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Normal Impedance Ranges for Liquid-Immersed Transformers

<i>Single-phase</i>		<i>Three-phase</i>	
<i>kVA</i>	<i>Impedance (%)</i>	<i>kVA</i>	<i>Impedance (%)</i>
10	1.0–4.5	15	1.0–4.5
15	1.0–4.5	30	1.0–4.5
25	1.0–4.5	45	1.0–4.5
37.5	1.0–4.5	75	1.0–5.0
50	1.5–4.5	112.5	1.2–6.0
75	1.5–4.5	150	1.2–6.0
100	1.5–4.5	225	1.2–6.0
167	1.5–4.5	300	1.2–6.0
250	1.5–6.0	500	1.5–7.0
333	1.5–6.0	750	5.0–7.5
500	1.5–7.0	1000	5.0–7.5
667	5.0–7.5	1500	5.0–7.5
833	5.0–7.5	2000	5.0–7.5
		2500	5.0–7.5

**Table T-2**  
Normal Impedance Ranges for Dry-Type Transformers

<i>Single-phase</i>		<i>Three-phase</i>	
<i>kVA</i>	<i>Impedance (%)</i>	<i>kVA</i>	<i>Impedance (%)</i>
15	1.5–6.0	15	1.5–6.0
25	1.5–6.0	30	1.5–6.0
37.5	1.5–6.0	45	1.5–6.0
50	1.5–6.0	75	1.5–6.0
75	2.0–7.0	112.5	1.5–6.0
100	2.0–7.0	150	1.5–6.0
167	2.5–8.0	225	3.0–7.0
250	3.5–8.0	300	3.0–7.0
333	3.5–8.0	500	4.5–8.0
500	3.5–8.0	750	5.0–8.0
667	5.0–8.0	1000	5.0–8.0
833	5.0–8.0	1500	5.0–8.0
		2000	5.0–8.0
		2500	5.0–8.0

**Table A-1  
Non-Commercial Refrigerator, Refrigerator-Freezer, and Freezer Test Methods**

<i>Appliance</i>	<i>Test Method</i>
Non-commercial refrigerators, designed for the refrigerated storage of food at temperatures above 32°F and below 39°F, configured for general refrigerated food storage; refrigerator-freezers; and freezers.	10 C.F.R. sections 430.23(a) (Appendix A1 to Subpart B of part 430) and 430.23(b) (Appendix B1 to Subpart B of part 430), as applicable for models manufactured before September 15, 2014  10 C.F.R. sections 430.23(a) (Appendix A to Subpart B of part 430) and 430.23(b) (Appendix B to Subpart B of part 430), as applicable for models manufactured on or after September 15, 2014
Wine chillers that are consumer products	10 C.F.R. section 430.23(a) (Appendix A1 to Subpart B of part 430), with the following modifications:  Standardized temperature as referred to in Section 3.2 of Appendix A1 shall be 55°F (12.8°C).  The calculation of test cycle energy expended (ET) in section 5.2.1.1 of Appendix A1 shall be made using the modified formula:  $ET = (EP \times 1440 \times k) / T$  Where $k = 0.85$

**Table A-2  
Commercial Refrigerators, Refrigerator-Freezer, and Freezer Test Methods**

<i>Appliance</i>	<i>Test Method</i>
Automatic commercial ice makers	10 C.F.R. sections 431.133 and 431.134
Refrigerated bottled or canned beverage vending machines	10 C.F.R. sections 431.293 and 431.294
Refrigerated buffet and preparation tables	ANSI/ASTM F2143-01
Other commercial refrigerators, refrigerator-freezers, and freezers, with doors	10 C.F.R. sections 431.63 and 431.64
Other commercial refrigerators, refrigerator-freezers, and freezers, without doors	10 C.F.R. sections 431.63 and 431.64
Walk-in coolers and walk-in freezers	10 C.F.R. sections 431.303 and 431.304

**Table B-1**  
**Room Air Conditioner, Room Air-Conditioning Heat Pump, Packaged Terminal Air Conditioner, and Packaged Terminal Heat Pump Test Methods**

<i>Appliance</i>	<i>Test Method</i>
Room air conditioners and room air-conditioning heat pumps	10 C.F.R. section 430.23(f) (Appendix F to Subpart B of part 430)
Packaged terminal air conditioners and packaged terminal heat pumps	10 C.F.R. sections 431.95 and 431.96

**Table C-1**  
**Central Air Conditioner Test Methods**

<i>Appliance</i>	<i>Test Method</i>
Computer Room Air Conditioners evaporatively-cooled air-cooled, glycol-cooled, water-cooled	ANSI/ASHRAE 127-2001 10 C.F.R. sections 431.95 and 431.96
Other electric-powered unitary air-conditioners and electric-powered heat pumps  air-cooled air conditioners and air-source heat pumps < 65,000 Btu/hr, single-phase < 65,000 Btu/hr, three-phase ≥ 65,000 and < 760,000 Btu/hr evaporatively-cooled air conditioners < 240,000 Btu/hr water-cooled air conditioners and water-source heat pumps < 240,000 Btu/hr ground water-source heat pumps ground-source closed-loop heat pumps	10 C.F.R. section 430.23(m) (Appendix M to Subpart B of part 430)  10 C.F.R. sections 431.95 and 431.96 10 C.F.R. sections 431.95 and 431.96 10 C.F.R. sections 431.95 and 431.96 10 C.F.R. sections 431.95 and 431.96 10 C.F.R. sections 431.95 and 431.96 ARI/ISO-13256-1:1998 ARI/ISO-13256-1:1998
Variable Refrigerant Flow Multi-Split Systems	10 C.F.R. sections 431.95 and 431.96
Single Package Vertical Air Conditioners and Single Package Vertical Heat Pumps	10 C.F.R. sections 431.95 and 431.96
Gas-fired air conditioners and gas-fired heat pumps	ANSI Z21.40.4-1996 as modified by CEC, Efficiency Calculation Method for Gas-Fired Heat Pumps as a New Compliance Option (1996)

**Table D-1  
Spot Air Conditioner, Ceiling Fan, Ceiling Fan Light Kit, Evaporative Cooler, Whole House Fan,  
Residential Exhaust Fan, and Dehumidifier Test Methods**

<i>Appliance</i>	<i>Test Method</i>
Spot Air Conditioners	ANSI/ASHRAE 128-2001
Ceiling Fans, Except Low-Profile Ceiling Fans	10 C.F.R. section 430.23(w) (Appendix U to Subpart B of part 430)
Ceiling Fan Light Kits	10 C.F.R. section 430.23(x) (Appendix V to Subpart B of part 430)
Evaporative Coolers	ANSI/ASHRAE 133-2008 for packaged direct evaporative coolers and packaged indirect/direct evaporative coolers; ANSI/ASHRAE 143-2007 for packaged indirect evaporative coolers
Whole House Fans	HVI-916, tested with manufacturer-provided louvers in place (2009)
Dehumidifiers	10 C.F.R. section 430.23(z) (Appendix X to Subpart B of part 430) OR 10 C.F.R. section 430.23(z) (Appendix X1 to Subpart B of part 430) (at manufacturer's discretion) for models manufactured before April 29, 2013  10 C.F.R. section 430.23(z) (Appendix X1 to Subpart B of part 430) for models manufactured on or after April 29, 2013
Residential Exhaust Fans	HVI-916 (2009)



**Table E-1  
Gas and Oil Space Heater Test Methods**

<i>Appliance</i>	<i>Test Method</i>
Central furnaces < 225,000 Btu/hr, single phase  < 225,000 Btu/hr, three phase  ≥ 225,000 Btu/hr	10 C.F.R. section 430.23(n) (Appendix N to Subpart B of part 430)  10 C.F.R. section 430.23(n) (Appendix N to Subpart B of part 430) or 10 C.F.R. sections 431.75 and 431.76 (at manufacturer's option)  10 C.F.R. sections 431.75 and 431.76
Gas infrared heaters patio heaters gas-fired high-intensity infrared heaters gas-fired low-intensity infrared heaters	ASTM F2644-07 ANSI Z83.19-001 ANSI Z83.20-
Unit heaters gas-fired  oil-fired	ANSI Z83.8-2002*  UL 731-1995*
Gas duct furnaces	ANSI Z83.8-
Boilers < 300,000 Btu/hr  ≥ 300,000 Btu/hr	10 C.F.R. section 430.23(n) (Appendix N to Subpart B of part 430)  10 C.F.R. sections 431.85 and 431.86
Wall furnaces, floor furnaces, and room heaters	10 C.F.R. section 430.23(o) (Appendix O to Subpart B of part 430)
*To calculate maximum energy consumption during standby, measure the gas energy used in one hour (in Btus) and the electrical energy used (in watt-hours) over a one-hour period, when the main burner is off. Divide Btus and watt-hours by one hour to obtain Btus per hour and watts. Divide Btus per hour by 3.412 to obtain watts. Add watts of gas energy to watts of electrical energy to obtain standby energy consumption in watts.	

**Table F-1  
Small Water Heater Test Methods**

<i>Appliance</i>	<i>Test Method</i>
Small water heaters that are federally regulated consumer products	10 CFR Section 430.23(e) (Appendix E to Subpart B of Part 430) (2008)
Small water heaters that are not federally regulated consumer products	
Gas and oil storage-type < 20 gallons rated capacity	ANSI/ASHRAE 118.2-1993
Booster water heaters	ANSI/ASTM F2022-00 (for all matters other than volume) ANSI Z21.10.3-1998 (for volume)
Hot water dispensers	Test Method in 1604(f)(4)
Mini-tank electric water heaters	Test Method in 1604(f)(5)
All others	10 CFR Section 430.23(e) (Appendix E to Subpart B of Part 430) (2008)

**Table F-2  
Standards for Large Water Heaters Effective October 29, 2003**

<i>Appliance</i>	<i>Input to Volume Ratio</i>	<i>Size (Volume)</i>	<i>Minimum Thermal Efficiency (%)</i>	<i>Maximum Standby Loss<sup>1,2</sup></i>
Gas storage water heaters	< 4,000 Btu/hr/gal	Any	80	$Q/800 + 110(V_r)^{1/2}$ Btu/hr
Gas instantaneous water heaters	$\geq 4,000$ Btu/hr/gal	< 10 gal	80	–
		$\geq 10$ gal	80	$Q/800 + 110(V_r)^{1/2}$ Btu/hr
Gas hot water supply boilers	$\geq 4,000$ Btu/hr/gal	< 10 gal	80	–
		$\geq 10$ gal	80	$Q/800 + 110(V_r)^{1/2}$ Btu/hr
Oil storage water heaters	< 4,000 Btu/hr/gal	Any	78	$Q/800 + 110(V_r)^{1/2}$ Btu/hr
Oil instantaneous water heaters	$\geq 4,000$ Btu/hr/gal	< 10 gal	80	–
		$\geq 10$ gal	78	$Q/800 + 110(V_r)^{1/2}$ Btu/hr
Oil hot water supply boilers	$\geq 4,000$ Btu/hr/gal	< 10 gal	80	–
		$\geq 10$ gal	78	$Q/800 + 110(V_r)^{1/2}$ Btu/hr
Electric storage water heaters	< 4,000 Btu/hr/gal	Any	–	$0.3 + 27/V_m$ %/hr

<sup>1</sup> Standby loss is based on a 70°F temperature difference between stored water and ambient requirements. In the standby loss equations,  $V_r$  is the rated volume in gallons,  $V_m$  is the measured volume in gallons, and  $Q$  is the nameplate input rate in Btu/hr.

<sup>2</sup> Water heaters and hot water supply boilers having more than 140 gallons of storage capacity are not required to meet the standby loss requirement if the tank surface is thermally insulated to R- 12.5, if a standing pilot light is not installed, and for gas- or oil-fired storage water heaters, there is a flue damper or fan-assisted combustion.

**Table G-1  
Pool Heater Test Methods**

<b>Appliance</b>		<b>Test Method</b>	
Gas-fired and oil-fired pool heaters		10 C.F.R. section 430.23(p) (Appendix P to Subpart B of part 430)	
Electric resistance pool heaters		ANSI/ASHRAE 146-1998	
Heat pump pool heaters		ANSI/ASHRAE 146-1998, as modified by Addendum Test Procedure published by Pool Heat Pump Manufacturers Association dated April 1999, Rev 4: Feb. 28, 2000:	
<b>Reading</b>	<b>Standard Temperature Rating</b>	<b>Low-Temperature Rating</b>	<b>Spa Conditions Rating</b>
Air Temperature Dry bulb	27.0°C (80.6°F)	10.0°C (50.0°F)	27.0°C (80.6°F)
Wet bulb	21.7°C (71.0°F)	6.9°C (44.4°F)	21.7°C (71.0°F)
Relative Humidity	63%	63%	63%
Pool Water Temperature	26.7°C (80.0°F)	26.7°C (80.0°F)	40.0°C (104.0°F)

**Table R-1  
Cooking Product and Food Service Equipment Test Methods**

<b>Appliance</b>	<b>Test Method</b>
Cooking products that are consumer products	10 CFR Section 430.23(i) (Appendix I to Subpart B of Part 430) (2008)
Commercial hot food holding cabinets	ANSI/ASTM F2140-01 (Test for idle energy rate-dry test) and US EPA's Energy Star Guidelines, "Measuring Interior Volume" (Test for interior volume)
Commercial convection ovens	ANSI/ASTM F1496-99 (Test for energy input rate and idle energy consumption only)
Commercial range tops	ANSI/ASTM F1521-96 (Test for cooking energy efficiency only)

**Table A-3 Standards for Non-Commercial Refrigerators, Refrigerator-Freezers, and Freezers**

Appliance	Defrost	Compact, Built-in, Neither	Ice		Maximum Energy Consumption (kWh/year)	
			Equipped with Automatic Ice Maker?	Dispense Ice Through Door?	July 1, 2001 <sup>1</sup>	Sept. 15, 2014 <sup>2</sup>
Refrigerators						
Not 'all refrigerator'	Manual	Neither	--	--	8.82AV + 248.4	7.99AV + 225.0
Not 'all refrigerator'	Manual	Compact	--	--	10.70AV + 299.0	9.03AV + 252.3
'All refrigerator'	Manual	Compact	--	--	10.70AV + 299.0	7.84AV + 219.1
'All refrigerator'	Manual	Neither	--	--	--	6.79AV + 193.6
'All refrigerator'	Automatic	Neither	--	--	9.80AV + 276.0	7.07AV + 201.6
'All refrigerator'	Automatic	Built-in	--	--	--	8.02AV + 228.5
'All refrigerator'	Automatic	Compact	--	--	12.70AV + 355.0	9.17AV + 259.3
Refrigerator-freezers						
	Manual	Neither	--	--	8.82AV + 248.4	7.99AV + 225.0
	Partial	Neither	--	--	8.82AV + 248.4	7.99AV + 225.0
	Manual	Compact	--	--	--	9.03AV + 252.3
	Partial	Compact	--	--	7.00AV + 398.0	5.91AV + 335.8
Refrigerator-freezers Bottom-Freezer						
	Automatic	Neither	No	--	4.60AV + 459.0	8.85AV + 317.0
	Automatic	Neither	Yes	No	--	8.85AV + 401.0
	Automatic	Neither	Yes	Yes	--	9.25AV + 475.4
	Automatic	Compact	No	--	13.10AV + 367.0	11.80AV + 339.2
	Automatic	Compact	Yes	--	--	11.80AV + 423.2
	Automatic	Built-in	No	--	--	9.40AV + 336.9
	Automatic	Built-in	Yes	No	--	9.40AV + 420.9
	Automatic	Built-in	Yes	Yes	--	9.83AV + 499.9
Refrigerator-freezers Side-by-side						
	Automatic	Neither	No	--	4.91AV+507.5	8.51AV + 297.8
	Automatic	Neither	Yes	No	--	8.51AV + 381.8
	Automatic	Neither	Yes	Yes	10.10AV + 406.0	8.54AV + 432.8
	Automatic	Compact	No	--	7.60AV + 501.0	6.82AV + 456.9
	Automatic	Compact	Yes	--	--	6.82AV + 540.9
	Automatic	Built-in	No	--	--	10.22AV + 357.4
	Automatic	Built-in	Yes	No	--	10.22AV + 441.4
	Automatic	Built-in	Yes	Yes	--	10.25AV + 502.6
Refrigerator-freezers Top-Freezer						
	Automatic	Neither	No	--	9.80AV + 276.0	8.07AV + 233.7
	Automatic	Neither	Yes	No	--	8.07AV + 317.7
	Automatic	Neither	Yes	Yes	10.20AV + 356.0	8.40AV + 385.4
	Automatic	Compact	No	--	12.70AV + 355.0	11.80AV + 339.2
	Automatic	Compact	Yes	--	--	11.80AV + 423.2
	Automatic	Built-in	No	--	--	9.15AV + 264.9
	Automatic	Built-in	Yes	No	--	9.15AV + 348.9
Freezers Upright Freezer						
	Manual	Neither	No	--	7.55AV + 258.3	5.57AV + 193.7
	Manual	Compact	--	--	9.78AV + 250.8	8.65AV + 225.7
	Automatic	Neither	No	--	12.43AV + 326.1	8.62AV + 228.3
	Automatic	Neither	Yes	--	--	8.62AV + 312.3
	Automatic	Compact	--	--	11.40AV + 391.0	10.17AV + 351.9
	Automatic	Built-in	No	--	--	9.86AV + 260.9
	Automatic	Built-in	Yes	--	--	9.86AV + 344.9
Freezers Chest Freezer						
	Manual	NOT Compact	No	--	--	7.29AV + 107.8
	Partial	NOT Compact	No	--	--	7.29AV + 107.8
	Automatic	NOT Compact	No	--	9.88AV + 143.7	10.24AV + 148.1
	--	Compact	--	--	10.45AV + 152.0	9.25AV + 136.8

Freezers Neither Chest Freezer nor Upright Freezer	--	NOT Compact	No	--	--	7.29AV + 107.8
<sup>1</sup> AV = adjusted total volume, expressed in ft <sup>3</sup> , as determined in 10 C.F.R., part 430, Appendices A1 and B1 of Subpart B, which is: [1.44 x freezer volume (ft <sup>3</sup> ) + refrigerator volume (ft <sup>3</sup> ) for refrigerators; [1.63 x freezer volume (ft <sup>3</sup> ) + refrigerator volume (ft <sup>3</sup> ) for refrigerator-freezers; [1.73 x freezer volume (ft <sup>3</sup> )] for freezers. <sup>2</sup> AV = adjusted total volume, expressed in ft <sup>3</sup> , as determined in 10 C.F.R., part 430, Appendices A and B of Subpart B.						
Note: Maximum energy consumption standards for refrigerator-freezers with internal freezers are same as those for refrigerator-freezers with top-mounted freezers.						

**Table A-4  
Standards for Commercial Refrigerators and Freezers with a Self-Contained Condensing Unit That  
are Not Commercial Hybrid Units**

	<b>Condensing Unit Configuration</b>	<b>Equipment Family</b>	<b>Rating Temperature (°F)</b>	<b>Operating Temperature (°F)</b>	<b>Equipment Class Designation*</b>	<b>Maximum Daily Energy Consumption (kWh)</b>
Refrigerators and Freezers  Effective January 1, 2010	Self-Contained (SC)	Vertical Closed Transparent (VCT)	38 (M) 0 (L)	≥ 32 < 32	VCT, SC, M VCT, SC, L	0.12 × V + 3.34 0.75 × V + 4.10
		Horizontal Closed Transparent (HCT)	38 (M) 0 (L)	≥ 32 < 32	HCT, SC, M HCT, SC, L	0.12 × V + 3.34 0.75 × V + 4.10
		Vertical Closed Solid (VCS)	38 (M) 0 (L)	≥ 32 < 32	VCS, SC, M VCS, SC, L	0.10 × V + 2.04 0.40 × V + 1.38
		Horizontal Closed Solid (HCS)	38 (M) 0 (L)	≥ 32 < 32	HCS, SC, M HCS, SC, L	0.10 × V + 2.04 0.40 × V + 1.38
		Service Over Counter (SOC)	38 (M) 0 (L)	≥ 32 < 32	SOC, SC, M SOC, SC, L	0.12 × V + 3.34 0.75 × V + 4.10
Refrigerators with transparent doors designed for pull-down temperature applications  Effective January 1, 2010	Self-Contained (SC)	Vertical Closed Transparent (VCT)	38 (P)	≥ 32	VCT, SC, P	0.126 × V + 3.51
		Horizontal Closed Transparent (HCT)	38 (P)	≥ 32	HCT, SC, P	0.126 × V + 3.51
Refrigerators and Freezers without doors  Effective January 1, 2012	Self-Contained (SC)	Vertical Open (VOP)	38 (M) 0 (L)	≥ 32 < 32	VOP, SC, M VOP, SC, L	1.74 × TDA + 4.71 4.37 × TDA + 11.82
		Semi-vertical Open (SVO)	38 (M) 0 (L)	≥ 32 < 32	SVO, SC, M SVO, SC, L	1.73 × TDA + 4.59 4.34 × TDA + 11.51
		Horizontal Open (HZO)	38 (M) 0 (L)	≥ 32 < 32	HZO, SC, M HZO, SC, L	0.77 × TDA + 5.55 1.92 × TDA + 7.08

\* The meaning of the letters in this column is indicated in the *Condensing Unit Configuration*, *Equipment Family*, and *Rating Temperature (°F)* columns to the left.

**Table A-5  
Standards for Commercial Refrigerators and Freezers with a Remote Condensing Unit That are Not Commercial Hybrid Units**

<b>Equipment Category</b>	<b>Condensing Unit Configuration</b>	<b>Equipment Family</b>	<b>Rating Temperature (°F)</b>	<b>Operating Temperature (°F)</b>	<b>Equipment Class Designation*</b>	<b>Maximum Daily Energy Consumption (kWh)</b>
Refrigerators and Freezers	Remote (RC)	Vertical Open (VOP)	38 (M) 0 (L)	≥ 32 < 32	VOP, RC, M VOP, RC, L	0.82 × TDA + 4.07 2.27 × TDA + 6.85
Effective January 1, 2012		Semi-vertical Open (SVO)	38 (M) 0 (L)	≥ 32 < 32	SVO, RC, M SVO, RC, L	0.83 × TDA + 3.18 2.27 × TDA + 6.85
		Horizontal Open (HZO)	38 (M) 0 (L)	≥ 32 < 32	HZO, RC, M HZO, RC, L	0.35 × TDA + 2.88 0.57 × TDA + 6.88
		Vertical Closed Transparent (VCT)	38 (M) 0 (L)	≥ 32 < 32	VCT, RC, M VCT, RC, L	0.22 × TDA + 1.95 0.56 × TDA + 2.61
		Horizontal Closed Transparent (HCT)	38 (M) 0 (L)	≥ 32 < 32	HCT, RC, M HCT, RC, L	0.16 × TDA + 0.13 0.34 × TDA + 0.26
		Vertical Closed Solid (VCS)	38 (M) 0 (L)	≥ 32 < 32	VCS, RC, M VCS, RC, L	0.11 × V + 0.26 0.23 × V + 0.54
		Horizontal Closed Solid (HCS)	38 (M) 0 (L)	≥ 32 < 32	HCS, RC, M HCS, RC, L	0.11 × V + 0.26 0.23 × V + 0.54
		Service Over Counter (SOC)	38 (M) 0 (L)	≥ 32 < 32	SOC, RC, M SOC, RC, L	0.51 × TDA + 0.11 1.08 × TDA + 0.22
* The meaning of the letters in this column is indicated in the <i>Condensing Unit Configuration, Equipment Family, and Rating Temperature (°F)</i> columns to the left.						

**Table A-7  
Standards for Automatic Commercial Ice Makers Manufactured on or After January 1, 2010**

<i>Equipment type</i>	<i>Type of cooling</i>	<i>Harvest rate (lbs ice/24 hours)</i>	<i>Maximum energy use (kWh/100 lbs ice)</i>	<i>Maximum condenser water use* (gal/100 lbs ice)</i>
Ice Making Head	Water	< 500	7.80–0.0055H	200–0.022H.
Ice Making Head	Water	≥ 500 and < 1436	5.58–0.0011H	200–0.022H.
Ice Making Head	Water	≥ 1436	4.0	200–0.022H.
Ice Making Head	Air	< 450	10.26–0.0086H	Not applicable.
Ice Making Head	Air	≥ 450	6.89–0.0011H	Not applicable.
Remote Condensing (but not remote compressor)	Air	< 1000	8.85–0.0038H	Not applicable.
Remote Condensing (but not remote compressor)	Air	≥ 1000	5.1	Not applicable.
Remote Condensing and Remote Compressor	Air	< 934	8.85–0.0038H	Not applicable.
Remote Condensing and Remote Compressor	Air	≥ 934	5.3	Not applicable.
Self-Contained	Water	< 200	11.40–0.019H	191–0.0315H.
Self-Contained	Water	≥ 200	7.6	191–0.0315H.
Self-Contained	Air	< 175	18.0–0.0469H	Not applicable.
Self-Contained	Air	≥ 175	9.8	Not applicable.
H Harvest rate in pounds per 24 hours. *Water use is for the condenser only and does not include potable water used to make ice.				

**Table B-2**  
**Standards for Room Air Conditioners and Room Air-Conditioning Heat Pumps Manufactured on or After October 1, 2000 and before June 1, 2014**

<i>Appliance</i>	<i>Louvered Sides</i>	<i>Cooling Capacity (Btu/hr)</i>	<i>Minimum EER</i>
Room Air Conditioner	Yes	< 6,000	9.7
Room Air Conditioner	Yes	≥ 6,000 – 7,999	9.7
Room Air Conditioner	Yes	≥ 8,000 – 13,999	9.8
Room Air Conditioner	Yes	≥ 14,000 – 19,999	9.7
Room Air Conditioner	Yes	≥ 20,000	8.5
Room Air Conditioner	No	< 6,000	9.0
Room Air Conditioner	No	≥ 6,000 – 7,999	9.0
Room Air Conditioner	No	≥ 8,000 – 19,999	8.5
Room Air Conditioner	No	≥ 20,000	8.5
Room Air Conditioning Heat Pump	Yes	< 20,000	9.0
Room Air Conditioning Heat Pump	Yes	≥ 20,000	8.5
Room Air Conditioning Heat Pump	No	< 14,000	8.5
Room Air Conditioning Heat Pump	No	≥ 14,000	8.0
Casement-Only Room Air Conditioner	Either	Any	8.7
Casement-Slider Room Air Conditioner	Either	Any	9.5

**Table B-3**  
**Standards for Room Air Conditioners and Room Air-Conditioning Heat Pumps Manufactured On or After June 1, 2014**

<i>Appliance</i>	<i>Louvered Sides</i>	<i>Cooling Capacity (Btu/hr)</i>	<i>Minimum Combined EER</i>
Room Air Conditioner	Yes	< 6,000	11.0
Room Air Conditioner	Yes	≥ 6,000 – 7,999	11.0
Room Air Conditioner	Yes	≥ 8,000 – 13,999	10.9
Room Air Conditioner	Yes	≥ 14,000 – 19,999	10.7
Room Air Conditioner	Yes	≥ 20,000 – 27,999	9.4
Room Air Conditioner	Yes	≥ 28,000	9.0
Room Air Conditioner	No	< 6,000	10.0
Room Air Conditioner	No	≥ 6,000 – 7,999	10.0
Room Air Conditioner	No	≥ 8,000 – 10,999	9.6
Room Air Conditioner	No	≥ 11,000 – 13,999	9.5
Room Air Conditioner	No	≥ 14,000 – 19,999	9.3
Room Air Conditioner	No	≥ 20,000	9.4
Room Air Conditioning Heat Pump	Yes	< 20,000	9.8
Room Air Conditioning Heat Pump	Yes	≥ 20,000	9.3
Room Air Conditioning Heat Pump	No	< 14,000	9.3
Room Air Conditioning Heat Pump	No	≥ 14,000	8.7
Casement-Only Room Air Conditioner	Either	Any	9.5
Casement-Slider Room Air Conditioner	Either	Any	10.4



**Table B-6 Standards for Standard Size Packaged Terminal Air Conditioners and Standard Size Packaged Terminal Heat Pumps Manufactured On or After October 8, 2012**

<b>Appliance</b>	<b>Cooling Capacity (Btu/hour)</b>	<b>Minimum Efficiency</b>	
		<b>Minimum EER</b>	<b>Minimum COP</b>
Packaged Terminal Air Conditioners	< 7,000	11.7	—
	≥ 7,000 < 15,000	13.8 – (0.300 x Cap <sup>1</sup> )	—
	≥ 15,000	9.3	—
Packaged Terminal Heat Pumps	< 7,000	11.9	3.3
	≥ 7,000 < 15,000	14.0 – (0.300 x Cap <sup>1</sup> )	3.7 - (0.052 x Cap <sup>1</sup> )
	≥ 15,000	9.5	2.9

<sup>1</sup> Cap means cooling capacity in thousand British thermal units per hour (Btu/h) at 95°F outdoor dry-bulb temperature.

**Table C-2  
Standards for Single Phase Air-Cooled Air Conditioners with  
Cooling Capacity Less than 65,000 Btu per Hour and Single-Phase Air-Source Heat  
Pumps with Cooling Capacity Less than 65,000 Btu per Hour, Not Subject to EPA Act**

<b>Appliance</b>	<b>Minimum Efficiency</b>					
	<b>Effective January 23, 2006</b>		<b>Effective January 1, 2015</b>			
	<b>Minimum SEER</b>	<b>Minimum HSPF</b>	<b>Minimum SEER</b>	<b>Minimum HSPF</b>	<b>Minimum EER</b>	<b>Average Off-Mode Power Consumption <i>P<sub>w, pff</sub></i> (watts)</b>
Split system air conditioners with rated cooling capacity < 45,000 Btu/hour <sup>1</sup>	13.0	—	14.0	—	12.2	30
Split system air conditioners with rated cooling capacity ≥ 45,000 Btu/hour <sup>1</sup>			14.0	—	11.7	30
Split system heat pumps	13.0	7.7	14.0	8.2	—	33
Single package air conditioners <sup>1</sup>	13.0	—	14.0	—	11.0	30
Single package heat pumps	13.0	7.7	14.0	8.0	—	33
Space constrained air conditioners – split system	12.0		12.0	—	—	30
Space constrained heat pumps – split system	12.0	7.4	12.0	7.4	—	33
Space constrained air conditioners – single package	12.0		12.0	—	—	30
Space constrained heat pumps – single package	12.0	7.4	12.0	7.4	—	33
Small duct, high velocity air conditioner systems	13.0		13.0	—	—	30
Small duct, high velocity heat pump systems	13.0	7.7	13.0	7.7	—	30

<sup>1</sup> See 10 C.F.R. section 430.32(c) for less stringent federal standards applicable to these units that are manufactured on or after January 1, 2015 and installed in states other than Arizona, California, Nevada, or New Mexico

**Table C-3**  
**Standards for Air-Cooled Air Conditioners and Air-Source Heat Pumps Subject to EPart**  
**(Standards Effective January 1, 2010 do not apply To Single Package Vertical Air Conditioners)**

<i>Appliance</i>	<i>Cooling Capacity (Btu/hr)</i>	<i>System Type</i>	<i>Minimum Efficiency</i>		
			<i>Effective June 15, 2008</i>	<i>Effective January 1, 2010</i>	
				<i>Air Conditioners</i>	<i>Heat Pumps</i>
Air-cooled unitary air conditioners and heat pumps (cooling mode)	< 65,000 *	Split system	13.0 SEER		
	< 65,000 *	Single package	13.0 SEER		
	≥ 65,000 and < 135,000	All		11.2 EER <sup>3</sup> 11.0 EER <sup>4</sup>	11.0 EER <sup>3</sup> 10.8 EER <sup>4</sup>
	≥ 135,000 and < 240,000	All		11.0 EER <sup>3</sup> 10.8 EER <sup>4</sup>	10.6 EER <sup>3</sup> 10.4 EER <sup>4</sup>
	≥ 240,000 and < 760,000	All		10.0 EER <sup>3</sup> 9.8 EER <sup>4</sup>	9.5 EER <sup>3</sup> 9.3 EER <sup>4</sup>
Air-cooled unitary air-conditioning heat pumps (heating mode)	< 65,000 *	Split system	7.7 HSPF		
	< 65,000 *	Single package	7.7 HSPF		
	≥ 65,000 and < 135,000	All		3.3 COP	
	≥ 135,000 and < 240,000	All		3.2 COP	
	≥ 240,000 and < 760,000	All		3.2 COP	
<p>* Three phase models only.</p> <p><sup>3</sup> Applies to equipment that has electric resistance heat or no heating.</p> <p><sup>4</sup> Applies to equipment with all other heating-system types that are integrated into the unitary equipment.</p>					

**Table C-4  
Standards for Water-Cooled Air Conditioners, Evaporatively Cooled Air Conditioners, and Water-Source Heat Pumps**

Appliance	Cooling Capacity (Btu per hour)	Minimum Efficiency							
		Effective Prior to October 29, 2012		Effective January 10, 2011		Effective †October 29, 2012 or ††October 29, 2013		Effective *June 1, 2013 or **June 1, 2014	
		Minimum EER	Minimum COP	Minimum EER	Minimum COP	Minimum EER	Minimum COP	Minimum EER	Minimum COP
Water-cooled air conditioners and evaporatively cooled air	< 17,000	12.1	—						
Water-source heat pumps	< 17,000	11.2	4.2						
Water-source VRF multi-split heat pumps	< 17,000	—	4.2			12.0 <sup>†</sup>	4.2		
Water-cooled air conditioners and evaporatively cooled air	≥17,000 and < 65,000	12.1	—						
Water-source heat pumps, including VRF	≥17,000 and < 65,000	12.0	4.2						
Water-cooled air conditioners and evaporatively cooled air	≥65,000 and < 135,000	11.5 <sup>1</sup>	—					12.1 <sup>*</sup>	—
Water-source heat pumps, including VRF	≥65,000 and < 135,000	12.0	4.2					11.9 <sup>*</sup>	4.2
Water-cooled air conditioners	≥135,000 and < 240,000	11.0	—					12.5 <sup>**</sup>	—
Evaporatively cooled air conditioners	≥135,000 and < 240,000	11.0	—					12.0 <sup>***</sup>	—
Water-source heat pumps	≥135,000 and < 240,000	11.0	2.9					12.3 <sup>**</sup>	2.9
Water-source VRF multi-split heat pumps	≥135,000 and < 760,000					10.0 <sup>††</sup>	3.9 <sup>††</sup>		
Water-cooled air conditioners	≥240,000 and < 760,000	11.0 <sup>1</sup>	—	11.0 <sup>1</sup>	—			12.4 <sup>***</sup>	—
Evaporatively cooled air conditioners	≥240,000 and < 760,000	11.0 <sup>1</sup>	—	11.0 <sup>1</sup>	—			11.9 <sup>1**</sup>	—
Water-source heat pumps	≥240,000 and < 760,000	11.0 <sup>1</sup>	—	11.0 <sup>1</sup>	—			12.2 <sup>**</sup>	—

<sup>1</sup> Deduct 0.2 from the required EER for units with heating sections other than electric resistance heat. For VRF multi-split heat pumps this applies to units with heat recovery.

**Table C-5**  
**Standards for Single Package Vertical Air Conditioners and Single Package Vertical Heat Pumps**  
**Manufactured on or After January 1, 2010**

<b>Appliance</b>	<b>Cooling Capacity (BTU/hr)</b>	<b>System Type</b>	<b>Minimum Efficiency</b>	
			<b>Cooling Mode</b>	<b>Heating Mode</b>
Single package vertical air conditioners	< 65,000	Single-phase	9.0 EER	N/A
	< 65,000	3-phase	9.0 EER	N/A
	≥ 65,000 and < 135,000	All	8.9 EER	N/A
	≥ 135,000 and < 240,000	All	8.6 EER	N/A
Single package vertical heat pumps	< 65,000	Single-phase	9.0 EER	3.0 COP
	< 65,000	3-phase	9.0 EER	3.0 COP
	≥ 65,000 and < 135,000	All	8.9 EER	3.0 COP
	≥ 135,000 and < 240,000	All	8.6 EER	2.9 COP

**Table D-2**  
**Standards for Dehumidifiers**

<b>Product capacity (pint/day)</b>	<b>Minimum energy factor (liters/kWh)</b>	
	<b>Effective October 1, 2007</b>	<b>Effective October 1, 2012</b>
25.00 or less	1.00	1.35
25.01 – 35.00	1.20	1.35
35.01 – 45.00	1.30	1.50
45.01 – 54.00	1.30	1.60
54.01 – 74.99	1.50	1.70
75.00 or more	2.25	2.50

**Table E-2**  
**Standards for Gas Wall Furnaces, Floor Furnaces, and Room Heaters**

<i>Appliance</i>	<i>Design Type</i>	<i>Capacity (Btu per hour)</i>	<i>Minimum AFUE (%)</i>	
			<i>Effective Before April 16, 2013</i>	<i>Effective On or After April 16, 2013</i>
Wall furnace	Fan	≤ 42,000	73	75
Wall furnace	Fan	> 42,000	74	76
Wall furnace	Gravity	≤10,000	59	65
Wall furnace	Gravity	> 10,000 and ≤ 12,000	60	
Wall furnace	Gravity	> 12,000 and ≤ 15,000	61	
Wall furnace	Gravity	> 15,000 and ≤ 19,000	62	
Wall furnace	Gravity	> 19,000 and ≤ 27,000	63	
Wall furnace	Gravity	> 27,000 and ≤ 46,000	64	
Wall furnace	Gravity	> 46,000	65	67
Floor furnace	All	≤ 37,000	56	57
Floor furnace	All	> 37,000	57	58
Room heater	All	≤ 18,000	57	61
Room heater	All	> 18,000 and ≤ 20,000	58	
Room heater	All	> 20,000 and ≤ 27,000	63	66
Room heater	All	> 27,000 and ≤ 46,000	64	67
Room heater	All	> 46,000	65	68

**Table E-3**  
**Standards for Gas- and Oil-Fired Central Boilers < 300,000 Btu/hr input and Electric Residential Boilers**

<b>Appliance</b>	<b>Minimum AFUE (%)</b>	
	<b>Effective January 1, 1992</b>	
	75	<b>Effective September 1, 2012</b>
Gas steam boilers with single phase electrical supply	80	80 <sup>1</sup>
Gas hot water boilers with single phase electrical supply	—	82 <sup>1,2</sup>
Oil steam boilers with single phase electrical supply	—	82
Oil hot water boilers with single phase electrical supply	—	84 <sup>2</sup>
Electric steam residential boilers	—	NONE
Electric hot water residential boilers	80	NONE <sup>2</sup>
All other boilers with single phase electrical supply	—	—
<sup>1</sup> No constant burning pilot light design standard effective September 1, 2012. <sup>2</sup> Automatic means for adjusting temperature design standard effective September 1, 2012. (Boilers equipped with tankless domestic water heating coils do not need to comply with this requirement.)		

**Table E-5**  
**Standards for Gas- and Oil-Fired Central Furnaces**

<b>Appliance</b>	<b>Rated Input (Btu/hr)</b>	<b>Minimum Thermal Efficiency</b>
Gas central furnaces	≥ 225,000	80
Oil central furnaces	≥ 225,000	81

**Table F-2  
Standards for Large Water Heaters Effective October 29, 2003**

<i>Appliance</i>	<i>Input to Volume Ratio</i>	<i>Size (Volume)</i>	<i>Minimum Thermal Efficiency (%)</i>	<i>Maximum Standby Loss<sup>1,2</sup></i>
Gas storage water heaters	< 4,000 Btu/hr/gal	any	80	$Q/800 + 110(V_r)^{1/2}$ Btu/hr
Gas instantaneous water heaters	≥ 4,000 Btu/hr/gal	< 10 gal	80	–
		≥ 10 gal	80	$Q/800 + 110(V_r)^{1/2}$ Btu/hr
Gas hot water supply boilers	≥ 4,000 Btu/hr/gal	< 10 gal	80	–
		≥ 10 gal	80	$Q/800 + 110(V_r)^{1/2}$ Btu/hr
Oil storage water heaters	< 4,000 Btu/hr/gal	any	78	$Q/800 + 110(V_r)^{1/2}$ Btu/hr
Oil instantaneous water heaters	≥ 4,000 Btu/hr/gal	< 10 gal	80	–
		≥ 10 gal	78	$Q/800 + 110(V_r)^{1/2}$ Btu/hr
Oil hot water supply boilers	≥ 4,000 Btu/hr/gal	< 10 gal	80	–
		≥ 10 gal	78	$Q/800 + 110(V_r)^{1/2}$ Btu/hr
Electric storage water heaters	< 4,000 Btu/hr/gal	Any	–	$0.3 + 27/V_m$ %/hr

<sup>1</sup> Standby loss is based on a 70° F temperature difference between stored water and ambient requirements. In the standby loss equations,  $V_r$  is the rated volume in gallons,  $V_m$  is the measured volume in gallons, and Q is the nameplate input rate in Btu/hr.

<sup>2</sup> Water heaters and hot water supply boilers having more than 140 gallons of storage capacity are not required to meet the standby loss requirement if the tank surface is thermally insulated to R-12.5, if a standing pilot light is not installed, and for gas- or oil-fired storage water heaters, there is a flue damper or fan-assisted combustion.



**Table F-3  
Standards for Small Federally Regulated Water Heaters**

<i>Appliance</i>	<i>Rated Storage Volume (gallons)</i>	<i>Minimum Energy Factor</i>	
		<i>Effective January 20, 2004</i>	<i>Effective April 16, 2015</i>
Gas-fired storage-type water heaters	≤ 55	0.67 – (.0019 x V)	0.675 – (0.0015 x V)
	> 55		0.8012 – (0.00078 x V)
Oil-fired water heaters (storage and instantaneous)	Any	0.59 – (.0019 x V)	0.68 – (.0019 x V)
Electric storage water heaters (excluding tabletop water heaters)	≤ 55	0.97 – (.00132 x V)	0.960 – (0.0003 x V)
	> 55		2.057 – (0.00113 x V)
Electric tabletop water heaters	Any	0.93 – (.00132 x V)	0.93 – (.00132 x V)
Gas-fired instantaneous water heaters	Any	0.62 – (.0019 x V)	0.82 – (.0019 x V)
Electric instantaneous water heaters (excluding tabletop water heaters)	Any	0.93 – (.00132 x V)	0.93 – (.00132 x V)
Heat pump water heaters	Any	0.97 – (.00132 x V)	0.97 – (.00132 x V)

V = Rated storage volume in gallons.

**Table H-1  
Standards for Plumbing Fittings**

<i>Appliance</i>	<i>Maximum Flow Rate</i>
Showerheads	2.5 gpm at 80 psi
Lavatory faucets	2.2 gpm at 60 psi
Kitchen faucets	2.2 gpm at 60 psi
Replacement aerators	2.2 gpm at 60 psi
Wash fountains	$2.2 \times \frac{\text{rim space (inches)}}{20}$ gpm at 60 psi
Metering faucets	0.25 gallons/cycle <sup>1,2</sup>
Metering faucets for wash fountains	$0.25 \times \frac{\text{rim space (inches)}}{20}$ gpm at 60 psi <sup>1,2</sup>
<p><sup>1</sup> <b>Sprayheads with independently controlled orifices and metered controls.</b> The maximum flow rate of each orifice that delivers a pre-set volume of water before gradually shutting itself off shall not exceed the maximum flow rate for a metering faucet.</p> <p><sup>2</sup> <b>Sprayheads with collectively controlled orifices and metered controls.</b> The maximum flow rate of a sprayhead that delivers a pre-set volume of water before gradually shutting itself off shall be the product of (a) the maximum flow rate for a metering faucet and (b) the number of component lavatories (rim space of the lavatory in inches (millimeters) divided by 20 inches (508 millimeters)).</p>	

**Table J-1  
Standards for Fluorescent Lamp Ballasts and Replacement Fluorescent Lamp Ballasts**

<i>Application for Operation of</i>	<i>Ballast Input Voltage</i>	<i>Total Nominal Lamp Watts</i>	<i>Minimum Ballast Efficacy Factor</i>	
one F40T12 lamp	120 or 277	40	2.29 <sup>1</sup>	1.805 <sup>2</sup>
two F40T12 lamps	120	80	1.17 <sup>1</sup>	1.060 <sup>2</sup>
	277	80	1.17 <sup>1</sup>	1.050 <sup>2</sup>
two F96T12 lamps	120 or 277	150	0.63 <sup>1</sup>	0.570 <sup>2</sup>
two F96T12HO lamps	120 or 277	220	0.39 <sup>1</sup>	0.390 <sup>2</sup>
<sup>1</sup> For fluorescent lamp ballasts manufactured on or after April 1, 2005; sold by the manufacturer on or after July 1, 2005; or incorporated into a luminaire by a luminaire manufacturer on or after April 1, 2006. <sup>2</sup> For fluorescent lamp ballasts designed, marked, and shipped as replacement ballasts.				

**Table J-2  
Standards for Fluorescent Lamp Ballasts<sup>1</sup>**

<i>Application for Operation of</i>	<i>Ballast Input Voltage</i>	<i>Total Nominal Lamp Watts</i>	<i>Minimum Ballast Efficacy Factor</i>
one F34T12 lamp	120 or 277	34	2.61
two F34T12 lamps	120 or 277	68	1.35
two F96T12/ES lamps	120 or 277	120	0.77
two F96T12HO/ES lamps	120 or 277	190	0.42
<sup>1</sup> For fluorescent lamp ballasts manufactured on or after July 1, 2009; sold by the manufacturer on or after October 1, 2009; or fluorescent lamp ballasts incorporated into a luminaire by a luminaire manufacturer on or after July 1, 2010.			

**Table K-1  
Standards for Federally Regulated General Service Fluorescent Lamps Manufactured Before July 15, 2012**

<i>Appliance</i>	<i>Nominal Lamp Wattage</i>	<i>Minimum Color Rendering Index (CRI)</i>	<i>Minimum Average Lamp Efficacy (LPW)</i>
4-foot medium bi-pin lamps	> 35	69	75.0
	≤ 35	45	75.0
2-foot U-shaped lamps	> 35	69	68.0
	≤ 35	45	64.0
8-foot slimline lamps	> 65	69	80.0
	≤ 65	45	80.0
8-foot high output lamps	> 100	69	80.0
	≤ 100	45	80.0

**Table K-2**  
**Standards for Federally Regulated General Service Fluorescent Lamps Manufactured On or After July 15, 2012**

<i>Appliance</i>	<i>Correlated Color Temperature</i>	<i>Minimum Average Lamp Efficacy (LPW)</i>
4-foot medium bipin lamps	≤ 4,500K	89
	> 4,500K and ≤ 7,000K	88
2-foot U-shaped lamps	≤ 4,500K	84
	> 4,500K and ≤ 7,000K	81
8-foot slimline lamps	≤ 4,500K	97
	> 4,500K and ≤ 7,000K	93
8-foot high output lamps	≤ 4,500K	92
	> 4,500K and ≤ 7,000K	88
4-foot miniature bipin standard output	≤ 4,500K	86
	> 4,500K and ≤ 7,000K	81
4-foot miniature bipin high output	≤ 4,500K	76
	> 4,500K and ≤ 7,000K	72

**Table K-3**  
**Standards for Federally Regulated Incandescent Reflector Lamps Manufactured Before July 15, 2012**

<i>Nominal Lamp Wattage</i>	<i>Minimum Average Lamp Efficacy (LPW)</i>
40-50	10.5
51-66	11.0
67-85	12.5
86-115	14.0
116-155	14.5
156-205	15.0

**Table K-4  
Standards for Federally Regulated Incandescent Reflector Lamps  
Manufactured On or After July 15, 2012**

<i>Lamp Spectrum</i>	<i>Lamp Diameter (inches)</i>	<i>Rated Voltage</i>	<i>Minimum Average Lamp Efficacy (LPW)<sup>1</sup></i>
Standard Spectrum	> 2.5	≥ 125	6.8 x P <sup>0.27</sup>
		< 125	5.9 x P <sup>0.27</sup>
	≤ 2.5	≥ 125	5.7 x P <sup>0.27</sup>
		< 125	5.0 x P <sup>0.27</sup>
Modified Spectrum	> 2.5	≥ 125	5.8 x P <sup>0.27</sup>
		< 125	5.0 x P <sup>0.27</sup>
	≤ 2.5	≥ 125	4.9 x P <sup>0.27</sup>
		< 125	4.2 x P <sup>0.27</sup>

<sup>1</sup>P = Rated Lamp Wattage, in Watts

**Table K-5  
Standards for Medium Base Compact Fluorescent Lamps**

<i>Factor</i>	<i>Requirements</i>
<i>Lamp Power (Watts) and Configuration<sup>1</sup></i>	<i>Minimum Efficacy: lumens/watt (Based upon initial lumen data)<sup>2</sup></i>
<i>Bare Lamp:</i> Lamp Power < 15 Lamp Power ≥ 15	45.0 60.0
<i>Covered Lamp (no reflector)</i> Lamp Power < 15 15 ≥ Lamp Power < 19 19 ≥ Lamp Power < 25 Lamp Power ≥ 25	40.0 48.0 50.0 55.0
1,000-hour Lumen Maintenance	The average of at least 5 lamps must be a minimum 90% of initial (100-hour) lumen output @ 1,000 hours of rated life.
Lumen Maintenance	80% of initial (100-hour) rating at 40 percent of rated life (per ANSI C78.5 Clause 4.10).
Rapid Cycle Stress Test	Per ANSI C78.5 and IESNA LM-65 (Clauses 2, 3, 5, and 6) <i>Exception:</i> Cycle times must be 5 minutes on, 5 minutes off. Lamp will be cycled once for every two hours of rated life. At least 5 lamps <i>must meet or exceed</i> the minimum number of cycles.
Average Rated Lamp Life	≥ 6,000 hours as declared by the manufacturer on the packaging. 80% of rated life, statistical methods may be used to confirm lifetime claims based on sampling performance.
<sup>1</sup> Take performance and electrical requirements at the end of the 100-hour aging period according to ANSI Standard C78.5. The lamp efficacy shall be the average of the lesser of the lumens per watt measured in the base up and/or other specified positions. Use wattages placed on packaging to select proper specification efficacy in this table, not measured wattage. Labeled wattages are for reference only.	
<sup>2</sup> Efficacies are based on measured values for lumens and wattages from pertinent test data. Wattages and lumens placed on packages may not be used in calculation and are not governed by	

this specification. For multi-level or dimmable systems, measurements shall be at the highest setting. Acceptable measurement error is  $\pm 3\%$ .

**Table K-6**  
**Standards for Federally Regulated General Service Incandescent Lamps**

<i>Rated Lumen Ranges</i>	<i>Maximum Rate Wattage</i>	<i>Minimum Rate Lifetime</i>	<i>Effective Date</i>
1490-2600	72	1,000 hours	January 1, 2012
1050 – 1489	53	1,000 hours	January 1, 2013
750 – 1049	43	1,000 hours	January 1, 2014
310 – 749	29	1,000 hours	January 1, 2014

**Table K-7**  
**Standards for Federally Regulated Modified Spectrum General Service Incandescent Lamps**

<i>Rated Lumen Ranges</i>	<i>Maximum Rate Wattage</i>	<i>Minimum Rate Lifetime</i>	<i>Effective Date</i>
1118-1950	72	1,000 hours	January 1, 2012
788-1117	53	1,000 hours	January 1, 2013
563-787	43	1,000 hours	January 1, 2014
232-562	29	1,000 hours	January 1, 2014

**Table M-1**  
**Standards for Traffic Signals for Vehicle and Pedestrian Control**

<i>Appliance</i>	<i>Maximum Wattage (at 74°C)</i>	<i>Nominal Wattage (at 25°C)</i>
Traffic Signal Module Type:		
12-inch; Red Ball	17	11
8-inch; Red Ball	13	8
12-inch; Red Arrow	12	9
12-inch; Green Ball	15	15
8-inch; Green Ball	12	12
12-inch; Green Arrow	11	11
Pedestrian Module Type:		
Combination Walking Man/Hand	16	13
Walking Man	12	9
Orange Hand	16	13

**Table O**  
**Standards for Dishwashers**

<i>Appliance</i>	<i>Effective January 1, 2010</i>		<i>Effective May 30, 2013</i>	
	<i>Maximum Energy Use (kWh/year)</i>	<i>Maximum Water Use (gallons/cycle)</i>	<i>Maximum Energy Use (kWh/year)</i>	<i>Maximum Water Use (gallons/cycle)</i>
Compact dishwashers	260	4.5	222	3.5
Standard dishwashers	355	6.5	307	5.0

**Table P-1**  
**Standards for Residential Clothes Washers Manufactured On or After January 1, 2007 and Manufactured Before March 7, 2015**

<i>Appliance</i>	<i>Minimum Modified Energy Factor Effective January 1, 2007</i>	<i>Maximum Water Factor Effective January 1, 2011</i>
Top-loading compact clothes washers	0.65	--
Top-loading standard clothes washers	1.26	9.5
Top-loading, semi-automatic	N/A <sup>1</sup>	--
Front-loading clothes washers	1.26	9.5
Suds-saving	N/A <sup>1</sup>	--

<sup>1</sup> Must have an unheated rinse water option.

**Table P-2**  
**Standards for Residential Clothes Washers Manufactured On or After March 7, 2015**

<i>Appliance</i>	<i>Minimum Integrated Modified Energy Factor</i>		<i>Maximum Integrated Water Factor</i>	
	<i>March 7, 2015</i>	<i>January 1, 2018</i>	<i>March 7, 2015</i>	<i>January 1, 2018</i>
Top-loading, Compact	0.86	1.15	14.4	12.0
Top-loading, Standard	1.29	1.57	8.4	6.5
Front-loading, Compact	1.13	1.13	8.3	8.3
Front-loading, Standard	1.84	1.84	4.7	4.7

**Table P-3  
Standards for Clothes Washers**

<b>Appliance</b>	<b>Minimum Modified Energy Factor</b>		<b>Maximum Water Factor</b>	
	<b>Effective January 1, 2007</b>	<b>Effective January 8, 2013</b>	<b>Effective January 1, 2007</b>	<b>Effective January 8, 2013</b>
Top-loading clothes washers	1.26	1.60	9.5	8.5
Front-loading clothes washers	1.26	2.00	9.5	5.5

**Table Q-1  
Standards for Clothes Dryers Manufactured On or After May 14, 1994  
and Before January 1, 2015**

<b>Appliance</b>	<b>Minimum Energy Factor (lbs/kWh)</b>
Electric, standard clothes dryers	3.01
Electric, compact, 120-volt clothes dryers	3.13
Electric, compact, 240-volt clothes dryers	2.90
Gas clothes dryers	2.67

**Table S-1  
Standards for Electric Motors**

<b>Motor Horsepower/Standard Kilowatt Equivalent</b>	<b>Minimum Nominal Full-Load Efficiency</b>					
	<b>Open Motors</b>			<b>Enclosed Motors</b>		
	<b>6 poles</b>	<b>4 poles</b>	<b>2 poles</b>	<b>6 poles</b>	<b>4 poles</b>	<b>2 poles</b>
1/0.75	80.0	82.5	...	80.0	82.5	75.5
1.5/1.1	84.0	84.0	82.5	85.5	84.0	82.5
2/1.5	85.5	84.0	84.0	86.5	84.0	84.0
3/2.2	86.5	86.5	84.0	87.5	87.5	85.5
5/3.7	87.5	87.5	85.5	87.5	87.5	87.5
7.5/5.5	88.5	88.5	87.5	89.5	89.5	88.5
10/7.5	90.2	89.5	88.5	89.5	89.5	89.5
15/11	90.2	91.0	89.5	90.2	91.0	90.2
20/15	91.0	91.0	90.2	90.2	91.0	90.2
25/18.5	91.7	91.7	91.0	91.7	92.4	91.0
30/22	92.4	92.4	91.0	91.7	92.4	91.0
40/30	93.0	93.0	91.7	93.0	93.0	91.7
50/37	93.0	93.0	92.4	93.0	93.0	92.4
60/45	93.6	93.6	93.0	93.6	93.6	93.0
75/55	93.6	94.1	93.0	93.6	94.1	93.0
100/75	94.1	94.1	93.0	94.1	94.5	93.6
125/90	94.1	94.5	93.6	94.1	94.5	94.5
150/110	94.5	95.0	93.6	95.0	95.0	94.5
200/150	94.5	95.0	94.5	95.0	95.0	95.0

**Table T-3  
Standards for Low-Voltage Dry-Type Distribution Transformers**

<i>Single phase</i>			<i>Three phase</i>		
<i>kVA</i>	<i>Efficiency (%)<sup>1</sup></i>		<i>kVA</i>	<i>Efficiency (%)<sup>1</sup></i>	
	<i>Effective January 1, 2007</i>	<i>Effective January 1, 2016</i>		<i>Effective January 1, 2007</i>	<i>Effective January 1, 2016</i>
15	97.7	97.70	15	97.0	97.89
25	98.0	98.00	30	97.5	98.23
37.5	98.2	98.20	45	97.7	98.40
50	98.3	98.30	75	98.0	98.60
75	98.5	98.50	112.5	98.2	98.74
100	98.6	98.60	150	98.3	98.83
167	98.7	98.70	225	98.5	98.94
250	98.8	98.80	300	98.6	99.02
333	98.9	98.90	500	98.7	99.14
			750	98.8	99.23
			1000	98.9	99.28

<sup>1</sup> Efficiencies are determined at the following reference conditions:  
(1) for no-load losses, at the temperature of 20°C, and (2) for load-losses, at the temperature of 75°C and 35 percent of nameplate load.  
(Source: Table 4–2 of NEMA Standard TP–1–2002, “Guide for Determining Energy Efficiency for Distribution Transformers.”)



**Table T-4  
Standards for Liquid-Immersed Distribution Transformers**

Single phase			Three phase		
kVA	Efficiency (%) <sup>1</sup>		kVA	Efficiency (%) <sup>1</sup>	
	<i>Effective January 1, 2007</i>	<i>Effective January 1, 2016</i>		<i>Effective January 1, 2007</i>	<i>Effective January 1, 2016</i>
10	98.62	98.70	15	98.36	98.65
15	98.76	98.82	30	98.62	98.83
25	98.91	98.95	45	98.76	98.92
37.5	99.01	99.05	75	98.91	99.03
50	99.08	99.11	112.5	99.01	99.11
75	99.17	99.19	150	99.08	99.16
100	99.23	99.25	225	99.17	99.23
167	99.25	99.33	300	99.23	99.27
250	99.32	99.39	500	99.25	99.35
333	99.36	99.43	750	99.32	99.40
500	99.42	99.49	1000	99.36	99.43
667	99.46	99.52	1500	99.42	99.48
833	99.49	99.55	2000	99.46	99.51
			2500	99.49	99.53

<sup>1</sup> Note: All efficiency values are at 50 percent of nameplate-rated load, determined when tested according to the test procedure in Section 1604(t).

**Table T-5**  
**Standards for Medium-Voltage Dry-Type Distribution Transformers Manufactured On or After**  
**January 1, 2010 and Before January 1, 2016**

<i>Single phase</i>				<i>Three phase</i>			
<i>BIL kVA</i>	<i>20-45 kV Efficiency<sup>1</sup> (%)</i>	<i>46-95 kV efficiency<sup>1</sup> (%)</i>	<i>≥ 96 kV efficiency<sup>1</sup> (%)</i>	<i>BIL kVA</i>	<i>20-45 kV Efficiency<sup>1</sup> (%)</i>	<i>46-95 kV efficiency<sup>1</sup> (%)</i>	<i>≥ 96 kV efficiency<sup>1</sup> (%)</i>
15	98.10	97.86		15	97.50	97.18	
25	98.33	98.12		30	97.90	97.63	
37.5	98.49	98.30		45	98.10	97.86	
50	98.60	98.42		75	98.33	98.12	
75	98.73	98.57	98.53	112.5	98.49	98.30	
100	98.82	98.67	98.63	150	98.60	98.42	
167	98.96	98.83	98.80	225	98.73	98.57	98.53
250	99.07	98.95	98.91	300	98.82	98.67	98.63
333	99.14	99.03	98.99	500	98.96	98.83	98.80
500	99.22	99.12	99.09	750	99.07	98.95	98.91
667	99.27	99.18	99.15	1000	99.14	99.03	98.99
833	99.31	99.23	99.20	1500	99.22	99.12	99.09
				2000	99.27	99.18	99.15
				2500	99.31	99.23	99.20

<sup>1</sup> All efficiency values are at 50 percent of nameplate rated load, determined when tested according to the test procedure in Section 1604(t).

**Table T-6  
Standards for Medium-Voltage Dry-Type Distribution Transformers  
Manufactured On or After January 1, 2016**

<i>Single phase</i>				<i>Three phase</i>			
<i>BIL kVA</i>	<i>20-45 kV Efficiency<sup>1</sup> (%)</i>	<i>46-95 kV efficiency<sup>1</sup> (%)</i>	<i>≥ 96 kV efficiency<sup>1</sup> (%)</i>	<i>BIL kVA</i>	<i>20-45 kV Efficiency<sup>1</sup> (%)</i>	<i>46-95 kV efficiency<sup>1</sup> (%)</i>	<i>≥ 96 kV efficiency<sup>1</sup> (%)</i>
15	98.10	97.86		15	97.50	97.18	
25	98.33	98.12		30	97.90	97.63	
37.5	98.49	98.30		45	98.10	97.86	
50	98.60	98.42		75	98.33	98.13	
75	98.73	98.57	98.53	112.5	98.52	98.36	
100	98.82	98.67	98.63	150	98.65	98.51	
167	98.96	98.83	98.80	225	98.82	98.69	98.57
250	99.07	98.95	98.91	300	98.93	98.81	98.69
333	99.14	99.03	98.99	500	99.09	98.99	98.89
500	99.22	99.12	99.09	750	99.21	99.12	99.02
667	99.27	99.18	99.15	1000	99.28	99.20	99.11
833	99.31	99.23	99.20	1500	99.37	99.30	99.21
				2000	99.43	99.36	99.28
				2500	99.47	99.41	99.33

<sup>1</sup> All efficiency values are at 50 percent of nameplate rated load, determined when tested according to the test procedure in Section 1604(t).

**Table U-1  
Standards for Class A External Power Supplies That are Federally Regulated**

<i>Nameplate Output</i>	<i>Minimum Efficiency in Active Mode (Decimal equivalent of a Percentage)</i>
< 1 watt	0.5 * Nameplate Output
≥ 1 and ≤ 51 watts	0.09*Ln(Nameplate Output) + 0.5
> 51 watts	0.85
	<i>Maximum Energy Consumption in No-Load Mode</i>
≤ 250 watts	0.5 watts
Where Ln (Nameplate Output) = Natural Logarithm of the nameplate output expressed in watts.	

**Table A-9  
Standards for Wine Chillers**

<i>Appliance</i>	<i>Maximum Annual Energy Consumption (kWh)</i>
Wine chillers with manual defrost	13.7V + 267
Wine chillers with automatic defrost	17.4V + 344
V = volume in ft <sup>3</sup> .	

**Table A-10  
Standards for Freezers that are Consumer Products**

<i>Appliance</i>	<i>Maximum Annual Energy Consumption (kWh)</i>
Upright Freezers with manual defrost	7.55AV + 258.3
Upright Freezers with automatic defrost	12.43AV + 326.1
Chest Freezers	9.88AV + 143.7
AV = adjusted total volume, expressed in ft <sup>3</sup> , which is 1.73 x freezer volume (ft <sup>3</sup> ).	

**Table A-12  
Standards for Refrigerated Canned and Bottled Beverage Vending Machines**

<i>Appliance</i>	<i>Doors</i>	<i>Maximum Daily Energy Consumption (kWh)</i>	
		<i>January 1, 2006</i>	<i>January 1, 2007</i>
Refrigerated canned and bottled beverage vending machines when tested at 90° F ambient temperature except multi-package units	Not applicable	0.55(8.66 + (0.009 × C))	0.55(8.66 + (0.009 × C))
Refrigerated multi-package canned and bottled beverage vending machines when tested at 75° F ambient temperature	Not applicable	0.55(8.66 + (0.009 × C))	0.55(8.66 + (0.009 × C))
V = total volume (ft <sup>3</sup> ) AV = Adjusted Volume = [1.63 x freezer volume (ft <sup>3</sup> )] + refrigerator volume (ft <sup>3</sup> ) C=Rated capacity (number of 12-ounce cans)			

**Table C-7**  
**Standards for Ground Water-Source and Ground-Source Heat Pumps**

<i>Appliance</i>	<i>Rating Condition</i>	<i>Minimum Standard</i>
Ground water-source heat pumps (cooling)	59°F entering water temperature	16.2 EER
Ground water-source heat pumps (heating)	50°F entering water temperature	3.6 COP
Ground-source heat pumps (cooling)	77°F entering brine temperature	13.4 EER
Ground-source heat pumps (heating)	32°F entering brine temperature	3.1 COP

**Table C-8**  
**Standards for Evaporatively Cooled Computer Room Air Conditioners**

<i>Appliance</i>	<i>Cooling Capacity (Btu/hr)</i>	<i>Minimum EER (Btu/watt-hour)</i>	
		<i>Air-Cooled Effective January 1, 2006</i>	<i>Water-Cooled, Glycol-Cooled, and Evaporatively-Cooled Effective October 29, 2006</i>
Computer room air conditioners	< 65,000	11.0	11.1
	≥ 65,000 and < 135,000	10.4	10.5
	≥ 135,000 and < 240,000	10.2	10.0

**Table E-7**  
**Standards for Boilers**

<i>Appliance</i>	<i>Output (Btu/hr)</i>	<i>Standards</i>		
		<i>Minimum AFUE %</i>	<i>Minimum Combustion Efficiency % *</i>	<i>Maximum Standby Loss (watts)</i>
Gas steam boilers with 3-phase electrical supply	< 300,000	75	—	—
All other boilers with 3-phase electrical supply	< 300,000	80	—	—
Natural gas, non-packaged boilers	≥ 300,000	—	80	147
LPG Non-packaged boilers	≥ 300,000	—	80	352
Oil, non-packaged boilers	≥ 300,000	—	83	—

\*At both maximum and minimum rated capacity, as provided and allowed by the controls.

**Table E-8  
Standards for Furnaces**

<i>Appliance</i>	<i>Application</i>	<i>Minimum Efficiency %</i>
Central furnaces with 3-phase electrical supply < 225,000 Btu/hour	Mobile Home	75 AFUE
	All others	78 AFUE or 80 Thermal Efficiency (at manufacturer's option)

**Table E-9  
Standards for Duct Furnaces**

<i>Appliance</i>	<i>Fuel</i>	<i>Standards</i>		
		<i>Minimum Thermal Efficiency %<sup>1</sup></i>		<i>Maximum Energy Consumption during standby (watts)</i>
		<i>At maximum rated capacity</i>	<i>At minimum rated capacity</i>	
Duct furnaces	Natural gas	80	75	10
Duct furnaces	LPG <sup>2</sup>	80	75	147

<sup>1</sup> As provided and allowed by the controls.  
<sup>2</sup> Designed expressly for use with LPG.

**Table F-4  
Standards for Small Water Heaters that are Not Federally Regulated Consumer Products**

<i>Appliance</i>	<i>Energy Source</i>	<i>Input Rating</i>	<i>Rated Storage Volume (gallons)</i>	<i>Minimum Energy Factor<sup>1</sup></i>
Storage water heaters	Gas	≤ 75,000 Btu/hr	< 20	0.62 – (.0019 x V)
Storage water heaters	Gas	≤ 75,000 Btu/hr	> 100	0.62 – (.0019 x V)
Storage water heaters	Oil	≤ 105,000 Btu/hr	> 50	0.59 – (.0019 x V)
Storage water heaters	Electricity	≤ 12 kW	> 120	0.93 – (.00132 x V)
Instantaneous Water Heaters	Gas	≤ 50,000 Btu/hr	Any	0.62 – (.0019 x V)
Instantaneous Water Heaters	Gas	≤ 200,000 Btu/hr	≥ 2	0.62 – (.0019 x V)
Instantaneous Water Heaters	Oil	≤ 210,000 Btu/hr	Any	0.59 – (.0019 x V)

Instantaneous Water Heaters	Electricity	$\leq 12$ kW	Any	$0.93 - (.00132 \times V)$
<sup>1</sup> Volume (V) = rated storage volume in gallons.				

**Table H-2  
Standards for Tub Spout Diverters**

<i>Appliance</i>	<i>Testing Conditions</i>	<i>Maximum Leakage Rate</i>
Tub spout diverters	When new	0.01 gpm
	After 15,000 cycles of diverting	0.05 gpm

**Table K-9  
Standards for State-Regulated Incandescent Reflector Lamps**

<b>Rated Lamp Wattage</b>	<b>Minimum Average Lamp Efficacy (LPW)</b>
40-50	10.5
51-66	11.0
67-85	12.5
86-115	14.0
116-155	14.5
156-205	15.0

**Table K-10  
Standards for State-Regulated General Service Incandescent Lamps -Tier I**

<i>Rated Lumen Ranges</i>	<i>Maximum Rated Wattage</i>	<i>Minimum Rated Lifetime</i>	<i>Effective Date</i>
1490-2600 Lumens	72 watts	1,000 Hours	Jan 1, 2011
1050-1489 Lumens	53 watts	1,000 Hours	Jan 1, 2012
750-1049 Lumens	43 watts	1,000 Hours	Jan 1, 2013
310-749 Lumens	29 watts	1,000 Hours	Jan 1, 2013

**Table K-11  
Standards for State-Regulated General Service Lamps -Tier II**

<i>Lumen Ranges</i>	<i>Minimum Lamp Efficacy</i>	<i>Minimum Rated Lifetime</i>	<i>Effective Date</i>
All	45 lumens per watt	1,000 Hours	Jan 1, 2018

**Table K-12**  
**Standards for State-Regulated Modified Spectrum General Service Incandescent Lamps -Tier I**

<i>Rated Lumen Ranges</i>	<i>Maximum Rated Wattage</i>	<i>Minimum Rated Lifetime</i>	<i>Effective Date</i>
1118-1950 Lumens	72 watts	1,000 Hours	Jan 1, 2011
788-1117 Lumens	53 watts	1,000 Hours	Jan 1, 2012
563-787 Lumens	43 watts	1,000 Hours	Jan 1, 2013
232-562 Lumens	29 watts	1,000 Hours	Jan 1, 2013

**Table L-1**  
**Ultrasound Maximum Decibel Values**

<i>Mid-frequency of Sound Pressure Third-Octave Band (in kHz)</i>	<i>Maximum db Level within third-Octave Band (in dB reference 20 micropascals)</i>
Less than 20	80
20 or more to less than 25	105
25 or more to less than 31.5	110
31.5 or more	115

**Table M-2**  
**Standards for Traffic Signal Modules for Pedestrian Control Sold or Offered for Sale in California**

<i>Type</i>	<i>at 25°C (77°F)</i>	<i>At 74°C (165.2°F)</i>
Hand or 'Don't Walk' sign or countdown.	10 watts	12 watts
Walking Person or 'Walk' sign	9 watts	12 watts

**Table N-1**  
**Standards for Under-Cabinet Luminaires**

<i>Lamp Length (inches)</i>	<i>Minimum Ballast Efficacy Factor (BEF) for one lamp</i>	<i>Minimum Ballast Efficacy Factor (BEF) for two lamps</i>
≤29	4.70	2.80
>29 and ≤35	3.95	2.30
>35 and ≤41	3.40	1.90



>41 and ≤47	3.05	1.65
>47	2.80	1.45

**Table N-2**  
**Minimum Requirements for Portable LED Luminaires, and Portable Luminaires with LED Light Engines with Integral Heat Sink**

<b>Criteria</b>	<b>Requirement</b>
Light Output	≥ 200 lumens (initial)
Minimum LED Luminaire Efficacy	29 lumens/W
Minimum LED Light Engine Efficacy	40 lumens/W
Color Correlated Temperature (CCT)	2700 K through 5000 K
Minimum Color Rendering Index (CRI)	75
Power Factor (for luminaires labeled or sold for residential use)	≥ 0.70

**Table U-2**  
**Standards for State-Regulated External Power Supplies Effective January 1, 2007 for external power supplies used with laptop computers, mobile phones, printers, print servers, canners, personal digital assistants (PDAs), and digital cameras.**  
**Effective July 1, 2007 for external power supplies used with wireline telephones and all other applications.**

<b>Nameplate Output</b>	<b>Minimum Efficiency in Active Mode</b>
0 to < 1 watt	0.49 * Nameplate Output
≥ 1 and ≤ 49 watts	0.09 * Ln(Nameplate Output) + 0.49
> 49 watts	0.84
	<b>Maximum Energy Consumption in No-Load Mode</b>
0 to <10 watts	0.5 watts
≥ 10 to ≤ 250 watts	0.75 watts

Where Ln (Nameplate Output) = Natural Logarithm of the nameplate output expressed in watts.

**Table U-3**  
**Standards for State-Regulated External Power Supplies**  
**Effective July 1, 2008**

<b>Nameplate Output</b>	<b>Minimum Efficiency in Active Mode</b>
<1 watt	0.5 * Nameplate Output
≥ 1 and ≤ 51 watts	0.09*Ln(Nameplate Output) + 0.5
> 51 watts	0.85
	<b>Maximum Energy Consumption in No-Load Mode</b>
Any output	0.5 watts

Where Ln (Nameplate Output) = Natural Logarithm of the nameplate output expressed in watts.

**Table V-1  
Standards for Consumer Audio and Video Equipment**

<i>Appliance Type</i>	<i>Effective Date</i>	<i>Maximum Power Usage (Watts)</i>
Compact Audio Products	January 1, 2007	2 W in Audio standby-passive mode for those without a permanently illuminated clock display 4 W in Audio standby-passive mode for those with a permanently illuminated clock display
Digital Versatile Disc Players and Digital Versatile Disc Recorders	January 1, 2006	3 W in Video standby-passive mode

**Table V-2  
Standards for Televisions**

<i>Effective Date</i>	<i>Screen Size (area A in square inches)</i>	<i>Maximum TV Standby-passive Mode Power Usage (watts)</i>	<i>Maximum On Mode Power Usage (P in Watts)</i>	<i>Minimum Power Factor for (P ≥ 100W)</i>
January 1, 2006	All	3 W	No standard	No standard
January 1, 2011 <sup>±</sup>	A < 1400	1 W	$P \leq 0.20 \times A + 32$	0.9
January 1, 2013	A < 1400	1 W	$P \leq 0.12 \times A + 25$	0.9

**Table W-1  
Standards for Large Battery Charger Systems**

<i>Performance Parameter</i>		<i>Standard</i>
Charge Return Factor (CRF)	100 percent, 80 percent Depth of discharge	$CRF \leq 1.10$
	40 percent Depth of discharge	$CRF \leq 1.15$
Power Conversion Efficiency		Greater than or equal to: 89 percent
Power Factor		Greater than or equal to: 0.90
Maintenance Mode Power ( $E_b$ = battery capacity of tested battery)		Less than or equal to: $10 + 0.0012E_b$ W
No Battery Mode Power		Less than or equal to: 10 W

**Table W-2**  
**Standards for Small Battery Charger Systems**

<b>Performance Parameter</b>	<b>Standard</b>
Maximum 24-hour charge and maintenance energy (Wh)  ( $E_b$ = capacity of all batteries in ports and $N$ = number of charger ports)	For $E_b$ of 2.5 Wh or less: $16 \times N$
	For $E_b$ greater than 2.5 Wh and less than or equal to 100 Wh: $12 \times N + 1.6E_b$
	For $E_b$ greater than 100 Wh and less than or equal to 1000 Wh: $22 \times N + 1.5E_b$
	For $E_b$ greater than 1000 Wh: $36.4 \times N + 1.486E_b$
Maintenance Mode Power and No Battery Mode Power (W) ( $E_b$ = capacity of all batteries in ports and $N$ = number of charger ports)	The sum of maintenance mode power and no battery mode power must be less than or equal to: $1 \times N + 0.0021 \times E_b$