small compared to the overall financial investment needed to undertake the business enterprise of developing and testing consumer products. DOE determined that no small business would require the purchase or modification of testing equipment in order to conduct cooling mode testing, and estimated a potential cost of approximately $2,000 in the event that a small business needed to purchase a wattmeter suitable for standby mode, off mode, and off-cycle mode testing. 80 FR 10211, 10239 (Feb. 25, 2015), 80 FR 74020, 74033 (Nov. 27, 2015).

After estimating the potential impacts of the new test procedure provisions and considering feedback from interested parties regarding test burdens, DOE concludes that the cost effects accruing from the final rule would not have a ''significant economic impact on a substantial number of small entities,'' and that the preparation of an FRFA on that basis also would not be warranted.

C. Review Under the Paperwork Reduction Act of 1995

While there are currently no energy conservation standards for portable ACs, DOE recently published a final determination establishing portable ACs as a type of covered product (81 FR 22514, 22517 (April 18, 2016)) and is considering establishing energy conservation standards for such products as part of a parallel rulemaking (Docket No. EERE–2013–BT–STD–0033). Manufacturers of portable ACs must certify to DOE that their products comply with any applicable energy conservation standards, once established. To certify compliance, manufacturers must first obtain test data for their products according to the DOE test procedures for portable ACs and maintain records of that testing for a period of two years, consistent with the requirements of 10 CFR 429.71. As part of this test procedure final rule, DOE is establishing regulations for recordkeeping requirements for portable ACs. The collection-of-information requirement for the certification and recordkeeping is subject to review and approval by OMB under the Paperwork Reduction Act (PRA). This requirement has been approved by OMB under OMB control number 1910–1400. Public reporting burden for the certification is estimated to average 30 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information.

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

D. Review Under the National Environmental Policy Act of 1969

In this final rule, DOE establishes a test procedure for portable ACs that will be used to support any future energy conservation standards for portable ACs. DOE has determined that this rule falls into a class of actions that are categorically excluded from review under the National Environmental Policy Act of 1969 (42 U.S.C. 4321 *et seq.*) and DOE's implementing regulations at 10 CFR part 1021. Specifically, this rule considers a test procedure for portable ACs that is largely based upon industry test procedures and methodologies, subject to significant input from interested parties in response to the February 2015 NOPR and November 2015 SNOPR, so it would not affect the amount, quality or distribution of energy usage, and, therefore, will not result in any environmental impacts. Thus, this rulemaking is covered by Categorical Exclusion A5 under 10 CFR part 1021, subpart D. Accordingly, neither an environmental assessment nor an environmental impact statement is required.

E. Review Under Executive Order 13132

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

F. Review Under Executive Order 12988

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

G. Review Under the Unfunded Mandates Reform Act of 1995

Title II of the Unfunded Mandates Reform Act of 1995 (UMRA) requires each Federal agency to assess the effects of Federal regulatory actions on State, local, and Tribal governments and the private sector. Public Law 104–4, sec. 201 (codified at 2 U.S.C. 1531). For a regulatory action resulting in a rule that may cause the expenditure by State, local, and Tribal governments, in the aggregate, or by the private sector of $100 million or more in any one year (adjusted annually for inflation), section 202 of UMRA requires a Federal agency to publish a written statement that estimates the resulting costs, benefits, and other effects on the national economy. (2 U.S.C. 1532(a), (b)) The UMRA also requires a Federal agency to develop an effective process to permit timely input by elected officers of State, local, and Tribal governments on a proposed ''significant intergovernmental mandate,'' and requires an agency plan for giving notice and opportunity for timely input to potentially affected small governments before establishing any requirements that might significantly or uniquely affect small governments. On March 18, 1997, DOE published a statement of policy on its process for intergovernmental consultation under UMRA. 62 FR 12820; also available at *http://energy.gov/gc/office-general-counsel.* DOE examined this final rule according to UMRA and its statement of policy and determined that the rule contains neither an intergovernmental mandate, nor a mandate that may result in the expenditure of $100 million or more in any year, so these requirements do not apply.

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

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

I. Review Under Executive Order 12630

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

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

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

K. Review Under Executive Order 13211

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

This regulatory action is not a significant regulatory action under Executive Order 12866. Moreover, it would not have a significant adverse effect on the supply, distribution, or use of energy, nor has it been designated as a significant energy action by the Administrator of OIRA. Therefore, it is not a significant energy action, and, accordingly, DOE has not prepared a Statement of Energy Effects.

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

Under section 301 of the Department of Energy Organization Act (Pub. L. 95–91; 42 U.S.C. 7101 *et seq.*), DOE must comply with section 32 of the Federal Energy Administration Act of 1974 (Pub. L. 93–275), as amended by the Federal Energy Administration Authorization Act of 1977 (Pub. L. 95–70). (15 U.S.C. 788; FEAA) Section 32 essentially provides in relevant part that, where a proposed rule authorizes or requires use of commercial standards, the notice of proposed rulemaking must inform the public of the use and background of such standards. In addition, section 32(c) requires DOE to consult with the Attorney General and the Chairman of the Federal Trade Commission (FTC) concerning the impact of the commercial or industry standards on competition.

This final rule establishes testing methods contained in the following commercial standards: ANSI/AHAM PAC–1–2015, ''Portable Air Conditioners''; and ANSI/ASHRAE Standard 37–2009, ''Methods of Testing for Rating Electrically Driven Unitary Air-Conditioning and Heat Pump Equipment''. While the newly established test procedure at appendix CC is not exclusively based on these standards, the general approach and many components of the test procedure adopt provisions from these standards without amendment. DOE has evaluated these standards and is unable to conclude whether they fully comply with the requirements of section 32(b) of the FEAA, (*i.e.,* that they were developed in a manner that fully provides for public participation, comment, and review). DOE has consulted with the Attorney General and the Chairman of the FTC concerning the impact on competition of requiring manufacturers to use the test methods contained in these standards, and neither recommended against incorporation of these standards.

M. Congressional Notification

As required by 5 U.S.C. 801, DOE will report to Congress on the promulgation of this rule before its effective date. The report will state that it has been determined that the rule is not a ''major rule'' as defined by 5 U.S.C. 804(2).

N. Materials Incorporated by Reference

In this final rule, DOE incorporates by reference the test standard published by AHAM, titled ''Portable Air Conditioners,'' ANSI/AHAM PAC–1–2015 (ANSI Approved). ANSI/AHAM PAC–1–2015 is an industry-accepted test procedure that measures portable AC performance in cooling mode and is applicable to products sold in North America. ANSI/AHAM PAC–1–2015 specifies testing conducted in accordance with other industry-accepted test procedures (already incorporated by reference) and determines energy efficiency metrics for various portable AC configurations. The test procedure established in this final rule references various sections of ANSI/AHAM PAC–1–2015 that address test setup, instrumentation, test conduct, calculations, and rounding. ANSI/AHAM PAC–1–2015 is readily available on AHAM's Web site at *https://www.aham.org/ht/d/Store/*.

In this final rule, DOE also incorporates by reference the test standard ASHRAE Standard 37–2009, titled ''Methods of Testing for Rating Electrically Driven Unitary Air-Conditioning and Heat Pump Equipment,'' (ANSI Approved). ANSI/ASHRAE Standard 37–2009 is an industry-accepted test standard referenced by ANSI/AHAM PAC–1–2015 that defines various uniform methods for measuring performance of air conditioning and heat pump equipment. Although ANSI/AHAM PAC–1–2015 references a number of sections in ANSI/ASHRAE Standards 37–2009, the test procedure established in this final rule additionally references one section in ANSI/ASHRAE Standard 37–2009 that addresses test duration. ANSI/ASHRAE Standard 37–2009 is readily available at *http://www.ashrae.org*.

In this final rule, DOE also incorporates by reference the test standard IEC 62301, titled ''Household electrical appliances—Measurement of standby power,'' (Edition 2.0, 2011–01). IEC 62301 is an industry-accepted test standard that sets a standardized method to measure the standby power of household and similar electrical appliances. IEC 62301 includes details regarding test set-up, test conditions, and stability requirements that are necessary to ensure consistent and repeatable standby and off-mode test results. IEC 62301 is readily available at *https://webstore.iec.ch/* and *http://www.webstore.ansi.org*.

V. Approval of the Office of the Secretary

The Secretary of Energy has approved publication of this final rule.

List of Subjects

10 CFR Part 429

Confidential business information, Energy conservation, Household appliances, Imports, Incorporation by reference, Reporting and recordkeeping requirements.

10 CFR Part 430

Administrative practice and procedure, Confidential business information, Energy conservation, Household appliances, Imports, Incorporation by reference, Intergovernmental relations, Small businesses.

Issued in Washington, DC, on April 26, 2016.

Kathleen B. Hogan,

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

For the reasons stated in the preamble, DOE amends parts 429 and 430 of chapter II of title 10, Code of Federal Regulations as set forth below:

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

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

Authority: 42 U.S.C. 6291–6317.

■ 2. Section 429.4 is amended by adding paragraph (b)(3) to read as follows:

§ 429.4 Materials incorporated by reference.

* * * * *

(b) * * *

(3) ANSI/AHAM PAC–1–2015 (''ANSI/AHAM PAC–1–2015''), Portable Air Conditioners, June 19, 2015, IBR approved for § 429.62.

* * * * *

■ 3. Add § 429.62 to read as follows:

§ 429.62 Portable air conditioners.

(a) *Sampling plan for selection of units for testing.* (1) The requirements of § 429.11 are applicable to portable air conditioners; and

(2) For each basic model of portable air conditioner, a sample of sufficient size must be randomly selected and tested to ensure that—

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

(A) The mean of the sample:

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

Where:

$\bar{x}$ is the sample mean;
x_i is the ith sample; and
n is the number of units in the test sample.

Or,

(B) The upper 95 percent confidence limit (UCL) of the true mean divided by 1.10:

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

Where:

$\bar{x}$ is the sample mean;
s is the sample standard deviation;
n is the number of units in the test sample; and
$t_{0.95}$ is the t statistic for a 95% one-tailed confidence interval with n–1 degrees of freedom.

And,

(ii) Any represented value of the combined energy efficiency ratio or other measure of energy consumption of a basic model for which consumers would favor higher values is less than or equal to the lower of:

(A) The mean of the sample:

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

Where:

$\bar{x}$ is the sample mean;
x_i is the ith sample; and
n is the number of units in the test sample.

Or,

(B) The lower 95 percent confidence limit (LCL) of the true mean divided by 0.90:

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

$\bar{x}$ is the sample mean;
s is the sample standard deviation;
n is the number of units in the test sample; and
$t_{0.95}$ is the t statistic for a 95% one-tailed confidence interval with n–1 degrees of freedom.

And,

(3) The value of seasonally adjusted cooling capacity of a basic model must be the mean of the seasonally adjusted cooling capacities for each tested unit of the basic model. Round the mean seasonally adjusted cooling capacity value to the nearest 50, 100, 200, or 500 Btu/h, depending on the magnitude of the calculated seasonally adjusted cooling capacity, in accordance with Table 1 of ANSI/AHAM PAC–1–2015, (incorporated by reference, see § 429.4), ''Multiples for reporting Dual Duct Cooling Capacity, Single Duct Cooling Capacity, Spot Cooling Capacity, Water Cooled Condenser Capacity and Power Input Ratings.''

(4) Round the value of combined energy efficiency ratio of a basic model to the nearest 0.1 Btu/Wh.

(5) Single-duct and dual-duct portable air conditioners distributed in commerce by the manufacturer with multiple duct configuration options that meet DOE's definitions for single-duct portable AC and dual-duct portable AC, must be rated and certified under both applicable duct configurations.

(b) *Certification reports.* [Reserved]

PART 430—ENERGY CONSERVATION PROGRAM FOR CONSUMER PRODUCTS

■ 4. The authority citation for part 430 continues to read as follows:

Authority: 42 U.S.C. 6291–6309; 28 U.S.C. 2461 note.

■ 5. Section 430.2 is amended by adding, in alphabetical order, the definitions for ''dual-duct portable air conditioner'' and ''single-duct portable air conditioner'' to read as follows:

§ 430.2 Definitions.

* * * * *

Dual-duct portable air conditioner means a portable air conditioner that draws some or all of the condenser inlet air from outside the conditioned space through a duct attached to an adjustable window bracket, may draw additional condenser inlet air from the conditioned space, and discharges the condenser outlet air outside the conditioned space by means of a separate duct attached to an adjustable window bracket.

* * * * *

Single-duct portable air conditioner means a portable air conditioner that draws all of the condenser inlet air from the conditioned space without the means of a duct, and discharges the condenser outlet air outside the conditioned space through a single duct attached to an adjustable window bracket.

* * * * *

■ 6. Section 430.3 is amended by:

■ a. Removing ''appendix AA to subpart B'' in paragraph (g)(4), and adding in its place, ''appendices AA and CC to subpart B'';

■ b. Redesignating paragraph (i)(8) as (i)(9), and adding a new paragraph (i)(8); and

■ c. Removing ''and Z to subpart B'' in paragraph (p)(5), and adding in its place, ''Z and CC to subpart B''.

The addition reads as follows:

§ 430.3 Materials incorporated by reference.

* * * * *

(i) * * *

(8) ANSI/AHAM PAC–1–2015, (''ANSI/AHAM PAC–1–2015''), Portable Air Conditioners, June 19, 2015, IBR approved for appendix CC to subpart B.

* * * * *

■ 7. Section 430.23 is amended by adding paragraph (dd) to read as follows:

§ 430.23 Test procedures for the measurement of energy and water consumption.

* * * * *

(dd) *Portable air conditioners.* (1) For single-duct and dual-duct portable air conditioners, measure the seasonally adjusted cooling capacity, expressed in British thermal units per hour (Btu/h), and the combined energy efficiency ratio, expressed in British thermal units per watt-hour (Btu/Wh) in accordance with appendix CC of this subpart.

(2) Determine the estimated annual operating cost for portable air conditioners, expressed in dollars per year, by multiplying the following two factors:

(i) For dual-duct portable air conditioners, the sum of AEC_{95} multiplied by 0.2, AEC_{83} multiplied by 0.8, and AEC_T as measured in accordance with section 5.3 of appendix CC of this subpart; or for single-duct portable air conditioners, the sum of AEC_{SD} and AEC_T as measured in accordance with section 5.3 of appendix CC of this subpart; and

(ii) A representative average unit cost of electrical energy in dollars per kilowatt-hour as provided by the Secretary.

(iii) Round the resulting product to the nearest dollar per year.

■ 8. Add and reserve appendix BB to subpart B of part 430 to read as follows:

Appendix BB to Subpart B of Part 430—[Reserved]

■ 9. Add appendix CC to subpart B of part 430 to read as follows:

Appendix CC to Subpart B of Part 430—Uniform Test Method for Measuring the Energy Consumption of Portable Air Conditioners

1. Scope

This appendix covers the test requirements used to measure the energy performance of single-duct and dual-duct portable air conditioners, as defined at 10 CFR 430.2.

2. Definitions

2.1 *ANSI/AHAM PAC–1–2015* means the test standard published by the Association of Home Appliance Manufacturers, titled ''Portable Air Conditioners,'' ANSI/AHAM PAC–1–2015 (incorporated by reference; see § 430.3).

2.2 *ASHRAE Standard 37–2009* means the test standard published by the American National Standards Institute and American Society of Heating, Refrigerating and Air-Conditioning Engineers and, titled ''Methods of Testing for Rating Electrically Driven Unitary Air-Conditioning and Heat Pump Equipment,'' ASHRAE Standard 37–2009 (incorporated by reference; see § 430.3).

2.3 *Combined energy efficiency ratio* is the energy efficiency of a portable air conditioner as measured in accordance with this test procedure in Btu per watt-hours (Btu/Wh) and determined in section 5.4.

2.4 *Cooling mode* means a mode in which a portable air conditioner has activated the main cooling function according to the thermostat or temperature sensor signal, including activating the refrigeration system, or activating the fan or blower without activation of the refrigeration system.

2.5 *IEC 62301* means the test standard published by the International Electrotechnical Commission, titled ''Household electrical appliances–Measurement of standby power,'' Publication 62301 (Edition 2.0 2011–01) (incorporated by reference; see § 430.3).

2.6 *Inactive mode* means a standby mode that facilitates the activation of an active mode or off-cycle mode by remote switch (including remote control), internal sensor, or timer, or that provides continuous status display.

2.7 *Off-cycle mode* means a mode in which a portable air conditioner:

(1) Has cycled off its main cooling or heating function by thermostat or temperature sensor signal;

(2) May or may not operate its fan or blower; and

(3) Will reactivate the main function according to the thermostat or temperature sensor signal.

2.8 *Off mode* means a mode in which a portable air conditioner is connected to a mains power source and is not providing any active mode, off-cycle mode, or standby mode function, and where the mode may persist for an indefinite time. An indicator that only shows the user that the portable air conditioner is in the off position is included within the classification of an off mode.

2.9 *Seasonally adjusted cooling capacity* means the amount of cooling, measured in Btu/h, provided to the indoor conditioned space, measured under the specified ambient conditions.

2.10 *Standby mode* means any mode where a portable air conditioner is connected to a mains power source and offers one or more of the following user-oriented or protective functions which may persist for an indefinite time:

(1) To facilitate the activation of other modes (including activation or deactivation of cooling mode) by remote switch (including remote control), internal sensor, or timer; or

(2) Continuous functions, including information or status displays (including clocks) or sensor-based functions. A timer is a continuous clock function (which may or may not be associated with a display) that provides regular scheduled tasks (*e.g.,* switching) and that operates on a continuous basis.

3. Test Apparatus and General Instructions

3.1 Active mode.

3.1.1 *Test conduct.* The test apparatus and instructions for testing portable air conditioners in cooling mode and off-cycle mode must conform to the requirements specified in Section 4, ''Definitions'' and Section 7, ''Tests,'' of ANSI/AHAM PAC–1–2015 (incorporated by reference; see § 430.3), except as otherwise specified in this appendix. Where applicable, measure duct heat transfer and infiltration air heat transfer according to section 4.1.1.1 and section 4.1.1.2 of this appendix, respectively. Note that if a product is able to operate as both a single-duct and dual-duct portable AC as distributed in commerce by the manufacturer, it must be tested and rated for both duct configurations.

3.1.1.1 *Duct setup.* Use ducting components provided by the manufacturer, including, where provided by the manufacturer, ducts, connectors for attaching the duct(s) to the test unit, sealing, insulation, and window mounting fixtures. Do not apply additional sealing or insulation.

3.1.1.2 *Single-duct evaporator inlet test conditions.* When testing single-duct portable air conditioners, maintain the evaporator inlet dry-bulb temperature within a range of 1.0 °F with an average difference within 0.3 °F.

3.1.1.3 *Condensate Removal.* Set up the test unit in accordance with manufacturer instructions. If the unit has an auto-evaporative feature, keep any provided drain plug installed as shipped and do not provide other means of condensate removal. If the internal condensate collection bucket fills during the test, halt the test, remove the drain plug, install a gravity drain line, and start the test from the beginning. If no auto-evaporative feature is available, remove the drain plug and install a gravity drain line. If no auto-evaporative feature or gravity drain is available and a condensate pump is included, or if the manufacturer specifies the use of an included condensate pump during cooling mode operation, then test the portable air conditioner with the condensate pump enabled. For units tested with a condensate pump, apply the provisions in Section 7.1.2 of ANSI/AHAM PAC–1–2015 (incorporated by reference; see § 430.3) if the pump cycles on and off.

3.1.1.4 *Unit Placement.* There shall be no less than 3 feet between any test chamber wall surface and any surface on the portable air conditioner, except the surface or surfaces of the portable air conditioner that include a duct attachment. The distance between the test chamber wall and a surface with one or more duct attachments is prescribed by the test setup requirements in Section 7.3.7 of ANSI/AHAM PAC–1–2015 (incorporated by reference; see § 430.3).

3.1.1.5 *Electrical supply.* Maintain the input standard voltage at 115 V ±1 percent. Test at the rated frequency, maintained within ±1 percent.

3.1.1.6 *Duct temperature measurements.* Install any insulation and sealing provided by the manufacturer. Then adhere four equally spaced thermocouples per duct to the outer surface of the entire length of the duct. Measure the surface temperatures of each duct. Temperature measurements must have an error no greater than ±0.5 °F over the range being measured.

3.1.2 *Control settings.* Set the controls to the lowest available temperature setpoint for cooling mode. If the portable air conditioner has a user-adjustable fan speed, select the maximum fan speed setting. If the portable air conditioner has an automatic louver oscillation feature, disable that feature throughout testing. If the louver oscillation feature is included but there is no option to disable it, test with the louver oscillation enabled. If the portable air conditioner has adjustable louvers, position the louvers parallel with the air flow to maximize air flow and minimize static pressure loss.

3.1.3 *Measurement resolution.* Record measurements at the resolution of the test instrumentation.

3.2 Standby mode and off mode.

3.2.1 *Installation requirements.* For the standby mode and off mode testing, install the portable air conditioner in accordance with Section 5, Paragraph 5.2 of IEC 62301 (incorporated by reference; see § 430.3), disregarding the provisions regarding batteries and the determination, classification, and testing of relevant modes.

3.2.2 *Electrical energy supply.*

3.2.2.1 *Electrical supply.* For the standby mode and off mode testing, maintain the input standard voltage at 115 V ±1 percent. Maintain the electrical supply at the rated frequency ±1 percent.

3.2.2.2 *Supply voltage waveform.* For the standby mode and off mode testing, maintain the electrical supply voltage waveform indicated in Section 4, Paragraph 4.3.2 of IEC 62301 (incorporated by reference; see § 430.3).

3.2.3 *Standby mode and off mode wattmeter.* The wattmeter used to measure standby mode and off mode power consumption must meet the requirements specified in Section 4, Paragraph 4.4 of IEC 62301 (incorporated by reference; see § 430.3).

3.2.4 *Standby mode and off mode ambient temperature.* For standby mode and off mode testing, maintain room ambient air temperature conditions as specified in Section 4, Paragraph 4.2 of IEC 62301 (incorporated by reference; see § 430.3).

4. Test Measurement

4.1 *Cooling mode.* Measure the indoor room cooling capacity and overall power input in cooling mode in accordance with Section 7.1.b and 7.1.c of ANSI/AHAM PAC–1–2015 (incorporated by reference; see § 430.3), respectively. Determine the test duration in accordance with Section 8.7 of ASHRAE Standard 37–2009 (incorporated by reference; § 430.3). Apply the test conditions for single-duct and dual-duct portable air conditioners presented in Table 1 of this appendix instead of the test conditions in Table 3 of ANSI/AHAM PAC–1–2015. For single-duct units, measure the indoor room cooling capacity, $Capacity_{SD}$, and overall power input in cooling mode, P_{SD}, in accordance with the ambient conditions for test configuration 5, presented in Table 1 of this appendix. For dual-duct units, measure the indoor room cooling capacity and overall power input in accordance with ambient conditions for test configuration 3, condition A ($Capacity_{95}$, P_{95}), and then measure the indoor room cooling capacity and overall power input a second time in accordance with the ambient conditions for test configuration 3, condition B ($Capacity_{83}$, P_{83}), presented in Table 1 of this appendix. Note that for the purposes of this cooling mode test procedure, evaporator inlet air is considered the ''indoor air'' of the conditioned space and condenser inlet air is considered the ''outdoor air'' outside of the conditioned space.

TABLE 1—EVAPORATOR (INDOOR) AND CONDENSER (OUTDOOR) INLET TEST CONDITIONS

Test configuration	Evaporator inlet air, °F (°C)		Condenser inlet air, °F (°C)	
	Dry bulb	Wet bulb	Dry bulb	Wet bulb
3 (Dual-Duct, Condition A)	80 (26.7)	67 (19.4)	95 (35.0)	75 (23.9)
3 (Dual-Duct, Condition B)	80 (26.7)	67 (19.4)	83 (28.3)	67.5 (19.7)
5 (Single-Duct)	80 (26.7)	67 (19.4)	80 (26.7)	67 (19.4)

4.1.1. *Duct Heat Transfer.* Measure the surface temperature of the condenser exhaust duct and condenser inlet duct, where applicable, throughout the cooling mode test. Calculate the average temperature at each individual location, and then calculate the average surface temperature of each duct by averaging the four average temperature measurements taken on that duct. Calculate the surface area (A_{duct_j}) of each duct according to:

$A_{duct\_j} = \pi \times d_j \times L_j$

Where:

d_j = the outer diameter of duct ''j'', including any manufacturer-supplied insulation.

L_j = the extended length of duct ''j'' while under test.

j represents the condenser exhaust duct and, for dual-duct units, the condenser exhaust duct and the condenser inlet duct.

Calculate the total heat transferred from the surface of the duct(s) to the indoor conditioned space while operating in cooling mode for the outdoor test conditions in Table 1 of this appendix, as follows. For single-duct portable air conditioners:

$Q_{duct\_SD} = h \times A_{duct\_j} \times (T_{duct\_SD} = - T_{ei})$

For dual-duct portable air conditioners:

$Q_{duct\_95} = \Sigma_j\{h \times A_{duct\_j} \times (T_{duct\_95} - T_{ei})\}$

$Q_{duct\_83} = \Sigma_j\{h \times A_{duct\_j} \times (T_{duct\_83} - T_{ei})\}$

Where:

Q_{duct_SD} = for single-duct portable air conditioners, the total heat transferred from the duct to the indoor conditioned space in cooling mode when tested according to the test conditions in Table 1 of this appendix, in Btu/h.

Q_{duct_95} and Q_{duct_83} = for dual-duct portable air conditioners, the total heat transferred from the ducts to the indoor conditioned space in cooling mode, in Btu/h, when tested according to the 95 °F dry-bulb and 83 °F dry-bulb outdoor test conditions in Table 1 of this appendix, respectively.

h = convection coefficient, 3 Btu/h per square foot per °F.

A_{duct_j} = surface area of duct ''j'', in square feet.

$T_{duct\_SD\_j}$ = average surface temperature for the condenser exhaust duct of single-duct portable air conditioners, as measured during testing according to the test condition in Table 1 of this appendix, in °F.

$T_{duct\_95\_j}$ and $T_{duct\_83\_j}$ = average surface temperature for duct ''j'' of dual-duct portable air conditioners, as measured during testing according to the two outdoor test conditions in Table 1 of this appendix, in °F.

j represents the condenser exhaust duct and, for dual-duct units, the condenser exhaust duct and the condenser inlet duct.

T_{ei} = average evaporator inlet air dry-bulb temperature, in °F.

4.1.2 *Infiltration Air Heat Transfer.* Measure the heat contribution from infiltration air for single-duct portable air conditioners and dual-duct portable air conditioners that draw at least part of the condenser air from the conditioned space. Calculate the heat contribution from infiltration air for single-duct and dual-duct portable air conditioners for both cooling mode outdoor test conditions, as described in this section. Calculate the dry air mass flow rate of infiltration air according to the following equations:

$$\dot{m}_{SD} = \frac{V_{co\_SD} \times \rho_{co\_SD}}{(1 + \omega_{co\_SD})}$$

For dual-duct portable air conditioners:

$$\dot{m}_{95} = \left[\frac{V_{co\_95} \times \rho_{co\_95}}{(1+\omega_{co\_95})}\right] - \left[\frac{V_{ci\_95} \times \rho_{ci\_95}}{(1+\omega_{ci\_95})}\right]$$

$$\dot{m}_{83} = \left[\frac{V_{co\_83} \times \rho_{co\_83}}{(1+\omega_{co\_83})}\right] - \left[\frac{V_{ci\_83} \times \rho_{ci\_83}}{(1+\omega_{ci\_83})}\right]$$

Where:

$\dot{m}_{SD}$ = dry air mass flow rate of infiltration air for single-duct portable air conditioners, in pounds per minute (lb/m).

$\dot{m}_{95}$ and $\dot{m}_{83}$ = dry air mass flow rate of infiltration air for dual-duct portable air conditioners, as calculated based on testing according to the test conditions in Table 1 of this appendix, in lb/m.

V_{co_SD}, V_{co_95}, and V_{co_83} = average volumetric flow rate of the condenser outlet air during cooling mode testing for single-duct portable air conditioners; and at the 95 °F and 83 °F dry-bulb outdoor conditions for dual-duct portable air conditioners, respectively, in cubic feet per minute (cfm).

V_{ci_95}, and V_{ci_83} = average volumetric flow rate of the condenser inlet air during cooling mode testing at the 95 °F and 83 °F dry-bulb outdoor conditions for dual-duct portable air conditioners, respectively, in cfm.

ρ_{co_SD}, ρ_{co_95}, and ρ_{co_83} = average density of the condenser outlet air during cooling mode testing for single-duct portable air conditioners, and at the 95 °F and 83 °F dry-bulb outdoor conditions for dual-duct portable air conditioners, respectively, in pounds mass per cubic foot (lb_m/ft^3).

ρ_{ci_95}, and ρ_{ci_83} = average density of the condenser inlet air during cooling mode testing at the 95 °F and 83 °F dry-bulb outdoor conditions for dual-duct portable air conditioners, respectively, in lb_m/ft^3.

ω_{co_SD}, ω_{co_95}, and ω_{co_83} = average humidity ratio of condenser outlet air during cooling mode testing for single-duct portable air conditioners, and at the 95 °F and 83 °F dry-bulb outdoor conditions for dual-duct portable air conditioners, respectively, in pounds mass of water vapor per pounds mass of dry air (lb_w/lb_{da}).

ω_{ci_95}, and ω_{ci_83} = average humidity ratio of condenser inlet air during cooling mode testing at the 95 °F and 83 °F dry-bulb outdoor conditions for dual-duct portable air conditioners, respectively, in lb_w/lb_{da}.

For single-duct and dual-duct portable air conditioners, calculate the sensible component of infiltration air heat contribution according to:

$Q_{s\_95}\ \dot{m} \times 60 \times [(c_{p\_95} \times T_{ai\_95} - T_{indoor})) + C_{p\_wv} \times (\omega_{ai\_95} \times T_{ai\_95} - \omega_{indoor} \times T_{indoor})]$

$Q_{s\_83} = \dot{m} \times 60 \times [(c_{p\_da} \times (T_{ai\_83} - T_{indoor})) + C_{p\_wv} \times (\omega_{ai\_83} \times T_{ai\_83} - \omega_{indoor} \times T_{indoor})]$

Where:

Q_{s_95} and Q_{s_83} = sensible heat added to the room by infiltration air, calculated at the 95 °F and 83 °F dry-bulb outdoor conditions in Table 1 of this appendix, in Btu/h.

$\dot{m}$ = dry air mass flow rate of infiltration air, $\dot{m}_{SD}$ or $\dot{m}_{95}$ when calculating Q_{s_95} and $\dot{m}_{sd}$ or $\dot{m}_{83}$ when calculating Q_{s_83}, in lb/m.

c_{p_da} = specific heat of dry air, 0.24 Btu/lb_m-°F.

c_{p_wv} = specific heat of water vapor, 0.444 Btu/lb_m-°F.

T_{indoor} = indoor chamber dry-bulb temperature, 80 °F.

T_{ia_95} and T_{ia_83} = infiltration air dry-bulb temperatures for the two test conditions in Table 1 of this appendix, 95 °F and 83 °F, respectively.

ω_{ia_95} and ω_{ia_83}= humidity ratios of the 95 °F and 83 °F dry-bulb infiltration air, 0.0141 and 0.01086 lb_w/lb_{da}, respectively.

ω_{indoor} = humidity ratio of the indoor chamber air, 0.0112 lb_w/lb_{da}.

60 = conversion factor from minutes to hours.

Calculate the latent heat contribution of the infiltration air according to:

$Q_{l\_95}\ \dot{m} \times 60 \times H_{fg} \times (\omega_{ia\_95} - \omega_{indoor})$

$Q_{l\_83}\ \dot{m} \times 60 \times H_{fg} \times (\omega_{ia\_83} - \omega_{indoor})$

Where:

Q_{l_95} and Q_{l_83} = latent heat added to the room by infiltration air, calculated at the 95 °F and 83 °F dry-bulb outdoor conditions in Table 1 of this appendix, in Btu/h.

$\dot{m}$ = mass flow rate of infiltration air, $\dot{m}_{SD}$ or $\dot{m}_{95}$ when calculating Q_{l_95} and $\dot{m}_{SD}$ or $\dot{m}_{83}$ when calculating Q_{l_83}, in lb/m.

H_{fg} = latent heat of vaporization for water vapor, 1061 Btu/lb_m.

ω_{ia_95} and ω_{ia_83} = humidity ratios of the 95 °F and 83 °F dry-bulb infiltration air, 0.0141 and 0.01086 lb_w/lb_{da}, respectively.

ω_{indoor} = humidity ratio of the indoor chamber air, 0.0112 lb_w/lb_{da}.

60 = conversion factor from minutes to hours.

The total heat contribution of the infiltration air is the sum of the sensible and latent heat:

$_{infiltration\_95} = Q_{s\_95} + Q_{l\_95}$

$_{infiltration\_83} = Q_{s\_83} + Q_{l\_83}$

Where:

$Q_{infiltration\_95}$ and $Q_{infiltration\_83}$ = total infiltration air heat in cooling mode, calculated at the 95 °F and 83 °F dry-bulb outdoor conditions in Table 1 of this appendix, in Btu/h.

Q_{s_95} and Q_{s_83} = sensible heat added to the room by infiltration air, calculated at the 95 °F and 83 °F dry-bulb outdoor conditions in Table 1 of this appendix, in Btu/h.

Q_{l_95} and Q_{l_83} = latent heat added to the room by infiltration air, calculated at the 95 °F and 83 °F dry-bulb outdoor conditions in Table 1 of this appendix, in Btu/h.

4.2 *Off-cycle mode.* Establish the test conditions specified in section 3.1.1 of this appendix for off-cycle mode and use the wattmeter specified in section 3.2.3 of this appendix (but do not use the duct measurements in section 3.1.1.6). Begin the off-cycle mode test period 5 minutes following the cooling mode test period. Adjust the setpoint higher than the ambient temperature to ensure the product will not enter cooling mode and begin the test 5 minutes after the compressor cycles off due to the change in setpoint. Do not change any other control settings between the end of the cooling mode test period and the start of the off-cycle mode test period. The off-cycle mode test period must be 2 hours in duration, during which period, record the power consumption at the same intervals as recorded for cooling mode testing. Measure and record the average off-cycle mode power of the portable air conditioner, P_{oc}, in watts.

4.3 *Standby mode and off mode.* Establish the testing conditions set forth in section 3.2 of this appendix, ensuring that the portable air conditioner does not enter any active modes during the test. For portable air conditioners that take some time to enter a stable state from a higher power state as discussed in Section 5, Paragraph 5.1, Note 1 of IEC 62301, (incorporated by reference; see § 430.3), allow sufficient time for the portable air conditioner to reach the lowest power state before proceeding with the test measurement. Follow the test procedure specified in Section 5, Paragraph 5.3.2 of IEC 62301 for testing in each possible mode as described in sections 4.3.1 and 4.3.2 of this appendix.

4.3.1 If the portable air conditioner has an inactive mode, as defined in section 2.6 of this appendix, but not an off mode, as defined in section 2.8 of this appendix, measure and record the average inactive mode power of the portable air conditioner, P_{ia}, in watts.

4.3.2 If the portable air conditioner has an off mode, as defined in section 2.8 of this appendix, measure and record the average off mode power of the portable air conditioner, P_{om}, in watts.

5. Calculation of Derived Results From Test Measurements

5.1 *Adjusted Cooling Capacity.* Calculate the adjusted cooling capacities for portable air conditioners, ACC_{95} and ACC_{83}, expressed in Btu/h, according to the following equations. For single-duct portable air conditioners:

$ACC_{95} = Capacity_{SD} - Q_{duct\_SD} - Q_{infiltration\_95}$

$ACC_{83} = Capacity_{SD} - Q_{duct\_SD} - Q_{infiltration\_83}$

For dual-duct portable air conditioners:

$ACC_{95} = Capacity_{95} - Q_{duct\_95} - Q_{infiltration\_95}$

$ACC_{83} = Capacity_{83} - Q_{duct\_83} - Q_{infiltration\_83}$

Where:

$Capacity_{SD}$, $Capacity_{95}$, and $Capacity_{83}$ = cooling capacity measured in section 4.1.1 of this appendix.

Q_{duct_SD}, Q_{duct_95}, and Q_{duct_83} = duct heat transfer while operating in cooling mode, calculated in section 4.1.1.1 of this appendix.

$Q_{infiltration\_95}$ and $Q_{infiltration\_83}$ = total infiltration air heat transfer in cooling mode, calculated in section 4.1.1.2 of this appendix.

5.2 *Seasonally Adjusted Cooling Capacity.* Calculate the seasonally adjusted cooling capacity for portable air conditioners, SACC, expressed in Btu/h, according to:

$$SACC = ACC_{95} \times 0.2 + ACC_{83} \times 0.8$$

Where:

ACC_{95} and ACC_{83} = adjusted cooling capacity, in Btu/h, calculated in section 5.1 of this appendix.

0.2 = weighting factor for ACC_{95}.

0.8 = weighting factor for ACC_{83}.

5.3 *Annual Energy Consumption.* Calculate the annual energy consumption in each operating mode, AEC_m, expressed in kilowatt-hours per year (kWh/year). Use the following annual hours of operation for each mode:

Operating mode	Annual operating hours
Cooling Mode, Dual-Duct 95 °F [1]	750
Cooling Mode, Dual-Duct 83 °F [1]	750
Cooling Mode, Single-Duct	750
Off-Cycle	880
Inactive or Off	1,355

[1] These operating mode hours are for the purposes of calculating annual energy consumption under different ambient conditions for dual-duct portable air conditioners, and are not a division of the total cooling mode operating hours. The total dual-duct cooling mode operating hours are 750 hours.

$$AEC_m = P_m \times t_m \times k$$

Where:

AEC_m = annual energy consumption in each mode, in kWh/year.

P_m = average power in each mode, in watts.

m represents the operating mode (''95'' and ''83'' cooling mode at the 95 °F and 83 °F dry-bulb outdoor conditions, respectively for dual-duct portable air conditioners, ''SD'' cooling mode for single-duct portable air conditioners, ''oc'' off-cycle, and ''ia'' inactive or ''om'' off mode).

t = number of annual operating time in each mode, in hours.

k = 0.001 kWh/Wh conversion factor from watt-hours to kilowatt-hours.

Total annual energy consumption in all modes except cooling, is calculated according to:

$$AEC_T = \sum_m AEC_m$$

Where:

AEC_T = total annual energy consumption attributed to all modes except cooling, in kWh/year;

AEC_m = total annual energy consumption in each mode, in kWh/year.

m represents the operating modes included in AEC_T (''oc'' off-cycle, and ''im'' inactive or ''om'' off mode).

5.4 *Combined Energy Efficiency Ratio.* Using the annual operating hours, as outlined in section 5.3 of this appendix, calculate the combined energy efficiency ratio, CEER, expressed in Btu/Wh, according to the following:

$$CEER_{SD} = \left[\frac{(ACC_{95} \times 0.2 + ACC_{83} \times 0.8)}{\left(\frac{AEC_{SD} + AEC_T}{k \times t}\right)}\right]$$

$$CEER_{DD} = \left[\frac{ACC_{95}}{\left(\frac{AEC_{95} + AEC_T}{k \times t}\right)}\right] \times 0.2 + \left[\frac{ACC_{83}}{\left(\frac{AEC_{83} + AEC_T}{k \times t}\right)}\right] \times 0.8$$

Where:

$CEER_{SD}$ and $CEER_{DD}$ = combined energy efficiency ratio for single-duct and dual-duct portable air conditioners, respectively, in Btu/Wh.

ACC_{95} and ACC_{83} = adjusted cooling capacity, tested at the 95 °F and 83 °F dry-bulb outdoor conditions in Table 1 of this appendix, in Btu/h, calculated in section 5.1 of this appendix.

AEC_{SD} = annual energy consumption in cooling mode for single-duct portable air conditioners, in kWh/year, calculated in section 5.3 of this appendix.

AEC_{95} and AEC_{83} = annual energy consumption for the two cooling mode test conditions in Table 1 of this appendix for dual-duct portable air conditioners, in kWh/year, calculated in section 5.3 of this appendix.

AEC_T = total annual energy consumption attributed to all modes except cooling, in kWh/year, calculated in section 5.3 of this appendix.

t = number of cooling mode hours per year, 750.

k = 0.001 kWh/Wh conversion factor for watt-hours to kilowatt-hours.

0.2 = weighting factor for the 95 °F dry-bulb outdoor condition test.

0.8 = weighting factor for the 83 °F dry-bulb outdoor condition test.

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