Sec. 16a-48-5. Test methods

(a) **General Testing Requirements.** The manufacturer shall cause the testing of units of each basic model of appliance or covered product using the applicable test method listed. If the manufacturer of the basic model does not participate in an approved industry certification program for the basic model, or does not apply such a program to test all units, the testing shall be at a laboratory that, as determined by the Secretary:

(1) has conducted tests using the applicable test method within the previous 12 months;

(2) agrees to interpret and apply the applicable test method set forth precisely as written;

(3) has, and keeps properly calibrated and maintained, all equipment, material, and facilities necessary to apply the applicable test method precisely as written;

(4) agrees to and does maintain copies of all test reports, and provides any such report to the Secretary upon request, for all basic models that are still in commercial production; and

(5) agrees to permit the Secretary to witness any test of such an appliance upon request, up to once per calendar year for each basic model.

(b) **Commercial Clothes Washers:** The test method for commercial clothes washers is that described in 10 CFR Section 430.23(j), Appendix J1 to Subpart B of Part 430 (2005).

(c) **Commercial Refrigerators/Freezers:** The test method for commercial refrigerators and freezers is as follows:

Volume shall be measured using ANSI/AHAM HRF1-1979. Energy consumption shall be measured using ANSI/ASHRAE 1171992, except that the back (loading) doors of pass-through and roll-through refrigerators and freezers shall remain closed throughout the test, and except that the controls of all appliances shall be adjusted to obtain the following product temperatures in degrees Fahrenheit:

- Refrigerator Compartment 38 ± 2
- Freezer Compartment 0 ± 2
- Wine chiller 45 ± 2
- Ice Cream Cabinet -5 ± 2

When a refrigerator, refrigerator-freezer, or freezer can be operated using either alternating current electricity or one or more other sources of primary power, the test shall be performed using alternating current electricity only.

(d) **Illuminated Exit Signs:**

The test method for illuminated exit signs (Energy Star Qualified Exit Signs Specification Version 2.0) is as follows:

(1) Conditions for testing:

(A) testing shall be conducted in clear (non-smoke) conditions;

(B) all measurements shall be made in a stable ambient air temperature of 25°C ± 5°C;

(C) all voltages shall be provided within ± 0.5 percent by a constant voltage power supply;

(D) signs which are rated for continuous operation at more than one AC input voltage shall be tested at each of the rated AC input voltages.

(E) prior to input power or photometric measurements, the sign shall be operated at the rated input voltage for a period of 100 hours;

(F) in addition, a sign with an internal battery shall be operated from the battery for one-

and-one-half hours and then recharged for the period specified by the manufacturer; and

(G) all of the light sources of the sign, except those only energized in the battery operation mode, shall produce light throughout the first 100 hours of operation.

(2) Input power measurement:

Measure the total input power of the sign in its entirety with an appropriate true RMS watt meter at the rated input voltage which represents normal operation. For a sign that includes a battery, the battery circuit shall be connected and the battery fully charged before any measurements are made. Calculate input power per face by dividing total input power of the sign by the number of faces.

(3) Photometric measurements:

Each of the luminance characteristics of the sign shall be measured at three voltages (or three voltages for each of the rated AC input voltages for signs rated for continuous operation at more than one AC input voltage).

(A) the rated input voltage which represents normal operation;

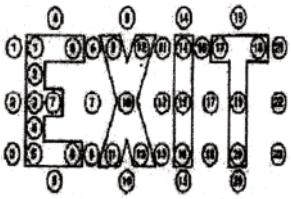
(B) a voltage corresponding to the minimum voltage provided either by the internal battery or a remote emergency power source after one minute of operation, as applicable; and

(C) a voltage corresponding to the minimum voltage provided by the internal battery after the marked rated operating time or at 87.5 percent of the rated emergency input voltage for signs intended to be connected to a remote emergency power source. The level of illumination of the exit sign shall be permitted to decline to 60 percent of the initial illumination by the end of the emergency lighting time duration. All measurements shall be taken with less than 0.01 foot-candles of external illumination on the face of the sign. The luminances shall be measured from two viewing angles: 1) from normal (0°) to the face of the sign, and 2) from 45° to the face of the sign.

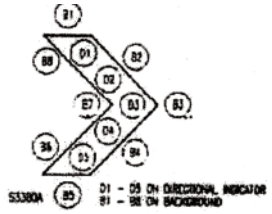
(4) Luminance measurement positions:

The positions where the luminances for the legend and background of the exit sign are to be measured are found in Figures 40.4 through 40.9A (as appropriate for the type of sign being tested) of UL 924-1995 (revised 1999).

(5) Measurement of exit sign luminance



Measurement of directional indicator



The luminance for each numbered position in the legend and directional indicator shall be measured over a circular area as large as possible while maintaining at least a 1.6 mm distance between the perimeter of the circular area and the adjacent border. The positions for measuring the luminances of the background shall lie within 25.4 mm of the legend and directional indicator but no closer than 1.6 mm to the border.

(6) Luminance calculations:

The following shall be calculated:

(A) Average luminance of (i) the legend or background of the legend, whichever is

higher, and where applicable, (ii) the directional indicator or its background, whichever is higher: for each, the luminance of all the positions measured.

(B) Luminance contrast:

$$\text{Contrast} = \frac{Lg - Le}{Lg}$$

Where: Lg is the greater luminance and Le is the lesser luminance, either the variable Lg or Le may represent the legend or directional indicator, and the remaining variable shall represent the respective background.

(C) Minimum luminance of (i) the legend or background of the legend, whichever is higher, and where applicable, (ii) the directional indicator or its background, whichever is higher: for each, the lowest luminance of all points measured.

(D) Maximum to minimum luminance ratio of (i) the legend, or background of the legend, whichever is higher, and where applicable, (ii) the directional indicator or its background, whichever is higher: for each the ratio of the highest luminance of any position measured to the lowest luminance of any position measured.

(e) **Large Packaged Air Conditioning Equipment:** The test method for large packaged air conditioning equipment is ARI Standard 340/360-2000 "Commercial and Industrial Unitary Air-Conditioning and Heat-Pump Equipment."

(f) **Distribution Transformers:** The test method for distribution transformers is NEMA TP-2-2005.

(g) **Torchieres:** There is no test method for torchieres.

(h) **Traffic Signal Modules:** Traffic signal modules must meet the minimum performance requirements of the relevant Institute of Transportation Engineers specification, and be tested under the conditions presented in Section 6.4.2 of the "Interim LED Purchase Specification, Vehicle Traffic Control Signal Heads, Part 2: Light Emitting Diode (LED) Vehicle Traffic Signal Modules (VTCSH Part 2).

(i) **Unit Heaters:** There is no test method for unit heaters.

(j) **Residential furnaces and boilers:** The test method for residential boilers and furnaces is 10 CFR Section 430.23(n) (2005).

(k) **Metal halide lamp fixtures:** The test method for metal halide lamp fixtures is ANSI C82.6-2005.

(*l*) **Single-voltage external AC to DC power supplies:** The test method for single-voltage external ac to dc power supplies is US Epa "test method for calculating the energy efficiency of single-voltage extermal ac-dc and ac-ac power supplies" dated august 11, 2004.

(m) **State regulated incandescent reflector lamps:** Test method for state regulated incandescent reflector lamps is 10 CFR Section 430.23(r) (2005).

(n) **Bottle-type water dispensers:** The test method for bottle-type water dispensers is EPA Energy Star Program Requirements for Bottled Water Coolers (2004), with the exception that units equipped with and integral automatic timer shall not be tested using Section 4D, "Timer Usage", of the referenced test method.

(o) **Commercial hot food holding cabinets:** The test method for commercial hot food

holding cabinets is 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).

(p) **Portable electric spas:** The test method for portable electric spas is as follows:

(1) Minimum continuous testing time shall be 72 hours;

(2) The water temperature shall remain at or above the test temperature of 102°F and the ambient air temperature shall remain at or below the test temperature of 60°F for the duration of the test;

(3) The standard cover that comes with the unit shall be used during the test;

(4) The test shall start when the water temperature has been at 102°F for at least four hours;

(5) The unit shall remain covered and in the default operation mode during the test. Energy-conserving circulation functions, if present, must not be enabled if not appropriate for continuous, long-term use;

(6) Total energy use shall be recorded for the period of the test, beginning at the end of the first heating cycle after the four hour stabilization period, and finishing at the end of the first heating cycle after 72 hours has elapsed;

(7) Data reported shall include: spa identification (make, model, S/N, specifications); volume of the unit in gallons; cover R-value; supply voltage; average relative humidity during the test; minimum, maximum, and average water temperatures during the test; minimum, maximum, and average ambient air temperatures during the test; date of test, length of test (t in hours); total energy used during the test (P, in watt-hours); and standby power (P/T, in watts).

(q) **Residential pool pumps:** The test method for residential pool pumps is as follows:

(1) IEEE 114-2001 shall be used for the measurement of motor efficiency;

(2) ANSI/HI 1.6-2000 shall be used for the measurement of pump and motor combinations efficiency;

(3) Two curves shall be calculated:

Curve A: $H = 0.0167 \times F^2$

Curve B: $H = 0.050 \times F^2$

Where F is the flow rate in gallons per minute and H is the total system head in feet of water.

(4) For each curve (A & B), the pump head shall be adjusted until the flow and head lie on the curve. The following shall be reported for each curve and pump speed (two speed pumps shall be tested at both high and low speeds): head, in feet of water; flow in gallons per minute; power in watts and volt amps; and energy factor in gallons per watt hour, where energy factor (EF) is calculated as: EF = flow (gpm) *60 / power (watts).

(r) **Pool heaters:** The test method for pool heaters is as follows:

Pool Heater Test Methods

Appliance	Test Method
Gas-fired and oil-fired pool heaters	ANSI Z21.56-1998
Electric resistance pool heaters	ANSI/ASHRAE 146-1998

Heat pump pool heaters		ANSI/ASHRAE 146-1998 as modified by Addendum Test Procedures published by Pool Heat Pump Manufacturers Association dated April 1999, Rev. 4: February 28, 2000.	
Reading	**Standard Temperature Rating**	**Low Temperature Rating**	**Spa Conditions Rating**
Air Temperature Dry-bulb Wet-bulb	27°C (80.6°F) 21.7°C (71°F)	10°C (50°F) 6.9°C (44.4°F)	27°C (80.6°F) 21.7°C (71°F)
Relative Humidity	63%	63%	63%
Pool Water Temperature	23.7°C (80°F)	23.7°C (80°F)	40°C (104°F)

(s) **Walk-in Refrigerators and Walk-in Freezers:** There is no test method for walk-in refrigerators or walk-in freezers.

(t) **References**

(1) Section 6.4.2, VTCSH Part 2
Institute of Transportation Engineers
1099 14th Street, NW, Suite 300 West
Washington, DC 20005-3438
Phone: (202) 289-0222
Fax: (202)-289-7722
www.ite.org

(2) CFR, Title 10, Section 430.23 (2005)
Copies available from:
Superintendent of Documents
U.S. Government Printing Office
Washington, DC 20402
www.access.gpo.gov/nara/cfr

(3) Energy Star Qualified Exit Signs Specification Version 2.0; EPA Energy Star Program Requirements for Bottled Water Coolers (2004); EPA test method for calculating the energy efficiency of single-voltage AC-DC and AC-AC power supplies, August 11, 2004.
Copies available from:
US EPA
Energy Star Programs Hotline & Distribution (MS-6202J)
1200 Pennsylvania Ave NW
Washington, DC 20460
www.energystar.gov

(4) ANSI/ASHRAE 117-1992; ANSI/ASHRAE 146-1998
Copies available from:

American Society of Heating, Refrigerating and Air-Conditioning Engineers 1791 Tullie Circle N.E.
Atlanta, GA 30329
Phone: (800) 527-4723 (U.S./Canada) or (404) 636-8400
Fax: (404) 321-5478
www.ashrae.org

(5) ANSI/AHAM HRF1-1979
Copies available from:
Association of Home Appliance Manufacturers
1111 19th Street, NW, Suite 402
Washington, DC 20036
Phone: (202) 872-5955
Fax: (202) 872-9354
www.aham.org

(6) NEMA TP-2-2005
Copies available from:
National Electrical Manufacturers Association
1300 North 17th Street, Suite 1752
Rosslyn, VA 22209
Phone: (703) 841-3200
Fax: (703) 841-5900
www.nema.org

(7) ARI Standard 340/360-2000
Air Conditioning and Refrigeration Institute
4100 N. Fairfax Drive, Suite 200
Arlington, VA 22203
Phone (703)-524-8800
Fax (703)-528-3816
www.ari.org

(8) ANSI C82.6-2005; ANSI Z21.56-1998
Copies available from:
American National Standards Institute 1819 L Street, NW, 6th floor
Washington, DC 20036
www.ansi.org
Phone: (202) 293-8020
Fax: (202) 293-9287

(9) ANSI/ASTM F2140-01
Copies available from:
American Society for Testing and Materials 100 Barr Harbor Drive

West Conshohocken, PA 19428-2959
www.astm.org
Phone: (610) 832-9585
Fax: (610) 832-9555

(10) ANSI/HI 1.6-2000
Copies available from:
Hydraulic Institute
9 Sylvan Way
Parsippany, NJ 07054
www.hydraulicinstitute.com
Phone: (973) 267-9700

(11) IEEE 114-2001
Copies available from:
Institute of Electrical and Electronics Engineers Publications Office
10662 Los Vaqueros Circle
PO Box 3014
Los Alamitos, CA 90720-1264
www.ieee.org
Phone: (714) 821-8380
Fax: (714) 821-4010

(12) Addendum Test Procedure-April 1999, rev. 4: Feb 28, 2000
Copies available from:
Pool Heat Pump Manufacturers Association
Jeff Tawney, President
c/o Aquacal
2737 24th Street, North
St. Petersburg, FL 33713
Phone: (727) 823-5642 ext. 130

(Effective June 27, 1988; Amended April 11, 2006; Amended June 3, 2008)