DEPARTMENT OF ENERGY

10 CFR Parts 429 and 430

[EERE–2020–BT–TP–0029]

RIN 1904–AF03

Energy Conservation Program: Test Procedure for Portable Air Conditioners

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

ACTION: Final rule.

SUMMARY: The U.S. Department of Energy (''DOE'') amends the current test procedure for portable air conditioners (''portable ACs'') to incorporate a measure of variable-speed portable AC performance, generally consistent with previously granted waivers, and to make minor clarifying edits. DOE also establishes a new test procedure for portable ACs that provides more representative measures of cooling capacity and energy consumption. The new test procedure will provide the basis for development of any updated efficiency standards for portable ACs. Should DOE establish such standards, the amended test procedure would become the required test method for determining compliance.

DATES: The effective date of this rule is June 14, 2023. The amendments to Appendix CC will be mandatory for product testing starting November 13, 2023. Manufacturers will be required to use the Appendix CC until the compliance date of any final rule establishing amended energy conservation standards for portable ACs based on the newly established test procedure at Appendix CC1. At such time, manufacturers will be required to begin using Appendix CC1.

The incorporation by reference of certain material listed in the rule is approved by the Director of the Federal Register as of June 14, 2023. The incorporation by reference of certain other material listed in this rule was approved by the Director of the Federal Register on August 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, not all documents listed in the index may be publicly available, such as those containing information that is exempt from public disclosure.

A link to the docket web page can be found at *www.regulations.gov/docket/EERE-2020-BT-TP-0029*. The docket web page contains instructions on how to access all documents, including public comments, in the docket.

For further information on how to review the docket, contact the Appliance and Equipment Standards Program staff at (202) 287–1445 or by email: *ApplianceStandardsQuestions@ee.doe.gov*.

FOR FURTHER INFORMATION CONTACT:

Mr. Lucas Adin, U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, Building Technologies Office, EE–5B, 1000 Independence Avenue SW, Washington, DC, 20585–0121. Telephone: (202) 287–5904. Email: *ApplianceStandardsQuestions@ee.doe.gov*.

Ms. Sarah Butler, U.S. Department of Energy, Office of the General Counsel, GC–33, 1000 Independence Avenue SW, Washington, DC, 20585–0121. Telephone: (202) 586–1777. Email: *Sarah.Butler@hq.doe.gov*.

SUPPLEMENTARY INFORMATION: DOE maintains material previously approved for incorporation by reference in appendix CC to 10 CFR part 430, subpart B and incorporates by reference the following industry standards into parts 429 and 430:

AHAM PAC–1–2022, ''Energy Measurement Test Procedure for Portable Air Conditioners'', copyright 2022 (''AHAM PAC–1–2022'').

Copies of AHAM PAC–1–2022 can be obtained from the Association of Home Appliance Manufacturers (''AHAM''), 1111 19th Street NW, Suite 402, Washington, DC 20036; or by going to AHAM's online store at *www.aham.org/AHAM/AuxStore*.

ANSI/ASHRAE Standard 37–2009, ''Methods of Testing for Rating Electrically Driven Unitary Air-Conditioning and Heat Pump Equipment'', copyright 2009 (''ASHRAE 37–2009'').

ANSI/ASHRAE Standard 41.1–1986 (Reaffirmed 2006), ''Standard Method for Temperature Measurement'', copyright 1987 (''ANSI/ASHRAE 41.1'').

ANSI/ASHRAE Standard 41.6–1994 (RA 2006), ''Standard Method for Measurement of Moist Air Properties'', copyright 1994. (''ANSI/ASHRAE 41.6–1994'').

ANSI/AMCA 210–99 (co-published as ANSI–ASHRAE S51–1999), ''Laboratory Methods of Testing Fans for Certified Aerodynamic Performance Rating'' (copyright 1999) (''ANSI/AMCA 210'').

Copies of ASHRAE 37–2009, ANSI/ASHRAE 41.1, ANSI/ASHRAE 41.6–1994, and ANSI/AMCA 210 can be obtained from the American National Standards Institute (''ANSI''), 1899 L Street NW, 11th Floor, Washington, DC; or by going to ANSI's online store at *webstore.ansi.org/*.

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

Copies of IEC 62301 Ed. 2.0 can be obtained from the International Electrotechnical Commission (''IEC''), 3 Rue de Varembe, Case Postale 131, 1211 Geneva 20, Switzerland; +41 22 919 02 11, *webstore.iec.ch/*.

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

Table of Contents

I. Authority and Background

The Department of Energy's (''DOE's'') test procedure for portable air conditioners (''portable ACs'') is currently prescribed at 10 CFR 430.23(dd) and appendix CC to subpart B of part 430 (''appendix CC''). The following sections discuss DOE's authority to establish test procedures for portable ACs and relevant background information regarding DOE's consideration of test procedures for this product.

A. Authority

The Energy Policy and Conservation Act, as amended (''EPCA''),[1] authorizes DOE to regulate the energy efficiency of a number of consumer products and certain industrial equipment. (42 U.S.C. 6291–6317) Title III, Part B [2] of EPCA established the Energy Conservation Program for Consumer Products Other Than Automobiles, which sets forth a variety of provisions designed to improve energy efficiency. In addition to specifying a list of covered products, EPCA enables the Secretary of Energy to classify additional types of consumer products as covered products under EPCA. These products include portable ACs, the subject of this document. (42 U.S.C. 6292(a)(20)) In a final determination of coverage published in the **Federal Register** on April 18, 2016, DOE classified portable ACs as covered products under EPCA. 81 FR 22514.

The energy conservation program under EPCA consists essentially of four parts: (1) testing, (2) labeling, (3) Federal energy conservation standards, and (4) certification and enforcement procedures. Relevant provisions of EPCA specifically include definitions (42 U.S.C. 6291), test procedures (42 U.S.C. 6293), labeling provisions (42 U.S.C. 6294), energy conservation standards (42 U.S.C. 6295), and the authority to require information and reports from manufacturers (42 U.S.C. 6296).

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 (42 U.S.C. 6295(s)), and (2) making other representations about the efficiency of those products (42 U.S.C. 6293(c)). Similarly, DOE must use these test procedures to determine whether the products comply with any relevant standards promulgated under EPCA. (42 U.S.C. 6295(s))

Federal energy efficiency requirements for covered products established under EPCA generally supersede State laws and regulations concerning energy conservation testing, labeling, and standards. (42 U.S.C. 6297) DOE may, however, grant waivers of Federal preemption for particular State laws or regulations, in accordance with the procedures and other provisions of EPCA. (42 U.S.C. 6297(d))

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 requires that any test procedures prescribed or amended under this section shall 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 (as determined by the Secretary) or period of use and shall not be unduly burdensome to conduct. (42 U.S.C. 6293(b)(3))

EPCA also requires that, at least once every 7 years, DOE evaluate test procedures for each type of covered product, including portable ACs, to determine whether amended test procedures would more accurately or fully comply with the requirements for the test procedures to not be unduly burdensome to conduct and be reasonably designed to produce test results that reflect energy efficiency, energy use, and estimated operating costs during a representative average use cycle or period of use. (42 U.S.C. 6293(b)(1)(A))

If the Secretary determines, on her own behalf or in response to a petition by any interested person, that a test procedure should be prescribed or amended, the Secretary shall promptly publish in the **Federal Register** proposed test procedures and afford interested persons an opportunity to present oral and written data, views, and arguments with respect to such procedures. The comment period on a proposed rule to amend a test procedure shall be at least 60 days and may not exceed 270 days. In prescribing or amending a test procedure, the Secretary shall take into account such information as the Secretary determines relevant to such procedure, including technological developments relating to energy use or energy efficiency of the type (or class) of covered products involved. (42 U.S.C. 6293(b)(2)) If DOE determines that test procedure revisions are not appropriate, DOE must publish its determination not to amend the test procedures. (42 U.S.C. 6293(b)(1)(A)(ii))

In addition, EPCA requires that DOE amend its test procedures for all covered products to integrate measures of standby mode and off mode energy consumption into the overall energy efficiency, energy consumption, or other energy descriptor, unless the current test procedure already incorporates the standby mode and off mode energy consumption, or if such integration is technically infeasible. (42 U.S.C. 6295(gg)(2)(A)) If an integrated test procedure is technically infeasible, DOE must prescribe separate standby mode and off mode energy use test procedures for the covered product, if a separate test is technically feasible. (*Id.*) Any such amendment must consider the most current versions of the International Electrotechnical Commission (''IEC'') Standard 62301 [3] and IEC Standard 62087 [4] as applicable. (*Id.*)

DOE is publishing this final rule in satisfaction of the 7-year review requirement specified in EPCA. (42 U.S.C. 6293(b)(1)(A))

B. Background

As stated, DOE's existing test procedures for portable ACs appear at appendix CC. DOE established the current test procedure for portable ACs on June 1, 2016. 81 FR 35241 (''June 2016 Final Rule''). The June 2016 Final Rule established provisions for measuring the energy consumption of single-duct and dual-duct portable ACs in active, standby, and off modes. The current test procedure includes provisions for determining seasonally adjusted cooling capacity (''SACC'') in British thermal units per hour (''Btu/h''), combined energy efficiency ratio (''CEER'') in British thermal units per watt-hour (''Btu/Wh''), and estimated annual operating cost (''EAOC'') in dollars per year. 10 CFR 430.23(dd). The June 2016 Final Rule also established provisions for certification, compliance, and enforcement for portable ACs in 10 CFR part 429.

On June 2, 2020, DOE published a Decision and Order granting a waiver to LG Electronics USA, Inc. (''LG'') for basic models of single-duct variable-speed portable ACs to account for variable-speed portable AC performance under multiple outdoor temperature operating conditions, thus yielding more representative results. 85 FR 33643 (Case No. 2018–004, ''LG Waiver'').

On November 5, 2020, DOE published in the **Federal Register** an early assessment review request for information (''RFI'') (''November 2020 RFI'') in which it sought data and

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

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

[3] IEC 62301, *Household electrical appliances—Measurement of standby power* (Edition 2.0, 2011–01).

[4] IEC 62087, *Audio, video and related equipment—Methods of measurement for power consumption* (Edition 1.0, Parts 1–6: 2015, Part 7: 2018).

information pertinent to whether amended test procedures would (1) more accurately or fully comply with the requirement that the test procedure produces results that measure energy use during a representative average use cycle or period of use for the product without being unduly burdensome to conduct, or (2) reduce testing burden. 85 FR 70508.

On April 6, 2021, DOE published a notice of interim waiver for GD Midea Air Conditioning Equipment Co. LTD. (''Midea''), which issued a similar alternate test procedure to that from the LG Waiver with additional specifications to accommodate the combined-duct configurations of the specified Midea basic models. 86 FR 17803 (Case No. 2020–006, ''Midea Interim Waiver'').

On April 16, 2021, DOE published in the **Federal Register** an RFI (''April 2021 RFI'') seeking data and information regarding issues pertinent to whether amended test procedures would more accurately or fully comply with the requirement that the test procedure (1) produces results that measure energy use during a representative average use cycle or period of use for the product without being unduly burdensome to conduct, or (2) reduces testing burden. In the April 2021 RFI, DOE requested comments, information, and data about a number of issues, including (1) updates to industry test standards, (2) test harmonization, (3) energy use measurements, (4) representative average period of use, (5) test burden, (6) heat transfer measurements and calculations, (7) heating mode, fan-only mode, and dehumidification mode, (8) network connectivity, (9) part-load performance and load-based testing, (10) spot coolers, and (11) test procedure waivers. 86 FR 20044.

On June 8, 2022, DOE published in the **Federal Register** a notice of proposed rulemaking (''June 2022 NOPR'') proposing to amend the test procedures for portable ACs to incorporate a measure of variable-speed portable AC performance and make minor clarifying edits. DOE also proposed to adopt a new test procedure in appendix CC1 to improve representativeness for all configurations of portable ACs by including substantively different measures of cooling capacity and energy consumption compared to the current portable AC test procedure at appendix CC. The provisions in appendix CC1 were largely derived from a draft version of the most recent update to the AHAM standard for portable ACs, AHAM PAC–1, ''Portable Air Conditioners.'' DOE requested comments from interested parties on the proposal. 87 FR 34934.

DOE received comments in response to the June 2022 NOPR from the interested parties listed in Table I.1.

TABLE I.1—LIST OF COMMENTERS WITH WRITTEN SUBMISSIONS IN RESPONSE TO THE JUNE 2022 NOPR

Commenter(s)	Reference in this final rule	Comment No. in the docket	Commenter type
New York State Energy Research and Development Authority	NYSERDA	17	State Agency.
Association of Home Appliance Manufacturers	AHAM	18	Trade Association.
Appliance Standards Awareness Project, American Council for an Energy-Efficient Economy, National Consumer Law Center.	Joint Commenters	19	Efficiency Organizations.
Pacific Gas and Electric Company, San Diego Gas and Electric, Southern California Edison; collectively, the California Investor-Owned Utilities.	California IOUs	20	Utilities.
Keith Rice	Rice	21	Individual.
Northwest Energy Efficiency Alliance and Northwest Power and Conservation Council.	NEEA and NWPCC	22	Efficiency Organizations.

A parenthetical reference at the end of a comment quotation or paraphrase provides the location of the item in the public record.[5] To the extent that interested parties have provided written comments that are substantively consistent with any oral comments provided during the July 13, 2022, public meeting (hereafter referred to as the ''July 2022 NOPR public meeting''), DOE cites the written comments throughout this final rule. Any oral comments provided during the webinar that are not substantively addressed by written comments are summarized and cited separately throughout this final rule.

II. Synopsis of the Final Rule

In this final rule, DOE (1) amends 10 CFR 429.4 ''Materials incorporated by reference'' and 10 CFR 429.62, ''Portable air conditioners''; (2) updates 10 CFR 430.2, ''Definitions'' and 10 CFR 430.23, ''Test procedures for the measurement of energy and water consumption'' to address combined-duct portable ACs; (3) amends appendix CC, ''10 CFR Appendix CC to Subpart B of Part 430 Uniform Test Method for Measuring the Energy Consumption of Portable Air Conditioners''; and (4) adopts a new appendix CC1, ''10 CFR Appendix CC1 to Subpart B of Part 430 Uniform Test Method for Measuring the Energy Consumption of Portable Air Conditioners,'' as summarized in Tables II.1 through II.4 below, respectively.

Specifically, in this final rule, DOE amends 10 CFR 429.4 ''Materials incorporated by reference'' and 10 CFR 429.62, ''Portable air conditioners'' as follows:

(1) Incorporates by reference AHAM PAC–1–2022, ''Portable Air Conditioners'' (''AHAM PAC–1–2022''), which includes an industry-accepted method for testing variable-speed portable ACs, in 10 CFR 429.4; and

(2) Adds rounding instructions for the SACC and the new energy efficiency metric, annualized energy efficiency ratio (''AEER''), in 10 CFR 429.62;

DOE's adopted amendments in 10 CFR 429.4 and 429.62 are summarized in Table II.1 compared to the previous 10 CFR 429.4 and 429.62, as well as the reason for the changes.

[5] The parenthetical reference provides a reference for information located in the docket of DOE's rulemaking to develop test procedures for portable ACs. (Docket No. EERE–2020–BT–TP–0029, which is maintained at *www.regulations.gov*). The references are arranged as follows: (commenter name, comment docket ID number, page of that document).

TABLE II.1—SUMMARY OF CHANGES IN AMENDED 10 CFR 429.4 AND 429.62 RELATIVE TO PREVIOUS 10 CFR 429.4 AND 429.62

Previous 10 CFR 429.4 and 429.62	Amended 10 CFR 429.4 and 429.62	Attribution
10 CFR 429.4 incorporated by reference ANSI/AHAM PAC–1–2015.	Adds incorporation by reference in 10 CFR 429.4 of AHAM PAC–1–2022.	Harmonize with updated industry test procedure.
10 CFR 429.62 required rounding based on AHAM PAC–1–2015.	Adds to 10 CFR 429.62 rounding instructions for SACC and AEER when using appendix CC1.	Improve reproducibility of the test procedure.

In this final rule, DOE also updates 10 CFR 430.2, ''Definitions'' and 10 CFR 430.23, ''Test procedures for the measurement of energy and water consumption'' as follows:

(1) Adds a definition for the term ''combined-duct portable air conditioner'' to 10 CFR 430.2; and

(2) Adds requirements to determine estimated annual operating cost for single-duct and dual-duct variable-speed portable ACs in 10 CFR 430.23.

DOE's actions in 10 CFR 430.2 and 430.23 are summarized in Table II.1 compared to the previous 10 CFR 430.2 and 430.23, as well as the reason for the changes.

TABLE II.2—SUMMARY OF CHANGES IN AMENDED 10 CFR 430.2 AND 430.23 RELATIVE TO PREVIOUS 10 CFR 430.2 AND 430.23.

Previous 10 CFR 430.2 and 430.23	Amended 10 CFR 430.2 and 430.23	Attribution
10 CFR 430.2 did not define combined-duct portable AC.	Adds a definition to 10 CFR 430.2 for combined-duct portable AC.	Address test procedure waiver.
10 CFR 430.23 did not have a method to estimate annual operating cost for single-duct and dual-duct variable-speed portable ACs.	Adds a method to 10 CFR 430.23 to estimate annual operating cost for single-duct and dual-duct variable-speed portable ACs.	Address test procedure waiver.

In this final rule, DOE also amends appendix CC, ''10 CFR Appendix CC to Subpart B of Part 430 Uniform Test Method for Measuring the Energy Consumption of Portable Air Conditioners'' as follows:

(1) Adds definitions in section 2 for ''combined-duct,'' ''single-speed,'' ''variable-speed,'' ''full compressor speed (full),'' ''low compressor speed (low),'' ''theoretical comparable single-speed,'' and ''seasonally adjusted cooling capacity, full;''

(2) Divides section 4.1 into two sections, 4.1.1 and 4.1.2, for single-speed and variable-speed portable ACs, respectively, and details configuration-specific cooling mode testing requirements for variable-speed portable ACs;

(3) Adds a requirement in section 4.1.2 that, for variable-speed portable ACs, the full compressor speed at the 95-degrees Fahrenheit (''°F'') test condition be achieved with user controls, and the low compressor speed at the 83 °F test condition be achieved with manufacturer-provided settings or controls;

(4) Adds cycling factors (''CFs'') in section 5.5.1 (0.82 for single-duct units and 0.77 for dual-duct units);

(5) Adds a requirement to calculate SACC with full compressor speed at the 95 °F test condition and low compressor speed at the 83 °F test condition in sections 5.1 and 5.2, consistent with the LG waiver and Midea Interim Waiver, with an additional requirement for variable-speed portable ACs to represent SACC with full compressor speed for both test conditions (''$SACC_{Full}$''), and;

(6) Adds a requirement in section 3.1.2 that, if a portable AC has network functions, all network functions must be disabled throughout testing if such settings can be disabled by the end-user and the product's user manual provides instructions on how to do so. If the network functions cannot be disabled by the end-user, or the product's user manual does not provide instructions for disabling network settings, test the unit with the network settings in the factory default configuration for the duration of the test.

DOE's actions in appendix CC are summarized in Table II.3 compared to the current appendix CC, as well as the reason for the changes.

TABLE II.3—SUMMARY OF CHANGES IN AMENDED APPENDIX CC TO PREVIOUS APPENDIX CC

Previous appendix CC	Amended appendix CC	Attribution
Did not specify compressor type or include variable-speed portable ACs.	Adds definitions for single-speed and variable-speed pertaining to portable ACs and additional compressor speed definitions.	Address test procedure waiver.
Specified cooling mode requirements and subsequent calculations for single-speed portable ACs.	Adds cooling mode requirements and subsequent calculations for variable-speed portable ACs.	Address test procedure waiver.
Did not specify requirements to achieve compressor speeds.	Adds a requirement that the full compressor speed at the 95 °F test condition be achieved with user controls and the low compressor speed at the 83 °F test condition be achieved with manufacturer settings.	Address test procedure waiver.
Did not include a CF	Adds CFs of 0.82 for single-duct units and 0.77 for dual-duct units to determine theoretical single-speed portable AC cooling capacities.	Address test procedure waiver.

TABLE II.3—SUMMARY OF CHANGES IN AMENDED APPENDIX CC TO PREVIOUS APPENDIX CC—Continued

Previous appendix CC	Amended appendix CC	Attribution
Calculated SACC for single-speed portable ACs	Adds equations to calculate SACC for variable-speed portable ACs. Requires that the full compressor speed be used to determine capacity at the 95 °F test and the low compressor speed be used to determine capacity at the 83 °F test condition. Requires additional representation of new metric, $SACC_{Full}$, using the full compressor speed at the 83 °F test condition.	Address test procedure waiver and ensure comparability between single-speed and variable-speed capacity ratings.
Did not address portable ACs with network functions.	Adds a requirement that, if a portable AC has network functions, all network functions must be disabled throughout testing.	Ensure reproducibility of the test procedure.

In this final rule, DOE additionally adopts a new appendix CC1, ''10 CFR Appendix CC1 to Subpart B of Part 430—Uniform Test Method for Measuring the Energy Consumption of Portable Air Conditioners,'' which, compared to appendix CC as amended in this final rule:

(1) Incorporates by reference parts of the updated version of the AHAM standard, AHAM PAC–1–2022, which includes an industry-accepted method for testing portable ACs;

(2) Adopts a new efficiency metric, AEER, to calculate more representatively the efficiency of both variable-speed and single-speed portable ACs;

(3) Amends the annual operating hours;

(4) Updates the SACC equation for both single-speed and variable-speed portable ACs; and

(5) Adds cycling factors (''CFs'') in section 5.5.1 (0.82 for single-duct units and 0.77 for dual-duct units).

Key aspects of DOE's new appendix CC1 are described in Table II.4 compared to the previous appendix CC, as well as the reason for the new appendix CC1.

TABLE II.4—SUMMARY OF PROPOSED NEW APPENDIX CC1 TO CURRENT APPENDIX CC

Previous appendix CC	New appendix CC1	Attribution
Incorporates by reference ANSI/AHAM PAC–1–2015.	Incorporates by reference AHAM PAC–1–2022	Harmonize with updated industry test procedure.
Specifies cooling mode requirements and subsequent calculations for single-speed portable ACs.	Adds cooling mode requirements, operating hours, and a new efficiency metric.	Improve representativeness of the test procedure.
Calculates SACC for single-speed portable ACs	Adds equation to calculate SACC for variable-speed portable ACs and updates the SACC for single-speed portable ACs.	Improve representativeness of the test procedure.
Calculates CEER for single-speed portable ACs	Replaces CEER equation with AEER equation to calculate efficiency for single-speed and variable-speed portable ACs.	Improve representativeness of the test procedure.
Does not include a CF	Adds CFs of 0.82 for single-duct units and 0.77 for dual-duct units to determine theoretical single-speed portable AC cooling capacities.	Improve representativeness of the test procedure.

DOE has determined that the amendments adopted in this final rule for appendix CC will not require DOE to amend the energy conservation standards for portable ACs because the amendments will not impact the measured efficiency of covered products that minimally comply (*i.e.,* those with single-speed compressors) with the standards for portable ACs at 10 CFR 430.32(cc). *See* 42 U.S.C. 6293(e). The currently applicable appendix CC does not have separate provisions for variable-speed portable ACs. DOE is adopting a test method for such units that address the ability of variable-speed compressors to adjust their operating speed based on the demand load of the conditioned space. Although the measured efficiency could change for variable-speed portable ACs that are currently subject to waivers, DOE has concluded that this proposal will not require an adjustment to the energy conservation standard for portable ACs to ensure that minimally compliant portable ACs will remain compliant. DOE reached this conclusion because variable-speed portable ACs currently on the market are not representative of minimally compliant units.

In addition, the amendments specified in the newly established appendix CC1 would alter the measured efficiency of portable ACs, as discussed further in each relevant section of this final rule. However, testing in accordance with the new appendix CC1 will not be required until such time as compliance is required with any amended energy conservation standards based on the new appendix CC1. Discussion of DOE's actions are addressed in detail in section III of this document.

The effective date for the amended test procedures adopted in this final rule is 30 days after publication of this document in the **Federal Register**. Representations of energy use or energy efficiency must be based on testing in accordance with the amended test procedure in appendix CC beginning 180 days after the publication of this final rule.

III. Discussion

A. Scope of Applicability

DOE defines a ''portable air conditioner'' 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. 10 CFR 430.2. The definition also states that a portable AC includes a source of refrigeration and may include additional means for air circulation and heating. *Id.*

Appendix CC specifies provisions for testing portable ACs with either single-duct [6] or dual-duct [7] configurations. In the June 2022 NOPR, DOE summarized comments previously received in response to the April 2021 RFI regarding ''spot coolers,'' which are not currently covered by the portable AC test procedure. Although DOE does not currently define the term ''spot cooler,'' the June 2022 NOPR discussed this term as applying to portable AC configurations that do not provide net cooling to a space, but rather move heat from one area to another in a space (*i.e.,* they reject the heated condenser air to the cooled space). Based on their physical and operating characteristics, spot coolers do not meet either of the definitions for a single-duct or dual-duct portable AC. DOE further noted in the June 2022 NOPR that it was not aware of any spot coolers on the market with an adjustable window mounting bracket for the condenser inlet and exhaust ducts, which is required for the portable AC configurations addressed by the current portable AC test procedure. DOE did not propose any amendments to the scope or definitions related to spot coolers. 87 FR 34934, 34940.

In response to the June 2022 NOPR, NEEA and NWPCC requested that DOE continue to monitor spot coolers for potential consideration in future rulemakings. (NEEA and NWPCC, No. 22 at p. 3)

For the reasons discussed in the June 2022 NOPR, in this final rule DOE is not adopting any amendments to the scope or definitions related to spot cooler configurations of portable ACs. In summary, DOE is not changing the scope of products covered by its portable AC test procedure in this final rule.

[6] DOE defines a ''single-duct portable air conditioner'' 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 attached to an adjustable window bracket. 10 CFR 430.2.

[7] DOE defines a ''dual-duct portable air conditioner'' is a portable AC 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. 10 CFR 430.2.

B. Test Procedure

1. Overview

Portable ACs are tested in accordance with the currently applicable appendix CC, which incorporates by reference ANSI/AHAM PAC–1–2015 ''Portable Air Conditioners'' (''ANSI/AHAM PAC–1–2015''), ASHRAE 37–2009, and IEC Standard 62301 ''Household electrical appliances—Measurement of standby power'' (Edition 2.0 2011–01) (''IEC Standard 62301''), with modifications. Regarding dual-duct portable ACs, the currently applicable DOE test procedure specifies provisions in addition to ANSI/AHAM PAC–1–2015. Specifically, the DOE test procedure specifies an additional test condition for dual-duct portable ACs (83 °F dry-bulb and 67.5 °F wet-bulb outdoor temperature) and additionally accounts for duct heat transfer, infiltration air heat transfer, and off-cycle mode energy use. (*See* sections 4.1, 4.1.1, 4.1.2, and 4.2 of appendix CC.) Appendix CC also includes instructions regarding tested configurations, duct setup, inlet test conditions, condensate removal, unit placement, duct temperature measurements, and control settings. (*See* sections 3.1.1, 3.1.1.1, 3.1.1.2, 3.1.1.3, 3.1.1.4, 3.1.1.6, and 3.1.2 of appendix CC.)

Under the currently applicable test procedure, a unit's SACC, in Btu/h, is calculated as a weighted average of the adjusted cooling capacity (''ACC'') measured at two representative operating conditions. The ACC is the measured indoor room cooling capacity while operating in cooling mode under the specified test conditions, adjusted based on the measured and calculated duct and infiltration air heat transfer. (*See* sections 4.1, 4.1.1, 4.1.2, 5.1, and 5.2 of appendix CC.) The CEER represents the efficiency of the unit, in Btu/Wh, based on the ACC at the two operating conditions; the annual energy consumption (''AEC'') in cooling mode, off-cycle mode, and inactive or off mode; and the number of cooling mode hours per year; with weighting factors applied for the two operating conditions. (*See* sections 4.2, 4.3, 5.3, and 5.4 of appendix CC.)

2. Definitions

As discussed previously in this document, the Midea Interim Waiver provided specifications to accommodate the ''combined-duct'' configuration of the specified Midea basic models. 86 FR 17803. The term ''combined-duct'' refers to a configuration in which both the condenser inlet and outlet air streams are incorporated into the same structure.

In the Midea Interim Waiver, DOE specified a definition for ''combined-duct portable air conditioner'' as part of the alternate test procedure. 86 FR 17803, 17808. Since this duct configuration was not previously defined, DOE proposed in the June 2022 NOPR to define ''combined-duct'' in 10 CFR 430.2 specifically as ''for a portable air conditioner, the condenser inlet and outlet air streams flow through separate ducts housed in a single duct structure.'' 87 FR 34934, 34939–34940. DOE did not receive comments on this proposed definition. For reasons described in the Midea Interim Waiver and the June 2022 NOPR, DOE is adopting this proposed definition in this final rule with a minor modification. The adopted definition will be ''combined-duct portable air conditioner'' and will be substantively the same as the proposed definition.

3. Updates to Industry Standards

a. AHAM PAC–1

DOE participated in AHAM's revision of its portable AC test procedure, recently published in December 2022, entitled AHAM PAC–1–2022, ''Energy Measurement Test Procedure for Portable Air Conditioners'' (hereinafter, ''AHAM PAC–1–2022''). As noted above, the previous version of AHAM PAC–1, ANSI/AHAM PAC–1–2015, is referenced by the currently applicable version of appendix CC. While the revision was under development, AHAM released a draft version of AHAM PAC–1–2022 in January 2022 (''AHAM PAC–1–2022 Draft''), the provisions of which DOE reviewed and considered for adoption in the amended appendix CC and the newly established appendix CC1, as discussed in the June 2022 NOPR. 87 FR 34934, 34941. In the June 2022 NOPR, DOE also stated that if AHAM publishes a final version of PAC–1–2022 Draft prior to DOE publishing a test procedure final rule, DOE intends to update the referenced industry test standard in the DOE test procedure to reference the latest version of AHAM PAC–1. *Id.* In this final rule, DOE evaluated the issued version of the standard, AHAM PAC–1–2022, for incorporation by reference in the portable AC test procedure.

In the June 2022 NOPR, DOE proposed to maintain references to AHAM PAC–1–2015 in appendix CC, with adjustments made to the test procedure to account for variable-speed operation in keeping with the LG Waiver and Midea Interim Waiver. DOE proposed this approach because adopting a test procedure consistent with AHAM PAC–1–2022 would result in an efficiency metric not comparable with existing portable AC standards established in the energy conservation standards final rule published by DOE on January 10, 2020 (85 FR 1378; ''January 2020 Final Rule''). 87 FR 34934, 34941. DOE also proposed to add a new capacity metric to appendix CC for variable-speed models, $SACC_{Full}$, that is comparable to the SACC for single-speed models. *Id.*

In the June 2022 NOPR, DOE proposed to adopt AHAM PAC–1–2022 in a new appendix CC1, with amendments intended to improve test procedure representativeness, noting that as proposed appendix CC1 would simplify the portable AC test procedure for variable-speed portable ACs and improve representativeness and comparability among different portable AC configurations. *Id.* DOE also proposed to incorporate by reference the AHAM PAC–1–2022 standard in 10 CFR 429.4. 87 FR 34934, 34941.

In response to the June 2022 NOR, AHAM urged DOE to incorporate by reference the final version of AHAM PAC–1–2022 in DOE's final rule by adopting AHAM PAC–1–2022 in full as the Federal test procedure. AHAM stated that AHAM PAC–1–2022 meets EPCA requirements and addresses some of DOE's proposed amendments to the test procedure. (AHAM, No. 18 at p. 2)

DOE has reviewed the final version of AHAM PAC–1–2022 and compared it to the draft version considered for the June 2022 NOPR. The draft and final versions of the standard are largely the same, with one notable change in the approach to calculate CEER that is mostly consistent with DOE's approach to determine AEER, discussed further in section III.B.7.g of this document. DOE is incorporating by reference the final version of AHAM PAC–1–2022 in newly established appendix CC1, with some additional amendments, generally consistent with the amendments proposed in the June 2022 NOPR, as discussed further in section III.B.7 of this document. DOE expects these additional amendments to improve test procedure representativeness.

b. Additional Industry Standards Referenced

Both ANSI/AHAM PAC–1–2015 and AHAM PAC–1–2022 reference ASHRAE 37–2009, which references certain industry test standards in specifying test conditions, measurements, and setup. In the June 2022 NOPR, DOE proposed to incorporate those industry standards specified in the relevant sections of ASHRAE 37–2009. Specifically, DOE proposed to incorporate by reference ANSI/AMCA 210, as referenced in section 6.2, ''Nozzle Airflow Measuring Apparatus,'' of ANSI/AHAM PAC–1–2015 and AHAM PAC–1–2022, for static pressure tap placement. DOE also proposed to incorporate by reference ASHRAE 41.1–1986 and ASHRAE 41.6–1994, as referenced in section 5.1, ''Temperature Measuring Instruments,'' of AHAM PAC–1–2022, for measuring dry-bulb temperature and humidity, respectively. 87 FR 34934, 34941.

DOE received no comments regarding the proposal to reference additional standards. For the reasons described in the June 2022 NOPR, is incorporating by reference these additional industry standards in the amended appendix CC and newly established appendix CC1.

4. Harmonization With Other AC Product Test Procedures

In the June 2022 NOPR, DOE proposed amendments to address and improve the representativeness of the test procedure for portable ACs, as required by EPCA. (*See* 42 U.S.C. 6293(b)(3))

In response to the June 2022 NOPR, NEEA and NWPCC recommended that DOE align the test procedures for portable ACs and room ACs, stating that these products are potential substitutes for one another and may be evaluated side-by-side by consumers. NEEA and NWPCC expressed concern that under the current test procedures for each product, portable ACs may appear to be more efficient than room ACs, whereas the opposite is generally the case. (NEEA and NWPCC, No. 22 at pp. 3–4)

DOE recognizes that consumers may consider portable ACs and room ACs for the same applications, and that it could be helpful to consumers for the portable AC and room AC ratings to be comparable. However, as discussed in a portable AC test procedure NOPR published on February 25, 2015, DOE also expects that portable ACs and room ACs have different operating hours and are likely utilized differently by consumers. 80 FR 10211, 10235. Data provided to DOE by the California IOUs in response to the June 2022 NOPR show that 47 percent of room AC owners surveyed typically use their room AC as a source of primary air conditioning compared to only 22 percent of portable AC owners surveyed. (CA IOUs, No. 20 at supp. p. 2) This suggests that, unlike room ACs that are typically used for primary cooling, the large majority of portable ACs are used for secondary or supplemental cooling (*i.e.,* not for primary cooling). Accordingly, the portable AC and room AC test procedures have different operating hours and test conditions, and the resulting CEER metric for each test procedure measures the efficiency of each distinct tested product during its representative period of use. In the future, DOE will continue to consider EPCA requirements and consumer usage data when amending both the portable AC and room AC test procedures.

5. Variable-Speed Technology

Since the previous portable AC test procedure rulemaking, portable ACs with variable-speed compressors have been introduced to the market. As compared to a portable AC with a single-speed compressor, a variable-speed portable AC can use an inverter-driven variable-speed compressor to maintain the desired temperature without cycling the compressor motor and fans on and off. The unit responds to surrounding conditions by adjusting the compressor rotational speed based on the cooling demand. At reduced speeds, variable-speed compressors typically operate more efficiently than a single-speed compressor under the same conditions.

The current portable AC test procedure does not account for improved efficiency of variable-speed portable ACs that automatically adjust their compressor operating speed and overall performance based on the cooling load of the conditioned space. Under the currently applicable appendix CC, the cooling capacity (as expressed by the SACC metric) does not reflect the reduced cooling provided at the lower outdoor test temperature (83 °F) in normal operation, because the test procedure does not allow single-speed units to cycle or variable-speed units to reduce their speed, as they would in normal operation. Similarly, the measured efficiency (as expressed by the current CEER metric) does not reflect the efficiency benefits associated with a variable-speed portable AC relative to a single-speed portable AC when operating at low outdoor temperature conditions.

In this final rule, DOE is amending appendix CC to adopt test provisions to provide more representative measures of SACC and CEER for variable-speed portable ACs. The amendments require testing variable-speed portable ACs at the low temperature (*i.e.,* 83 °F) test condition, in addition to the two test conditions currently specified for testing single-speed units. Incorporating the performance at this new test condition produces more representative values of SACC and CEER for variable-speed units in comparison to single-speed units. For variable-speed units, DOE is also introducing a new SACC metric that reflects operation at full speed (referred to as $SACC_{Full}$) to allow for comparisons of SACC between single-speed and variable-speed units on a like-to-like basis and to ensure that measured CEER values for variable-speed portable ACs are compatible with the energy conservation standards currently specified at 10 CFR 430.32(cc) for products manufactured on or after January 10, 2025.

For newly established appendix CC1, this final rule includes the same new low temperature test condition for variable-speed units. Additionally, appendix CC1 defines a new SACC metric, applicable to both single-speed and variable-speed units, that accounts for the reduced cooling capacity provided by both types of units at the low temperature test condition. Appendix CC1 defines a new efficiency metric (*i.e.,* AEER) that, in addition to accounting for the reduced operation of variable-speed units at the low temperature test condition, better accounts for the cyclic behavior of single-speed units at low temperature conditions.

The specific amendments related to each of these issues are discussed in detail in section III.B.7 of this document, including summaries of comments received in response to the specific amendments proposed in the June 2022 NOPR.

As discussed, DOE has issued the LG Waiver and Midea Interim Waiver, both of which specify alternate test procedures for certain basic models of variable-speed portable ACs. 85 FR 33643; 86 FR 17803. This final rule adopts provisions that address the issues presented in both the LG Waiver and Midea Interim Waiver. Upon the compliance date of the test procedure revisions to appendix CC, the LG Waiver and Midea Interim Waiver will automatically terminate. 10 CFR 430.27(h)(3).

6. Representative Average Period of Use

a. Operational Modes

The measured energy performance of a portable AC includes energy use associated with cooling mode and off-cycle mode during the cooling season, and inactive mode and off mode for the entire year. In the June 2022 NOPR, DOE considered whether operation in other modes—namely, heating mode, air circulation mode, and dehumidification mode—should be included in the portable AC test procedure. DOE tentatively determined not to address these modes and sought comment on this tentative determination. 87 FR 34934, 34953–34954. Comments received on heating mode, air circulation mode, and dehumidification mode are discussed in sections III.B.8, III.B.9, and III.B.10 of this document, respectively.

b. Hours of Operation

To determine the energy use during a representative period of use, the currently applicable DOE test procedure assigns the following hours of operation for each mode: 750 hours for cooling mode, 880 hours for off-cycle mode, and 1,355 hours for inactive mode or off mode. (*See* section 5.3 of appendix CC.) These operating hours were established in the June 2016 Final Rule. In that rule, DOE derived these values from the existing operating hours for room ACs, noting that little usage data for portable ACs existed at that time. DOE adjusted the room AC usage data to reflect portable AC usage; for example, inactive mode and off mode estimates outside of the cooling season were decreased because portable ACs are more likely to be unplugged outside of the cooling season as compared to room ACs, which are less portable.[8] 81 FR 35241, 35258–35259.

As discussed in the June 2022 NOPR, DOE maintains that the analysis used to develop appendix CC was based on the best available data for portable AC operation at the time, although it did not take into account cyclic behavior. To maintain compatibility with existing energy conservation standards for portable ACs, DOE did not propose any changes to the operating hours in the amended appendix CC in the June 2022 NOPR, but proposed other appendix CC modifications to account for variable-speed portable AC efficiency benefits relative to single-speed portable ACs, specifically associated with the avoidance of cycling losses, as discussed in section III.B.7.f of this document.

In appendix CC1, to increase overall test procedure representativeness by accounting for cyclic behavior in single-speed portable ACs, or the avoidance of cycling for variable-speed units, DOE proposed in the June 2022 NOPR to reassess the off mode and inactive mode hours for certain product configurations to reflect hours previously considered as part of off-cycle mode. The operating hours defined in appendix CC distinguish between off-cycle mode and cooling mode. By definition, when portable ACs are in cooling mode, the compressor is on, meaning that DOE expects 750 hours of compressor operation per year for single-speed portable ACs. Using the AHRI 210/240 fractional bin approach discussed in the June 2022 NOPR, DOE determined that single-speed portable ACs operate their compressors for 164 hours per year at the 95 °F test condition and for 586 hours per year at the 83 °F test condition. 87 FR 34934, 34945. As discussed in the June 2022 NOPR—based on the AHRI 210/240 Building Load Calculation found in section 11.2.1.2 of that standard—DOE expects that single-speed portable ACs operate at a reduced load at the 83 °F test condition, equal to 60 percent of the full cooling load. Therefore, at the reduced load represented by the 83 °F test condition, DOE estimates a single-speed portable AC would operate in cooling mode (*i.e.,* compressor on) for 60 percent of that time and off-cycle mode (*i.e.,* compressor off) for the remaining 40 percent. Accordingly, based on DOE's estimate of 586 annual cooling-mode hours assigned to the 83 °F cooling-mode test condition, which represent 60 percent of the total operating hours at reduced load conditions, DOE estimated that there are 977 total operating hours at the 83 °F cooling mode test condition (*i.e.,* including both cooling mode and off-cycle mode for a single-speed unit) and therefore estimated there are a total of 391 annual off-cycle mode hours. Because at low loads variable-speed units operate continuously at a lower compressor speed during periods of time when single-speed units are in off-cycle mode, DOE proposed to set the variable-speed portable AC operating hours at the low test condition equal to the single-speed portable AC operating hours in cooling mode at the low test condition and off-cycle mode. 87 FR 34934, 34944–34946.

Table III.1 summarizes the June 2022 NOPR proposals for the annual operating hours for portable ACs in appendix CC and the newly proposed appendix CC1.

[8] Further information regarding the development of the operating hours is provided in the February 25, 2015 NOPR and November 27, 2015 supplemental NOPR for the previous portable AC test procedure rulemaking, available at *www.regulations.gov/document/EERE-2014-BT-TP-0014-0009* and *www.regulations.gov/document/EERE-2014-BT-TP-0014-0021*, respectively.

TABLE III.1—ANNUAL OPERATING HOURS FOR PORTABLE ACS AS PROPOSED IN JUNE 2022 NOPR

Operating mode	Appendix CC	Appendix CC1
Cooling Mode, 95 °F	[1] 750	164.
Cooling Mode, 83 °F	[1] 750	586 (Single-Speed). 977 (Variable-Speed).
Off-Cycle Mode	880	391 (Single-Speed). 0 (Variable-Speed).
Off/Inactive Mode	1,355	1,844.

[1] These operating mode hours are for the purposes of calculating annual energy consumption under different ambient conditions and are not a division of the total cooling mode operating hours. 750 represents the total cooling mode operating hours.

NYSERDA and the Joint Commenters supported DOE's proposed modified operating hours in appendix CC1. NYSERDA asserted that they better reflect reduced capacity at lower outdoor temperatures and account for the relationship between cyclic behavior and off-cycle mode of single-speed portable ACs. The Joint Commenters believe that DOE's approach will better represent the operation of single-speed and variable-speed portable ACs. (NYSERDA, No. 17 at p. 2; Joint Commenters, No. 19 at p. 1)

Rice supported deriving the number of operating hours at 95 °F for both single-speed and variable-speed units from the fractional hours of occurrence from the Air-Conditioning, Heating, and Refrigeration Institute (''AHRI'') Standard 210/240, ''Performance Rating of Unitary Air-conditioning & Air-source Heat Pump Equipment'' (''AHRI 210/240''). Rice commented that the variable-speed operating hours should be identical to that proposed for single-speed units (586 hours), assuming that the 83 °F delivered capacity for variable-speed units at reduced speed is given as the capacity matching the required house load at 83 °F per AHRI 210/240 at 100-percent sizing. Rice also stated that using the fractional off times (0.4 for single-duct units and 0.4637 for dual-duct units) multiplied by the effective single-speed hours at net cyclic capacity would result in 234 and 271 off-cycle mode hours for single-duct and dual-duct single-speed units, respectively. The off-cycle mode hours would be 0 for the variable-speed units. (Rice, No. 21 at p. 1)

Regarding the proposal from Rice to allocate a total of 586 hours to cooling mode and off-cycle mode for both single-speed and variable-speed portable ACs at the 83 °F test condition, as discussed previously, DOE has previously determined and maintains that the representative number of cooling mode operating hours for single-speed portable ACs (*i.e.,* compressor on hours) is 750 hours for the entirety of the cooling season, with 586 of those hours at the 83 °F test condition. According to the Rice proposal, only 352 or 315 cooling mode hours at the 83 °F test condition would be considered, for single-duct or dual-duct portable ACs, respectively, which would underrepresent the total number of hours typically spent with the compressor operating in cooling mode. The DOE approach, as described previously, considers the same total number of operating hours for single-speed and variable-speed units in cooling mode and off-cycle mode, thereby maintaining consistency with prior analyses and providing a consistent basis of comparison among different portable AC configurations. This approach aligns with the main objective of the approach suggested by Rice while ensuring the representativeness of test results.

For these reasons, in this final rule DOE is adopting the operating hours proposed in the June 2022 NOPR for appendix CC1, as shown in Table III.1. As discussed previously, DOE did not propose any amendments to the operating hours in appendix CC and is not adopting any amendments to those operating hours in this final rule.

7. Configurations

The current portable AC test procedure in appendix CC addresses two configurations of portable ACs: dual-duct and single-duct. Appendix CC currently requires that portable ACs that are able to operate as both a single-duct and dual-duct portable AC as distributed in commerce by the manufacturer must be tested and rated for both duct configurations. (*See* section 3.1.1 of appendix CC.)

In the June 2022 NOPR, DOE did not propose any amendments to the configurations addressed by the test procedure in appendix CC and proposed to adopt the same requirements in the new appendix CC1. 87 FR 34934, 34946.

The Joint Commenters stated that it is important to continue to require testing and rating for units with both single-duct and dual-duct configurations in order to provide consumers with relevant information and to ensure that these units meet minimum standards with either configuration. The Joint Commenters supported DOE's proposal to maintain the requirement that if a portable AC can operate in both single-duct and dual-duct configurations, the model should be tested and rated for both configurations. (Joint Commenters, No. 19 at p. 2)

NEEA and NWPCC supported maintaining requirements for separately testing both portable AC ducting configurations given the difference in performance between products with these configurations. (NEEA and NWPCC, No. 22 at p. 3)

For the reasons discussed in the previous paragraphs and in the June 2022 NOPR, DOE is maintaining in appendix CC and adopting in appendix CC1 the distinction between single-duct and dual-duct configurations and continues to require that a unit able to operate as both a single-duct and dual-duct portable AC, as distributed in commerce by the manufacturer, must be tested and rated for both duct configurations.

a. Combined-Duct Units

As discussed previously in section III.B.2 of this document, the Midea Interim Waiver provided specifications to accommodate the ''combined-duct'' configuration of the specified Midea basic models and DOE is adopting a new definition for ''combined-duct'' in this final rule.

In the June 2022 NOPR, DOE proposed to include provisions in both appendix CC and appendix CC1 to test combined-duct portable ACs using an adapter to interface with the combined duct to allow for individual connections of the condenser inlet and outlet airflows to the test facility's measuring apparatuses. DOE further proposed specific instructions requiring 16 thermocouples and their placement radially and along the length of the duct to measure temperature variations on the surface of the combined duct. These combined-duct portable AC test provisions proposed in the June 2022 NOPR were consistent with the test procedure approved by DOE in the Midea Interim Waiver. 87 FR 34934, 34942.

DOE received no comments regarding the combined-duct portable AC test provisions. In this final rule, for the reasons discussed in the June 2022 NOPR and Midea Interim Waiver, DOE is adopting the test provisions discussed above for combined-duct portable ACs in appendix CC and appendix CC1.

In the June 2022 NOPR, DOE did not propose any amendments to the duct test setup for single-duct or dual-duct portable ACs that do not contain a combined duct. Appendix CC requires that four thermocouples be placed on the outside of the duct, or ducts, to measure external temperature. AHAM PAC–1–2022 has adopted the same combined-duct approach for all duct configurations in terms of thermocouple placement, requiring that the duct test setup for all portable ACs employ 16 thermocouples per duct. DOE has reviewed this approach in AHAM PAC–1–2022 and concludes that the increased number of thermocouples for single-duct and dual-duct portable ACs that do not contain a combined duct is unnecessary and increases test burden, given that temperature is unlikely to vary radially for any given single duct. The AHAM PAC–1–2022 approach would require the lab to maintain, mount, and monitor many times more thermocouples than are necessary for this testing, and because increasing the number of thermocouples would not improve the accuracy of the test procedure for non-combined-duct units, this increase in test burden is not justified. Therefore, DOE maintains the previous approach in appendix CC and appendix CC1 to require that only four thermocouples be adhered to each duct for single-duct and dual-duct portable ACs, except combined-duct portable ACs, as discussed previously.

8. Cooling Mode

a. Single-Speed Test Conditions

Section 4 of appendix CC measures cooling capacity and overall power input in cooling mode using one test condition for single-duct units and two test conditions for dual-duct units. For single-duct units, the test procedure specifies an 80 °F dry-bulb/67 °F wet-bulb condenser (''outdoor'') inlet air test condition. For dual-duct units, condition A specifies a 95 °F dry-bulb/75 °F wet-bulb outdoor test condition and condition B specifies an 83 °F dry-bulb/67.5 °F wet-bulb outdoor test condition. *See* section 4.1 of appendix CC for the current test requirements and Table 1 in section 4.1 of appendix CC for the list of test conditions.

In the June 2022 NOPR, DOE proposed to maintain the existing test conditions for single-speed portable ACs in appendix CC. In the June 2022 NOPR, DOE also proposed the same single-speed portable AC test conditions in appendix CC1. 87 FR 34934, 34946–34947.

In response to the June 2022 NOPR, Rice recommended that DOE consider using a 92.5 °F interpolated value in place of the measured 95 °F values, stating that 92.5 °F is the true midpoint of the 85 °F to 100 °F temperature range used in AHRI 210/240. (Rice, Public Meeting Transcript, No. 16 at p. 29)

In past rulemakings, DOE has determined that a 95 °F outdoor test condition is representative of conditions when cooling is most needed, an important part of the average use cycle of portable ACs. 81 FR 35241, 35249. Furthermore, DOE notes that the 95 °F test condition is widely adopted in the portable AC industry, as demonstrated by its use in AHAM PAC–1–2015 and AHAM PAC–1–2022. While 92.5 °F is the midpoint of the temperature range in AHRI 210/240, EPCA requires that the DOE test procedure produce results that reflect a representative average use cycle or period of use. (42 U.S.C. 6293(b)(3)) For the purposes of appendix CC, DOE utilized the building loads specified by AHRI 210/240 to determine that a 95 °F outdoor test condition produces the most representative results. On this basis, DOE continues to conclude that the 95 °F outdoor test condition is most representative of portable AC full-load performance and continues to define a 95 °F outdoor test condition in both appendix CC and appendix CC1.

In response to the June 2022 NOPR, AHAM expressed support for DOE's proposal to include in appendix CC one test condition for single-duct portable ACs and two test conditions for dual-duct portable ACs as these test conditions are identical to those found in the AHAM PAC–1–2022 Draft. AHAM also supported DOE's proposal to adopt in appendix CC two test configurations for single-duct variable-speed portable ACs and three test configurations for dual-duct variable-speed portable ACs as those test conditions were identical to those found in the AHAM PAC–1–2022 Draft. According to AHAM, this proposal supports its request to incorporate the final version of AHAM PAC–1–2022 in a final rule as the Federal test procedure. (AHAM, No. 18 at pp. 2–3)

For the reasons previously discussed, DOE is maintaining the existing test conditions for single-speed portable ACs in appendix CC and appendix CC1 in this final rule.

b. Variable-Speed Compressor Speed Test Conditions and Configurations

The alternate test methods specified in the LG Waiver and Midea Interim Waiver maintained the test conditions from appendix CC with respect to dry-bulb and wet-bulb temperature. However, the alternate test methods added compressor speed specifications to the test conditions for variable-speed units (*e.g.,* a full speed and a reduced speed for single-duct units at condition C, and a full speed at the higher temperature test condition, condition A), and two other tests (*e.g.,* one at full speed and the other at reduced speed at the lower temperature test condition, condition B). In the June 2022 NOPR, DOE proposed to amend appendix CC to adopt the approach used in the LG Waiver and Midea Interim Waiver to address variable-speed portable ACs. 87 FR 34934, 34942–34944.

In the June 2022 NOPR, DOE also proposed to adopt in the new appendix CC1 the same compressor configurations as in the LG Waiver and Midea Interim Waiver, except requiring only the low compressor speed configuration at the 83 °F test condition for variable-speed units. As proposed, this approach would be consistent with two of the three test conditions found in the AHAM PAC–1–2022 Draft. The AHAM PAC–1–2022 Draft included both a full-speed and a reduced-speed compressor configuration at the 83 °F test condition for variable-speed units. As discussed in the June 2022 NOPR, DOE expects that portable ACs will typically encounter reduced cooling loads when the outdoor temperature is 83 °F, based on the building load calculation found in section 11.2.1.2 of AHRI 210/240. Thus, DOE considers the most representative mode of operation for variable-speed portable ACs to involve reduced compressor speed when operating at the 83 °F (and therefore lower cooling load) test condition. 87 FR 34934, 34944.

AHAM cited its AHAM Home Comfort Study, which found that the two most-common reasons for choosing a portable AC are the ability to move the unit from room to room (34 percent of consumers), and the ability to store the unit elsewhere in cooler weather (36 percent of consumers). AHAM stated that portable ACs may run at higher speeds when moved due to experiencing a ''hard start'' in an unconditioned, newly occupied space, and, that it is unlikely that low speed would be significantly utilized in these scenarios. AHAM stated that units may run at higher speeds even at lower outdoor temperatures as the conditioned space gets closer to the set point. AHAM also noted that the 2020 RECS showed that the control setting most used by consumers of individual AC units is to turn the equipment on or off as needed. AHAM urged DOE to consider full speed operation at 83 °F to maintain consistency with the AHAM PAC–1–2022 Draft and asserted that this would improve the representativeness of the test procedure. AHAM also presented data from connected portable ACs to support the use of high-speed performance to represent operation at the 83 °F test condition. The data presented by AHAM show the average amount of running time required to reach the portable AC setpoints in the morning and in the evening for nine portable ACs. AHAM also included the average number times the portable ACs cycled per day. (AHAM, No. 18 at p. 8–9)

DOE appreciates the consumer usage data supplied by AHAM in its response to the June 2022 NOPR. While DOE agrees that portable ACs may run at full compressor speed after being plugged in following a move from one room to another, DOE expects that it is unlikely that consumers move portable ACs from room to room as part of the average daily operation of their portable AC, given the amount of effort involved in uninstalling and reinstalling the ducts and window mounting bracket, and the likelihood that cooling is generally needed in the same room every day. Upon review of the supplied connected portable AC data, while they show that portable ACs on average take longer to reach their set point in the morning than in the evening and that portable ACs cycle on average more than once per day, the data do not definitively show that full-load operation should be represented as part of the average period of use for an outdoor temperature of 83 °F. In order to determine that portable ACs spend a significant amount of time in full-load operation at the 83 °F test condition, DOE would require information relating to: (1) the percentage of operating time spent or energy consumed by portable ACs under full load relative to under reduced load; and (2) the outdoor temperatures experienced during the data collection period. DOE would also need to determine that the data are representative of average portable AC operation. The data present no definitive information on operating time, energy use, or outdoor temperature and the set lacks key context to determine the representativeness of the sample, such as unit size, room size, and geographic location. Further, if DOE were able to determine that these data are representative and that full-load operation should be considered as representative of part of the average use cycle at lower temperatures, the data do not indicate how much weight to give to such operation in calculations. Without clear usage data showing otherwise, DOE continues to conclude, based on the AHRI 210/240 building load calculation, that the most representative capacity measurement for the 83 °F outdoor temperature condition captures reduced-speed operation for variable-speed units and cyclic behavior for single-speed units.

While the 2020 RECS data cited by AHAM do suggest that 36 percent of portable AC users mainly operate their unit by turning it on and off, the data miss key context regarding how frequently users turn their equipment on and off and the test conditions at which they do so. Without this information, DOE cannot: (1) estimate the amount of time or energy spent in full load due to this operation; (2) determine how much of this operation should be attributed to the average period of use at the 83 °F outdoor temperature condition; or (3) conclude from the RECS data that full-load operation is a representative part of the average period of use at the 83 °F outdoor temperature condition. As the data provided by AHAM is inconclusive with regards to full-speed operation at the 83 °F test condition, DOE expects that portable ACs will typically encounter reduced cooling loads when the outdoor temperature is 83 °F, based on the building load calculation found in section 11.2.1.2 of AHRI 210/240. Thus, and lacking conclusive user data that show otherwise, DOE continues to conclude that the most representative mode of operation for portable ACs at lower-temperature (and therefore lower cooling load) test conditions involves reduced compressor speed for variable-speed portable ACs and cyclic operation for single-speed portable ACs. For this reason, the DOE test procedure adopted in this final rule requires testing variable-speed portable ACs at a single representative reduced-speed test condition and DOE is providing annual hours of operation at the 83 °F test condition for cooling mode operation in the new appendix CC1.

c. Compressor Speed Control Methodology

In the June 2022 NOPR, DOE proposed that for variable-speed portable ACs, in both appendix CC and the proposed new appendix CC1, the full compressor speed be achieved by using ''native controls'' (*i.e.,* with user controls) with the thermostat setpoint set at 75 °F, and achieve the low compressor speed using supplemental test instructions and settings provided by the manufacturer to DOE and laboratories. The approach proposed in the June 2022 NOPR is consistent with the alternate test procedure specified in the Midea Interim Waiver and with AHAM PAC–1–2022 but represents a change from the procedure specified in the LG Waiver, which specifies using supplemental test instructions and settings provided by the manufacturer to achieve full compressor speed, and would require re-testing of the models listed in that waiver. 87 FR 34934, 34947.

The Joint Commenters supported DOE's proposal to require that variable speed units operate under their native controls, with the thermostat setpoint at 75 °F, to achieve the full compressor speed operation. The Joint Commenters asserted that this would better reflect how a variable-speed unit would operate in the field compared to testing at fixed manufacturer settings. (Joint Commenters, No. 19 at pp. 1–2)

For the reasons discussed in the preceding paragraphs and in the June 2022 NOPR, in revisions to appendix CC and the new appendix CC1, DOE is adopting the native control and manufacturer setting approach set forth in the Midea Interim Waiver and proposed in the June 2022 NOPR, which are consistent with the compressor speed setting requirements contained in AHAM PAC–1–2022.

d. Seasonally Adjusted Cooling Capacity

Under the current test procedure, a unit's SACC is calculated as the weighted average of two full-load tests at the 95 °F and 83 °F test conditions. (*See* section 5.2 of appendix CC.) The LG Waiver and Midea Interim Waiver changed the operating condition for variable-speed portable ACs at the 83 °F outdoor temperature test condition to use a reduced-speed test. As discussed in the June 2022 NOPR, DOE expects that portable ACs will typically encounter reduced cooling loads when the outdoor temperature is 83 °F, based on the building load calculation found in section 11.2.1.2 of AHRI 210/240. Thus, DOE considers the most representative mode of operation for portable ACs at the 83 °F (and therefore lower cooling load) test condition to involve reduced compressor speed for variable-speed portable ACs. 87 FR 34934, 34944.

Because reduced-compressor speed operation is most representative of performance at 83 °F, DOE proposed in the June 2022 NOPR to adopt for appendix CC the Midea Interim Waiver approach of determining SACC for variable-speed portable ACs using the low compressor speed to represent part-load operation at the 83 °F outdoor temperature test condition. DOE additionally proposed to add a new capacity metric for variable-speed portable ACs in appendix CC, $SACC_{Full}$, which calculates capacity using full compressor speed performance at the lower test condition to facilitate consumer comparisons between single-speed and variable-speed portable ACs. For appendix CC1, DOE proposed to account for single-speed cyclic behavior and variable-speed low compressor speed operation expected at lower loads by modifying the SACC calculation to reflect reduced capacity when operating at the low (83 °F) test condition. 87 FR 34934, 34948.

NYSERDA supported DOE's proposed modified SACC in appendix CC1, asserting that they better reflect reduced capacity at lower outdoor temperatures and account for the relationship between cyclic behavior and off-cycle mode of single-speed portable ACs. (NYSERDA, No. 17 at p. 2)

In response to the June 2022 NOPR, AHAM requested that DOE clarify how the proposed appendix CC1 capacity factors were calculated along with the base data used in these calculations. (AHAM, Public Meeting Transcript, No. 16 at p. 24)

The California IOUs also urged DOE to provide more details on how the load factors for single-duct and dual-duct units were derived using AHRI Standard 210/240. (California IOUs, No. 20 at p. 2)

As discussed in the June 2022 NOPR, DOE calculated the load factors based on the building load calculation in section 11.2.1.2 of AHRI 210/240 to estimate the typical cooling load when the outdoor temperature is 83 °F, assuming that full-load conditions are at a temperature of 95 °F. For single-duct units, this load factor is calculated to be 0.6. While all portable AC configurations experience the same indoor cooling load at each of the test conditions, dual-duct portable AC performance is impacted by the changes in the outdoor air temperature (*i.e.,* cooling capacity increases relative to the 95 °F outdoor condition as outdoor process air temperature decreases due to the cooler outdoor air being more effective at removing heat from the condenser). Single-duct portable ACs do not experience this effect because the air entering the condenser is always the same indoor air temperature of 80 °F, regardless of the outdoor air temperature. This cooling capacity increase results in a full-load cooling capacity for dual-duct portable ACs at 83 °F that is higher than the full-load cooling capacity at 95 °F, which is the basis of the AHRI 210/240 building load calculation used to calculate load factors. Therefore, DOE used a capacity adjustment factor developed during the room AC rulemaking using thermodynamic modeling [9] to estimate the cooling capacity increase for dual-duct portable ACs when operating at the 83 °F test condition relative to the 95 °F test condition, and thereby adjusted the single-duct cooling load factor of 60 percent as listed in AHRI 210/240 to a cooling load factor of 53.63 percent of full load operation for dual-duct portable ACs when operating at the 83 °F outdoor temperature. 87 FR 34934, 34948.

Rice noted that had the single speed ACC_{83} values been defined as the compressor-on capacities at 83 °F, their run time hours would be less and different for the single-duct and dual-duct cases. (Rice, No. 21 at p. 1)

The ACC at the 83 °F test condition in appendix CC1 represents the total cooling provided per hour at a given test condition, and accounts for cyclic behavior in single-speed units by using a fractional load factor rather than by adjusting the operating hours spent in cooling mode. While it would be possible to adjust the operating hours to account for the cyclic behavior, the test procedure accomplishes the same goal while maintaining the representative operating hours discussed above by multiplying the capacity measured for single-speed units at the 83 °F test condition by the load factor (different for single-duct and dual-duct units) to adjust for the percent of time spent in off-cycle mode with the compressor off when the unit is not providing any cooling.

AHAM opposed DOE's proposed calculation of SACC including low compressor speed as, according to AHAM, the proposed SACC calculation is not representative of the normal operation of a variable-speed portable AC and would increase consumer confusion. AHAM stated that although seasonal weighting for different temperature conditions is appropriate, the full capability of portable ACs at each temperature condition should be the reported capacity, as is the case for central and room ACs. AHAM stated that variable-speed portable ACs are likely to spend a significant portion of time at high compressor speed, even at a lower temperature condition; therefore, DOE should require only one SACC calculation, equivalent to $SACC_{Full}$. AHAM stated that $SACC_{Full}$ should suffice as a basis of comparison between single- and variable-speed units and suggested using AHAM PAC–1–2022 Draft, which calculates SACC using only full compressor speed. AHAM added that changing the capacity metric for portable ACs to further lower reported portable AC efficiency is unwarranted as AHAM PAC–1–2022 Draft accounts for efficiency losses particular to portable ACs. (AHAM, No. 18 at pp. 3–4, 6)

EPCA requires that DOE's test procedures be reasonably designed to produce test results that measure energy efficiency and estimated annual operating cost during a representative average use cycle or period of use. (42 U.S.C. 6293(b)(3)) As the SACC metric is determined using the DOE test and also used to estimate annual operating cost, EPCA requires that the SACC metric be representative of an average use cycle. As discussed previously, DOE considers the most representative mode of operation for portable ACs at the 83 °F (and therefore lower cooling load) test conditions to involve reduced compressor speed for variable-speed portable ACs. Because reduced-compressor speed operation is most representative of performance at 83 °F, in appendix CC, variable-speed SACC is calculated using the capacity measured from the reduced compressor speed configuration in accordance with the LG Waiver and Midea Interim Waiver approach. The $SACC_{Full}$ metric is employed and represents full-speed capacity at both test conditions, as recommended by AHAM, to allow consumers to easily compare the capacities of variable-speed and single-speed portable ACs and to maintain compatibility with the existing portable AC standards, which are calculated based on single-speed SACC. The approach in appendix CC maintains a representative capacity metric for variable-speed portable ACs (SACC), while addressing comparability with the new capacity metric ($SACC_{Full}$).

AHAM opposed DOE's proposal in appendix CC1 to include de-rating factors for single-duct units to account for cyclic behavior from part-load operation at the low (83 °F) test condition for comparison between single-speed and variable-speed models. AHAM stated that home appliance

[9] For more information on this capacity adjustment for room ACs, see the test procedure final rule published on March 29, 2021. 86 FR 16446, 16458.

manufacturers believe capacity entails the unit's ability to cool down a room (*i.e.,* what the unit is capable of providing) and compared this rationale with other home appliances to support the same approach for portable AC capacity reporting. According to AHAM, capacity representations should be based on what the unit is capable of. AHAM added that the AHRI standard only measures capacity using full speed and therefore is not used in the correct context under DOE's proposed de-rating value for single-duct portable ACs, which is based on the standard. AHAM requested that de-rating factors should be the same for single-duct and dual-duct units as single-duct units will experience a decreased load at the low ambient temperature as well due to the lower temperature of infiltration air. According to AHAM, DOE's proposal inappropriately punishes dual-duct units when decreased operation could translate to increased overall efficiency. (AHAM, No. 18 at p. 4–6)

As discussed previously and in the June 2022 NOPR, because DOE determined that the low compressor speed test configuration at the low temperature test condition is most representative of portable AC operation, the most representative SACC metric is based on this capacity. This determination is consistent with the requirement under EPCA that the portable AC capacity metric be representative of an average period of use. (42 U.S.C. 6293(b)(3)) DOE has adopted a relevant industry standard, AHRI 210/240, to account for single-speed cyclic behavior under this test condition, with modifications necessary to ensure compatibility with the EPCA requirements regarding measurements of a representative use cycle, as provided for in section 8.c of appendix A to subpart C of to 10 CFR part 430.[10] In both appendix CC (for variable-speed units only) and appendix CC1 (for all units), DOE modified the load factor of 0.6 derived from the building load calculation for use in the ACC_{83} calculation to account for the difference in full-load cooling capacity at the 95 °F and 83 °F test conditions, as discussed in the June 2022 NOPR and in this final rule. 87 FR 34934, 34949. Single-duct units do not require this adjustment to the building load calculation because the air entering the condenser is always the same indoor air temperature of 80 °F and there is no difference in cooling capacity between test conditions.

AHAM stated that because the SACC calculations proposed by DOE are different than the nominal ASHRAE capacity, users who are accustomed to making purchase decisions based on nominal capacity (full capacity, as measured in the test procedure) or who have little or no background on SACC could be confused as a result. Additionally, AHAM stated that manufacturers would face additional burden in educating consumers and retailers on SACC and the deviation from ASHRAE ratings. AHAM also stated that DOE's proposed SACC calculation will exacerbate the challenges manufacturers already have in providing accurate room sizes. AHAM added that DOE's proposed SACC calculation results in a lower number than the SACC calculation in AHAM PAC–1–2022 Draft which, if implemented, would likely cause consumers to purchase a unit that is too large for the space and will perform less efficiently and less effectively than a smaller, properly sized unit. According to AHAM, the sizing recommendations found on DOE's website and EPA's website are based on the full capacity that the unit is capable of delivering and do not account for different compressor speeds, which may lead to consumers purchasing oversized units. AHAM stated that the SACC calculation in AHAM PAC–1–2022 Draft properly marks portable ACs and better matches these sizing tables, allowing consumers to select units that operate efficiently according to space needs. (AHAM, No. 18 at pp. 5–6)

DOE understands that the use of reduced-load performance in calculating SACC may be confusing to consumers in the short term, given the wide range of guidance available that refers to SACC calculated using only full-load performance. The new metric, $SACC_{Full}$, will be available for consumers to rely on until the new appendix CC1 is effective and required for representations. In the interim, while appendix CC remains in effect, manufacturers must additionally represent variable-speed portable AC capacity using $SACC_{Full}$, maintaining comparability with SACC as currently calculated using appendix CC. Manufacturers and retailers will have time to educate consumers on the changes to SACC resulting from the new test procedure during the period until appendix CC1 would become required for testing and rating.

In this final rule, DOE is maintaining the current SACC calculation for single-speed units in the revised appendix CC. The SACC for variable-speed units in appendix CC shall be calculated using the low compressor speed at the 83 °F test condition, consistent with the previously granted LG Waiver and Midea Interim Waiver. DOE is also amending appendix CC to include a new capacity metric for variable-speed portable ACs, $SACC_{Full}$, that uses the full compressor speed at the 83 °F test condition, and a corresponding definition for the new metric.

To ensure proper use of the new $SACC_{Full}$ metric when determining compliance of a variable-speed portable AC in accordance with the energy conservation standards that go into effect for single-duct and dual-duct portable ACs manufactured on or after January 10, 2025, DOE is amending the text in 10 CFR 430.32(cc) to clarify which capacity metric shall be used when determining compliance. Specifically, DOE is adjusting the equation description to clarify that for a single-speed portable AC, ''SACC'' is seasonally adjusted cooling capacity, in Btu/h, as determined in appendix CC, whereas for a variable-speed portable AC, ''SACC'' is the full-load seasonally adjusted cooling capacity (*i.e.,* $SACC_{Full}$), in Btu/h, as determined in appendix CC.

For appendix CC1, DOE is adopting an updated SACC calculation for all portable ACs that uses the measured cooling capacity at the 83 °F test condition. For variable-speed portable ACs, the cooling capacity at that condition is measured with low compressor speed. For single-speed portable ACs, the measured cooling capacity at the 83 °F test condition is multiplied by a load factor of 0.6 for single-duct units and 0.5363 for dual-duct units.

e. Weighting Factors

The current portable AC test procedure calculates SACC and CEER as weighted averages of the results of various calculations based on the measured capacity and power values at the two portable AC test conditions, representing outdoor temperatures of 95 °F and 83 °F. Both equations use weighting factors of 0.2 and 0.8 for the two test conditions, respectively. (*See* section 5.4 of appendix CC.)

In the June 2022 NOPR, DOE did not propose amendments to the existing weighting factors in appendix CC. However, for appendix CC1, based on the new set of operating hours, revised capacity equation, and new efficiency equation intended to improve representativeness (*see* sections III.B.6.b, III.B.7.d, and III.B.7.g of this final rule, respectively), in the June

[10] This appendix establishes procedures, interpretations, and policies to guide DOE in the consideration and promulgation of new or revised appliance energy conservation standards and test procedures under EPCA, and is commonly referred to as the ''Appendix A.''

2022 NOPR, DOE proposed weighting factors of 0.144 and 0.856 for the 95 °F and 83 °F test conditions, respectively. 87 FR 34934, 34949.

In response to the June 2022 NOPR, Rice suggested that weighting factors of 0.218 and 0.782 for the 95 °F and 83 °F test condition, respectively, are the appropriate basis for the new weighting factors in appendix CC1 in place of the weighting factors proposed in the NOPR. (Rice, No. 21 at p. 1)

Because DOE is adopting new operating hours in appendix CC1, as discussed previously in section III.B.6.b of this document, the weighting factors adopted in appendix CC1 must reflect those new operating hours in order to maintain internal test procedure consistency and produce the most representative capacity value. The weighting factors adopted in appendix CC1 are used in the SACC calculation, while the AEER calculation uses operating hours to properly represent the annual cooling provided within that efficiency calculation. Using the AHRI 210/240 building load calculation alone, without factoring in the appendix CC1 operating hours, results in weighting factors of 0.218 and 0.782. However, the weighting factors used in appendix CC1 represent the total time DOE expects portable ACs to operate at each test condition and not only the cooling mode operation at each test condition. Considering the portion of the appendix CC1 total cooling mode and off-cycle mode hours spent at each temperature condition (*see* Table III.1 in section III.B.6.b of this document), 14.4 percent of the total cooling mode hours are allocated to the 95 °F test condition and 85.6 percent to the 83 °F test condition, corresponding to weighting factors of 0.144 and 0.856. 87 FR 34934, 34949. DOE continues to conclude, as was proposed in the June 2022 NOPR and used in AHAM PAC–1–2022, that weighting factors of 0.144 and 0.856 corresponding to the 95 °F test condition and the 83 °F test condition, respectively, are representative of the portable AC average period of use. DOE is therefore adopting them for the SACC calculation in appendix CC1.

f. Cycling Losses

Historically, portable ACs have been designed using a single-speed compressor, which operates at full cooling capacity while the compressor is on. When the required cooling load in a space is less than the full cooling capacity of the unit, a single-speed compressor cycles on and off. This cycling behavior introduces inefficiencies often referred to as ‘‘cycling losses.’’ In addition, single-speed portable ACs may experience inefficiencies by continuing to operate the blower fan during compressor off periods after the evaporator coils have warmed to the point that any further fan operation does not contribute to the unit's overall cooling capacity. These two types of inefficiencies occur only for single-speed portable ACs. As discussed in the June 2022 NOPR, variable-speed ACs avoid such inefficiencies because their compressors run continuously, adjusting their speeds as required to match the cooling load. 87 FR 34934, 34949–34950.

As discussed in the June 2022 NOPR, DOE proposed a means of accounting for the losses associated with single-speed cyclical operation at reduced conditions, namely the use of a cycling factor (‘‘CF’’) of 0.82, in both appendix CC and the new appendix CC1, based on available test data and consistent with the value in AHAM PAC–1–2022, to adjust the measured efficiency to represent the expected losses when operating at the low test condition that are not otherwise captured as part of the test. 87 FR 34934, 34949–34950.

In response to the proposed cycling loss factor of 0.82 proposed in the June 2022 NOPR, DOE received the following comments.

The California IOUs agreed with DOE's methodology and the proposed cycling loss factor of 0.82 and requested any additional information regarding the units tested—such as the range of efficiency rating and capacity and if the tested units were single duct or dual duct, as well as the methodology used in unit selection. (California IOUs, No. 20 at p. 2)

ASAP and the Joint Commenters encouraged DOE to fully account for the losses of single-speed units in the determination of an appropriate CF value by including the energy required to operate the blower fan during compressor off periods after the evaporator coils have warmed to the point that any further fan operation does not contribute to the unit's overall cooling capacity. ASAP and the Joint Commenters believe the CF proposed by DOE is therefore too high and artificially deflates the calculated CEER of variable-speed units relative to the CEER of single-speed units. According to the Joint Commenters, if the efficiency metric fails to appropriately recognize the full performance benefits of variable-speed units, manufacturers will have less incentive to adopt variable-speed technology. (ASAP, Public Meeting Transcript, No. 16 at p. 16; Joint Commenters, No. 19 at p. 2)

The test procedure in both appendix CC and appendix CC1 accounts for the cyclic losses for single-speed units (*i.e.,* compressor cycling losses and fan operation in off-cycle mode). The cycling loss factor incorporated in the cooling mode power calculation for both appendix CC and appendix CC1 accounts for cycling losses due to the compressor itself turning on and off. The off-cycle mode power measurement as a part of the annual energy consumed in the denominator of the CEER and AEER calculations accounts for the energy used by the fan blower motor with the compressor off (*i.e.,* fan operation during off-cycle mode). In the CEER and AEER equations, these two types of cycling losses are addressed, with the cooling mode power as adjusted with the cycling loss factor and the off-cycle mode average power multiplied by the relevant operating hours to determine the total cooling mode and off-cycle mode energy use, which is considered along with the energy use for all other modes measured in the test procedure to calculate the total energy consumed. In this way, both CEER and AEER are fully representative of the energy use differences between single-speed and variable-speed portable ACs.

ASAP and the Joint Commenters believe that as DOE's test results showed significant differences in CFs across units (ranging from 76 to 86 percent), using a single CF for all single speed units would fail to capture the efficiency benefits of units with improved cycling performance. ASAP and the Joint Commenters therefore proposed that DOE consider establishing a conservative CF value and allow manufacturers who demonstrate improved performance under cycling operation to measure and use a CF value determined by testing. ASAP further requested that DOE require measurement of the CF in the test procedure to improve representativeness. (ASAP, Public Meeting Transcript, No. 16 at p. 16; Joint Commenters, No. 19 at p. 2)

Rice stated that DOE's proposed cycling loss factor of 0.82 appeared to be derived using the load factor for dual-duct portable ACs. Rice suggested that different cycling loss factors should therefore be used for the two different ducting configurations because they also have different load factors. According to Rice, this new single-speed single-duct portable AC cycling loss factor should be 0.844. (Rice, No. 21 at p. 2)

While DOE agrees that it would be most representative to test the cycling loss factor for each individual unit, such testing involves significant time and technician expertise that would represent a large test burden increase that would not be outweighed by the potential benefit of increased accuracy in the cycling factor. To measure CFs for the June 2022 NOPR, DOE performed cyclic tests, which triggered single-speed portable AC cycling by remotely adjusting the setpoint of the test unit in a cyclic pattern while it was in the test chamber, simulating the behavior of the unit when the room temperature reaches the unit setpoint. Such a test required an additional hour or more of test time with the technician closely supervising the test. Additionally, this cyclic test procedure is not codified in any industry standard. Further, the test did not always produce results. In order to conduct the test, the unit must be controlled remotely from outside the test chamber. One unit in DOE's test sample was unable to be controlled in this way and so the test could not be conducted. The June 2022 NOPR test sample is representative of single-duct portable ACs, including units from three manufacturers and cooling capacities ranging between 4,000 Btu/h and 10,000 Btu/h. While there is some variation in the CFs measured during testing in support of the June 2022 NOPR, DOE maintains that using the average of the measured CFs is the best approach to produce a representative test procedure in appendix CC and appendix CC1, because it incorporates a representative sample of portable ACs and represents the only portable AC-specific cycling loss data available to DOE. Furthermore, this approach of using a universal average cycling loss factor from these data does not add any additional test burden, which would be significant should a cyclic test be performed for each unit. Additionally, while manufacturers may be able to mitigate some effects of cycling losses, single-speed portable ACs must cycle on and off to maintain a given load, which directly leads to cycling losses, suggesting that while there may be some differences in unit-specific CFs, it would be appropriate to reflect cycling losses inherent to all single-speed units using a single representative CF in lieu of overly burdensome and complex cycling tests. Therefore, DOE maintains that, for single-duct units, the average CF of 0.82 derived from cyclic portable AC testing conducted for the June 2022 NOPR is representative of efficiency losses attributable to compressor cycling, and DOE is therefore adopting this factor for single-speed units in appendix CC and appendix CC1.

To address comments from interested parties suggesting that the proposed cycling loss factors should reflect the behavior of all portable AC configurations, DOE completed additional investigative testing on dual-duct portable AC cycling loss factors. This testing was conducted in the same manner as the testing described in the June 2022 NOPR: DOE performed cyclic tests, which triggered single-speed portable AC cycling by remotely adjusting the setpoint of the test unit in a cyclic pattern while it was in the test chamber, simulating the behavior of the unit when the room temperature reaches the unit setpoint. DOE obtained cooling capacity and power data for two dual-duct units with test lengths of 10 minutes and 30 minutes. The relative efficiency during cycling operation as a percentage of efficiency during continuous operation for dual-duct portable ACs (*i.e.,* the cycling loss factors) observed from these tests are summarized in Table III.2.

TABLE III.2—TESTED CYCLING FACTORS FOR DUAL-DUCT PORTABLE ACS

Test Length	30 min (%)	10 min (%)
Unit 1	72	76
Unit 2	80	81
Combined Avg.	77	

While the test sample is limited and displays similar amounts of variance between units as the single-duct samples from the June 2022 NOPR, the data show that on average, and individually, the cycling loss factors for dual-duct portable ACs are lower than those originally proposed in the June 2022 NOPR. Based on these data and Rice's explanation that the difference in loading factors should lead to a difference in CFs, in this final rule DOE is adopting a CF of 0.77 for dual-duct portable ACs and maintaining the previously proposed CF of 0.82 for single-duct portable ACs in appendix CC and appendix CC1, thereby improving representativeness for both portable AC configurations as compared to the single CF specified in AHAM PAC–1–2022.

According to Rice, one would have expected a larger cyclic degradation factor compared to that previously determined for single-speed room ACs.[11] Rice suggested that this may be due to the room AC cyclic loss determination potentially being for continuous fan operation (*i.e.,* ''cool'' mode), which gives a higher cyclic degradation result than in an energy-saving mode. Rice therefore requested that DOE clarify if the cyclic loss factors were determined differently for the portable AC versus room AC applications and to provide a report on the details of the lab cyclic testing for both portable ACs and room ACs to best document this work as reference points for future investigations into cyclic loss factors in both cool mode and energy-saving mode for these products. (Rice, No. 21 at p. 2)

As described previously and in the June 2022 NOPR, DOE based the CFs for this portable AC test procedure on portable AC test data using a manual cycling approach, independent of the testing conducted for the recent room AC rulemaking. Additionally, the room AC cycling loss factor included fan operation, which the portable AC CF does not include because fan operation is measured by the off-cycle mode test. More information regarding the room AC rulemaking, including test data and discussion of the derivation of the cycling loss factor used for room ACs, can be found in the room AC test procedure rulemaking docket.[12]

In this final rule, DOE is accounting for cycling losses in the amended appendix CC using the test procedure waiver approach, as previously discussed. Based on DOE's investigative testing and feedback from commenters, DOE is amending appendix CC to adopt a CF of 0.82 and 0.77 for single-duct and dual-duct units, respectively, when calculating the performance of a theoretical comparable single-speed unit.

In the new appendix CC1, DOE accounts for cycling losses directly in the single-speed portable AC CEER calculation, using the same CF adopted for appendix CC, 0.82 for single-duct units and 0.77 for dual-duct units.

g. Energy Efficiency Calculations

The current portable AC test procedure at appendix CC represents efficiency using CEER, an efficiency metric calculated as the weighted average of the condition-specific CEER values, including the AEC in cooling mode, off-cycle mode, and off or inactive mode.

In the June 2022 NOPR, DOE proposed to retain the existing appendix CC approach when determining single-speed portable AC efficiency, but proposed to amend appendix CC to adopt the general approach from the LG

[11] For room ACs, DOE defines a CF of 0.81 for the lowest test condition (*i.e.,* test condition 4), for calculating the theoretical comparable single-speed room AC adjusted combined energy efficiency ratio. *See* section 5.3.8 of appendix F to subpart B.

[12] The room AC test procedure docket is available at *www.regulations.gov/docket/EERE-2017-BT-TP-0012*.

Waiver and Midea Interim Waiver to determine variable-speed portable AC efficiency. The waiver approach addresses the efficiency impacts of single-speed compressor cycling using a performance adjustment factor (''PAF''). The PAF, which represents the average performance improvement of the variable-speed unit relative to a theoretical comparable single-duct single-speed unit at reduced operating conditions, is applied to the measured variable-speed unit efficiency. 87 FR 34934, 34951.

Additionally, in the June 2022 NOPR, DOE proposed to add a new appendix CC1 that directly accounts for cycling losses in the efficiency ratings for all portable AC configurations by using a new efficiency metric, annual energy efficiency ratio (AEER), that represents efficiency as the total annual cooling divided by the total annual energy consumption (AEC), with single-speed compressor losses and reduced cooling at the low test condition all considered.

AHAM stated that DOE's proposed capacity calculation using a reduced compressor speed configuration results in a lower CEER for variable-speed units. AHAM opposed DOE's compressor speed methodology and recommended using AHAM PAC–1–2022 Draft, which calculates CEER with both high and low compressor speeds for the low temperature conditions. (AHAM, No. 18 at pp. 6–7)

While simply reducing the capacity values used in the CEER or AEER calculation without other changes to the efficiency equations would inherently reduce the calculated and rated efficiency, DOE notes that the CEER and AEER equations in appendix CC and CC1, respectively, also consider the power draw of variable-speed portable ACs at these lower capacities. Furthermore, using the capacity measured with the full compressor speed for the low test condition portion of the efficiency equation would not be representative of real-world operation. As discussed in the June 2022 NOPR and in section III.B.7.b of this document, DOE considers reduced compressor speed operation to be representative of variable-speed portable AC operation when the outdoor temperature is 83 °F, and AHAM has not provided sufficient evidence to justify the use of the full-speed operation as part of a representative average period of use, or what portion of the representative period of use full-speed operation would represent. Therefore, DOE continues to conclude that reduced compressor speed operation at the lower outdoor temperature condition is representative of average portable AC use and should be the basis for the CEER and AEER calculations.

AHAM stated that CEER calculations for portable ACs should be treated in the same fashion as similar products like room and central ACs where full compressor speed is considered at multiple air conditions and therefore should be updated accordingly by DOE. (AHAM, No. 18 at p.7)

As discussed previously in section III.B.6 of this section, DOE considers amendments to address and improve the representativeness of the test procedure, as required by EPCA. (*See* 42 U.S.C. 6293(b)(3)) When considering amending the portable AC test procedure to account for variable-speed operation in the June 2022 NOPR, DOE determined that the most representative compressor speed at the upper, 95 °F outdoor test condition was full speed and the most representative compressor speed at the lower, 83 °F outdoor test condition was low speed. 87 FR 34934, 34946–34947. Similarly, the room AC test procedure requires full compressor speed at the two higher outdoor temperature conditions and reduced compressor speed at the two lower outdoor temperature test conditions. The central AC test procedure, however, does include a full-load test at low-temperature test conditions, but this reflects the consumer usage patterns for central ACs, which are likely different than those for room ACs or portable ACs, which occur over a wider range of temperatures and a larger number of hours. Therefore, DOE continues to conclude that the CEER calculation for portable ACs should use reduced compressor speed measurements for capacity and power when calculating CEER in appendix CC.

The California IOUs supported DOE's proposal to change the efficiency metric for portable ACs to AEER given the differences in use and ducting between portable ACs and similar products. According to a recently survey conducted by the California IOUs,[13] 47 percent of room AC owners use their room ACs as the sole source of air conditioning compared to 22 percent of portable AC owners; all room AC condenser inlets draw air from the outside while only 13 percent of portable AC condenser inlets use outside air; 44 percent of portable AC users use their unit every day or most days compared to 67 percent of room AC users; and 54 percent of portable AC users are located in the West, while the largest percentage of room AC users are based in the Northeast (37 percent). Based on the data obtained from their recent survey, the California IOUs estimated an average weekly usage of 53 percent for portable ACs and 69 percent for room ACs, and suggested that these differences support DOE's decision not to align the portable AC and room AC test procedures and the proposal for the new AEER metric for portable ACs, clarifying to consumers that the efficiency ratings for room ACs and portable ACs are not comparable. (California IOUs, No. 20 at pp. 2–6)

AHAM stated that the approach in AHAM PAC–1–2022 Draft is representative with no need to depart from it and therefore urged DOE to follow its stated policy of adopting industry test procedures that satisfy statutory conditions rather than adopting a new efficiency metric that would further confuse consumers with respect to an appliance category that already uses too many metrics. AHAM added that SEER, CEER, and AEER are not sufficiently distinctive to provide meaningful information to the consumer. AHAM opposed DOE's approach to calculating AEER and urged DOE to continue using CEER as its efficiency metric. (AHAM, No. 18 at pp. 8–9)

As discussed in section III.B.3.a of this document, DOE considers many parts of AHAM PAC–1–2022 to be representative and is incorporating by reference and generally adopting the AHAM PAC–1–2022 test procedure in appendix CC1. However, as also discussed in section III.B.3.a, DOE considers reduced compressor speed operation to be most representative of portable AC use at the low test condition, based on the building load calculation found in AHRI 210/240. Therefore, DOE continues to conclude that an efficiency metric using capacity and power measurements must be based on the reduced compressor speed test configuration to calculate performance at the 83 °F outdoor test configuration as it is most representative and has adopted this approach in appendix CC1. In this final rule, DOE is adopting a new AEER energy efficiency metric for portable ACs in appendix CC1 to replace the CEER metric and adding a corresponding definition for the new AEER efficiency metric. The AEER metric generally aligns within the CEER equation in AHAM PAC–1–2022 but retains the low compressor speed operation as representative of performance at the low test condition.

Rice stated that as all the ACC values ACC_{83} for single- and variable-speed equipment are the net cyclic or reduced

[13] The full-length survey was provided to the docket along with the comment from the California IOUs and is available at *www.regulations.gov/comment/EERE-2020-BT-TP-0029-0020.*

speed values per appendix CC1, these values should all be multiplied by the same number of hours at 83 °F, which is equal to the fractional hours at 83 °F multiplied by 750 total hours, to give the delivered cooling at that condition in the numerator of the AEER equation. (Rice, No. 21 at p. 1)

DOE agrees that in appendix CC1, the capacity calculated for the 83 °F test condition, ACC_{83}, should be multiplied by the same number of hours for both single-speed and variable-speed units in the AEER equation, because ACC_{83} represents the rate of cooling provided by both types of units at that test condition, adjusted to account for the reduced amount of cooling provided by single-speed portable ACs due to cyclic behavior. According to the new appendix CC1 operating hours, DOE expects that variable-speed portable ACs operate in cooling mode for the entirety of the 977 hours spent at the 83 °F test condition, while single-speed units spend 586 hours in cooling mode and 391 of these hours in off-cycle mode when the outdoor temperature is 83 °F. For single-speed units, ACC_{83} is adjusted using a load factor to account for time spent with the compressor off in off-cycle mode due to cycling. For variable-speed units, ACC_{83} reflects the reduced compressor speed operation at the low test condition, and therefore the reduced cooling capacity of variable-speed compressors. Because ACC_{83} accounts for reduced cooling capacity (*i.e.,* for single-speed units, reflecting the time spent in off-cycle mode; and for variable-speed units, reflecting the reduced cooling provided during time spent at the low test condition), ACC_{83} should be multiplied by 977, the total number of hours associated with reduced cooling load operation (*i.e.,* for single-speed units, the total hours spent in cooling mode at the reduced temperature test condition and in off-cycle mode; and for variable-speed units, the total number of hours spent in cooling mode at the reduced temperature test condition).

Rice supported the use of AEER for portable AC applications given the potential for possible negative delivered cooling fractions for portable ACs and stated that in doing so, DOE seems to acknowledge that the current weighting factor method for CEER in appendix CC is only an approximation of the appropriate binned seasonal performance calculation. Rice further requested that manufacturers be required to report AEER in any case as AEER values can be used to estimate annual energy use, while CEER values cannot. In addition, Rice stated that AEER does not incur the approximations to seasonal performance of the existing weighting equations used for CEER, and that reporting AEER would allow consumers to make appropriate accurate cost savings and payback calculations for variable vs single-speed portable AC units. (Rice, No. 21 at pp. 2–3)

As discussed in the June 2022 NOPR, DOE is retaining the CEER equation from the LG Waiver and Midea Interim Waiver alternative test procedures for variable-speed units in appendix CC to maintain compatibility with existing standards. 87 FR 34934, 34944. While DOE agrees that the AEER calculation is the most representative way to calculate portable AC efficiency, the CEER calculation in the LG Waiver and Midea Interim Waiver reasonably represents the efficiency of a variable-speed portable AC relative to a single-speed portable AC and retains compatibility with the existing energy conservation standards. DOE is not amending the certification or reporting requirements for portable ACs in this final rule. Instead, DOE may consider proposals to amend the certification and reporting requirements for portable ACs under a separate rulemaking regarding appliance certification.

h. Load-Based Testing

The existing DOE and industry-accepted standards for testing portable ACs measure cooling capacity and energy efficiency ratio when the portable AC operates continuously at fixed indoor and outdoor temperatures and humidity conditions (*i.e.,* a constant-temperature test), using an air enthalpy approach.[14] In contrast, a load-based test either fixes or varies the amount of heat added to the indoor test room by the reconditioning equipment, while the indoor test room temperature is permitted to change and is controlled by the test unit according to its thermostat setting.

In the June 2022 NOPR, DOE discussed the challenges associated with load-based testing. In particular, DOE discussed its continuing expectation that a load-based test would reduce repeatability and reproducibility due to limitations in current test chamber capabilities—namely, the lack of specificity in industry standards regarding chamber dimensions and reconditioning equipment characteristics, which would negatively impact the representativeness of the results and potentially be unduly burdensome. 87 FR 34934, 34953. Recognizing that neither DOE nor commenters had provided approaches to mitigate these challenges, DOE did not propose to amend the DOE test procedures in appendix CC or appendix CC1 to adopt a load-based testing approach.

DOE received the following comments in response to the June 2022 NOPR regarding load-based testing.

The California IOUs supported DOE's proposed test procedure for variable-speed portable ACs by adjusting user controls and low compressor speed using manufacturer-provided instructions based on the limitations of using user controls to test performance at low compressor speed. However, the California IOUs requested that DOE continue to assess load-based testing to further improve the representativeness of the test procedures. (California IOUs, No. 20 at pp. 1–2)

The Joint Commenters expressed concern that the test procedure may not adequately represent the operation of variable-speed units under part-load conditions and believe that DOE should strive to move away from ''steady-state'' testing and toward load-based testing and approaches that would capture the performance of variable-speed units under unlocked native controls. (Joint Commenters, No. 19 at pp. 2–3)

NEEA and NWPCC believe that load-based testing would better reflect field use and is necessary to capture the impact of cycling and variable-speed performance of a unit operating under its onboard control logic. NEEA and NWPCC further stated that as the product performance of more complex systems becomes increasingly dependent on how well onboard logic control is implemented, DOE should evaluate and pursue load-based testing. (NEEA and NWPCC, No. 22 at p. 4)

Acknowledging the potential advantages of load-based testing as discussed in these comments, DOE continues to recognize that neither DOE nor commenters have identified approaches to mitigate the specific challenges associated with load-based testing, which would reduce repeatability and reproducibility. Furthermore, DOE considers the test procedures in appendix CC and appendix CC1, as amended and adopted in this final rule, as representative of portable AC operation, addressing the impacts of compressor cycling and reduced capacity at low loads and the relative efficiency benefits of variable-speed units, while maintaining repeatability and reproducibility. Therefore, DOE is not adopting a load-

[14] The air enthalpy approach entails measuring the air flow rate, dry-bulb temperature, and water vapor content of air at the inlet and outlet of the portable AC.

based test approach in appendix CC or appendix CC1 at this time.

i. Annual Energy Consumption Calculation

In the June 2022 NOPR, in appendix CC, DOE proposed to adopt the PAF-based approach from the LG Waiver and Midea Interim Waiver to determine variable-speed portable AC efficiency, a weighted-average approach for the CEER equation, and not to change the CEER equation for single-speed portable ACs. In appendix CC1, DOE proposed to adopt a new efficiency metric, AEER, to represent efficiency as the total annual cooling divided by the total annual energy consumption in the proposed new appendix CC1. 87 FR 34934, 34952–34953.

In response to the June 2022 NOPR, AHAM requested that DOE clarify the proposed calculation involving cycling losses in section 5.5.1 of appendix CC, specifically $P83_{Low}$. AHAM believes that this power variable is meant to reflect operation of a single-speed unit, which can only operate at full compressor speed, and therefore $P83_{Low}$ should be $P83_{Full}$. (AHAM, No. 18 at p. 3)

DOE agrees with AHAM that the power variable in the equation to calculate the theoretical comparable single-speed portable AC power at the lower outdoor temperature condition should read ''$P83_{Full}$'' instead of ''$P83_{Low}$,'' as the calculation utilizes the full compressor speed performance of the variable-speed test unit at the lower test condition to estimate the performance of a comparable single-speed portable AC. DOE notes that the June 2022 NOPR preamble discussion correctly refers to the power measured at test condition 2.B, and is correcting the calculation in this final rule.

9. Heating Mode

In the previous portable AC rulemaking, DOE did not establish an efficiency metric for heating mode, noting that available data suggest that portable ACs are not used for heating purposes for a substantial amount of time. 81 FR 35241, 35257.

In the June 2022 NOPR, DOE noted that no new data had been identified that would allow DOE to draw a different conclusion to the use of portable ACs to provide heating and thus, DOE requested comment on the tentative determination not to establish a heating mode efficiency metric in appendix CC and the proposed new appendix CC1. 87 FR 34934, 34953.

In response to the June 2022 NOPR, NYSERDA noted that portable ACs offering heating capabilities are becoming available on the market, as suggested by the New York Housing Authority's partnership with New York Power Authority to purchase 30,000 heat pump units through the Clean Heat for All program, which provides portable solutions for both heating and cooling.[15] NYSERDA urged DOE to take steps to ensure that the portable AC standard and test procedure address the testing of heat mode to better capture all the energy consumed by portable ACs across both heating and cooling use cases. (NYSERDA, No. 17 at pp. 1–2)

DOE recognizes that the market for portable ACs that offer a heating function is evolving and is expected to expand as States and other jurisdictions pursue building electrification strategies. DOE notes, however, that it currently lacks data and information necessary to inform the development of a test method that would produce test results that reflect a representative average use cycle or period of use for the heating function of a portable AC. Therefore, at this time, DOE is not amending the portable AC test procedure to include a measure of heating performance. DOE welcomes further information and data that could be used to inform the future development of a test method for the heating function of portable ACs.

10. Air Circulation Mode

In air circulation mode, a portable AC has activated only the fan or blower and the compressor is off. Unlike off-cycle mode, air circulation mode is consumer-initiated. Due to a lack of usage information for this mode, in the June 2016 Final Rule DOE did not adopt methods to measure or allocate annual operating hours to air circulation mode. 81 FR 35241, 35257.

In the June 2022 NOPR, DOE noted that due to a continued lack of relevant consumer usage data regarding the user-initiated air circulation mode, DOE could not determine typical operating hours in air circulation mode. Therefore, while appendix CC and the proposed new appendix CC1 would require testing in off-cycle mode, and the energy use in that mode would be considered part of the efficiency metric, DOE did not propose a test for user-initiated air circulation mode. 87 FR 34934, 34953–34954.

In response to the June 2022 NOPR, DOE received no comments on its tentative determination not to dedicate distinct operating hours or testing to user-initiated air circulation mode in appendix CC and proposed new appendix CC1.

In this final rule, DOE is not adopting, as part of appendix CC or appendix CC1, a measure of user-initiated air circulation mode energy consumption for portable ACs.

11. Dehumidification Mode

In the June 2022 NOPR, DOE discussed a comment received in response to the April 2021 RFI stating that most portable ACs provide a dehumidification feature and recommending that DOE further investigate its usage and consider including dehumidification mode in an updated test procedure. 86 FR 20044, 20051; 87 FR 34934, 34954.

In the June 2022 NOPR, DOE noted that it was unaware of available consumer use data regarding dehumidification mode, and the presence of a function is insufficient to indicate the frequency of its use. Given the lack of data, DOE was unable to address dehumidification mode in a representative manner and therefore tentatively determined to not include test procedure provisions regarding dehumidification mode in either appendix CC or the proposed new appendix CC1. 87 FR 34934, 34954.

In response to the June 2022 NOPR, NEEA and NWPCC requested that DOE collect dehumidification data for both portable and window ACs for future rulemakings regarding test procedure provisions for a dehumidification mode. (NEEA and NWPCC, No. 22 at p. 3)

DOE recognizes the potential benefit that dehumidification mode performance data could have for future rulemakings and other industry programs. However, given the lack of consumer use data confirming the prevalent use of dehumidification mode for portable ACs, and the burden associated with requiring reporting of dehumidification performance, DOE has determined that there is not sufficient energy consumption in this mode to justify the development of such a test at this time.

Therefore, DOE is not adopting dehumidification mode testing in appendix CC or appendix CC1 at this time.

12. Network Connectivity

Network connectivity implemented in portable ACs can enable functions such as providing real-time room temperature conditions or receiving commands via a remote user interface such as a smartphone. Because DOE was unable to establish a representative test configuration for assessing the energy consumption of network functionality

[15] Further information regarding the Clean Heat for All program can be found at *www.nypa.gov/news/press-releases/2021/20211220-decarbonize.*

for portable ACs due to a lack of consumer usage data, DOE proposed in the June 2022 NOPR to specify in both appendix CC and appendix CC1 that, if a portable AC has network functions, those network functions must be disabled throughout testing if such settings can be disabled by the end-user and the product's user manual provides instructions on how to do so. If an end-user cannot disable the network functions, or the product's user manual does not provide instruction for disabling network settings, the unit is tested with the network settings in the factory default configuration for the duration of the test. 87 FR 34934, 34954–34955.

In response to the June 2022 NOPR, DOE received the following comments regarding network connectivity.

AHAM supported DOE's proposal regarding network functionality and noted that AHAM PAC–1–2022 adopts this provision. (AHAM, No. 18 at p. 3)

ASAP and the Joint Commenters requested that DOE test portable ACs that have network connectivity capabilities in their as-shipped configuration to better reflect consumer use and reduce test burden. The Joint Commenters and NYSERDA asserted that consumers are unlikely to adjust this type of capability from the original factory settings and therefore the proposal to turn off network functions does not reflect consumer use. The Joint Commenters further stated that such a provision would increase the representativeness of the test procedure and can easily be integrated into the test procedure with no expected test burden added. (ASAP, Public Meeting Transcript, No. 16 at pp. 27–28; Joint Commenters, No. 19 at p. 3; NYSERDA, No. 17 at p. 3)

NYSERDA encouraged DOE to incorporate network connectivity in the portable AC test procedure by requiring that connectivity be activated during testing to capture the energy used while accessing the connectivity circuitry. (NYSERDA, No. 17 at p. 3)

DOE appreciates the comments regarding default settings and recognizes the prevalence of such features as they enter the market and their potential use in the future. However, as discussed in the June 2022 NOPR, DOE is not aware of any data reflecting consumer usage data for network connectivity of portable ACs, nor did interested parties provide any such data. Without these data, DOE is unable to establish a representative test configuration for assessing the energy consumption of network connectivity features for portable ACs. Therefore, due to a lack of data and to harmonize with industry standards, DOE maintains its proposal to test portable ACs with network functions disabled, if possible, unless they cannot be disabled, in which case the portable AC would be tested with network functions in the factory default configuration.

13. Infiltration Air, Duct Heat Transfer, and Case Heat Transfer

The portable AC test procedure accounts for the effects of heat transfer from two sources: (1) infiltration of outdoor air into the conditioned space (*i.e.,* ''infiltration air'') and (2) heat leakage through the duct surface to the conditioned space (*i.e.,* ''duct heat transfer''). In the June 2016 Final Rule, DOE considered the effects of heat transfer through the outer chassis of the portable AC to the conditioned space (*i.e.,* ''case heat transfer'') but did not adopt provisions accounting for case heat transfer.

In the June 2022 NOPR, DOE tentatively determined to continue to exclude case heat transfer from the portable AC test procedure both in appendix CC and appendix CC1 because DOE had no data indicating that the impacts of case heat transfer had become more significant since the time the supporting analysis was conducted. DOE also proposed to maintain the incorporation of the energy impacts of infiltration air and duct heat transfer in the portable AC test procedure. 87 FR 34934, 34955.

In response to the June 2022 NOPR, DOE received the following comments regarding the energy impacts of case heat transfer in appendix CC and appendix CC1.

NEEA and NWPCC supported DOE in retaining the energy impacts of infiltration air and duct heat transfer and further stated support for including case heat transfer impacts. (NEEA and NWPCC, No. 22 at p. 3)

The Joint Commenters encouraged DOE to include a measurement of heat losses through the unit casing to better represent the capacity of portable ACs by adopting the approach DOE proposed in a NOPR published in February 2015 as part of the previous test procedure rulemaking, which required additional instrumentation to measure surface temperature. (Joint Commenters, No. 19 at p. 3)

In the June 2016 Final Rule, DOE concluded that case heat transfer had a minimal impact on the cooling capacity of portable ACs and did not include a measurement of case heat transfer in appendix CC because the test burdens outweighed the benefit of addressing the case heat transfer. 81 FR 35242, 35254–35255. DOE reached this conclusion using test data, gathered in support of the supplemental notice of proposed rulemaking that DOE published for portable AC test procedures on November 27, 2015, that showed the case heat transfer was 1.76 percent of the total portable AC cooling capacity on average. 80 FR 74020, 74030. As noted in the June 2022 NOPR, DOE is not aware of, and has not been provided, any additional data to suggest that case heat transfer is a significant enough form of heat loss that would justify the burden associated with the measurement approach discussed in the previous test procedure rulemaking. 87 FR 34934, 34955. Therefore, DOE maintains its determination to not adopt a measure of case heat transfer in appendix CC and appendix CC1.

C. Representations of Energy Efficiency

Manufacturers, including importers, must use product-specific test procedures in 10 CFR part 430 and sampling and rounding requirements in 10 CFR part 429 to determine the represented values of energy consumption or energy efficiency of a basic model. In the June 2022 NOPR, DOE proposed to include rounding instructions consistent with those in Table 1 of AHAM PAC–1–2022 in 10 CFR 429.62 when representing the energy efficiency of a basic model tested using appendix CC1.

DOE received no comments regarding the proposal to add rounding requirements consistent with AHAM PAC–1–2022 when certifying using appendix CC1 in 10 CFR 429.62. In this final rule, DOE adopts these rounding requirements as proposed in the June 2022 NOPR.

As discussed in section III.B.8.d of this document, in this final rule DOE is adopting a new capacity metric for variable-speed portable ACs in appendix CC, $SACC_{Full}$, which calculates capacity using full compressor speed performance at the lower test condition, to facilitate consumer comparisons between single-speed and variable-speed portable ACs. As noted in that section, the $SACC_{Full}$ metric allows consumers to easily compare the capacities of variable-speed and single-speed portable ACs and maintains compatibility with the existing portable AC standards, which are calculated based on single-speed SACC.

Accordingly, to ensure proper representation of capacity for variable-speed portable ACs, in this final rule DOE is adopting an additional instructional note in 10 CFR 429(a) requiring that $SACC_{Full}$, as determined in accordance with appendix CC, shall be used as the basis for representations of capacity for variable-speed portable ACs, whereas SACC, as determined in accordance with appendix CC, shall be the basis for representations of capacity for single-speed portable ACs.

D. Test Procedure Costs and Harmonization

1. Test Procedure Costs and Impact

EPCA requires that test procedures proposed by DOE not be unduly burdensome to conduct. (42 U.S.C. 6293(b)(3)) The following sections discuss DOE's evaluation of estimated costs associated with the amendments to the test procedure.

a. Appendix CC

DOE is amending appendix CC to account for energy use of variable-speed portable ACs per a modified version of the test method applied in the LG Waiver and Midea Interim Waiver. As discussed in the June 2022 NOPR, the LG Waiver uses manufacturer instructions to achieve a fixed full compressor speed, but DOE is amending appendix CC to require the use of consumer settings and a setpoint of 75 °F to do so. This modification would not require testing at additional conditions or increase the test time per test, as compared to the LG Waiver. As such, DOE has determined that the cost per test under appendix CC as amended by this final rule would be the same as the cost when using the alternate test procedure specified in the LG Waiver.

The amendments adopted for appendix CC in this final rule would require LG and Midea to both re-certify all of their variable-speed portable AC models that are currently subject to testing using the LG Waiver and Midea Interim Waiver, respectively. Midea would need to determine $SACC_{Full}$ by testing with the full compressor speed at the 83 °F test condition, and to re-calculate CEER using the new CF. LG would additionally need to re-test its variable-speed portable ACs subject to the LG Waiver at the full compressor speed at the 95 °F test condition if the full compressor speed measured under appendix CC differs from the full compressor speed measured using the LG Waiver procedure. Therefore, the amendment regarding use of consumer settings to achieve the full compressor speed may alter the measured energy efficiency for LG and Midea's affected portable ACs. Because of the change to the measured energy use, LG and Midea may not be able to rely on data generated under the test procedure waiver that was in effect prior to the amendments in this final rule.

b. Appendix CC1

DOE is adopting a new appendix CC1 consistent with AHAM PAC–1–2022 with modifications. For single-speed portable ACs, AHAM PAC–1–2022 uses the same test conditions as the current appendix CC. DOE is adopting a modification to that approach for single-speed portable ACs, however, to apply a load-based capacity adjustment factor to better represent delivered cooling at the low test condition. DOE is also adopting different CFs for single-duct and dual-duct portable ACs. This approach diverges from AHAM PAC–1–2022, which currently implements a single CF for all single-speed portable AC configurations. These differences in considering single-speed reduced capacity and cycling losses when operating at the low test condition inherently result in different overall capacity and efficiency equations for single-speed portable ACs. However, the cost to perform a single-speed portable AC test is estimated to be the same between the appendix CC1 and AHAM PAC–1–2022 approaches.

For variable-speed portable ACs, AHAM PAC–1–2022 uses the existing temperature conditions while requiring an additional test configuration that measures performance with full compressor speed at the low temperature test condition, as well as low compressor speed at the low temperature test condition. As discussed in this final rule, DOE is adopting the low compressor speed test configuration at the low temperature test condition in appendix CC1, but is not adopting the full compressor speed at the low temperature test condition test due to lack of information regarding representativeness of such a test. Appendix CC1, consistent with AHAM PAC–1–2022, updates the efficiency calculation to improve representativeness, albeit with slight modifications to remove consideration of full compressor operation at the low temperature test condition. The cost to conduct appendix CC1 testing for a variable-speed portable AC is expected to be significantly less than that of AHAM PAC–1–2022, given the reduction in the number of tests from three total cooling mode test runs to two cooling mode tests runs per unit.

DOE is not requiring testing in accordance with appendix CC1 unless and until the compliance date of any future amended energy conservation standards that are based on appendix CC1. At that time, manufacturers would have to re-test all basic models currently certified based on testing under appendix CC and re-certify them based on testing under appendix CC1.

2. Harmonization With Industry Standards

DOE's established practice is to adopt relevant industry standards as DOE test procedures unless such methodology would be unduly burdensome to conduct or would not produce test results that reflect the energy efficiency, energy use, water use (as specified in EPCA) or estimated operating costs of that product during a representative average use cycle or period of use. (*See* section 8(c) of appendix A of 10 CFR part 430 subpart C.) When the industry standard does not meet EPCA statutory criteria for test procedures, DOE will establish a test procedure reflecting modifications to these standards through the rulemaking process.

As discussed, appendices CC and CC1 incorporate by reference ANSI/AHAM PAC–1–2015, AHAM PAC–1–2022, ASHRAE 37–2009, IEC Standard 62301, ASHRAE 41.1–1986, ASHRAE 41.6–1994, and ANSI/AMCA 210, with modifications. The industry standards DOE is incorporating by reference are discussed in further detail in section IV.N of this document.

E. Compliance Date and Waivers

The effective date for the adopted test procedure amendment will be 30 days after publication of this final rule in the **Federal Register**. EPCA prescribes that all representations of energy efficiency and energy use, including those made on marketing materials and product labels, must be made in accordance with an amended test procedure, beginning 180 days after publication of the final rule in the **Federal Register**. (42 U.S.C. 6293(c)(2)) EPCA provides an allowance for individual manufacturers to petition DOE for an extension of the 180-day period if the manufacturer may experience undue hardship in meeting the deadline. (42 U.S.C. 6293(c)(3)) To receive such an extension, petitions must be filed with DOE no later than 60 days before the end of the 180-day period and must detail how the manufacturer will experience undue hardship. (*Id.*) To the extent the modified test procedure adopted in this final rule is required only for the evaluation and issuance of updated efficiency standards, compliance with the amended test procedure does not require use of such modified test procedure provisions until the compliance date of updated standards.

Upon the compliance date of test procedure provisions in this final rule, any waivers that had been previously issued and are in effect that pertain to issues addressed by such provisions are terminated. 10 CFR 430.27(h)(3). Recipients of any such waivers are required to test the products subject to the waiver according to the amended test procedure as of the compliance date of the amended test procedure. The amendments adopted in this document pertain to issues addressed by the waiver granted to LG and the interim waiver granted to Midea.[16]

IV. Procedural Issues and Regulatory Review

A. Review Under Executive Orders 12866, 13563, and 14094

Executive Order (''E.O.'') 12866, ''Regulatory Planning and Review,'' as supplemented and reaffirmed by E.O. 13563, ''Improving Regulation and Regulatory Review,'' 76 FR 3821 (Jan. 21, 2011) and E.O. 14094, ''Modernizing Regulatory Review,'' 88 FR 21879 (April 11, 2023), requires agencies, to the extent permitted by law, to (1) propose or adopt a regulation only upon a reasoned determination that its benefits justify its costs (recognizing that some benefits and costs are difficult to quantify); (2) tailor regulations to impose the least burden on society, consistent with obtaining regulatory objectives, taking into account, among other things, and to the extent practicable, the costs of cumulative regulations; (3) select, in choosing among alternative regulatory approaches, those approaches that maximize net benefits (including potential economic, environmental, public health and safety, and other advantages; distributive impacts; and equity); (4) to the extent feasible, specify performance objectives, rather than specifying the behavior or manner of compliance that regulated entities must adopt; and (5) identify and assess available alternatives to direct regulation, including providing economic incentives to encourage the desired behavior, such as user fees or marketable permits, or providing information upon which choices can be made by the public. DOE emphasizes as well that E.O. 13563 requires agencies to use the best available techniques to quantify anticipated present and future benefits and costs as accurately as possible. In its guidance, the Office of Information and Regulatory Affairs (''OIRA'') in the Office of Management and Budget (''OMB'') has emphasized that such techniques may include identifying changing future compliance costs that might result from technological innovation or anticipated behavioral changes. For the reasons stated in the preamble, this final regulatory action is consistent with these principles.

Section 6(a) of E.O. 12866 also requires agencies to submit ''significant regulatory actions'' to OIRA for review. OIRA has determined that this final regulatory action does not constitute a ''significant regulatory action'' under section 3(f) of E.O. 12866. Accordingly, this action was not submitted to OIRA for review under E.O. 12866.

B. Review Under the Regulatory Flexibility Act

The Regulatory Flexibility Act (5 U.S.C. 601 *et seq.*) requires preparation of a final regulatory flexibility analysis (FRFA) for any final rule where the agency was first required by law to publish a proposed rule for public comment, unless the agency certifies that the rule, if promulgated, will not have a significant economic impact on a substantial number of small entities. As required by Executive Order 13272, ''Proper Consideration of Small Entities in Agency Rulemaking,'' 67 FR 53461 (August 16, 2002), DOE published procedures and policies on February 19, 2003, to ensure that the potential impacts of its rules on small entities are properly considered during the DOE rulemaking process. 68 FR 7990. DOE has made its procedures and policies available on the Office of the General Counsel's website: *www.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. DOE has concluded that this rule would not have a significant impact on a substantial number of small entities. The factual basis for this certification is as follows:

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 requires that any test procedures prescribed or amended under this section shall 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 (as determined by the Secretary) or period of use and shall not be unduly burdensome to conduct. (42 U.S.C. 6293(b)(3))

EPCA also requires that, at least once every seven years, DOE evaluate test procedures for each type of covered product, including portable ACs, to determine whether amended test procedures would more accurately or fully comply with the requirements for the test procedures to not be unduly burdensome to conduct and be reasonably designed to produce test results that reflect energy efficiency, energy use, and estimated operating costs during a representative average use cycle or period of use. (42 U.S.C. 6293(b)(1)(A))

DOE is publishing this final rule in satisfaction of the seven-year review requirement specified in EPCA. (42 U.S.C. 6293(b)(1)(A))

In this final rule, DOE amends 10 CFR 429.4, ''Materials incorporated by reference'' and 10 CFR 429.62, ''Portable air conditioners'' as follows:

(1) Incorporate by reference AHAM PAC–1–2022, ''Portable Air Conditioners'' (''AHAM PAC–1–2022''), which includes an industry-accepted method for testing variable-speed portable ACs, in 10 CFR 429.4; and

(2) Add rounding instructions for the SACC and the new energy efficiency metric, annualized energy efficiency ratio (''AEER''), in 10 CFR 429.62.

In this final rule, DOE also updates 10 CFR 430.2, ''Definitions'' and 10 CFR 430.23, ''Test procedures for the measurement of energy and water consumption'' as follows:

(1) Adds a definition for the term ''combined-duct portable air conditioner'' to 10 CFR 430.2; and

(2) Adds requirements to determine estimated annual operating cost for single-duct and dual-duct variable-speed portable ACs in 10 CFR 430.23.

In this final rule, DOE also amends appendix CC as follows:

(1) Add definitions in section 2 for ''combined-duct,'' ''single-speed,'' ''variable-speed,'' ''full compressor speed (full),'' ''low compressor speed (low),'' ''theoretical comparable single-speed,'' and ''seasonally adjusted cooling capacity, full;''

(2) Divide section 4.1 into two sections, 4.1.1 and 4.1.2, for single-speed and variable-speed portable ACs, respectively, and detail configuration-specific cooling mode testing requirements for variable-speed portable ACs;

(3) Add a requirement in section 4.1.2 that, for variable-speed portable ACs, the full compressor speed at the 95 °F test condition be achieved with user controls, and the low compressor speed at the 83 °F test condition be achieved with manufacturer-provided settings or controls;

(4) Add cycling factors (''CFs'') in section 5.5.1, 0.82 for single-duct units and 0.77 for dual-duct units;

(5) Add a requirement to calculate SACC with full compressor speed at the

[16] Case No. 2018–004 included the LG Waiver; Case No. Case No. 2020–006 included the Midea Interim Waiver.

95 °F test condition and low compressor speed at the 83 °F test condition in sections 5.1 and 5.2, consistent with the LG Waiver and the Midea Interim Waiver, with an additional requirement for variable-speed portable ACs to represent SACC with full compressor speed for both test conditions; and

(6) Add a requirement in section 3.1.2 that if a portable AC has network functions, all network functions must be disabled throughout testing if such settings can be disabled by the end-user and the product's user manual provides instructions on how to do so. If the network functions cannot be disabled by the end-user, or the product's user manual does not provide instructions for disabling network settings, test the unit with the network settings in the factory-default configuration for the duration of the test.

In this final rule, DOE additionally adopts a new appendix CC1, ''10 CFR Appendix CC1 to Subpart B of Part 430, Uniform Test Method for Measuring the Energy Consumption of Portable Air Conditioners,'' which, compared to appendix CC in this final rule:

(1) Incorporates by reference parts of the updated version of the AHAM standard, AHAM PAC–1–2022, which includes an industry-accepted method for testing portable ACs;

(2) Adopts a new efficiency metric, AEER, in place of the CEER metric, to calculate more representatively the efficiency of both variable-speed and single-speed portable ACs;

(3) Amends the annual operating hours;

(4) Updates the SACC equation for both single-speed and variable-speed portable ACs;

(5) Applies cycling factors (''CFs'') to single-speed portable AC efficiency, 0.82 for single-duct units and 0.77 for dual-duct units; and

Testing in accordance with the new appendix CC1 would not be required until such time as compliance is required with any amended energy conservation standards based on the new appendix CC1.

The Small Business Administration (''SBA'') considers a business entity to be a small business if, together with its affiliates, it employs less than the threshold number of workers specified in 13 CFR part 121. DOE used SBA's small business size standards to determine whether any small entities would be subject to the requirements of the rule. These size standards and codes are established by the North American Industry Classification System (''NAICS'') and are available at *www.sba.gov/document/support-table-size-standards.* Portable ACs are classified under NAICS 333415, ''Air-Conditioning and Warm Air Heating Equipment and Commercial and Industrial Refrigeration Equipment Manufacturing.'' The SBA sets a threshold of 1,250 employees or fewer for an entity to be considered as a small business for this category.

DOE did not receive any comments that specifically addressed impacts on small businesses or that were provided in response to the initial regulatory flexibility analysis.

DOE used the California Energy Commission's Modernized Appliance Efficiency Database System (''MAEDbS'') [17] to create a list of companies in the United States that sell portable ACs covered by this rulemaking. DOE consulted publicly available data, such as manufacturer websites, manufacturer specifications and product literature, import and export logs, and basic model numbers to identify original equipment manufacturers (''OEMs'') of the products covered by this rulemaking. DOE relied on public data and subscription-based market research tools (*e.g.,* Dun & Bradstreet reports) [18] to determine company location, headcount, and annual revenue. DOE screened out companies that do not offer products covered by this rulemaking, do not meet the SBA's definition of a ''small business,'' or are foreign-owned and operated.

DOE identified 20 portable AC OEMs. DOE did not identify any domestic OEMs that qualify as a ''small business.''

Given the lack of small entities with a direct compliance burden, 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 a FRFA is not warranted. DOE 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).

C. Review Under the Paperwork Reduction Act of 1995

Manufacturers of portable ACs must certify to DOE that their products comply with any applicable energy conservation standards. To certify compliance, manufacturers must first obtain test data for their products according to the DOE test procedures, including any amendments adopted for those test procedures. DOE has established regulations for the certification and recordkeeping requirements for all covered consumer products and commercial equipment, including portable ACs. (*See generally* 10 CFR part 429.) The collection-of-information requirement for the certification and recordkeeping is subject to review and approval by OMB under the Paperwork Reduction Act (PRA). This requirement has been approved by OMB under OMB control number 1910–1400. Public reporting burden for the certification is estimated to average 35 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information.

DOE is not amending the certification or reporting requirements for portable ACs in this final rule. Instead, DOE may consider proposals to amend the certification requirements and reporting for portable ACs under a separate rulemaking regarding appliance and equipment certification. DOE will address changes to OMB Control Number 1910–1400 at that time, as necessary.

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

D. Review Under the National Environmental Policy Act of 1969

In this final rule, DOE establishes test procedure amendments that it expects will be used to develop and implement future energy conservation standards for portable ACs. DOE has determined that this final rule falls into a class of actions that are categorically excluded from review under the National Environmental Policy Act of 1969 (42 U.S.C. 4321 *et seq.*) and DOE's implementing regulations at 10 CFR part 1021. Specifically, DOE has determined that adopting test procedures for measuring energy efficiency of consumer products and industrial equipment is consistent with activities identified in 10 CFR part 1021, appendix A to subpart D, A5 and A6. Accordingly, neither an environmental assessment nor an environmental impact statement is required.

[17] California Energy Commission's Modernized Appliance Efficiency Database System. Available at *cacertappliances.energy.ca.gov/Pages/Search/AdvancedSearch.aspx* (last accessed December 11, 2022).

[18] The Dun & Bradstreet Hoovers subscription login is available online at *app.dnbhoovers.com/* (last accessed December 12, 2022).

E. Review Under Executive Order 13132

Executive Order 13132, ''Federalism,'' 64 FR 43255 (August 4, 1999), imposes certain requirements on agencies formulating and implementing policies or regulations that preempt State law or that have federalism implications. The Executive order requires agencies to examine the constitutional and statutory authority supporting any action that would limit the policymaking discretion of the States and to carefully assess the necessity for such actions. The Executive order also requires agencies to have an accountable process to ensure meaningful and timely input by State and local officials in the development of regulatory policies that have federalism implications. On March 14, 2000, DOE published a statement of policy describing the intergovernmental consultation process it will follow in the development of such regulations. 65 FR 13735. DOE 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 *www.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). Pursuant to OMB Memorandum M–19–15, Improving Implementation of the Information Quality Act (April 24, 2019), DOE published updated guidelines, which are available at *www.energy.gov/sites/prod/files/2019/12/f70/DOE%20Final%20Updated%20IQA%20Guidelines%20Dec%202019.pdf*. DOE has reviewed this 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 promulgated or is expected to lead to promulgation of a final rule, and that (1) is a significant regulatory action under Executive Order 12866, or any successor order; and (2) is likely to have a significant adverse effect on the supply, distribution, or use of energy; or (3) is designated by the Administrator of OIRA as a significant energy action. For any 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), DOE must comply with section 32 of the Federal Energy Administration Act of 1974, as amended by the Federal Energy Administration Authorization Act of 1977. (15 U.S.C. 788; ''FEAA'') Section 32 essentially provides in relevant part that, where a proposed rule authorizes or requires use of commercial standards, the notice of proposed rulemaking must inform the public of the use and background of such standards. In addition, section 32(c) requires DOE to consult with the Attorney General and the Chairman of the Federal Trade Commission (''FTC'') concerning the impact of the commercial or industry standards on competition.

The modifications to the test procedure for portable ACs adopted in this final rule incorporate testing methods contained in certain sections of the following commercial standards: ANSI/AHAM PAC–1–2015, AHAM PAC–1–2022, ASHRAE 37–2009, ANSI/AMCA 210, ASHRAE 41.1–1986, ANSI/ASHRAE 41.6–1994, and IEC 62301. DOE has evaluated these standards and is unable to conclude whether they fully comply with the requirements of section 32(b) of the FEAA (*i.e.,* whether they were developed in a manner that fully provides for public participation, comment, and review). DOE has consulted with both the Attorney General and the Chairman of the FTC about the impact on competition of using the methods contained in these standards and has received no comments objecting to their use.

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. Description of Materials Incorporated by Reference

AHAM PAC–1–2022 is an industry-accepted test procedure that measures portable AC performance in cooling mode in a more representative manner than the previous iteration, ANSI/AHAM PAC–1–2015, and is applicable to products sold in North America. AHAM PAC–1–2022 specifies testing conducted in accordance with other industry-accepted test procedures and determines energy efficiency metrics for various portable AC configurations and compressor types (*i.e.,* single-speed and variable-speed). Specifically, the appendix CC1 test procedure codified by this final rule references AHAM PAC–1–2022 for testing portable ACs. AHAM PAC–1–2022 is reasonably available from AHAM (*www.aham.org/AHAM/AuxStore*).

ASHRAE 37–2009 is an industry-accepted test standard referenced by ANSI/AHAM PAC–1–2015 and AHAM PAC–1–2022 that defines various uniform methods for measuring performance of air conditioning and heat pump equipment. Although ANSI/AHAM PAC–1–2015 and AHAM PAC–1–2022 reference a number of sections in ASHRAE 37–2009, the appendix CC1 test procedure established in this final rule additionally references one section in ASHRAE 37–2009 that addresses test duration.

ANSI/AMCA 210 is an industry-accepted test standard referenced by ASHRAE 37–2009 that defines methods for measuring the characteristics of air flow.

ASHRAE 41.1–1986 is an industry-accepted test standard referenced by ASHRAE 37–2009 that defines a standard method for measuring temperature.

ASHRAE 41.6–1994 is an industry-accepted test standard referenced by ASHRAE 37–2009 that defines a standard method for measuring moist air properties, including humidity and wet-bulb temperature.

These standards are all reasonably available from ASHRAE (*www.ashrae.org*), except for ANSI/AMCA 210, which is readily available from AMCA International at *www.amca.org*.

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 mode and off mode test results. IEC 62301 is reasonably available from IEC at *webstore.iec.ch/*.

The following standards are already approved for the sections/appendices where they appear in the regulatory text: ANSI/AHAM PAC–1–2015.

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

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

10 CFR Part 430

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

Signing Authority

This document of the Department of Energy was signed on May 1, 2023, by Francisco Alejandro Moreno, Acting Assistant Secretary for Energy Efficiency and Renewable Energy, U.S. Department of Energy, pursuant to delegated authority from the Secretary of Energy. That document with the original signature and date is maintained by DOE. For administrative purposes only, and in compliance with requirements of the Office of the Federal Register, the undersigned DOE Federal Register Liaison Officer has been authorized to sign and submit the document in electronic format for publication, as an official document of the Department of Energy. This administrative process in no way alters the legal effect of this document upon publication in the **Federal Register**.

Signed in Washington, DC, on May 3, 2023.

Treena V. Garrett,

Federal Register Liaison Officer, U.S. Department of 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; 28 U.S.C. 2461 note.

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

§ 429.4 Materials incorporated by reference.

* * * * *

(b) * * *

(3) AHAM PAC–1–2022, *Energy Measurement Test Procedure for Portable Air Conditioners,* Copyright 2022. IBR approved for § 429.62.

* * * * *

■ 3. Section 429.62 is amended by:

■ a. Redesignating paragraphs (a)(3) through (5) as paragraphs (a)(4) through (6);

■ b. Adding new paragraph (a)(3); and

■ c. Revising newly redesignated paragraphs (a)(4) and (5).

The addition and revisions read as follows:

§ 429.62 Portable air conditioners.

* * * * *

(a) * * *

(3) When testing in accordance with appendix CC of subpart B of part 430 of this chapter, the represented value of cooling capacity for a single-speed portable AC shall be seasonally adjusted cooling capacity (''SACC'') and the represented value of cooling capacity for a variable-speed portable AC shall be full-load seasonally adjusted cooling capacity (''$SACC_{Full}$''), as determined in appendix CC to subpart B of part 430 of this chapter. When testing in accordance with appendix CC1 to subpart B of part 430 of this chapter, the represented value of cooling capacity for both single-speed and variable-speed portable ACs shall be SACC, as determined in appendix CC1 to subpart B of part 430 of this chapter.

(4) Where SACC is used for representation, the represented value of SACC of a basic model must be the mean of the SACC for each tested unit of the basic model. Likewise, where $SACC_{Full}$ is used for representation, the represented value of $SACC_{Full}$ of a basic model must be the mean of the $SACC_{Full}$ for each tested unit of the basic model. When using appendix CC to subpart B of part 430 of this chapter, round the mean SACC or $SACC_{Full}$ value to the nearest 50, 100, 200, or 500 Btu/h, depending on the magnitude of the calculated SACC or $SACC_{Full}$, as applicable, 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''. When using appendix CC1 to subpart B of part 430 of this chapter, round SACC to the nearest 50, 100, 200, or 500 Btu/h, depending on the magnitude of the calculated SACC, in accordance with Table 1 of AHAM PAC–1–2022, (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''.

(5) The represented value of combined energy efficiency ratio or annualized energy efficiency ratio of a basic model must be rounded to the nearest 0.1 Btu/Wh.

* * * * *

PART 430—ENERGY CONSERVATION PROGRAM FOR CONSUMER PRODUCTS

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

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

■ 4. Section 430.2 is amended by adding, in alphabetical order, the definition for ''Combined-duct portable air conditioner'' to read as follows:

§ 430.2 Definitions.

* * * * *

Combined-duct portable air conditioner means a portable air conditioner for which condenser inlet and outlet air streams flow through separate ducts housed in a single duct structure.

* * * * *

■ 5. Amend § 430.3 by:

■ a. Redesignating paragraphs (b)(1) through (5) as (b)(2) through (6) and adding new paragraph (b)(1);

■ b. Revising paragraphs (g)(3) and (5);

■ c. Redesignating paragraphs (g)(11) through (19) as paragraphs (g)(12) through (20);

■ d. Adding new paragraph (g)(11);

■ e. Redesignating paragraph (i)(9) as (i)(10);

■ f. Adding new paragraph (i)(9);

■ g. In paragraph (q)(6), removing the text ''CC, EE'' and adding, in its place, the text ''CC, CC1, EE''; and

■ h. Removing note 2 to paragraph (q).

The revisions and additions read as follows:

§ 430.3 Materials incorporated by reference.

* * * * *

(b) * * *

(1) ANSI/AMCA 210–99, *Laboratory Methods of Testing Fans for Aerodynamic Performance Rating,* ANSI-approved December 2, 1999; IBR approved for appendices CC and CC1 to subpart B. (Co-published as ANSI/ASHRAE 51–1999.)

* * * * *

(g) * * *

(3) ANSI/ASHRAE Standard 37–2009 (''ASHRAE 37–2009''), *Methods of Testing for Rating Electrically Driven Unitary Air-Conditioning and Heat Pump Equipment,* ANSI-approved June 25, 2009; IBR approved for appendices AA, CC, and CC1 to subpart B.

* * * * *

(5) ASHRAE 41.1–1986 (Reaffirmed 2006) (''ASHRAE 41.1–1986''), *Standard Method for Temperature Measurement,* approved February 18, 1987; IBR approved for appendices E, AA, CC, and CC1 to subpart B.

* * * * *

(11) ANSI/ASHRAE Standard 41.6–1994 (RA 2006) (''ASHRAE 41.6–1994''), *Standard Method for Measurement of Moist Air Properties,* ANSI-reaffirmed January 27, 2006; IBR approved for appendices CC and CC1 to subpart B.

* * * * *

(i) * * *

(9) AHAM PAC–1–2022, *Energy Measurement Test Procedure for Portable Air Conditioners,* Copyright 2022; IBR approved for appendix CC1 to subpart B of this part.

* * * * *

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

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

* * * * *

(dd) *Portable air conditioners.*

(1) When using appendix CC to this subpart, measure the seasonally adjusted cooling capacity (''SACC'') in British thermal units per hour (Btu/h), and the combined energy efficiency ratio, in British thermal units per watt-hour (Btu/Wh) in accordance with sections 5.2 and 5.4 of appendix CC to this subpart, respectively. When using appendix CC1 to this subpart, measure the SACC in Btu/h, and the combined energy efficiency ratio, in Btu/Wh in accordance with sections 5.2 and 5.4, respectively, of appendix CC1 to this subpart.

(2) When using appendix CC to this subpart, determine the estimated annual

operating cost for portable air conditioners, in dollars per year and rounded to the nearest whole number, by multiplying a representative average unit cost of electrical energy in dollars per kilowatt-hour as provided by the Secretary by the total annual energy consumption (''AEC''), determined as follows:

(i) For dual-duct single-speed portable air conditioners, the sum of AEC_{DD_95} multiplied by 0.2, AEC_{DD_83} multiplied by 0.8, and AEC_T as measured in accordance with section 5.3 of appendix CC to this subpart.

(ii) For single-duct single-speed portable air conditioners, the sum of AEC_{SD} and AEC_T as measured in accordance with section 5.3 of appendix CC to this subpart.

(iii) For dual-duct variable-speed portable air conditioners the overall sum of

(A) The sum of $AEC_{DD\_95\_Full}$ and $AEC_{ia/om}$, multiplied by 0.2, and

(B) The sum of $AEC_{DD\_83\_Low}$ and $AEC_{ia/om}$, multiplied by 0.8, as measured in accordance with section 5.3 of appendix CC to this subpart.

(iv) For single-duct variable-speed portable air conditioners, the overall sum of

(A) The sum of AEC_{SD_Full} and $AEC_{ia/om}$, multiplied by 0.2, and

(B) The sum of AEC_{SD_Low} and $AEC_{ia/om}$, multiplied by 0.8, as measured in accordance with section 5.3 of appendix CC to this subpart.

(3) When using appendix CC1 to this subpart, determine the estimated annual operating cost for portable air conditioners, in dollars per year and rounded to the nearest whole number, by multiplying a representative average unit cost of electrical energy in dollars per kilowatt-hour as provided by the Secretary by the total AEC. The total AEC is the sum of AEC_{95}, AEC_{83}, AEC_{oc}, and AEC_{ia}, as measured in accordance with section 5.3 of appendix CC1 to this subpart.

* * * * *

■ 7. Appendix CC to subpart B of part 430 is amended by:

■ a. Adding an introductory note;

■ b. Adding section 0;

■ c. Revising sections 2, 3.1.1, 3.1.1.1, 3.1.1.6, 3.1.2, 3.2, 3.2.1, 3.2.2.2, 3.2.3, 4.1, 4.1.1, 4.1.2, and 4.3;

■ d. In sections 3.1.1.3, 3.1.1.4, and 4.3, removing the text ''(incorporated by reference; see § 430.3)'';

■ e. Adding sections 4.1.3 and 4.1.4; and

■ f. Revising sections 5.

The additions and revisions read as follows:

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

Note: Manufacturers must use the results of testing under this appendix to determine compliance with the relevant standards for portable air conditioners at § 430.32(cc) with which compliance is required as of January 10, 2025. Specifically, before November 13, 2023 representations must be based upon results generated either under this appendix or under this appendix CC as it appeared in the 10 CFR parts 200–499 edition revised as of January 1, 2021. Any representations made on or after November 13, 2023 but before the compliance date of any amended standards for portable ACs must be made based upon results generated using this appendix.

Manufacturers must use the results of testing under appendix CC1 to this subpart to determine compliance with any standards that amend the portable air conditioners standard at § 430.32(cc) with which compliance is required on January 10, 2025 and that use the Annualized Energy Efficiency Ratio (AEER) metric. Any representations related to energy also must be made in accordance with the appendix that applies (*i.e.,* this appendix or appendix CC1) when determining compliance with the relevant standard. Manufacturers may also use appendix CC1 to certify compliance with any amended standards prior to the applicable compliance date for those standards.

0. Incorporation by Reference

DOE incorporated by reference in § 430.3 the entire standard for ANSI/AHAM PAC–1–2015, ANSI/AMCA 210–99, ASHRAE 37–2009, ASHRAE 41.1–1986, ASHRAE 41.6–1994, and IEC 62301; however, only enumerated provisions of ANSI/AHAM PAC–1–2015, ANSI/AMCA 210–99, ASHRAE 37–2009, and IEC 62301 apply to this appendix CC as follows. Treat ''should'' in IEC 62301 as mandatory. When there is a conflict, the language of this appendix takes precedence over those documents.

0.1 ANSI/AHAM PAC–1–2015

(a) Section 4 ''Definitions,'' as specified in section 3.1.1 of this appendix, except for AHAM's definition for ''Portable Air Conditioner'';

(b) Section 7 ''Tests,'' as specified in sections 3.1.1, 3.1.1.3, 3.1.1.4, 4.1.1, and 4.1.2 of this appendix.

0.2 ANSI/AMCA 210–99 (''ANSI/AMCA 210'')

(a) Figure 12 ''Outlet chamber Setup—Multiple Nozzles in Chamber'' as specified in section 4.1.1 of this appendix;

(b) Figure 12 Notes as specified in section 4.1.1 of this appendix.

0.3 ASHRAE 37–2009

(a) Section 5.4 ''Electrical Instruments,'' as specified in sections 4.1.1 and 4.1.2 of this appendix;

(b) Section 7.3 ''Indoor and Outdoor Air Enthalpy Methods,'' as specified in sections 4.1.1 and 4.1.2 of this appendix;

(c) Section 7.6 ''Outdoor Liquid Coil Method,'' as specified in sections 4.1.1 and 4.1.2 of this appendix;

(d) Section 7.7 ''Airflow Rate Measurement,'' as specified in sections 4.1.1 and 4.1.2 of this appendix;

(e) Section 8.7 ''Test Procedure for Cooling Capacity Tests,'' as specified in sections 4.1.1 and 4.1.2 of this appendix;

(f) Section 9.2 ''Test Tolerances,'' as specified in sections 4.1.1 and 4.1.2 of this appendix;

(g) Section 11.1 ''Symbols Used In Equations,'' as specified in sections 4.1.1 and 4.1.2 of this appendix.

0.4 IEC 62301

(a) Paragraph 4.2 ''Test room,'' as specified in section 3.2.4 of this appendix;

(b) Paragraph 4.3.2 ''Supply voltage waveform,'' as specified in section 3.2.2.2 of this appendix;

(c) Paragraph 4.4 ''Power measuring instruments,'' as specified in section 3.2.3 of this appendix;

(d) Paragraph 5.1, ''General,'' Note 1, as specified in section 4.3 of this appendix;

(e) Paragraph 5.2 ''Preparation of product,'' as specified in section 3.2.1 of this appendix;

(f) Paragraph 5.3.2 ''Sampling method,'' as specified in section 4.3 of this appendix;

(g) Annex D, ''Determination of Uncertainty of Measurement,'' as specified in sections 3.2.1, 3.2.2.2, and 3.2.3 of this appendix.

* * * * *

2. Definitions

Combined-duct means the condenser inlet and outlet air streams flow through separate ducts housed in a single duct structure.

Combined energy efficiency ratio means 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 of this appendix.

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

Dual-duct means drawing some or all of the condenser inlet air from outside the conditioned space through a duct attached to an adjustable window bracket, potentially drawing additional condenser inlet air from the conditioned space, and discharging the condenser outlet air outside the conditioned space by means of a separate duct attached to an adjustable window bracket.

Full compressor speed (full) means the compressor speed at which the unit operates at full load test conditions, when using user controls with a unit thermostat setpoint of 75 °F to achieve maximum cooling capacity.

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.

Low compressor speed (low) means the compressor speed specified by the manufacturer, at which the unit operates at low load test conditions (*i.e.,* Test Condition C and Test Condition E in Table 2 of this appendix, for a dual-duct and single-duct portable air conditioner, respectively), such that the measured cooling capacity at this speed is no less than 50 percent and no greater than 60 percent of the measured cooling capacity with the full compressor speed at full load test conditioners (*i.e.,* Test Condition A and Test Condition C in Table 2 of this appendix, for a dual-duct and single-duct portable air conditioner, respectively).

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

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

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

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

Off mode means a mode that may persist for an indefinite time 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. This includes an indicator that only shows the user that the portable air conditioner is in the off position.

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

Seasonally adjusted cooling capacity, full means the amount of cooling provided to the indoor conditions space, measured under the specified ambient conditions when the unit compressor is operating at full speed at each condition, in Btu/h.

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

Single-speed means incapable of automatically adjusting the compressor speed based on detected conditions.

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:

(a) 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

(b) 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.

Theoretical comparable single-speed means a hypothetical single-speed unit that would have the same cooling capacity and electrical power input as the variable-speed unit under test, with no cycling losses considered, when operating with the full compressor speed and at the test conditions in Table 1 of this appendix.

Variable-speed means capable of automatically adjusting the compressor speed based on detected conditions.

* * * * *

3.1 * * *

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, except as otherwise specified in this appendix. Measure duct heat transfer and infiltration air heat transfer according to sections 4.1.1 and 4.1.2 of this appendix, respectively.

3.1.1.1 *Duct setup.* Use all ducting components provided by or required by the manufacturer and no others. Ducting components include ducts, connectors for attaching the duct(s) to the test unit, sealing, insulation, and window mounting fixtures. Do not apply additional sealing or insulation. For combined-duct units, the manufacturer must provide the testing facility an adapter that allows for the individual connection of the condenser inlet and outlet airflows to the test facility's airflow measuring apparatuses. Use that adapter to measure the condenser inlet and outlet airflows for any corresponding unit.

* * * * *

3.1.1.6 *Duct temperature measurements.* Install any insulation and sealing provided by the manufacturer. For a dual-duct or single-duct unit, adhere four thermocouples per duct, spaced along the entire length equally, to the outer surface of the duct. Measure the surface temperatures of each duct. For a combined-duct unit, adhere sixteen thermocouples to the outer surface of the duct, spaced evenly around the circumference (four thermocouples, each 90 degrees apart, radially) and down the entire length of the duct (four sets of four thermocouples, evenly spaced along the entire length of the duct), ensuring that the thermocouples are spaced along the entire length equally, on the surface of the combined duct. Place at least one thermocouple preferably adjacent to, but otherwise as close as possible to, the condenser inlet aperture and at least one thermocouple on the duct surface preferably adjacent to, but otherwise as close as possible to, the condenser outlet aperture. Measure the surface temperature of the combined duct at each thermocouple. Temperature measurements must have an error no greater than ±0.5 °F over the range being measured.

3.1.2 *Control settings.* For a single-speed unit, set the controls to the lowest available temperature setpoint for cooling mode, as described in section 4.1.1 of this appendix. For a variable-speed unit, set the thermostat setpoint to 75 °F to achieve the full compressor speed and use the manufacturer instructions to achieve the low compressor speed, as described in section 4.1.2 of this appendix. If the portable air conditioner has a user-adjustable fan speed, select the maximum fan speed setting. If the unit has an automatic louver oscillation feature and there is an option to disable that feature, disable that feature throughout testing. If the unit has adjustable louvers, position the louvers parallel with the air flow to maximize air flow and minimize static pressure loss. If the portable air conditioner has network functions, that an end-user can disable and the product's user manual provides instructions on how to do so, disable all network functions throughout testing. If an end-user cannot disable a network function or the product's user manual does not provide instruction for disabling a network function, test the unit with that network function in the factory default configuration for the duration of the test.

* * * * *

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 Paragraph 5.2 of IEC 62301, referring to Annex D of that standard as necessary. Disregard the provisions regarding batteries and the determination, classification, and testing of relevant modes.

* * * * *

3.2.2.2 *Supply voltage waveform.* For the standby mode and off mode testing, maintain the electrical supply voltage waveform indicated in, Paragraph 4.3.2 of IEC 62301, referring to Annex D of that standard as necessary.

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 Paragraph 4.4 of IEC 62301, using a two-tailed confidence interval and referring to Annex D of that standard as necessary.

4. * * *

4.1 Cooling Mode

Note: 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.

4.1.1 *Single-Speed Cooling Mode Test.* For single-speed portable air conditioners, measure the indoor room cooling capacity and overall power input in cooling mode in accordance with sections 7.1.b and 7.1.c of ANSI/AHAM PAC–1–2015, respectively, including the references to sections 5.4, 7.3, 7.6, 7.7, and 11 of ASHRAE 37–2009. Determine the test duration in accordance with section 8.7 of ASHRAE 37–2009, including the reference to section 9.2 of the same standard, referring to Figure 12 and the Figure 12 Notes of ANSI/AMCA 210 to determine placement of static pressure taps, and including references to ASHRAE 41.1–1986 and ASHRAE 41.6–1994. Disregard the test conditions in Table 3 of ANSI/AHAM PAC–1–2015. Instead, apply the test conditions for single-duct and dual-duct portable air conditioners presented in Table 1 of this appendix. 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 condition 1.C, presented in Table 1 of this appendix. For dual-duct units, measure the indoor room cooling capacity and overall power input twice, first in accordance with ambient conditions for test condition 1.A ($Capacity_{95}$, P_{95}), and then in accordance with test condition 1.B ($Capacity_{83}$, P_{83}), both presented in Table 1 of this appendix. For the remainder of this test procedure, test combined-duct single-speed portable air conditioners following any instruction for dual-duct single-speed portable air conditioners, unless otherwise specified.

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

Test condition	Evaporator inlet air, °F (°C)		Condenser inlet air, °F (°C)	
	Dry bulb	Wet bulb	Dry bulb	Wet bulb
1.A	80 (26.7)	67 (19.4)	95 (35.0)	75 (23.9)
1.B	80 (26.7)	67 (19.4)	83 (28.3)	67.5 (19.7)
1.C	80 (26.7)	67 (19.4)	80 (26.7)	67 (19.4)

4.1.2 *Variable-Speed Cooling Mode Test.* For variable-speed portable air conditioners, measure the indoor room cooling capacity and overall power input in cooling mode in accordance with sections 7.1.b and 7.1.c of ANSI/AHAM PAC–1–2015, respectively, including the references to sections 5.4, 7.3, 7.6, 7.7, and 11 of ASHRAE 37–2009, except as detailed below. Determine the test duration in accordance with section 8.7 of ASHRAE 37–2009, including the reference to section 9.2 of the same standard. Disregard the test conditions in Table 3 of ANSI/AHAM PAC–1–2015. Instead, apply the test conditions for single-duct and dual-duct portable air conditioners presented in Table 2 of this appendix. For a single-duct unit, measure the indoor room cooling capacity and overall power input in cooling mode twice, first in accordance with the ambient conditions and compressor speed settings for test condition 2.D ($Capacity_{SD\_Full}$, P_{SD_Full}), and then in accordance with the ambient conditions for test condition 2.E ($Capacity_{SD\_Low}$, P_{SD_Low}), both presented in Table 2 of this appendix. For dual-duct units, measure the indoor room cooling capacity and overall power input three times, first in accordance with ambient conditions for test condition 2.A ($Capacity_{95\_Full}$, P_{95_Full}), second in accordance with the ambient conditions for test condition 2.B ($Capacity_{83\_Full}$, P_{83_Full}), and third in accordance with the ambient conditions for test condition 2.C ($Capacity_{83\_Low}$, P_{83_Low}), each presented in Table 2 of this appendix. For the remainder of this test procedure, test combined-duct variable-speed portable air conditioners following any instruction for dual-duct variable-speed portable air conditioners, unless otherwise specified. For test conditions 2.A, 2.B, and 2.D, achieve the full compressor speed with user controls, as defined in section 2.13 of this appendix. For test conditions 2.C and 2.E, set the required compressor speed in accordance with instructions the manufacturer provided to DOE.

TABLE 2—VARIABLE-SPEED EVAPORATOR (INDOOR) AND CONDENSER (OUTDOOR) INLET TEST CONDITIONS

Test condition	Evaporator inlet air °F (°C)		Condenser inlet air °F (°C)		Compressor speed
	Dry bulb	Wet bulb	Dry bulb	Wet bulb	
2.A	80 (26.7)	67 (19.4)	95 (35.0)	75 (23.9)	Full.
2.B	80 (26.7)	67 (19.4)	83 (28.3)	67.5 (19.7)	Full.
2.C	80 (26.7)	67 (19.4)	83 (28.3)	67.5 (19.7)	Low.
2.D	80 (26.7)	67 (19.4)	80 (26.7)	67 (19.4)	Full.
2.E	80 (26.7)	67 (19.4)	80 (26.7)	67 (19.4)	Low.

4.1.3. *Duct Heat Transfer*

Throughout the cooling mode test, measure the surface temperature of the condenser exhaust duct and condenser inlet duct, where applicable. Calculate the average temperature at each thermocouple placement location. Then calculate the average surface temperature of each duct. For single-duct and dual-duct units, calculate the average of the four average temperature measurements taken on the duct. For combined-duct units, calculate the average of the sixteen average temperature measurements taken on the duct. Calculate the surface area (A_{duct_j}) of each duct according to:

$A_{duct\_j} = Cj \times Lj$

Where:

Cj = the circumference of duct ''j'', including any manufacturer-supplied insulation, measured by wrapping a flexible measuring tape, or equivalent, around the outside of a combined duct, making sure the tape is on the outermost ridges or, alternatively, if the duct has a circular cross-section, by multiplying the outer diameter by 3.14.

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

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

Calculate the total heat transferred from the surface of the duct(s) to the indoor conditioned space while operating in cooling mode at each test condition, as follows:

For single-duct single-speed portable air conditioners:

$Q_{duct\_SD} = 3 \times A_{duct\_j} \times (T_{duct\_j} - T_{ei})$

For dual-duct single-speed portable air conditioners:

$Q_{duct\_DD\_95} = \Sigma_j\{3 \times A_{duct\_j} \times (T_{duct\_95\_j} - T_{ei})\}$
$Q_{duct\_DD\_83} = \Sigma_j\{3 \times A_{duct\_j} \times (T_{duct\_83\_j} - T_{ei})\}$

For single-duct variable-speed portable air conditioners:

$Q_{duct\_SD\_Full} = 3 \times A_{duct} \times (T_{duct\_Full\_j} - T_{ei})$
$Q_{duct\_SD\_Low} = 3 \times A_{duct} \times (T_{duct\_Low\_j} - T_{ei})$

For dual-duct variable-speed portable air conditioners:

$Q_{duct\_DD\_95\_Full} = \Sigma_j\{3 \times A_{duct\_j} \times (T_{duct\_Full\_95\_j} - T_{ei})\}$
$Q_{duct\_DD\_83\_Full} = \Sigma_j\{3 \times A_{duct\_j} \times (T_{duct\_Full\_83\_j} - T_{ei})\}$
$Q_{duct\_DD\_83\_Low} = \Sigma_j\{3 \times A_{duct\_j} \times (T_{duct\_Low\_83\_j} - T_{ei})\}$

Where:

Q_{duct_SD} = the total heat transferred from the duct to the indoor conditioned space in cooling mode, in Btu/h, when tested at Test Condition 1.C.

$Q_{duct\_DD\_95}$ and $Q_{duct\_DD\_83}$ = the total heat transferred from the ducts to the indoor conditioned space in cooling mode, in Btu/h, when tested at Test Conditions 1.A and 1.B, respectively.

$Q_{duct\_SD\_Full}$ and $Q_{duct\_SD\_Low}$ = the total heat transferred from the duct to the indoor conditioned space in cooling mode, in Btu/h, when tested at Test Conditions 2.D and 2.E, respectively.

$Q_{duct\_DD\_95\_Full}$, $Q_{duct\_DD\_83\_Full}$, and $Q_{duct\_DD\_83\_Low}$ = the total heat transferred from the ducts to the indoor conditioned space in cooling mode, in Btu/h, when tested at Test Condition 2.A, Test Condition 2.B, and Test Condition 2.C, respectively.

3 = empirically-derived convection coefficient in Btu/h per square foot per °F.

A_{duct_j} = surface area of the duct "j", as calculated in this section, in square feet.
T_{duct_j} = average surface temperature for duct "j" of single-duct single-speed portable air conditioners, in °F, as measured at Test Condition 1.C.
$T_{duct\_95\_j}$ and $T_{duct\_83\_j}$ = average surface temperature for duct "j" of dual-duct single-speed portable air conditioners, in °F, as measured at Test Conditions 1.A and 1.B, respectively.
$T_{duct\_Full\_j}$ and $T_{duct\_Low\_j}$ = average surface temperature for duct "j" of single-duct variable-speed portable air conditioners, in °F, as measured at Test Conditions 2.D and 2.E, respectively.
$T_{duct\_Full\_95\_j}$, $T_{duct\_Full\_83\_j}$, and $T_{duct\_Low\_83\_j}$ = average surface temperature for duct "j" of dual-duct variable-speed portable air conditioners, in °F, as measured at Test Conditions 2.A, 2.B, and 2.C, respectively.
j represents the condenser exhaust duct for single-duct units, the condenser exhaust duct and the condenser inlet duct for dual-duct units, and the combined duct for combined-duct units.
T_{ei} = average evaporator inlet air dry-bulb temperature, as measured in section 4.1 of this appendix, in °F.

4.1.4. *Infiltration Air Heat Transfer.*

Calculate the sample unit's heat contribution from infiltration air into the conditioned space for each cooling mode test as follows:

Calculate the dry air mass flow rate of infiltration air, which affects the sensible and latent components of heat contribution from infiltration air, according to the following equations.

For a single-duct single-speed unit:

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

For a dual-duct single-speed unit:

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

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

For a single-duct variable-speed unit:

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

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

For a dual-duct variable-speed unit:

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

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

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

Where:

$\dot{m}_{SD}$, $\dot{m}_{SD\_Full}$, and $\dot{m}_{SD\_Low}$ = dry air mass flow rate of infiltration air for single-duct portable air conditioners, in pounds per minute (lb/m) when tested at Test Conditions 1.C, 2.D, and 2.E, respectively.
$\dot{m}_{95}$, $\dot{m}_{83}$, $\dot{m}_{95\_Full}$, $\dot{m}_{83\_Full}$, and $\dot{m}_{83\_Low}$ = dry air mass flow rate of infiltration air for dual-duct portable air conditioners, in lb/m, when tested at Test Conditions 1.A, 1.B, 2.A, 2.B, and 2.C, respectively.
V_{co_SD}, $V_{co\_SD\_Full}$, $V_{co\_SD\_Low}$, V_{co_95}, V_{co_83}, $V_{co\_95\_Full}$, $V_{co\_83\_Full}$, and $V_{co\_83\_Low}$ = average volumetric flow rate of the condenser outlet air, in cubic feet per minute (cfm), as measured at Test Conditions 1.C, 2.D, 2.E, 1.A, 1.B, 2.A, 2.B, and 2.C, respectively, as required in sections 4.1.1 and 4.1.2 of this appendix.
V_{ci_95}, V_{ci_83}, $V_{ci\_95\_Full}$, $V_{ci\_83\_Full}$, and $V_{ci\_83\_Low}$ = average volumetric flow rate of the condenser inlet air, in cfm, as measured at Test Conditions 1.A, 1.B, 2.A, 2.B, and 2.C, respectively, as required in sections 4.1.1 and 4.1.2 of this appendix.
ρ_{co_SD}, $\rho_{co\_SD\_Full}$, $\rho_{co\_SD\_Low}$, ρ_{co_95}, ρ_{co_83}, $\rho_{co\_95\_Full}$, $\rho_{co\_83\_Full}$, and $\rho_{co\_83\_Low}$ = average density of the condenser outlet air, in pounds mass per cubic foot (lb_m/ft^3), as measured at Test Conditions 1.C, 2.D, 2.E, 1.A, 1.B, 2.A, 2.B, and 2.C, respectively, as required in sections 4.1.1 and 4.1.2 of this appendix.
ρ_{ci_95}, ρ_{ci_83}, $\rho_{ci\_95\_Full}$, $\rho_{ci\_83\_Full}$, and $\rho_{ci\_83\_Low}$ = average density of the condenser inlet air, in lb_m/ft^3, as measured at Test Conditions 1.A, 1.B, 2.A, 2.B, and 2.C, respectively, as required in sections 4.1.1 and 4.1.2 of this appendix.
ω_{co_SD}, $\omega_{co\_SD\_Full}$, $\omega_{co\_SD\_Low}$, ω_{co_95}, ω_{co_83}, $\omega_{co\_95\_Full}$, $\omega_{co\_83\_Full}$, and $\omega_{co\_83\_Low}$ = average humidity ratio of condenser outlet air, in pounds mass of water vapor per pounds mass of dry air (lb_w/lb_{da}), as

measured at Test Conditions 1.C, 2.D, 2.E, 1.A, 1.B, 2.A, 2.B, and 2.C, respectively, as required in sections 4.1.1 and 4.1.2 of this appendix.

ω_{ci_95}, ω_{ci_83}, $\omega_{ci\_95\_Full}$, $\omega_{ci\_83\_Full}$, and $\omega_{ci\_83\_Low}$ = average humidity ratio of condenser inlet air, in lb_w/lb_{da}, as measured at Test Conditions 1.A, 1.B, 2.A, 2.B, and 2.C, respectively, as required in sections 4.1.1 and 4.1.2 of this appendix.

Calculate the sensible component of infiltration air heat contribution according to the following equations.

For single-duct single-speed units:

$Q_{s\_SD\_95} = \dot{m}_{SD} \times 60 \times [c_{p\_da} \times (95 - 80) + (c_{p\_wv} \times (0.0141 \times 95 - 0.0112 \times 80))]$

$Q_{s\_SD\_83} = \dot{m}_{SD} \times 60 \times [(c_{p\_da} \times (83 - 80) + (c_{p\_wv} \times (0.01086 \times 83 - 0.0112 \times 80))]$

For dual-duct single-speed units:

$Q_{s\_DD\_95} = \dot{m}_{95} \times 60 \times [c_{p\_da} \times (95 - 80) + (c_{p\_wv} \times (0.0141 \times 95 - 0.0112 \times 80))]$

$Q_{s\_DD\_83} = \dot{m}_{83} \times 60 \times [(c_{p\_da} \times (83 - 80) + (c_{p\_wv} \times (0.01086 \times 83 - 0.0112 \times 80))]$

For single-duct variable-speed units:

$Q_{s\_SD\_95\_Full} = \dot{m}_{SD\_Full} \times 60 \times [c_{p\_da} \times (95 - 80) + (c_{p\_wv} \times (0.0141 \times 95 - 0.0112 \times 80))]$

$Q_{s\_SD\_83\_Full} = \dot{m}_{SD\_Full} \times 60 \times [(c_{p\_da} \times (83 - 80) + (c_{p\_wv} \times (0.01086 \times 83 - 0.0112 \times 80))]$

$Q_{s\_SD\_83\_Low} = \dot{m}_{SD\_Low} \times 60 \times [(c_{p\_da} \times (83 - 80) + (c_{p\_wv} \times (0.01086 \times 83 - 0.0112 \times 80))]$

For dual-duct variable-speed units:

$Q_{s\_DD\_95\_Full} = \dot{m}_{95\_Full} \times 60 \times [c_{p\_da} \times (95 - 80) + (c_{p\_wv} \times (0.0141 \times 95 - 0.0112 \times 80))]$

$Q_{s\_DD\_83\_Full} = \dot{m}_{83\_Full} \times 60 \times [(c_{p\_da} \times (83 - 80) + (c_{p\_wv} \times (0.01086 \times 83 - 0.0112 \times 80))]$

$Q_{s\_DD\_83\_Low} = \dot{m}_{83\_Low} \times 60 \times [(c_{p\_da} \times (83 - 80) + (c_{p\_wv} \times (0.01086 \times 83 - 0.0112 \times 80))]$

Where:

$Q_{s\_SD\_95}$, $Q_{s\_SD\_83}$, $Q_{s\_DD\_95}$, and $Q_{s\_DD\_83}$ = sensible heat added to the room by infiltration air, in Btu/h, for each duct configuration and temperature condition.

$Q_{s\_SD\_95\_Full}$, $Q_{s\_SD\_83\_Full}$, $Q_{s\_SD\_83\_Low}$, $Q_{s\_DD\_95\_Full}$, $Q_{s\_DD\_83\_Full}$, and $Q_{s\_DD\_83\_Low}$ = sensible heat added to the room by infiltration air, in Btu/h, for each duct configuration, temperature condition, and compressor speed.

$\dot{m}_{SD}$, $\dot{m}_{95}$, and $\dot{m}_{83}$ = dry air mass flow rate of infiltration air for single-speed portable air conditioners, in lb/m, as calculated in section 4.1.4 of this appendix.

$\dot{m}_{SD\_95\_Full}$, $\dot{m}_{SD\_83\_Low}$, $\dot{m}_{95\_Full}$ and $\dot{m}_{83\_Low}$ = dry air mass flow rate of infiltration air for variable-speed portable air conditioners, in lb/m, as calculated in section 4.1.4 of this appendix.

c_{p_da} = specific heat of dry air, 0.24 Btu/(lbm °F).

c_{p_wv} = specific heat of water vapor, 0.444 Btu/(lbm °F).

80 = indoor chamber dry-bulb temperature, in °F.

95 = infiltration air dry-bulb temperature for Test Conditions 1.A and 2.A, in °F.

83 = infiltration air dry-bulb temperature for Test Conditions 1.B, 2.B, and 2.C, in °F.

0.0141 = humidity ratio of the dry-bulb infiltration air for Test Conditions 1.A and 2.A, in lb_w/lb_{da}.

0.01086 = humidity ratio of the dry-bulb infiltration air for Test Conditions 1.B, 2.B, and 2.C, in lb_w/lb_{da}.

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

60 = conversion factor from minutes to hours.

Calculate the latent heat contribution of the infiltration air according to the following equations. For a single-duct single-speed unit:

$Q_{l\_SD\_95} = \dot{m}_{SD} \times 60 \times 1061 \times (0.0141 - 0.0112)$

$Q_{l\_SD\_83} = \dot{m}_{SD} \times 60 \times 1061 \times (0.01086 - 0.0112)$

For a dual-duct single-speed unit:

$Q_{l\_DD\_95} = \dot{m}_{95} \times 60 \times 1061 \times (0.0141 - 0.0112)$

$Q_{l\_DD\_83} = \dot{m}_{83} \times 60 \times 1061 \times (0.01086 - 0.0112)$

For a single-duct variable-speed unit:

$Q_{l\_SD\_95\_Full} = \dot{m}_{SD\_Full} \times 60 \times 1061 \times (0.0141 - 0.0112)$

$Q_{l\_SD\_83\_Full} = \dot{m}_{SD\_Full} \times 60 \times 1061 \times (0.01086 - 0.0112)$

$Q_{l\_SD\_83\_Low} = \dot{m}_{SD\_Low} \times 60 \times 1061 \times (0.01086 - 0.0112)$

For a dual-duct variable-speed unit:

$Q_{l\_DD\_95\_Full} = \dot{m}_{95\_Full} \times 60 \times 1061 \times (0.0141 - 0.0112)$

$Q_{l\_DD\_83\_Full} = \dot{m}_{83\_Full} \times 60 \times 1061 \times (0.01086 - 0.0112)$

$Q_{l\_DD\_83\_Low} = \dot{m}_{83\_Low} \times 60 \times 1061 \times (0.01086 - 0.0112)$

Where:

$Q_{l\_SD\_95}$, $Q_{l\_SD\_83}$, $Q_{l\_DD\_95}$, and $Q_{l\_DD\_83}$ = latent heat added to the room by infiltration air, in Btu/h, for each duct configuration and temperature condition.

$Q_{l\_SD\_95\_Full}$, $Q_{l\_SD\_83\_Full}$, $Q_{l\_SD\_Low}$, $Q_{l\_DD\_95\_Full}$, $Q_{l\_DD\_83\_Full}$, and $Q_{l\_DD\_83\_Low}$ = latent heat added to the room by infiltration air, in Btu/h, for each duct configuration, temperature condition, and compressor speed.

$\dot{m}_{SD}$, $\dot{m}_{95}$, and $\dot{m}_{83}$ = dry air mass flow rate of infiltration air for portable air conditioners, in lb/m, when tested at Test Conditions 1.C, 1.A, and 1.B, respectively, as calculated in section 4.1.4 of this appendix.

$\dot{m}_{SD\_Full}$, $\dot{m}_{SD\_Low}$, $\dot{m}_{95\_Full}$, $\dot{m}_{83\_Full}$ and $\dot{m}_{83\_Low}$ = dry air mass flow rate of infiltration air for portable air conditioners, in lb/m, when tested at Test Conditions 2.D, 2.E, 2.A, 2.B, and 2.C, respectively, as calculated in section 4.1.4 of this appendix.

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

0.0141 = humidity ratio of the dry-bulb infiltration air for Test Conditions 1.A and 2.A, in lb_w/lb_{da}.

0.01086 = humidity ratio of the dry-bulb infiltration air for Test Conditions 1.B, 2.B, and 2.C, in lb_w/lb_{da}.

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

60 = conversion factor from minutes to hours.

Calculate the total heat contribution of the infiltration air at each test condition by adding the sensible and latent heat according to the following equations.

For a single-duct single-speed unit:

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

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

For a dual-duct single-speed unit:

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

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

For a single-duct variable-speed unit:

$Q_{infiltration\_SD\_95\_Full} = Q_{s\_SD\_95\_Full} + Q_{l\_SD\_95\_Full}$

$Q_{infiltration\_SD\_83\_Full} = Q_{s\_SD\_83\_Full} + Q_{l\_SD\_83\_Full}$

$Q_{infiltration\_SD\_83\_Low} = Q_{s\_SD\_83\_Low} + Q_{l\_SD\_83\_Low}$

For a dual-duct variable-speed unit:

$Q_{infiltration\_DD\_95\_Full} = Q_{s\_DD\_95\_Full} + Q_{l\_DD\_95\_Full}$

$Q_{infiltration\_DD\_83\_Full} = Q_{s\_DD\_83\_Full} + Q_{l\_DD\_83\_Full}$

$Q_{infiltration\_DD\_83\_Low} = Q_{s\_DD\_83\_Low} + Q_{l\_DD\_83\_Low}$

Where:

$Q_{infiltration\_SD\_95}$, $Q_{infiltration\_SD\_83}$, $Q_{infiltration\_DD\_95}$, $Q_{infiltration\_DD\_83}$ = total infiltration air heat in cooling mode, in Btu/h, for each duct configuration and temperature condition.

$Q_{infiltration\_SD\_95\_Full}$, $Q_{infiltration\_SD\_83\_Full}$, $Q_{infiltration\_SD\_83\_Low}$, $Q_{infiltration\_DD\_95\_Full}$, $Q_{infiltration\_DD\_83\_Full}$, and $Q_{infiltration\_DD\_83\_Low}$ = total infiltration air heat in cooling mode, in Btu/h, for each duct configuration, temperature condition, and compressor speed.

$Q_{s\_SD\_95}$, $Q_{s\_SD\_83}$, $Q_{s\_DD\_95}$, and $Q_{s\_DD\_83}$ = sensible heat added to the room by infiltration air, in Btu/h, for each duct configuration, temperature condition, and compressor speed.

$Q_{s\_SD\_95\_Full}$, $Q_{s\_SD\_83\_Full}$, $Q_{s\_SD\_83\_Low}$, $Q_{s\_DD\_95\_Full}$, $Q_{s\_DD\_83\_Full}$, and $Q_{s\_DD\_83\_Low}$ = sensible heat added to the room by infiltration air, in Btu/h, for each duct configuration, temperature condition, and compressor speed.

$Q_{l\_SD\_95}$, $Q_{l\_SD\_83}$, $Q_{l\_DD\_95}$, and $Q_{l\_DD\_83}$ = latent heat added to the room by infiltration air, in Btu/h, for each duct configuration, and temperature condition.

$Q_{l\_SD\_95\_Full}$, $Q_{l\_SD\_83\_Full}$, $Q_{l\_SD\_83\_Low}$, $Q_{l\_DD\_95\_Full}$, $Q_{l\_DD\_83\_Full}$, and $Q_{l\_DD\_83\_Low}$ = latent heat added to the room by infiltration air, in Btu/h, for each duct configuration, temperature condition, and compressor speed.

* * * * *

4.3 *Standby mode and off mode.* Establish the testing conditions set forth in section 3.2 of this appendix, ensuring that the unit does not enter any active modes during the test. As discussed in Paragraph 5.1, Note 1 of IEC 62301, allow sufficient time for the unit to reach the lowest power state before proceeding with the test measurement. Follow the test procedure specified in 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. If the standby mode is cyclic and irregular or unstable, collect 10 cycles worth of data.

* * * * *

5. Calculation of Derived Results From Test Measurements

5.1 *Adjusted Cooling Capacity*

5.1.1 *Single-Speed Adjusted Cooling Capacity.* For a single-speed portable air conditioner, calculate the adjusted cooling capacity at each outdoor temperature operating condition, in Btu/h, according to the following equations.

For a single-duct single-speed portable air conditioner unit:

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

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

For a dual-duct single-speed portable air conditioner unit:

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

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

$Capacity_{SD}$, $Capacity_{95}$, and $Capacity_{83}$ = cooling capacity for each duct configuration or temperature condition measured in section 4.1.1 of this appendix.

Q_{duct_SD}, $Q_{duct\_DD\_95}$, and $Q_{duct\_DD\_83}$ = duct heat transfer for each duct configuration or temperature condition while operating in cooling mode, calculated in section 4.1.3 of this appendix.

$Q_{infiltration\_SD\_95}$, $Q_{infiltration\_SD\_83}$, $Q_{infiltration\_DD\_95}$, $Q_{infiltration\_DD\_83}$ = total infiltration air heat transfer in cooling mode for each duct configuration and temperature condition, calculated in section 4.1.4 of this appendix.

5.1.2 *Variable-Speed Adjusted Cooling Capacity.* For variable-speed portable air conditioners, calculate the adjusted cooling capacity at each outdoor temperature operating condition, in Btu/h, according to the following equations:

For a single-duct variable-speed portable air conditioner unit:

$$ACC_{SD\_95} = Capacity_{SD\_Full} - Q_{duct\_SD\_Full} - Q_{inflitration\_SD\_95\_Full}$$

$$ACC_{SD\_83\_Full} = Capacity_{SD\_Full} - Q_{duct\_SD\_Full} - Q_{inflitration\_SD\_83\_Full}$$

$$ACC_{SD\_83\_Low} = Capacity_{SD\_Low} - Q_{duct\_SD\_Low} - Q_{inflitration\_SD\_83\_Low}$$

For a dual-duct variable-speed portable air conditioner unit:

$$ACC_{DD\_95} = Capacity_{DD\_95\_Full} - Q_{duct\_DD\_95\_Full} - Q_{inflitration\_DD\_95\_Full}$$

$$ACC_{DD\_83\_Full} = Capacity_{DD\_83\_Full} - Q_{duct\_DD\_83\_Full} - Q_{inflitration\_DD\_83\_Full}$$

$$ACC_{DD\_83\_Low} = Capacity_{DD\_83\_Low} - Q_{duct\_DD\_83\_Low} - Q_{inflitration\_DD\_83\_Low}$$

Where:

$Capacity_{SD\_Full}$, $Capacity_{SD\_Low}$, $Capacity_{DD\_95\_Full}$, $Capacity_{DD\_83\_Full}$, and $Capacity_{DD\_83\_Low}$ = cooling capacity in Btu/h for each duct configuration, temperature condition (where applicable), and compressor speed, as measured in section 4.1.2 of this appendix.

$Q_{duct\_SD\_Full}$, $Q_{duct\_SD\_Low}$, $Q_{duct\_DD\_95\_Full}$, $Q_{duct\_DD\_83\_Full}$, and $Q_{duct\_DD\_83\_Low}$ = combined duct heat transfer for each duct configuration, temperature condition (where applicable), and compressor speed, as calculated in section 4.1.3 of this appendix.

$Q_{infiltration\_SD\_95\_Full}$, $Q_{infiltration\_SD\_83\_Full}$, $Q_{infiltration\_SD\_83\_Low}$, $Q_{infiltration\_DD\_95\_Full}$, $Q_{infiltration\_DD\_83\_Full}$, and $Q_{infiltration\_DD\_83\_Low}$ = total infiltration air heat transfer in cooling mode for each duct configuration, temperature condition, and compressor speed, as calculated in section 4.1.4 of this appendix.

5.2 *Seasonally Adjusted Cooling Capacity*

5.2.1 Calculate the unit's seasonally adjusted cooling capacity, SACC, in Btu/h, according to the following equations:

For a single-speed portable air conditioner unit:

$$SACC_{SD} = ACC_{SD\_95\_SS} \times 0.2 + ACC_{SD\_83\_SS} \times 0.8$$

$$SACC_{DD} = ACC_{DD\_95\_SS} \times 0.2 + ACC_{SD\_83\_SS} \times 0.8$$

For a variable-speed portable air conditioner unit:

$$SACC_{SD} = ACC_{SD\_95} \times 0.2 + ACC_{SD\_83\_Low} \times 0.8$$

$$SACC_{DD} = ACC_{DD\_95} \times 0.2 + ACC_{DD\_83\_Low} \times 0.8$$

Where:

$ACC_{SD\_95\_SS}$, $ACC_{SD\_83\_SS}$, $ACC_{DD\_95\_SS}$, and $ACC_{DD\_83\_SS}$ = adjusted cooling capacity for single-speed portable air conditioners for each duct configuration and temperature condition, in Btu/h, calculated in section 5.1.1 of this appendix.

ACC_{SD_95}, $ACC_{SD\_83\_Low}$, ACC_{DD_95}, and $ACC_{DD\_83\_Low}$ = adjusted cooling capacity for variable-speed portable air conditioners for each duct configuration, temperature condition, and compressor speed, in Btu/h, calculated in section 5.1.2 of this appendix.

0.2 = weighting factor for the 95 °F test condition.

0.8 = weighting factor for the 83 °F test condition.

5.2.2 For variable-speed portable ACs determine a Full-Load Seasonally Adjusted Cooling Capacity ($SACC_{Full\_SD}$ for single-speed units and $SACC_{Full\_DD}$ for dual-duct units) using the following formulas:

$$SACC_{Full\_SD} = ACC_{SD\_95} \times 0.2 + ACC_{SD\_83\_Full} \times 0.8$$

$$SACC_{Full\_DD} = ACC_{DD\_95} \times 0.2 + ACC_{DD\_83\_Full} \times 0.8$$

ACC_{SD_95}, $ACC_{SD\_83\_Full}$, ACC_{DD_95}, and $ACC_{DD\_83\_Full}$ = adjusted cooling capacity for variable-speed portable air conditioners for each duct configuration, temperature condition, and compressor speed (where applicable), in Btu/h, calculated in section 5.1.2 of this appendix.

0.2 = weighting factor for the 95 °F test condition.

0.8 = weighting factor for the 83 °F test condition.

5.3 *Annual Energy Consumption.* Calculate the sample unit's annual energy consumption in each operating mode according to the equation below. For each operating mode, use the following annual hours of operation and equation:

Type of portable air conditioner	Operating mode	Subscript	Annual operating hours
Variable speed (single- or dual-duct)	Cooling Mode: Test Conditions 2.A, 2.B, 2.C, 2.D, and 2.E [1].	DD_95_Full, DD_83_Full, DD_83_Low, SD_Full, and SD_Low.	750
Single speed (single- or dual-duct)	Cooling Mode: Test Conditions 1.A, 1.B, and 1C [1].	DD_95, DD_83, and SD	750
all	Off-Cycle	oc	880
all	Inactive or Off	ia or om	1,355

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

$$AEC_m = P_m \times t_m \times 0.001$$

Where:

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

m represents the operating mode as shown in the table above with each operating mode's respective subscript.

P_m = average power in the operating mode, in watts, as determined in sections 4.1.1 and 4.1.2.

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

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

Calculate the sample unit's total annual energy consumption in off-cycle mode and inactive or off mode as follows:

$$AEC_T = \sum_{ncm} AEC_{ncm}$$

Where:

AEC_T = total annual energy consumption attributed to off-cycle mode and inactive or off mode, in kWh/year;

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

ncm represents the following two non-cooling operating modes: off-cycle mode and inactive or off mode.

5.4 Combined Energy Efficiency Ratio

5.4.1 *Combined Energy Efficiency Ratio for Single-Speed Portable Air Conditioners.*

Using the annual operating hours established in section 5.3 of this appendix, calculate the combined energy efficiency ratio, CEER, in Btu/Wh, for single-speed portable air conditioners according to the following equation, as applicable:

$$CEER_{SD} = \left[\frac{\left(ACC_{SD\_95\_SS} \times 0.2 + ACC_{SD\_83\_SS} \times 0.8\right)}{\left(\frac{AEC_{SD} + AEC_T}{0.750}\right)}\right]$$

$$CEER_{DD} = \left[\frac{ACC_{DD\_95\_SS}}{\left(\frac{AEC_{DD\_95} + AEC_T}{0.750}\right)}\right] \times 0.2 + \left[\frac{ACC_{DD\_83\_SS}}{\left(\frac{AEC_{DD\_83} + AEC_T}{0.750}\right)}\right] \times 0.8$$

Where:

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

$ACC_{SD\_95\_SS}$, $ACC_{SD\_83\_SS}$, $ACC_{DD\_95\_SS}$, $ACC_{DD\_83\_SS}$ = adjusted cooling capacity for each duct configuration and temperature condition, in Btu/h, calculated in section 5.1 of this appendix.

AEC_{SD}, AEC_{DD_95} and AEC_{DD_83} = annual energy consumption in cooling mode for each duct configuration and temperature condition, 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.

0.750 = number of cooling mode hours per year, 750, multiplied by the conversion factor for watt-hours to kilowatt-hours, 0.001 kWh/Wh.

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.

5.4.2 *Unadjusted Combined Energy Efficiency Ratio for Variable-Speed Portable Air Conditioners.*

For a variable-speed portable air conditioner, calculate the unit's unadjusted combined energy efficiency ratio, $CEER_{UA}$, in Btu/Wh, as follows:

For single-duct variable-speed portable air conditioners:

$$CEER_{SD\_UA} = \left[\frac{ACC_{SD\_95}}{\left(\frac{AEC_{SD\_Full} + AEC_{ia/om}}{0.750}\right)}\right] \times 0.2 + \left[\frac{ACC_{SD\_83\_Low}}{\left(\frac{AEC_{SD\_Low} + AEC_{ia/om}}{0.750}\right)}\right] \times 0.8$$

For dual-duct variable-speed portable air conditioners:

$$CEER_{DD\_UA} = \left[\frac{ACC_{DD\_95}}{\left(\frac{AEC_{DD\_95\_Full} + AEC_{ia/om}}{0.750}\right)}\right] \times 0.2 + \left[\frac{ACC_{DD\_83\_Low}}{\left(\frac{AEC_{DD\_83\_Low} + AEC_{ia/om}}{0.750}\right)}\right] \times 0.8$$

Where:

$CEER_{SD\_UA}$, and $CEER_{DD\_UA}$ = unadjusted combined energy efficiency ratio for a single-duct and dual-duct sample unit, in Btu/Wh, respectively.

ACC_{SD_95}, $ACC_{SD\_83\_Low}$, ACC_{DD_95}, and ACC_{DD_83} = adjusted cooling capacity for each duct configuration, temperature condition, and compressor speed, as calculated in section 5.1.2 of this appendix, in Btu/h.

AEC_{SD_Full}, AEC_{SD_Low}, $AEC_{DD\_95\_Full}$, and $AEC_{DD\_83\_Low}$ = annual energy consumption for each duct configuration, temperature condition, and compressor speed in cooling mode operation, as calculated in section 5.3 of this appendix, in kWh/year.

$AEC_{ia/om}$ = annual energy consumption attributed to inactive or off mode, in kWh/year, calculated in section 5.3 of this appendix.

0.750 = number of cooling mode hours per year, 750, multiplied by the conversion factor for watt-hours to kilowatt-hours, 0.001 kWh/Wh.

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

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

5.5 *Adjustment of the Combined Energy Efficiency Ratio.* Adjust the sample unit's unadjusted combined energy efficiency ratio as follows.

5.5.1 *Theoretical Comparable Single-Speed Portable Air Conditioner Cooling Capacity and Power at the Lower Outdoor Temperature Operating Condition.* Calculate the cooling capacity without and with cycling losses, in British thermal units per hour (Btu/h), and electrical power input, in watts, for a single-duct or dual-duct theoretical comparable single-speed portable air conditioner at an 83 °F outdoor dry-bulb outdoor temperature operating condition according to the following equations:

For a single-duct theoretical comparable single speed portable air conditioner:

$Capacity_{SD\_83\_SS} = Capacity_{SD\_Full}$

$Capacity_{SD\_83\_SS\_CF} = Capacity_{SD\_Full} \times 0.82$

$P_{SD\_83\_SS} = P_{SD\_Full}$

For a dual-duct theoretical comparable single speed portable air conditioner:

$Capacity_{DD\_83\_SS} = Capacity_{83\_Full}$
$Capacity_{DD\_83\_SS\_CF} = Capacity_{83\_Full} \times 0.77$
$P_{DD\_83\_SS} = P_{83\_Full}$

Where:

$Capacity_{SD\_83\_SS}$ and $Capacity_{DD\_83\_SS}$ = cooling capacity of a single-duct and dual-duct theoretical comparable single-speed portable air conditioner, calculated for the 83 °F dry-bulb outdoor temperature operating condition (Test Conditions 2.E and 2.B, respectively), in Btu/h.

$Capacity_{SD\_83\_SS\_CF}$ and $Capacity_{DD\_83\_SS\_CF}$ = cooling capacity of a single-duct and dual-duct theoretical comparable single-speed portable air conditioner with cycling losses, in Btu/h, calculated for the 83 °F dry-bulb outdoor temperature operating condition (Test Conditions 2.E and 2.B, respectively).

$Capacity_{SD\_Full}$ and $Capacity_{83\_Full}$ = cooling capacity of the sample unit, measured in section 4.1.2 of this appendix at Test Conditions 2.D and 2.B, in Btu/h.

$P_{SD\_83\_SS}$ and $P_{DD\_83\_SS}$ = power input of a single-duct and dual-duct theoretical comparable single-speed portable air conditioner calculated for the 83 °F dry-bulb outdoor temperature operating condition (Test Conditions 2.E and 2.B, respectively), in watts.

P_{SD_Full} and P_{83_Full} = electrical power input of the sample unit, measured in section 4.1.2 of this appendix at Test Conditions 2.D and 2.B, in watts.

0.82 = empirically-derived cycling factor for the 83 °F dry-bulb outdoor temperature operating condition for single-duct units.

0.77 = empirically-derived cycling factor for the 83 °F dry-bulb outdoor temperature operating condition for dual-duct units.

5.5.2 *Duct Heat Transfer for a Theoretical Comparable Single-Speed Portable Air Conditioner at the Lower Outdoor Temperature Operating Condition.* Calculate the duct heat transfer to the conditioned space for a single-duct or dual-duct theoretical comparable single-speed portable air conditioner at the 83 °F dry-bulb outdoor temperature operating condition as follows:

For a single-duct theoretical comparable single-speed portable air conditioner:

$Q_{duct\_SD\_83\_SS} = Q_{duct\_SD\_Full}$

For a dual-duct theoretical comparable single-speed portable air conditioner:

$Q_{duct\_DD\_83\_SS} = Q_{duct\_DD\_83\_Full}$

Where:

$Q_{duct\_SD\_83\_SS}$ and $Q_{duct\_DD\_83\_SS}$ = total heat transferred from the condenser exhaust duct to the indoor conditioned space in cooling mode, for single-duct and dual-duct theoretical comparable single-speed portable air conditioners, respectively, at the 83 °F dry-bulb outdoor temperature operating condition (Test Conditions 2.E and 2.B, respectively), in Btu/h.

$Q_{duct\_SD\_Full}$ and $Q_{duct\_DD\_83\_Full}$ = the total heat transferred from the duct to the indoor conditioned space in cooling mode, when tested at Test Conditions 2.D and 2.B, respectively, as calculated in section 4.1.3 of this appendix, in Btu/h.

5.5.3 *Infiltration Air Heat Transfer for a Theoretical Comparable Single-Speed Portable Air Conditioner at the Lower Outdoor Temperature Operating Condition.* Calculate the total heat contribution from infiltration air for a single-duct or dual-duct theoretical comparable single-speed portable air conditioner at the 83 °F dry-bulb outdoor temperature operating condition, as follows:

For a single-duct theoretical comparable single-speed portable air conditioner:

$Q_{infiltration\_SD\_83\_SS} = Q_{infiltration\_SD\_83\_Full}$

For a dual-duct theoretical comparable single-speed portable air conditioner:

$Q_{infiltration\_DD\_83\_SS} = Q_{infiltration\_DD\_83\_Full}$

Where:

$Q_{infiltration\_SD\_83\_SS}$ and $Q_{infiltration\_DD\_83\_SS}$ = total infiltration air heat in cooling mode for a single-duct and dual-duct theoretical comparable single-speed portable air conditioner, respectively at the 83 °F dry-bulb outdoor temperature operating condition (Test Conditions 2.E and 2.B, respectively), in Btu/h.

$Q_{infiltration\_SD\_83\_Full}$ and $Q_{infiltration\_DD\_83\_Full}$ = total infiltration air heat transfer of the sample unit in cooling mode for each duct configuration, temperature condition, and compressor speed, as calculated in section 4.1.4 of this appendix, in Btu/h.

5.5.4 *Adjusted Cooling Capacity for a Theoretical Comparable Single-Speed Portable Air Conditioner at the Lower Outdoor Temperature Operating Condition.* Calculate the adjusted cooling capacity without and with cycling losses for a single-duct or dual-duct theoretical comparable single-speed portable air conditioner at the 83 °F dry-bulb outdoor temperature operating condition, in Btu/h, according to the following equations:

For a single-duct theoretical comparable single-speed portable air conditioner:

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

For a dual-duct theoretical comparable single-speed portable air conditioner:

$ACC_{DD\_\_83\_SS} = Capacity_{83\_SS} - Q_{duct\_DD\_83\_SS} - Q_{infiltration\_DD\_83\_SS}$
$ACC_{DD\_83\_SS\_CF} = Capacity_{DD\_83\_SS\_CF} - Q_{duct\_DD\_83\_SS} - Q_{infiltration\_DD\_83\_SS}$

Where:

$ACC_{SD\_83\_SS}$, $ACC_{SD\_83\_SS\_CF}$, $ACC_{DD\_83\_SS}$, and $ACC_{DD\_83\_SS\_CF}$ = adjusted cooling capacity for a single-duct and dual-duct theoretical comparable single-speed portable air conditioner at the 83 °F dry-bulb outdoor temperature operating condition (Test Conditions 2.E and 2.B, respectively) without and with cycling losses, respectively, in Btu/h.

$Capacity_{SD\_83\_SS}$ and $Capacity_{SD\_83\_SS\_CF}$ = cooling capacity of a single-duct theoretical comparable single-speed portable air conditioner without and with cycling losses, respectively, at Test Conditions 2.E and 2.B (the 83 °F dry-bulb outdoor temperature operating condition), respectively, calculated in section 5.5.1 of this appendix, in Btu/h.

$Capacity_{DD\_83\_SS}$ and $Capacity_{DD\_83\_SS\_CF}$ = cooling capacity of a dual-duct theoretical comparable single-speed portable air conditioner without and with cycling losses, respectively, at Test Conditions 2.E and 2.B (the 83 °F dry-bulb outdoor temperature operating condition), respectively, calculated in section 5.5.1 of this appendix, in Btu/h.

$Q_{duct\_SD\_83\_SS}$ and $Q_{duct\_DD\_83\_SS}$ = total heat transferred from the ducts to the indoor conditioned space in cooling mode for a single-duct and dual-duct theoretical comparable single-speed portable air conditioner, at Test Conditions 2.E and 2.B (the 83 °F dry-bulb outdoor temperature operating condition), respectively, calculated in section 5.5.2 of this appendix, in Btu/h.

$Q_{infiltration\_SD\_83\_SS}$ and $Q_{infiltration\_DD\_83\_SS}$ = total infiltration air heat in cooling mode for a single-duct and dual-duct theoretical comparable single-speed portable air conditioner, respectively, at Test Conditions 2.E and 2.B (the 83 °F dry-bulb outdoor temperature operating condition), respectively, calculated in section 5.5.3 of this appendix, in Btu/h.

5.5.5 *Annual Energy Consumption in Cooling Mode for a Theoretical Comparable Single-Speed Portable Air Conditioner at the Lower Outdoor Temperature Operating Condition.* Calculate the annual energy consumption in cooling mode for a single-duct or dual-duct theoretical comparable single-speed portable air conditioner at the 83 °F dry-bulb outdoor temperature operating condition, in kWh/year, according to the following equations:

For a single-duct theoretical comparable single-speed portable air conditioner:

$AEC_{SD\_83\_SS} = P_{SD\_83\_SS} \times 0.750$

For a dual-duct theoretical comparable single-speed portable air conditioner:

$AEC_{DD\_83\_SS} = P_{DD\_83\_SS} \times 0.750$

Where:

$AEC_{SD\_83\_SS}$ and $AEC_{DD\_83\_SS}$ = annual energy consumption for a single-duct and dual-duct theoretical comparable single-speed portable air conditioner, respectively, in cooling mode at the 83 °F dry-bulb outdoor temperature operating condition (Test Conditions 2.E and 2.B, respectively), in kWh/year.

$P_{SD\_83\_SS}$ and $P_{DD\_83\_SS}$ = electrical power input for a single-duct and dual-duct theoretical comparable single-speed portable air conditioner, respectively, at the 83 °F dry-bulb outdoor temperature operating condition (Test Conditions 2.E and 2.B, respectively) as calculated in section 5.5.1 of this appendix, in watts.

0.750 = number of cooling mode hours per year, 750, multiplied by the conversion factor for watt-hours to kilowatt-hours, 0.001 kWh/Wh.

5.5.6 *Combined Energy Efficiency Ratio for a Theoretical Comparable Single-Speed Portable Air Conditioner.* Calculate the combined energy efficiency ratios for a theoretical comparable single-speed portable air conditioner without cycling losses, $CEER_{SD\_SS}$ and $CEER_{DD\_SS}$, and with cycling losses, $CEER_{SD\_SS\_CF}$ and $CEER_{DD\_SS\_CF}$, in

Btu/Wh, according to the following equations:

For a single-duct portable air conditioner:

$$CEER_{SD\_SS} = \left[\frac{ACC_{SD\_95}}{\left(\frac{AEC_{SD\_Full} + AEC_T}{0.750}\right)}\right] \times 0.2 + \left[\frac{ACC_{SD\_83\_SS}}{\left(\frac{AEC_{SD\_83\_SS} + AEC_T}{0.750}\right)}\right] \times 0.8$$

$$CEER_{SD\_SS\_CF} = \left[\frac{ACC_{SD\_95}}{\left(\frac{AEC_{SD\_Full} + AEC_T}{0.750}\right)}\right] \times 0.2 + \left[\frac{ACC_{SD\_83\_SS\_CF}}{\left(\frac{AEC_{SD\_83\_SS} + AEC_T}{0.750}\right)}\right] \times 0.8$$

For a dual-duct portable air conditioner:

$$CEER_{DD\_SS} = \left[\frac{ACC_{DD\_95}}{\left(\frac{AEC_{DD\_95\_Full} + AEC_T}{0.750}\right)}\right] \times 0.2 + \left[\frac{ACC_{DD\_83\_SS}}{\left(\frac{AEC_{DD\_83\_SS} + AEC_T}{0.750}\right)}\right] \times 0.8$$

$$CEER_{DD\_SS\_CF} = \left[\frac{ACC_{DD\_95}}{\left(\frac{AEC_{DD\_95\_Full} + AEC_T}{0.750}\right)}\right] \times 0.2 + \left[\frac{ACC_{DD\_83\_SS\_CF}}{\left(\frac{AEC_{DD\_83\_SS} + AEC_T}{0.750}\right)}\right] \times 0.8$$

Where:

$CEER_{SD\_SS}$ and $CEER_{SD\_CF\_SS}$ = combined energy efficiency ratio for a single-duct theoretical comparable single-speed portable air conditioner without and with cycling losses, respectively, in Btu/Wh.

$CEER_{DD\_SS}$ and $CEER_{DD\_CF\_SS}$ = combined energy efficiency ratio for a dual-duct theoretical comparable single-speed portable air conditioner without and with cycling losses, respectively, in Btu/Wh.

ACC_{SD_95} and ACC_{DD_95} = adjusted cooling capacity of the sample unit, as calculated in section 5.1.2 of this appendix, when tested at Test Conditions 2.D and 2.A, respectively, in Btu/h.

$ACC_{SD\_83\_SS}$ and $ACC_{SD\_83\_SS\_CF}$ = adjusted cooling capacity for a single-duct theoretical comparable single-speed portable air conditioner at the 83 °F dry-bulb outdoor temperature operating condition (Test Conditions 2.E) without and with cycling losses, respectively, as calculated in section 5.5.4 of this appendix, in Btu/h.

$ACC_{DD\_83\_SS}$ and $ACC_{DD\_83\_SS\_CF}$ = adjusted cooling capacity for a dual-duct theoretical comparable single-speed portable air conditioner at the 83 °F dry-bulb outdoor temperature operating condition (Test Condition 2.B) without and with cycling losses, respectively, as calculated in section 5.5.4 of this appendix, in Btu/h.

AEC_{SD_Full} = annual energy consumption of the single-duct sample unit, as calculated in section 5.4.2.1 of this appendix, in kWh/year.

$AEC_{DD\_95\_Full}$ = annual energy consumption for the dual-duct sample unit, as calculated in section 5.4.2.1 of this appendix, in kWh/year.

$AEC_{SD\_83\_SS}$ and $AEC_{DD\_83\_SS}$ = annual energy consumption for a single-duct and dual-duct theoretical comparable single-speed portable air conditioner, respectively, in cooling mode at the 83 °F dry-bulb outdoor temperature operating condition (Test Conditions 2.E and 2.B, respectively), calculated in section 5.5.5 of this appendix, in kWh/year.

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

0.750 as defined previously in this section.

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

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

5.5.7 *Performance Adjustment Factor.* Calculate the sample unit's performance adjustment factor, F_p, as follows:

For a single-duct unit:

$$F_{p\_SD} = \frac{(CEER_{SD\_SS} - CEER_{SD\_SS\_CF})}{CEER_{SD\_SS\_CF}}$$

For a dual-duct unit:

$$F_{p\_DD} = \frac{(CEER_{DD\_SS} - CEER_{DD\_SS\_CF})}{CEER_{DD\_SS\_CF}}$$

Where:

$CEER_{SD\_SS}$ and $CEER_{SD\_SS\_CF}$ = combined energy efficiency ratio for a single-duct theoretical comparable single-speed portable air conditioner without and with cycling losses considered, respectively, calculated in section 5.5.6 of this appendix, in Btu/Wh.

$CEER_{DD\_SS}$ and $CEER_{DD\_SS\_CF}$ = combined energy efficiency ratio for a dual-duct theoretical comparable single-speed portable air conditioner without and with cycling losses considered, respectively, calculated in section 5.5.6 of this appendix, in Btu/Wh.

5.5.8 *Single-Duct and Dual-Duct Variable-Speed Portable Air Conditioner Combined Energy Efficiency Ratio.* Calculate the sample unit's final combined energy efficiency ratio, CEER, in Btu/Wh, as follows:

For a single-duct portable air conditioner:

$$CEER_{SD} = CEER_{SD\_UA} \times (1 + F_{p\_SD})$$

For a dual-duct portable air conditioner:

$$CEER_{DD} = CEER_{DD\_UA} \times (1 + F_{p\_DD})$$

Where:

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

$CEER_{SD\_UA}$ and $CEER_{DD\_UA}$ = unadjusted combined energy efficiency ratio for a single-duct and dual-duct sample unit, respectively, calculated in section 5.4.2.1 of this appendix, in Btu/Wh.

F_{p_SD} and F_{p_DD} = single-duct and dual-duct sample unit's performance adjustment factor, respectively, calculated in section 5.5.7 of this appendix.

■ 8. Appendix CC1 to subpart B of part 430 is added to read as follows:

Appendix CC1 to Subpart B of Part 430—Uniform Test Method for Measuring the Energy Consumption of Portable Air Conditioners

Note: Manufacturers must use the results of testing under this appendix CC1 to determine compliance with any standards that amend the portable air conditioners standard at § 430.32(cc) with which compliance is required on January 10, 2025 and that use the Annualized Energy Efficiency Ratio (AEER) metric. Any representation related to energy also must be made in accordance with the appendix that applies (*i.e.,* appendix CC to this subpart or this appendix CC1). Manufacturers may also use this appendix CC1 to certify compliance with any amended standards before the compliance date for those standards.

0. Incorporation by Reference

DOE incorporated by reference in § 430.3, the entire standard for AHAM PAC–1–2022, ANSI/AMCA 210–99, ASHRAE 37–2009, ASHRAE 41.1–1986, ASHRAE 41.6–1994, and IEC 62301; however, only enumerated provisions of AHAM PAC–1–2022, ANSI/AMCA 210–99, ASHRAE 37–2009, and IEC 62301 are applicable to this appendix CC1, as follows. Treat ''should'' in IEC 62301 as mandatory. When there is a conflict, the language of this appendix takes precedence over those documents.

0.1 AHAM PAC–1–2022

(a) Section 4 ''Definitions,'' as specified in section 2 of this appendix;

(b) Section 7 ''Test Setup,'' as specified in sections 3 and 4 of this appendix;

(c) Section 8 ''Test Conduct,'' as specified in section 4 of this appendix;

(d) Section 8.1 ''Cooling Mode,'' as specified in sections 5.1 and 5.3 of this appendix;

(e) Section 9 ''Calculation of Derived Results from Test Measurements,'' as specified in section 5 of this appendix;

(f) Section 9.1 ''Duct Heat Transfer,'' as specified in section 5.1 of this appendix;

(g) Section 9.2 ''Infiltration Air Heat Transfer,'' as specified in section 5.1 of this appendix.

0.2 ANSI/AMCA 210–99 (''ANSI/AMCA 210'')

(a) Figure 12, ''Outlet chamber Setup—Multiple Nozzles in Chamber,'' as specified in section 4 of this appendix;

(b) Figure 12 Notes, as specified in section 4 of this appendix.

0.3 ASHRAE 37–2009

(a) Section 5.1 ''Temperature Measuring Instruments,'' as specified in section 3 of this appendix;

(b) Section 5.3 ''Air Differential Pressure and Airflow Measurements,'' as specified in section 3 of this appendix;

(c) Section 5.4 ''Electrical Instruments,'' as specified in section 4 of this appendix;

(d) Section 6.2 ''Nozzle Airflow Measuring Apparatus,'' as specified in section 4 of this appendix;

(e) Section 6.3 ''Nozzles,'' as specified in section 4 of this appendix;

(f) Section 7.3 ''Indoor and Outdoor Air Enthalpy Methods,'' as specified in section 4 of this appendix;

(g) Section 7.7 ''Airflow Rate Measurement,'' as specified in section 4 of this appendix;

(h) Section 8.7 ''Test Procedure for Cooling Capacity Tests,'' as specified in section 4 of this appendix;

(i) Section 9 ''Data to be Recorded,'' as specified in section 4 of this appendix;

(j) Section 10 ''Test Results,'' as specified in section 4 of this appendix;

(k) Section 11.1 ''Symbols Used In Equations,'' as specified in section 4 of this appendix.

0.4 IEC 62301

(a) Paragraph 4.2 ''Test room'' as specified in section 3 of this appendix;

(b) Paragraph 4.3.2 ''Supply voltage waveform,'' as specified in section 3 of this appendix;

(c) Paragraph 4.4 ''Power measuring instruments,'' as specified in section 3 of this appendix;

(d) Paragraph 5.1, ''General,'' Note 1 as specified in section 4 of this appendix;

(e)Paragraph 5.2 ''Preparation of product,'' as specified in section 3 of this appendix;

(f) Paragraph 5.3.2 ''Sampling method,'' as specified in section 4 of this appendix;

(g) Annex D, ''Determination of Uncertainty of Measurement,'' as specified in section 3 of this appendix.

1. Scope

Establishes test requirements to measure the energy performance of single-duct and dual-duct, and single-speed and variable-speed portable air conditioners in accordance with AHAM PAC–1–2022, unless otherwise specified.

2. Definitions

Definitions for industry standards, terms, modes, calculations, etc. are in accordance with AHAM PAC–1–2022, section 4, with the following added definition:

Annualized Energy Efficiency Ratio means the energy efficiency of a portable air conditioner as measured in accordance with this test procedure as the total annual cooling delivered divided by the total annual energy consumption in per watt-hours (Btu/Wh) and determined in section 5.4.

3. Test Apparatus and General Instructions

Follow requirements and instructions for test conduct and test setup in accordance with AHAM PAC–1–2022, section 7, excluding section 7.1.3, including references to ASHRAE 37–2009, sections 5.1 and 5.3, and IEC 62301 sections 4.2, 4.3.2, 4.4, and 5.2, and Annex D. If the portable air conditioner has network functions, disable all network functions throughout testing if possible. If an end-user cannot disable a network function or the product's user manual does not provide instruction for disabling a network function, test the unit with that network function in the factory default configuration for the duration of the test.

3.1 *Duct temperature measurements.* Install any insulation and sealing provided by the manufacturer. For a dual-duct or single-duct unit, adhere four thermocouples per duct, spaced along the entire length equally, to the outer surface of the duct. Measure the surface temperatures of each duct. For a combined-duct unit, adhere sixteen thermocouples to the outer surface of the duct, spaced evenly around the circumference (four thermocouples, each 90 degrees apart, radially) and down the entire length of the duct (four sets of four thermocouples, evenly spaced along the entire length of the duct), ensuring that the thermocouples are spaced along the entire length equally, on the surface of the combined duct. Place at least one thermocouple preferably adjacent to, but otherwise as close as possible to, the condenser inlet aperture and at least one thermocouple on the duct surface preferably adjacent to, but otherwise as close as possible to, the condenser outlet aperture. Measure the surface temperature of the combined duct at each thermocouple. Temperature measurements must have an error no greater than ±0.5 °F over the range being measured.

4. Test Measurement

Follow requirements for test conduct in active and inactive modes of operation in accordance with AHAM PAC–1–2022, section 8, except section 8.1.b, including references to sections 5.4, 6.2, 6.3, 7.3, 7.7, 8.7, 9, 10, and 11 of ASHRAE 37–2009, referring to Figure 12 and Figure 12 Notes of ANSI/AMCA 210 to determine placement of static pressure taps, and including references to ASHRAE 41.1–1986 and ASHRAE 41.6–1994. When conducting cooling mode testing for a variable-speed dual-duct portable air conditioner, use test configurations 1C and 1E in Table 2 of AHAM PAC–1–2022. Conduct the first test in accordance with ambient conditions for test configuration 1C in Table 2 of AHAM PAC–1–2022, and measure cooling capacity ($Capacity_{DD\_95\_Full}$) and input power ($P_{DD\_95\_Full}$). Conduct the second test in accordance with the ambient conditions for test configuration 1E in Table 2 of AHAM PAC–1–2022, with the compressor speed set to low for the duration of cooling mode testing (in accordance with the manufacturer instructions as described in section 7.1.10), and measure cooling capacity ($Capacity_{DD\_83\_Low}$) and input power ($P_{DD\_83\_Low}$). When conducting standby power testing using the sampling method described in section 5.3.2 of IEC 62301, if the standby mode is cyclic and irregular or unstable, collect 10 cycles worth of data. As discussed in Paragraph 5.1, Note 1 of IEC 62301, allow sufficient time for the unit to reach the lowest power state before proceeding with the test measurement.

5. Calculation of Derived Results From Test Measurements

Perform calculations from test measurements to determine Seasonally Adjusted Cooling Capacity (SACC) and Annualized Energy Efficiency Ratio (AEER) in accordance with AHAM PAC–1–2022, section 9 unless otherwise specified in this section.

5.1 *Adjusted Cooling Capacity.* Calculate the adjusted cooling capacities at the 95 °F and 83 °F operating conditions specified below of the sample unit, in Btu/h, according to the following equations.

For a single-duct single-speed unit:

$$ACC_{95} = Capacity_{SD} - Q_{duct\_SD} - Q_{infiltration\_95}$$
$$ACC_{83} = 0.6000 \times (Capacity_{SD} - Q_{duct\_SD} - Q_{infiltration\_95})$$

For a single-duct variable-speed unit:

$$ACC_{95} = Capacity_{SD\_Full} - Q_{duct\_SD\_Full} - Q_{infiltration\_95}$$
$$ACC_{83} = Capacity_{SD\_Low} - Q_{duct\_SD\_Low} - Q_{infiltration\_83\_Low}$$

For a dual-duct single-speed unit:

$$ACC_{95} = Capacity_{DD\_95} - Q_{duct\_DD\_95} - Q_{infiltration\_95}$$
$$ACC_{83} = 0.5363 \times (Capacity_{DD\_83} - Q_{duct\_DD\_83} - Q_{infiltration\_83})$$

For a dual-duct variable-speed unit:

$$ACC_{95} = Capacity_{DD\_95\_Full} - Q_{duct\_DD\_95\_Full} - Q_{infiltration\_95}$$
$$ACC_{83} = Capacity_{DD\_\_Low} - Q_{duct\_DD\_83\_Low} - Q_{infiltration\_83\_Low}$$

Where:

ACC_{95} and ACC_{83} = adjusted cooling capacity of the sample unit, in Btu/h, calculated from testing at:

For a single-duct single-speed unit, test configuration 2A in Table 2 of AHAM PAC–1–2022.

For a single-duct variable-speed unit, test configurations 2B and 2C in Table 2 of AHAM PAC–1–2022.

For a dual-duct single-speed unit, test configurations 1A and 1B in Table 2 of AHAM PAC–1–2022.

For a dual-duct variable-speed unit: test configurations 1C and 1E in Table 2 of AHAM PAC–1–2022.

$Capacity_{SD}$, $Capacity_{SD\_Full}$, $Capacity_{SD\_Low}$, $Capacity_{DD\_95}$, $Capacity_{DD\_83}$, $Capacity_{DD\_95\_Full}$, and $Capacity_{DD\_83\_Low}$ = cooling capacity, in Btu/h, measured in testing at test configuration 2A, 2B, 2C, 1A, 1B, 1C, and 1E of Table 2 in section 8.1 of AHAM PAC–1–2022, respectively.

Q_{duct_SD}, $Q_{duct\_SD\_Full}$, $Q_{duct\_SD\_Low}$, $Q_{duct\_DD\_95}$, $Q_{duct\_DD\_83}$, $Q_{duct\_DD\_95\_Full}$, and $Q_{duct\_DD\_83\_Low}$ = duct heat transfer while operating in cooling mode for each duct configuration, compressor speed (where applicable) and temperature condition (where applicable), calculated in section 9.1 of AHAM PAC–1–2022, in Btu/h.

$Q_{infiltration\_95}$, $Q_{infiltration\_83}$, and $Q_{infiltration\_83\_Low}$ = total infiltration air heat transfer in cooling mode, in Btu/h, for each of the following compressor speed and duct configuration combinations:

For a single-duct single-speed unit, use $Q_{infiltration\_95}$ as calculated for a single-duct single-speed unit in section 9.2 of AHAM PAC–1–2022.

For a single-duct variable-speed unit, use $Q_{infiltration\_95}$ and $Q_{infiltration\_83\_Low}$ as calculated for a single-duct variable-speed unit in section 9.2 of AHAM PAC–1–2022.

For a dual-duct single-speed unit, use $Q_{infiltration\_95}$ and $Q_{infiltration\_83}$ as calculated for a dual-duct single-speed unit in section 9.2 of AHAM PAC–1–2022.

For a dual-duct variable-speed unit, use $Q_{infiltration\_95}$ and $Q_{infiltration\_83\_Low}$ as calculated for a dual-duct variable-speed unit in section 9.2 of AHAM PAC–1–2022.

0.6000 and 0.5363 = empirically-derived load-based capacity adjustment factor for a single-duct and dual-duct single-speed unit, respectively, when operating at test conditions 2A and 1B.

5.2 *Seasonally Adjusted Cooling Capacity.* Calculate the seasonally adjusted cooling capacity for the sample unit, SACC, in Btu/h, according to:

$$SACC = ACC_{95} \times 0.144 + ACC_{83} \times 0.856$$

Where:

ACC_{95} and ACC_{83} = adjusted cooling capacities at the 95 °F and 83 °F outdoor temperature conditions, respectively, in Btu/h, calculated in section 5.1 of this appendix.

0.144 = empirically-derived weighting factor for ACC_{95}.

0.856 = empirically-derived weighting factor for ACC_{83}.

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

TABLE 1—ANNUAL OPERATING HOURS

Operating mode	Annual operating hours
Cooling Mode Test Configurations 1A, 1C, 2A (95), 2B	164
Cooling Mode Test Configurations 1B, 2A (83)	586
Cooling Mode Test Configuration 1E, 2C	977
Off-Cycle, Single-Speed	391
Off-Cycle, Variable-Speed	0
Total Cooling and Off-cycle Mode	1,141
Inactive or Off Mode	1,844

Calculate total annual energy consumption in all modes according to the following equations:

$$AEC_{ia/om} = P_{ia/om} \times t_{ia/om} \times k$$

For a single-duct single-speed unit:

$$AEC_{95} = P_{SD\_95} \times t_{SD\_95} \times k$$

$$AEC_{83} = \frac{P_{SD\_83} \times t_{SD\_83} \times k}{0.82}$$

For a single-duct variable-speed unit:

$$AEC_{95} = P_{SD\_Full} \times t_{SD\_Full} \times k$$
$$AEC_{83} = P_{SD\_Low} \times t_{SD\_Low} \times k$$

For a dual-duct single-speed unit:

$$AEC_{95} = P_{DD\_95} \times t_{DD\_95} \times k$$

$$AEC_{83} = \frac{P_{DD\_83} \times t_{DD\_83} \times k}{0.77}$$

For a dual-duct variable-speed unit:

$$AEC_{95} = P_{DD\_95\_Full} \times t_{DD\_95\_Full} \times k$$
$$AEC_{83} = P_{DD\_83\_Low} \times t_{DD\_83\_Low} \times k$$

Where:

AEC_{95} and AEC_{83} = total annual energy consumption attributed to all modes representative of either the 95 °F and 83 °F operating condition, respectively, in kWh/year.

P_m = average power in each mode, in watts, as determined in sections 4.1.1 and 4.1.2.

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

k = 0.001 kWh/Wh conversion factor from watt-hours to kilowatt-hours.
0.82 = empirically-derived factor representing efficiency losses due to compressor cycling outside of fan operation for single-duct units
0.77 = empirically-derived factor representing efficiency losses due to compressor cycling outside of fan operation for dual-duct units

m represents the operating mode:

—''DD_95'' and ''DD_83'' correspond to cooling mode in Test Configurations 1A and 1B in Table 2 of AHAM PAC–1–2022, respectively, for dual-duct single-speed units,
—''DD_95_Full'', ''DD_83_Low'' correspond to cooling mode in Test Configurations 1C and 1E in Table 2 of AHAM PAC–1–2022, respectively, for dual-duct variable-speed units,
—''SD_95'' corresponds to cooling mode in Test Configuration 2A in Table 2 of AHAM PAC–1–2022 for single-duct single-speed units, for use when calculating AEC at the 95 °F outdoor temperature condition,
—''SD_83'' corresponds to cooling mode in Test Configuration 2A in Table 2 of AHAM PAC–1–2022 for single-duct single-speed units, for use when calculating AEC at the 83 °F outdoor temperature condition,
—''SD_Full'' and ''SD_Low'' correspond to cooling mode in Test Configurations 2B and 2C in Table 2 of AHAM PAC–1–2022, respectively, for single-duct variable-speed units,
—''oc'' corresponds to off-cycle,
—''ia/om'' corresponds to inactive or off mode,

5.4 *Annualized Cooling and Energy Ratio.* Calculate the annualized energy efficiency ratio, AEER, in Btu/Wh, according to the following equation:

$$AEER = 0.001 \times \frac{(ACC_{95} \times 164) + (ACC_{83} \times 977)}{AEC_{95} + AEC_{83} + AEC_{oc} + AEC_{ia/om}}$$

Where:

AEER = the annualized energy efficiency ratio of the sample unit in Btu/Wh.
ACC_{95} and ACC_{83} = adjusted cooling capacity at the 95 °F and 83 °F outdoor temperature conditions, respectively, calculated in section 5.1 of this appendix.
AEC_{95}, AEC_{83}, AEC_{oc}, and $AEC_{ia/om}$ = total annual energy consumption attributed to all modes representative the 95 °F operating condition, the 83 °F operating condition, off-cycle mode, and inactive or off mode respectively, in kWh/year, calculated in section 5.3 of this appendix.
t_{cm_95} = number of annual hours spent in cooling mode at the 95 °F operating condition, t_{DD_95} for dual-duct single-speed units, $t_{DD\_95\_Full}$ for dual-duct variable-speed units, t_{SD_95} for single-duct single-speed units, or t_{SD_Full} for single-duct variable-speed units, defined in section 5.3 of this appendix.
164 = number of annual hours spent in cooling mode at the 95 °F operating condition, as shown in Table III.2
977 = number of annual hours spent in cooling mode and off-cycle mode at the 83 °F operating condition, defined in section 5.3 of this appendix. 0.001 = kWh/Wh conversion factor for watt-hours to kilowatt-hours.

■ 9. Amend § 430.32 by revising paragraph (cc) to read as follows:

§ 430.32 Energy and water conservation standards and their compliance dates.

* * * * *

(cc) *Portable air conditioners.* Single-duct portable air conditioners and dual-duct portable air conditioners manufactured on or after January 10, 2025 must have a combined energy efficiency ratio (CEER) in Btu/Wh no less than:

$$CEER = 1.04 \times \frac{SACC}{(3.7117 \times SACC^{0.6384})}$$

SACC: For single-speed portable air conditioners, SACC is seasonally adjusted cooling capacity in Btu/h, as determined in appendix CC of subpart B of this part. For variable-speed portable air conditioners, SACC shall be $SACC_{Full}$ in Btu/h, as determined in appendix CC of subpart B of this part.

* * * * *

[FR Doc. 2023–09755 Filed 5–12–23; 8:45 am]

BILLING CODE 6450–01–P