4.6.4.2.1. Project time to failure using the projection method described in section 5.1.4 of IES TM–28 (incorporated by reference; see §430.3). Project time to failure for each individual LED lamp. Do not use data obtained prior to a test duration value of 1,000 hours.

4.6.4.2.2. Calculate the limiting multiplier from the following equation:

$$Limiting\ multiplier = \frac{1}{600} * test\ duration - 4$$

4.6.4.3. For test duration values greater than 6,000 hours, time to failure is equal to the lesser of the projected time to failure calculated according to section 4.6.4.3.1 or the test duration multiplied by six.

4.6.4.3.1. Project time to failure using the projection method described in section 5.1.4 of IES TM–28 (incorporated by reference; see §430.3). Project time to failure for each individual LED lamp. Data used for the time to failure projection method must be as specified in section 5.1.3 of IES TM–28.

5. Standby Mode Test Method for Determining Standby Mode Power

Measure standby mode power consumption for integrated LED lamps capable of operating in standby mode. The standby mode test method in this section 5 may be completed before or after the active mode test method for determining lumen output, input power, CCT, CRI, power factor, and lamp efficacy in section 3 of this appendix. The standby mode test method in this section 5 must be completed before the active mode test method for determining time to failure in section 4 of this appendix. In cases where there is a conflict, the language of the test procedure in this appendix takes precedence over IES LM–79 (incorporated by reference; see §430.3) and IEC 62301 (incorporated by reference; see §430.3).

5.1. Test Conditions and Setup

5.1.1. Establish the ambient conditions, power supply, electrical settings, and instrumentation in accordance with the specifications in sections 2.0, 3.0, 7.0, and 8.0 of IES LM–79 (incorporated by reference; see §430.3), respectively. Maintain the ambient temperature at 25 °C ± 1 °C.

5.1.2. Position a lamp in either the base-up and base-down orientation throughout testing. An equal number of lamps in the sample must be tested in the base-up and base-down orientations.

5.1.3. Operate the integrated LED lamp at the rated voltage throughout testing. For an integrated LED lamp with multiple rated voltages, operate the integrated LED lamp at 120 volts. If an integrated LED lamp with multiple rated voltages is not rated for 120 volts, operate the integrated LED lamp at the highest rated input voltage.

5.2. Test Method, Measurements, and Calculations

5.2.1. The test conditions and setup described in section 3.1 of this appendix apply to this section.

5.2.2. Connect the integrated LED lamp to the manufacturer-specified wireless control network (if applicable) and configure the integrated LED lamp in standby mode by sending a signal to the integrated LED lamp instructing it to have zero light output. Lamp must remain connected to the network throughout the duration of the test.

5.2.3. Stabilize the integrated LED lamp as specified in section 5 of IEC 62301 (incorporated by reference; see §430.3) prior to measurement.

5.2.4. Measure the standby mode power in watts as specified in section 5 of IEC 62301.

[81 FR 43427, July 1, 2016]

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

1. Scope

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

2. Definitions

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

3. Test Apparatus and General Instructions

3.1 Active mode.

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

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

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

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

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

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

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

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

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

3.2 Standby mode and off mode.

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

3.2.2 *Electrical energy supply*.

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

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

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

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

4. Test Measurement

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

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

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

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

$$A_{duct—j} = \pi \times d_j \times L_j$$

Where:

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

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

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

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

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

For dual-duct portable air conditioners:

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

Where:

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

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

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

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

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

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

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

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

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

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

For dual-duct portable air conditioners:

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

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

Where:

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

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

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

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

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

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

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

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

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

$$Q_{s—95} = \dot{m} \times 60 \times [c_{p—da} \times (T_{ia—95} - T_{indoor})) + (c_{p\_\_wv} \times (\omega_{ia95} \times T_{ia—95} - \omega_{indoor} \times T_{indoor}))]$$

$$Q_{s—83} = \dot{m} \times 60 \times [(c_{p—da} \times T_{ia—83} - T_{indoor} + (c_{p—wv} \times (\omega_{ia—83} \times T_{ia—83} - \omega_{indoor} \times T_{indoor}))]$$

Where:

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

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

$c_{p—da}$ = specific heat of dry air, 0.24 Btu/lb_m − °F.

$c_{p—wv}$ = specific heat of water vapor, 0.444 Btu/lb_m − °F.

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

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

$\omega_{ia—95}$ and $\omega_{ia—83}$ = humidity ratios of the 95 °F and 83 °F dry-bulb infiltration air, 0.0141 and 0.01086 lb_w/lb_{da}, respectively.

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

60 = conversion factor from minutes to hours.

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

$$Q_{l—95} = \dot{m} \times 60 \times H_{fg} \times (\omega_{ia—95} - \omega_{indoor})$$

$$Q_{l—83} = \dot{m} \times 60 \times H_{fg} \times (\omega_{ia—83} - \omega_{indoor})$$

Where:

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

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

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

$\omega_{ia—95}$ and $\omega_{ia—83}$ = humidity ratios of the 95 °F and 83 °F dry-bulb infiltration air, 0.0141 and 0.01086 lb_w/lb_{da}, respectively.

ω_{indoor} = humidity ratio of the indoor chamber air, 0.0112 lb_w/lb_{da}.60 = conversion factor from minutes to hours.

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

$$Q_{infiltration—95} = Q_{s—95} + Q_{l—95}$$

$$Q_{infiltration—83} = Q_{s—83} + Q_{\ 83}$$

Where:

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

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

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

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

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

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

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

5. Calculation of Derived Results From Test Measurements

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

$$ACC_{95} = Capacity_{SD} - Q_{duct—SD} - Q_{infiltration—95}$$
$$ACC_{83} = Capacity_{SD} - Q_{duct—SD} - Q_{infiltration—83}$$

For dual-duct portable air conditioners:

$$ACC_{95} = Capacity_{95} - Q_{duct—95} - Q_{infiltration—95}$$
$$ACC_{83} = Capacity_{83} - Q_{duct—83} - Q_{infiltration—83}$$

Where:

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

$Q_{duct—SD}$, $Q_{duct—95}$, and $Q_{duct—83}$ = duct heat transfer while operating in cooling mode, calculated in section 4.1.1.1 of this appendix.

$Q_{infiltration—95}$ and $Q_{infiltration—83}$ = total infiltration air heat transfer in cooling mode, calculated in section 4.1.1.2 of this appendix.

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

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

Where:

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

0.2 = weighting factor for ACC_{95}.

0.8 = weighting factor for ACC_{83}.

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

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

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

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

Where:

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

P_m = average power in each mode, in watts.

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

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

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

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

$$AEC_T = \sum_m AEC_m$$

Where:

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

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

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

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

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

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

Where:

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

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

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

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

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

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

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

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

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

[81 FR 35265, June 1, 2016, as amended at 81 FR 70923, Oct. 14, 2016]

APPENDIX DD TO SUBPART B OF PART 430—UNIFORM TEST METHOD FOR MEASURING THE ENERGY CONSUMPTION AND ENERGY EFFICIENCY OF GENERAL SERVICE LAMPS THAT ARE NOT GENERAL SERVICE INCANDESCENT LAMPS, COMPACT FLUORESCENT LAMPS, OR INTEGRATED LED LAMPS

NOTE: On or after April 19, 2017, any representations, including certifications of compliance (if required), made with respect to the energy use or efficiency of general service lamps that are not general service incandescent lamps, compact fluorescent lamps, or integrated LED lamps must be made in accordance with the results of testing pursuant to this appendix DD.

1. *Scope:* This appendix DD specifies the test methods required to measure the initial lumen output, input power, lamp efficacy, power factor, and standby mode energy consumption of general service lamps that are not general service incandescent lamps, compact fluorescent lamps, or integrated LED lamps.

2. *Definitions:*

Measured initial input power means the input power to the lamp, measured after the lamp is stabilized and seasoned (if applicable), and expressed in watts (W).

Measured initial lumen output means the lumen output of the lamp, measured after the lamp is stabilized and seasoned (if applicable), and expressed in lumens (lm).

Power factor means the measured initial input power (watts) divided by the product of the input voltage (volts) and the input current (amps) measured at the same time as the initial input power.