# Multifamily Performance Program

## Code Reference Guide

### For Minimum Performance Standards

Latest Update January 25, 2022

**All references are from the 2020 NYS Code and supplements**

The purpose of this document is to provide easy reference for any mention of the NYS code within the Minimum Performance Standards and the Inspection Checklist. Where applicable, comply with NYS code or local code, whichever is more stringent.

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# 1 Domestic Hot Water

## 1.1 Piping

All DHW piping in mechanical rooms and all accessible DHW piping in unconditioned spaces shall be insulated to ECCC NYS – See code reference C403.11.3 below.

C403.11.3: Piping serving as part of a heating or cooling system shall be thermally insulated in accordance with Table C403.11.3

**Exceptions:**

- Factory-installed piping within HVAC equipment tested and rated in accordance with a test procedure referenced by this code.
- Factory-installed piping within room fan-coils and unit ventilators tested and rated according to AHRI 440 (except that the sampling and variation provisions of Section 6.5 shall not apply) and AHRI 840, respectively.
- Piping that conveys fluids that have a design operating temperature range between 60°F and 105°F.
- Piping that conveys fluids that have not been heated or cooled through the use of fossil fuels or electric power.
- Strainers, control valves, and balancing valves associated with piping1 inch or less in diameter.
- Direct buried piping that conveys fluids at or below 60°F.

C403.11.3 Minimum Pipe Insulation Thickness (in Inches) [a,c]

| FLUID OPERATING TEMPERATURE RANGE AND USAGE (°F) | INSULATION CONDUCTIVITY | | NOMINAL PIPE OR TUBE SIZE (inches) | | | | |
|---|---|---|---|---|---|---|---|
| | Conductivity Btu • in./(h • ft$^2$ • °F)[b] | Mean Rating Temperature, °F | < 1 | 1 to < 1 1/2 | 1 1/2 to < 4 | 4 to < 8 | ≥ 8 |
| > 350 | 0.32 - 0.34 | 250 | 4.5 | 5.0 | 5.0 | 5.0 | 5.0 |
| 251 – 350 | 0.29 – 0.32 | 200 | 3.0 | 4.0 | 4.5 | 4.5 | 4.5 |
| 201 – 250 | 0.27 – 0.30 | 150 | 2.5 | 2.5 | 2.5 | 3.0 | 3.0 |
| 141 – 200 | 0.25 – 0.29 | 125 | 1.5 | 1.5 | 2.0 | 2.0 | 2.0 |
| 105 – 140 | 0.21 – 0.28 | 100 | 1.0 | 1.0 | 1.5 | 1.5 | 1.5 |
| 40 – 60 | 0.21 – 0.27 | 75 | 0.5 | 0.5 | 1.0 | 1.0 | 1.0 |
| < 40 | 0.20 – 0.26 | 50 | 0.5 | 1.0 | 1.0 | 1.0 | 1.5 |

For SI: 1 inch = 25.4 mm, °C = [(°F)-32]/1.8.

[a] For piping smaller than 1 ½ inches and located in partitions within conditioned spaces, reduction of these thicknesses by 1 inch shall be permitted (before thickness adjustment required in footnote b) but not to a thickness less than 1 inch

*(Table notes continued on next page.)*

[b] For Insulation outside the stated conductivity ranve, the minimum thickness (T) shall be determined as follows:

$$T = r\left[(1 + t/r)^{K/k} - 1\right]$$

where:

T=minimum insulation thickness
r= actual outside radius of pipe
t=insulation thickness listed in the table for applicable fluid temperature and pipe size
K=conductivity of alternate material at mean rating temperature indicated for the applicable fluid temperature
(Btu·in/h·ft2·°F), and
k= the upper value of the conductivity range listed in the table for the applicable fluid temperature.

[c]. For direct buried heating and hot water system piping, reduction of these thicknesses by 1 ½ inches (38mm) shall be permitted (before thickness adjustment required in footnote b but not to thickness less than 1 inch.)

## 1.2 DHW Efficiency

Replacement domestic hot water heating plant(s) shall be ENERGY STAR® labeled. For systems where the ENERGY STAR® label is not available, the specified heating plant(s) shall have a minimum rated efficiency no less than that required by ECCC NYS – See code reference C404.2 below.

C404.2 Service Water-heating Equipment Performance Efficiency: Minimum Performance of Water-Heating Equipment

Water-heating equipment and hot water storage tanks shall meet the requirements of table C404.2. The efficiency shall be verified through data furnished by the manufacturer of the equipment or through certification under an *approved* certification program. Water-heating equipment intended to be used to provide space heating shall meet the applicable provisions of Table C404.2.

| EQUIPMENT TYPE | SIZE CATEGORY (input) | SUBCATEGORY OR RATING CONDITION | PERFORMANCE REQUIRED[a, b] | TEST PROCEDURE |
|---|---|---|---|---|
| Water heaters, electric | ≤ 12 kW[d] | Tabletop[e], ≥ 20 gallons and ≤ 120 gallons | 0.93 - 0.00132*V*, EF | DOE 10 CFR Part 430 |
| | | Resistance ≥ 20 gallons and ≤ 55 gallons | 0.960 - 0.0003*V*, EF | |
| | | Grid-enabled[f] > 75 gallons and ≤ 120 gallons | 1.061 - 0.00168*V*, EF | |
| | > 12 kW | Resistance | $(0.3 + 27/V_m)$, %/h | ANSI Z21.10.3 |
| | ≤ 24 amps and ≤ 250 volts | Heat pump > 55 gallons and ≤ 120 gallons | 2.057 - 0.00113*V*, EF | DOE 10 CFR Part 430 |

C404.2 Service Water-heating Equipment Performance Efficiency (continued)

| | | | | |
|---|---|---|---|---|
| Storage water heaters, gas | ≤ 75,000 Btu/h | ≥ 20 gallons and ≤ 55 gallons<br>> 55 gallons and ≤ 100 gallons | 0.675 - 0.0015*V*, EF<br>0.8012 - 0.00078*V*, EF | DOE 10 CFR Part 430 |
| | > 75,000 Btu/h and ≤ 155,000 Btu/h | < 4,000 Btu/h/gal | 80% $E_t$ $(Q/800 + 110\sqrt{V})$SL, Btu/h | ANSI Z21.10.3 |
| | > 155,000 Btu/h | < 4,000 Btu/h/gal | 80% $E_t$ $(Q/800 + 110\sqrt{V})$SL, Btu/h | |
| Instantaneous water heaters, gas | > 50,000 Btu/h and < 200,000 Btu/h[c] | ≥ 4,000 Btu/h/gal and < 2 gal | 0.82 - 0.00 19*V*, EF | DOE 10 CFR Part 430 |
| | ≥ 200,000 Btu/h | ≥ 4,000 Btu/h/gal and < 10 gal | 80% $E_t$ | ANSI Z21.10.3 |
| | ≥ 200,000 Btu/h | ≥ 4,000 Btu/h/gal and ≥ 10 gal | 80% $E_t$ $(Q/800 + 110\sqrt{V})$SL, Btu/h | |
| Storage water heaters, oil | ≤ 105,000 Btu/h | ≥ 20 gal and ≤ 50 gallons | 0.68 - 0.0019*V*, EF | DOE 10 CFR Part 430 |
| | ≥ 105,000 Btu/h | < 4,000 Btu/h/gal | 80% $E_t$ $(Q/800 + 110\sqrt{V})$SL, Btu/h | ANSI Z21.10.3 |
| Instantaneous water heaters, oil | ≤ 210,000 Btu/h | ≥ 4,000 Btu/h/gal and < 2 gal | 0.59 - 0.0019*V*, EF | DOE 10 CFR Part 430 |
| | > 210,000 Btu/h | ≥ 4,000 Btu/h/gal and < 10 gal | 80% $E_t$ | ANSI Z21.10.3 |
| | > 210,000 Btu/h | ≥ 4,000 Btu/h/gal and ≥ 10 gal | 78% $E_t$ $(Q/800 + 110\sqrt{V})$SL, Btu/h | |
| Hot water supply boilers, gas and oil | ≥ 300,000 Btu/h and < 12,500,000 Btu/h | ≥ 4,000 Btu/h/gal and < 10 gal | 80% $E_t$ | |
| Hot water supply boilers, gas | ≥ 300,000 Btu/h and < 12,500,000 Btu/h | ≥ 4,000 Btu/h/gal and ≥ 10 gal | 80% $E_t$ $(Q/800 + 110\sqrt{V})$SL, Btu/h | ANSI Z21.10.3 |

C404.2 Service Water-heating Equipment Performance Efficiency (continued)

| | | | | |
|---|---|---|---|---|
| Hot water supply boilers, oil | > 300,000 Btu/h and < 12,500,000 Btu/h | > 4,000 Btu/h/gal and > 10 gal | 78% $E_t$ $(Q/800 + 110\sqrt{V})$SL, Btu/h | |
| Pool heaters, gas and oil | All | — | 82% $E_t$ | ASHRAE 146 |
| Heat pump pool heaters | All | — | 4.0 COP | AHRI 1160 |
| Unfired storage tanks | All | — | Minimum insulation requirement R-12.5 (h • $ft^2$ • °F)/Btu | (none) |

For SI: 1 foot = 304.8mm, 1 square foot = 0.0929m2, °C = [(°F)-32]/1.8. 1 British thermal unit per hour = 0.2931W. 1 gallon = 3.785L. 1 British thermal unit per hour per gallon=0.078W/L.

[a] Energy Factor (EF) and thermal efficiency ($E_t$) are minimum requirements. In the EF equation, $V$ is the rated volume in gallons.

[b] Standby Loss (SL) is the maximum Btu/h based on a nominal 70°F temperature difference between stored water and ambient requirements. In the SL equation Q is the nameplate input rate in Btu/h. In the equations for electric water heaters, V is the rated volume in gallons and Vm is the measured volume in gallons. In the SL equation for oil and gas water heaters and boilers, V is the rated volume in gallons.

[c] Instantaneous water heaters with input rates below 200,000 Btu/h shall comply with these requirements where the water heater is designed to heat water to temperatures 180° or higher.

[d] Electric water heaters with an input rating of 122 kW (40,950 Btu/h) or less that are designed to heat water to temperatures of 180°F or greater shall comply with the requirements for electric water heaters that have an input rating greater than 12 kW (40,950 Btu/h)

[e] A tabletop water heater is a water heater that is enclosed in a rectangular cabinet with a flat top surface not more than 3 feet in height.

[f] A grid-enabled water heater is an electric resistance water heater that meets all of the following:

- Has a rated storage tank volume of more than 75 gallons
- Was manufactured on or after April 16, 2015
- Is equipped at the point of manufacture with an activation lock.
- Bears a permanent label applied by the manufacturer that complies with all of the following:
  - Is made of material not adversely affected by water
  - Is attached by means of nonwatery-soluble adhesive
  - Advises punchers and end users of the intended and appropriate use of the product with the following notice printed in 16.5-point Arial Narrow Bold font: “IMPORTANT INFORMATION: This water heater is intended only for use as part of an electric thermal storage or demand response program. It will not provide adequate hot water unless enrolled in such a program and activated by your utility company or another program operator. Confirm the availability of a program in your local area before purchasing or installing this product.”

## 1.3 Heated Water Circulation Control

Recirculation control installed meets ECCC NYS requirements – See code reference C404.6, C404.6.1 and 404.7 below.

C404.6 Heated-Water Circulating and Temperature Maintenance Systems

Heated-water circulation systems shall be in an accordance with Section C404.6.1. Heat trace temperature maintenance systems shall be in accordance with Section C404.6.2. Controls for hot water storage shall be in accordance with Section C404.6.3. Automatic Controls, temperature sensors and pumps shall be in a location with *access*. Manual controls shall be in a location with *ready access.*

C.404.6.1 Circulation Systems

Heated-water circulation systems shall be provided with a circulation pump. The system return pipe shall be a dedicated return pipe or a cold-water supply pipe. Gravity and thermo-syphon circulation systems shall be prohibited. Controls for *circulating hot water system* pumps shall start the pump based on the identification of a demand for hot water within the occupancy. The controls shall automatically turn off the pump when the water in the circulation loop is at the desired temperature and when there is not a demand for hot water.

C404.7 Demand Recirculation Controls

*Demand recirculation water systems* shall have controls that comply with both of the following:

- The controls shall start the pump upon receiving a signal from the action of a user of a fixture or appliance, sensing the presence of a user of a fixture, or sensing the flow of how or tempered water to a fixture fitting or appliance.
- The controls shall limit the temperature of the water entering the cold-water piping to not greater than 104°F (40°C).

# 2 Envelope

## 2.1 Windows and Doors

Specified windows and doors shall be ENERGY STAR® labeled and comply with ECCC NYS – See code reference C301.1, C303.1.3, C402.1.3, C402.1.4, C402.4, C402.4.3.4, C402.4.5 and C402.5.2 below.

[NY]TABLE C301.1

**NEW YORK STATE CLIMATE ZONES BY COUNTY**

| Zone 4A | Zone 5A | Zone 6A |
|---|---|---|
| Bronx | Albany | Allegany |
| Kings | Cayuga | Broome |
| Nassau | Chautauqua | Cattaraugus |
| New York | Chemung | Chenango |
| Queens | Columbia | Clinton |
| Richmond | Cortland | Delaware |
| Suffolk | Dutchess | Essex |
| Westchester | Erie | Franklin |
| | Genesee | Fulton |
| | Greene | Hamilton |
| | Livingston | Herkimer |
| | Monroe | Jefferson |
| | Niagara | Lewis |
| | Onondaga | Madison |
| | Ontario | Montgomery |
| | Orange | Oneida |
| | Orleans | Otsego |
| | Oswego | Schoharie |
| | Putnam | Schuyler |
| | Rensselaer | Steuben |
| | Rockland | St. Lawrence |
| | Saratoga | Sullivan |
| | Schenectady | Tompkins |
| | Seneca | Ulster |
| | Tioga | Warren |
| | Washington | Wyoming |
| | Wayne | |
| | Yates | |

C303.1.3 Fenestration Product Rating

*U-factors* of fenestration products shall be determined as follows:

1. For windows, doors and skylights, *U-factor* ratings shall be determined in accordance with NFRC 100.
2. Where required for garage doors and rolling doors, *U-factor* ratings shall be determined in accordance with either NFRC 100 or ANSI/DASMA 105.

*U-factors* shall be determined by an accredited, independent laboratory, and *labeled* and certified by the manufacturer.

[NY] TABLE C402.1.3

Opaque Thermal Envelope Insulation Component Minimum Requirements, R-Value Method [a-i]

| CLIMATE ZONE | 4 EXCEPT MARINE | | 5 AND MARINE 4 | | 6 | |
|---|---|---|---|---|---|---|
| | All other | Group R | All other | Group R | All other | Group R |
| **Opaque doors** | | | | | | |
| Nonswinging | R-4.75 | R-4.75 | R-4.75 | R-4.75 | R-4.75 | R-4.75 |

For SI: 1 inch = 25.4mm, 1 pound per square foot = 4.88kg/m2, 1 pound per cubic foot = 16 kg/m3.

Ci= Continuous Insulation, NR= No Requirement, LS = Liner System.

[a] Assembly descriptions can be found in ANSI/ASHRAE/IESNA Appendix A.

[b] Where using *R-value* compliance method, a thermal spacer block shall be provided, otherwise use the *U-factor* compliance method in Table C402.1.4.

[c] Reserved

[d] Where heated slabs are below grade, below-grade walls shall comply with the exterior insulation requirements for heated slabs.

[e] "Mass floors" shall be in accordance with Section C402.2.3.

[f] Steel floor joist systems shall be insulated to R-38.

[g] "Mass Walls" shall be in accordance with Section C402.2.2.

[h] The first value is for perimeter insulation and the second value is for slab insulation. Perimeter insulation is not required to extend below the bottom of the slab.

[i] Not applicable to garage doors. See Table C402.1.4.

C402.1.4 Assemble U-Factor, C-Factor, or F-Factor-Based Method

Building thermal envelope opaque assemblies shall meet the requirements of Sections C402.2 and C402.4 based on the climate zone specified in Chapter 3. Building thermal envelope opaque assemblies intended to comply on an assembly U-, C-, or F-factor basis shall have a U-, C-, or F-factor not greater than that specified in Table C402.1.4. Commercial buildings or portions of commercial buildings enclosing Group R occupancies shall use the U-, C-, or F-factor from the "Group R" column of Tables C402.1.4. Commercial buildings or portions of commercial buildings enclosing occupancies other than Group R shall use the U-, C-, or F-factor from the "All Other" column of Table C402.1.4.

[NY] Table C402.1.4 Opaque Thermal Envelope Assembly Maximum Requirements, *U-factor* Method

| CLIMATE ZONE | 4 EXCEPT MARINE | | 5 AND MARINE 4 | | 6 | |
|---|---|---|---|---|---|---|
| | All other | Group R | All other | Group R | All other | Group R |
| **Opaque doors** | | | | | | |
| Swinging door | U-0.61 | U-0.61 | U-0.37 | U-0.37 | U-0.37 | U-0.37 |
| Garage door <14% glazing | U-0.31 | U-0.31 | U-0.31 | U-0.31 | U-0.31 | U-0.31 |

[NY]Table C402.4 Building Envelope Fenestration Maximum *U-Factor* and SHGC Requirements

| CLIMATE ZONE | 4 | 5 | 6 |
|---|---|---|---|
| **Vertical fenestration** | | | |
| ***U*-factor** | | | |
| Fixed fenestration | 0.38 | 0.38 | 0.36 |
| Operable fenestration | 0.45 | 0.45 | 0.43 |
| Entrance doors | 0.77 | 0.77 | 0.77 |
| **SHGC** | | | |
| PF < 0.2 | 0.36 | 0.38 | 0.40 |
| 0.2 ≤ PF < 0.5 | 0.43 | 0.46 | 0.48 |
| PF ≥ 0.5 | 0.58 | 0.61 | 0.64 |
| **Skylights** | | | |
| *U*-factor | 0.50 | 0.50 | 0.50 |
| SHGC | 0.40 | 0.40 | 0.40 |

PF=Projection Factor

C402.4.3 Maximum U- Factor and SHGC

The maximum *U-factor* and solar heat gain coefficient (SHGC) for *fenestration* shall be as specified in the Table C402.4.

The window projection factor shall be determined in accordance with Equation 4-5

$$PF = A/B$$

Where PF=projection factor (decimal).
A=Distance measured horizontally from the farthest continuous extremity of any overhang, eave or permanently attached shading device to the vertical surface of the glazing.
B= Distance measured vertically from the bottom of the flasing to the underside of the overhand, eave or permanently attached shading device.
Where different windows or glass doors have different *PF* values, they shall each be evaluated separately

C402.3.4 Area-Weighted U- Factor

An area-weighted average shall be permitted to satisy the *U-factor* requirements for each fenestration product category *listed* in Table C402.4. Individual fenestration products from different fenestration product categories *listed* in Table 402.4 shall not be combined in calculating area-weighted average *U-factor*.

C402.5 Doors

Opaque swinning doors shall comply with Table C402.1.4. Opaque nonswinging doors shall comply with table 402.1.3. Opaque doors shall be considered as part of the gross area of above-grade walls that are part of the *building thermal envelope.* Other doors shall comply with the provisions of Section C402.4.3 for vertical fenestration.

C402.5.2 Air Leakage of Fenestration

The air leakage of *fenestration* assemblies shall meet the provisions of Table C402.5.2. Testing shall be in accordance with the applicatble reference test standard in Table C402.5.2 by an accredited, independent testing laboratory and *labeled* by the manufacturer.

Exceptions:

- Field-fabricated *fenestration* assemblies that are sealed in accordance with Section C402.5.1
- *Fenestration* in buildings that comply with the testing alternative of Section C402.5 are not required to meet the air leakage requirements in Table C402.5.2.

Table C402.5.2 Maximum Air Leakage Rate for Fenestration Assemblies

| FENESTRATION ASSEMBLY | MAXIMUM RATE (CFM/FT$^2$) | TEST PROCEDURE |
|---|---|---|
| Windows | 0.20 [a] | AAMA/WDMA/CSA101/I.S.2/A440 or NFRC 400 |
| Sliding doors | 0.20 [a] | |
| Swinging doors | 0.20 [a] | |
| Skylights — with condensation weepage openings | 0.30 | |
| Skylights — all other | 0.20 [a] | |
| Curtain walls | 0.06 | NFRC 400 or ASTM E283 at 1.57 psf (75 Pa) |
| Storefront glazing | 0.06 | |
| Commercial glazed swinging entrance doors | 1.00 | |
| Power-operated sliding doors and power operated folding doors | 1.00 | |
| Revolving doors | 1.00 | |
| Garage doors | 0.40 | ANSI/DASMA 105, NFRC 400, or ASTM E283 at 1.57 psf (75 Pa) |
| Rolling doors | 1.00 | |
| High-speed doors | 1.30 | |

For SI: 1 cubic foot per minute = 0.47 L/s. 1 square foot = 0.093m$^2$

[a] The maximum rate for windows, sliding and swinging doors, and skylights is permitted to be 0.3 cfm per square foot of fenestration or door area when tested in accordance with AAMA/WDMA/CSA 101/1.S.2/A440 at 6.24 psf (300pa).

# 3 Heating

## 3.1 Heating System Piping

Boiler and Furnace Systems: All steam, hot water, and, cooling system piping in mechanical rooms and all accessible steam, hot water, and cooling system piping in unconditioned spaces shall be insulated to ECCC NYS – See code reference C403.11.3 below.

C403.11.3: Piping serving as part of a heating or cooling system shall be thermally insulated in accordance with Table C403.11.3

Exceptions:

- Factory-installed piping within HVAC equipment tested and rated in accordance with a test procedure referenced by this code.
- Factory-installed piping within room fan-coils and unit ventilators tested and rated according to AHRI 440 (except that the sampling and variation provisions of Section 6.5 shall not apply) and AHRI 840, respectively.
- Piping that conveys fluids that have a design operating temperature range between 60°F and 105°F.
- Piping that conveys fluids that have not been heated or cooled through the use of fossil fuels or electric power.
- Strainers, control valves, and balancing valves associated with piping 1 inch or less in diameter.
- Direct buried piping that conveys fluids at or below 60°F.

Table C403.11.3 Minimum Pipe Insulation Thickness (in inches) [a,c]

| FLUID OPERATING TEMPERATURE RANGE AND USAGE (°F) | INSULATION CONDUCTIVITY | | NOMINAL PIPE OR TUBE SIZE (inches) | | | | |
|---|---|---|---|---|---|---|---|
| | Conductivity Btu • in./(h • ft$^2$ • °F)[b] | Mean Rating Temperature, °F | < 1 | 1 to < 1 1/2 | 1 1/2 to < 4 | 4 to < 8 | ≥ 8 |
| > 350 | 0.32 - 0.34 | 250 | 4.5 | 5.0 | 5.0 | 5.0 | 5.0 |
| 251 — 350 | 0.29 — 0.32 | 200 | 3.0 | 4.0 | 4.5 | 4.5 | 4.5 |
| 201 — 250 | 0.27 — 0.30 | 150 | 2.5 | 2.5 | 2.5 | 3.0 | 3.0 |
| 141 — 200 | 0.25 — 0.29 | 125 | 1.5 | 1.5 | 2.0 | 2.0 | 2.0 |
| 105 — 140 | 0.21 — 0.28 | 100 | 1.0 | 1.0 | 1.5 | 1.5 | 1.5 |
| 40 — 60 | 0.21 — 0.27 | 75 | 0.5 | 0.5 | 1.0 | 1.0 | 1.0 |
| < 40 | 0.20 — 0.26 | 50 | 0.5 | 1.0 | 1.0 | 1.0 | 1.5 |

*(Table notes continued on next page)*

For SI: 1 inch = 25.4 mm, °C=[(°F)-32]/1.8.

[a] For piping smaller than 1 ½ inches and located in partitions within conditioned spaces, reduction of these thicknesses by 1 inch shall be permitted (before thickness adjustment required in footnote b) but not to a thickness less than 1 inch.

[b] For insulation outside the stated conductivity range, the minimum thickness (T) shall be determined as follows:

$$T = r\left[(1 + t/r)^{K/k} - 1\right]$$

Where:
T=minimum insulation thickness,
R=actual outside radius of pipe,
*t*=insulation thickness *listed* in the table for applicable fluid temperature and pipe size,
K=conductivity of alternate material at mean rating temperature indicated for the applicable fluid temperature (Btu·in/h·ft$^2$·°F) and
*k*=the upper value of the conductivity range *listed* in the table for the applicable fluid temperature.

[c] For direct-buried heating and hot water system piping, reduction of these thicknesses by 1 ½ inches (38mm) shall be permitted (before thickness adjustments required in footnote b) but not to thicknesses less than 1 inch.

## 3.2 Heating System Efficiency

Heating Systems Efficiency: Replacement heating plants(s) smaller than 300,000 Btuh shall be ENERGY STAR® labeled. Boiler systems (hot water and steam) larger than 300,000 Btuh input shall have a minimum rated efficiency no less than that required by the ECCC NYS. For all other systems where the ENERGY STAR® label is not available, the specified heating plant(s) shall have a minimum rated efficiency no less than that required by the ECCC NYS – See code reference C403.3.2 below.

C403.3.2 HVAC Equipment Performance Requirements (Mandatory)

Equipment shall meet the minimum efficiency requirements of Tables C403.3.2(1) through C403.3.2(9) when tested and rated in accordance with the applicable test procedure. Plate-type liquid-to-liquid heat exchangers shall meet the minimum requirements of Table C403.3.2(10). The efficiency shall be verified through certification under an approved certification program or, where a certification program does not exist, the equipment efficiency ratings shall be supported by data furnished by the manufacturer. Where multiple rating conditions or performance requirements are provided, the equipment shall satisfy all stated requirements. Where components, such as indoor or outdoor coils, from different manufacturers are used, calculations and supporting data shall be furnished by the designer that demonstrates that the combined efficiency of the specified components meets the requirements herein.

Table C403.3.2(4) Warm-Air Furnaces and Combination Warm-Air Furnaces/Air-conditioning Units, Warm-Air Duct Furnaces and Unit Heaters, Minimum Efficiency Requirements.

| EQUIPMENT TYPE | SIZE CATEGORY (INPUT) | SUBCATEGORY OR RATING CONDITION | MINIMUM EFFICIENCY[d, e] | TEST PROCEDURE[a] |
|---|---|---|---|---|
| Warm-air furnaces, gas fired | < 225,000 Btu/h | — | 80% AFUE or 80%$E_t$[c] | DOE 10 CFR Part 430 or ANSI Z21.47 |
| | ≥ 225,000 Btu/h | Maximum capacity[c] | 80%$E_t$[f] | ANSI Z21.47 |
| Warm-air furnaces, oil fired | < 225,000 Btu/h | — | 83% AFUE or 80%$E_t$[c] | DOE 10 CFR Part 430 or UL 727 |
| | ≥ 225,000 Btu/h | Maximum capacity[b] | 81%$E_t$[g] | UL 727 |
| Warm-air duct furnaces, gas fired | All capacities | Maximum capacity[b] | 80%$E_c$ | ANSI Z83.8 |
| Warm-air unit heaters, gas fired | All capacities | Maximum capacity[b] | 80%$E_c$ | ANSI Z83.8 |
| Warm-air unit heaters, oil fired | All capacities | Maximum capacity[b] | 80%$E_c$ | UL 731 |

For SI: 1 British thermal unit per hour = 0.2931W.

[a] Chapter 6 contains a complete specification of the referenced test procedure, including the referenced year version of the test procedure.

[b] Minimum and maximum ratings as provided for and allowed by the unit's controls.

[c] Combination units not covered by the National Appliance Energy Conservation Act of 1987 (NAECA) (3-phase power or cooling capacity greater than or equal to 65,000 Btu/h [19kW]) shall comply with either rating.

[d] $E_t$=Thermal efficiency. See test procedure for detailed discussion.

[e] $E_C$= Combustion efficiency (100% less flue losses). See test procedure for detailed discussion.

[f] $E_C$=Combustion efficiency. Units shall also include an IID, have jackets not exceeding 0.75 percent of the input rating, and have either power venting or a flue damper. A vent damper is an acceptable alternative to a flue damper for those furnaces where combustion air is drawn from the conditioned space.

[g] $E_t$=Thermal efficiency. Units shall also include an IID, have jackets not exceeding 0.75 percent of the input rating, and have either power venting or a flue damper. A vent damper is an acceptable alternative to a flue damper for those furnaces where combustion air is drawn from the conditioned space.

Table C403.3.2(5) Minimum Efficiency Requirements: Gas- and Oil-Fired Boilers

| EQUIPMENT TYPE[a] | SUBCATEGORY OR RATING CONDITION | SIZE CATEGORY (INPUT) | MINIMUM EFFICIENCY[d, e] | TEST PROCEDURE |
|---|---|---|---|---|
| Boilers, hot water | Gas-fired | < 300,000 Btu/h[f, g] | 82% AFUE | 10 CFR Part 430 |
| | | ≥ 300,000 Btu/h and ≤ 2,500,000 Btu/h[b] | 80% $E_t$ | 10 CFR Part 431 |
| | | > 2,500,000 Btu/h[a] | 82% $E_c$ | |
| | Oil-fired[c] | < 300,000 Btu/h[g] | 84% AFUE | 10 CFR Part 430 |
| | | ≥ 300,000 Btu/h and ≤ 2,500,000 Btu/h[b] | 82% $E_t$ | 10 CFR Part 431 |
| | | > 2,500,000 Btu/h[a] | 84% $E_c$ | |
| Boilers, steam | Gas-fired | < 300,000 Btu/h[f] | 80% AFUE | 10 CFR Part 430 |
| | Gas-fired- all, except natural draft | ≥ 300,000 Btu/h and ≤ 2,500,000 Btu/h[b] | 79% $E_t$ | 10 CFR Part 431 |
| | | > 2,500,000 Btu/h[a] | 79% $E_t$ | |
| | Gas-fired-natural draft | ≥ 300,000 Btu/h and ≤ 2,500,000 Btu/h[b] | 77% $E_t$ | |
| | | > 2,500,000 Btu/h[a] | 77% $E_t$ | |
| | Oil-fired[c] | < 300,000 Btu/h | 82% AFUE | 10 CFR Part 430 |
| | | ≥ 300,000 Btu/h and ≤ 2,500,000 Btu/h[b] | 81% $E_t$ | 10 CFR Part 431 |
| | | > 2,500,000 Btu/h[a] | 81% $E_t$ | |

For SI: British thermal unit per hour = 0.2931W.

[a] These requirements apply to all boilers with rated input of 8,000,000 Btu/h or less that are not packaged boilers and to all packaged boilers. Minimum efficiency requirements for boilers cover all capacities of packaged boilers.

[b] maximum capacity–minimum and maximum ratings as provided for and allowed by the unit's controls.

[c] includes oil-fired (residual).

[d] $E_C$= combustion efficiency (100 percent less flue losses)

[e] $E_t$=Thermal efficiency. See referenced standard for detailed information.

[f] Boilers shall not be equipped with a constant-burning ignition pilot.

[g] A boiler not equipped with a tankless domestic water heating coil shall be equipped with an automatic means for adjusting the temperature of the water such that an incremental change in inferred heat load produces a corresponding incremental change in the temperature of the water supplied.

## 3.3 Heat Pumps

HEAT PUMPS: Equipment with a capacity of 65,000 btu/hr or less shall be listed on the NEEP Cold Climate ASHP Specification Listing. Equipment with a capacity of more than 65,000 btu/hr shall comply with ECCC NYS minimum efficiencies – See code reference C403.3.2(2) and C403.3.2(3) below.

Table C403.3.2(2) Minimum Efficiency Requirements: Electrically Operated Unitary and Applied Heat Pumps

| EQUIPMENT TYPE | SIZE CATEGORY | HEATING SECTION TYPE | SUBCATEGORY OR RATING CONDITION | MINIMUM EFFICIENCY | TEST PROCEDURE[a] |
|---|---|---|---|---|---|
| Air cooled (cooling mode) | < 65,000 Btu/h[b] | All | Split System | 14.0 SEER | AHRI 210/240 |
| | | | Single Package | 14.0 SEER | |
| Through-the-wall, air cooled | ≤ 30,000 Btu/h[b] | All | Split System | 12.0 SEER | |
| | | | Single Package | 12.0 SEER | |
| Single-duct high-velocity air cooled | < 65,000 Btu/h[b] | All | Split System | 11.0 SEER | |
| Air cooled (cooling mode) | ≥ 65,000 Btu/h and < 135,000 Btu/h | Electric Resistance (or None) | Split System and Single Package | 11.0 EER 12.0 IEER | AHRI 340/360 |
| | | All other | Split System and Single Package | 10.8 EER 11.8 IEER | |
| | ≥ 135,000 Btu/h and < 240,000 Btu/h | Electric Resistance (or None) | Split System and Single Package | 10.6 EER 11.6 IEER | |
| | | All other | Split System and Single Package | 10.4 EER 11.4 IEER | |

**Table C403.3.2(2) Continued**

| | | | | | |
|---|---|---|---|---|---|
| | ≥ 240,000 Btu/h | Electric Resistance (or None) | Split System and Single Package | 9.5 EER 10.6 IEER | |
| | | All other | Split System and Single Package | 9.3 EER 9.4 IEER | |
| Water to Air: Water Loop (cooling mode) | < 17,000 Btu/h | All | 86°F entering water | 12.2 EER | ISO 13256-1 |
| | ≥ 17,000 Btu/h and < 65,000 Btu/h | All | 86°F entering water | 13.0 EER | |
| | ≥ 65,000 Btu/h and < 135,000 Btu/h | All | 86°F entering water | 13.0 EER | |
| Water to Air: Ground Water (cooling mode) | < 135,000 Btu/h | All | 59°F entering water | 18.0 EER | ISO 13256-1 |
| Brine to Air: Ground Loop (cooling mode) | < 135,000 Btu/h | All | 77°F entering water | 14.1 EER | ISO 13256-1 |
| Water to Water: Water Loop (cooling mode) | < 135,000 Btu/h | All | 86°F entering water | 10.6 EER | ISO 13256-2 |
| Water to Water: Ground Water (cooling mode) | < 135,000 Btu/h | All | 59°F entering water | 16.3 EER | |
| Brine to Water: Ground Loop (cooling mode) | < 135,000 Btu/h | All | 77°F entering fluid | 12.1 EER | |

**Table C403.3.2(2) Continued**

| | | | | | |
|---|---|---|---|---|---|
| Air cooled (heating mode) | < 65,000 Btu/h[b] | — | Split System | 8.2 HSPF | AHRI 210/240 |
| | | — | Single Package | 8.0 HSPF | |
| Through-the-wall, (air cooled, heating mode) | ≤ 30,000 Btu/h[b] (cooling capacity) | — | Split System | 7.4 HSPF | |
| | | — | Single Package | 7.4 HSPF | |
| Small-duct high velocity (air cooled, heating mode) | < 65,000 Btu/h[b] | — | Split System | 6.8 HSPF | |
| Air cooled (heating mode) | ≥ 65,000 Btu/h and < 135,000 Btu/h (cooling capacity) | — | 47°F db/43°F wb outdoor air | 3.3 COP | AHRI 340/360 |
| | | | 17°Fdb/15°F wb outdoor air | 2.25 COP | |
| | ≥ 135,000 Btu/h (cooling capacity) | — | 47°F db/43°F wb outdoor air | 3.2 COP | |
| | | | 17°Fdb/15°F wb outdoor air | 2.05 COP | |
| Water to Air: Water Loop (heating mode) | < 135,000 Btu/h (cooling capacity) | — | 68°F entering water | 4.3 COP | ISO 13256-1 |
| Water to Air: Ground Water (heating mode) | < 135,000 Btu/h (cooling capacity) | — | 50°F entering water | 3.7 COP | |
| Brine to Air: Ground Loop (heating mode) | < 135,000 Btu/h (cooling capacity) | — | 32°F entering fluid | 3.2 COP | |

**Table C403.3.2(2) Continued**

| | | | | | |
|---|---|---|---|---|---|
| Water to Water: Water Loop (heating mode) | < 135,000 Btu/h (cooling capacity) | — | 68°F entering water | 3.7 COP | ISO 13256-2 |
| Water to Water: Ground Water (heating mode) | < 135,000 Btu/h (cooling capacity) | — | 50°F entering water | 3.1 COP | |
| Brine to Water: Ground Loop (heating mode) | < 135,000 Btu/h (cooling capacity) | — | 32°F entering fluid | 2.5 COP | |

For SI: 1 British thermal unit per hour = 0.2931 W, °C=[(°F)-32]/1.8.

[a] Chapter 6 contains a complete specification of the referenced test procedure, including the reference year version of the test procedure.

[b] Single-phase, air-cooled heat pumps less than 65,000 Btu/h are regulated by NAECA. SEER and HSPF values are those set by NAECA.

Table C403.3.2(3)

Minimum Efficiency requirements: electrically Operated Packaged Terminal Air Conditioners, Packaged Terminal Heat Pumps, Single Package Vertical Air Conditioners, Single Vertical Heat Pumps, Room Air Conditioners and Room Air-Conditioning Heat Pumps

| EQUIPMENT TYPE | SIZE CATEGORY (INPUT) | SUBCATEGORY OR RATING CONDITION | MINIMUM EFFICIENCY | TEST PROCEDURE[a] |
|---|---|---|---|---|
| PTAC (cooling mode) new construction | All Capacities | 95°F db outdoor air | 14.0 — (0.300 × Cap/1000) EER | AHRI 310/380 |
| PTAC (cooling mode) replacements[b] | All Capacities | 95°F db outdoor air | 10.9 - (0.213 × Cap/1000) EER | |
| PTHP (cooling mode) new construction | All Capacities | 95°F db outdoor air | 14.0 - (0.300 × Cap/1000) EER | |
| PTHP (cooling mode) replacements[b] | All Capacities | 95°F db outdoor air | 10.8 - (0.213 × Cap/1000) EER | |
| PTHP (heating mode) new construction | All Capacities | — | 3.2 - (0.026 × Cap/1000) COP | |
| PTHP (heating mode) replacements[b] | All Capacities | — | 2.9 - (0.026 × Cap/1000) COP | |
| SPVAC (cooling mode) | < 65,000 Btu/h | 95°F db/ 75°F wb outdoor air | 9.0 EER | AHRI 390 |
| | ≥ 65,000 Btu/h and < 135,000 Btu/h | 95°F db/ 75°F wb outdoor air | 8.9 EER | |
| | ≥ 135,000 Btu/h and < 240,000 Btu/h | 95°F db/ 75°F wb outdoor air | 8.6 EER | |
| SPVHP (cooling mode) | < 65,000 Btu/h | 95°F db/ 75°F wb outdoor air | 9.0 EER | |
| | ≥ 65,000 Btu/h and < 135,000 Btu/h | 95°F db/ 75°F wb outdoor air | 8.9 EER | |
| | ≥ 135,000 Btu/h and < 240,000 Btu/h | 95°F db/ 75°F wb outdoor air | 8.6 EER | |

**Table C403.3.2(3) Continued**

| | | | | |
|---|---|---|---|---|
| Room air conditioners, with louvered sides | < 6,000 Btu/h | — | 11.0 CEER | ANSI/AHAM RAC-1 |
| | ≥ 6,000 Btu/h and < 8,000 Btu/h | — | 11.0 CEER | |
| | ≥ 8,000 Btu/h and < 14,000 Btu/h | — | 10.9 CEER | |
| | ≥ 14,000 Btu/h and < 20,000 Btu/h | — | 10.7 CEER | |
| | ≥ 20,000 Btu/h and ≤ 25,000 Btu/h | — | 9.4 CEER | |
| | > 25,000 Btu/h | — | 9.0 CEER | |
| Room air conditioners, without louvered sides | < 6,000 Btu/h | — | 10.0 CEER | |
| | ≥ 6,000 Btu/h and < 8,000 Btu/h | — | 10.0 CEER | |
| | ≥ 8,000 Btu/h and < 11,000 Btu/h | — | 9.6 CEER | |
| | ≥ 11,000 Btu/h and < 14,000 Btu/h | — | 9.5 CEER | |
| | ≥ 14,000 Btu/h and < 20,000 Btu/h | — | 9.3 CEER | |
| | ≥ 20,000 Btu/h | — | 9.4 CEER | |
| Room air-conditioner heat pumps with louvered sides | < 20,000 Btu/h | — | 9.8 CEER | |
| | ≥ 20,000 Btu/h | — | 9.3 CEER | |
| Room air-conditioner heat pumps without louvered sides | < 14,000 Btu/h | — | 9.3 CEER | |
| | ≥ 14,000 Btu/h | — | 8.7 CEER | |

**Table C403.3.2(3) Continued**

| | | | | |
|---|---|---|---|---|
| Room air conditioner casement only | All capacities | — | 9.5 CEER | ANSI/AHAM RAC-1 |
| Room air conditioner casement-slider | All capacities | — | 10.4 CEER | |

For SI: 1 British thermal unit per hour = 0.2931 W, °C=[(°F)-32]/1.8, wb=wet bulb, db=dry bulb.
"Cap" = The rated cooling capacity of the project in Btu/h. Where the unit's capacity is less than 7000 Btu/h, use 7000 Btu/h in the calculation. Where the unit's capacity is greater than 15,000 Btu/h, use 15,000 Btu/h in the calculations.

a. Chapter 6 contains a complete specification of the referenced test procedure, including the referenced year version of the test procedure.
b. Replacement unit shall be factory *labeled* as follows: "MANUFACTURED FOR REPLACEMENT APPLICATIONS ONLY: NOT TO BE INSTALLED IN NEW CONSTRUCTION PROJECTS." Replacement efficiencies apply only to units with existing sleeves less than 16 inches (406 mm) in height and less than 42 inches (1067mm) in width.

## 3.4 Distribution System Control

Distribution System Replacements: When replacing existing distribution systems or installing new systems, terminal heating and cooling distribution equipment serving an apartment shall be controlled by a thermostat(s) located within the same apartment as per ECCC NYS – See code reference C403.4.1 below.

C403.4.1 Thermostatic Controls (Mandatory)

The supply of heating and cooling energy to each *zone* shall be controlled by the individual thermostatic controls capable of responding to temperature within the *zone*. Where humidifiers or dehumidification or both is provided, not fewer than one humidity control device shall be provided for each humidity control system.

Exception: Independent perimeter systems that are designed to offset only building envelope heat losses, gains or both serving one or more perimeter *zones* also served by an interior system provided that both of the following conditions are met:

- The perimeter system includes not fewer than one thermostatic control *zone* for each building exposure having *exterior walls* facing only one orientation (within ±45 degrees) (0.8rad) for more than 50 contiguous feet (15,240 mm).
- The perimeter system heating and cooling supply is controlled by thermostats located within the *zones* served by the system.

# 4 Cooling

## 4.1 PTAC Efficiency

Packaged Terminal Air Conditioners: Equipment shall be ENERGY STAR® labeled (for all model sizes covered by the ENERGY STAR® label). Where sizing does not allow ENERGY STAR® labeling, equipment shall comply with ECCC NYS minimum efficiencies – See code references C403.3.2 (3).

Table C403.3.2(3)

Minimum Efficiency requirements: Electrically Operated Packaged Terminal Air Conditioners, Packaged Terminal Heat Pumps, Single-Packaged Vertical Air Conditioners, Single Vertical Heat Pumps, Room Air Conditioners, and Room Air-Conditioner Heat Pumps

| EQUIPMENT TYPE | SIZE CATEGORY (INPUT) | SUBCATEGORY OR RATING CONDITION | MINIMUM EFFICIENCY | TEST PROCEDURE[a] |
|---|---|---|---|---|
| PTAC (cooling mode) new construction | All Capacities | 95°F db outdoor air | 14.0 — (0.300 × Cap/1000) EER | AHRI 310/380 |
| PTAC (cooling mode) replacements[b] | All Capacities | 95°F db outdoor air | 10.9 - (0.213 × Cap/1000) EER | |
| PTHP (cooling mode) new construction | All Capacities | 95°F db outdoor air | 14.0 - (0.300 × Cap/1000) EER | |
| PTHP (cooling mode) replacements[b] | All Capacities | 95°F db outdoor air | 10.8 - (0.213 × Cap/1000) EER | |
| PTHP (heating mode) new construction | All Capacities | — | 3.2 - (0.026 × Cap/1000) COP | |
| PTHP (heating mode) replacements[b] | All Capacities | — | 2.9 - (0.026 × Cap/1000) COP | |

**Table C403.3.2(2) Continued**

| | | | | |
|---|---|---|---|---|
| SPVAC (cooling mode) | < 65,000 Btu/h | 95°F db/ 75°F wb outdoor air | 9.0 EER | AHRI 390 |
| | ≥ 65,000 Btu/h and < 135,000 Btu/h | 95°F db/ 75°F wb outdoor air | 8.9 EER | |
| | ≥ 135,000 Btu/h and < 240,000 Btu/h | 95°F db/ 75°F wb outdoor air | 8.6 EER | |
| SPVHP (cooling mode) | < 65,000 Btu/h | 95°F db/ 75°F wb outdoor air | 9.0 EER | |
| | ≥ 65,000 Btu/h and < 135,000 Btu/h | 95°F db/ 75°F wb outdoor air | 8.9 EER | |
| | ≥ 135,000 Btu/h and < 240,000 Btu/h | 95°F db/ 75°F wb outdoor air | 8.6 EER | |

For SI: 1 British thermal unit per hour = 0.2931W, °C = [(°F)-32]/1.8, wb=wet bulb, db=dry bulb.

"Cap" = The rated cooling capacity of the project in Btu/h. Where the unit's capacity is less than 7000 Btu/h, use 7000 Btu/h in the calculation. Where the unit's capacity is greater than 15,000 Btu/h, use 15,000 Btu/h in the calculations.

3. Chapter 6 contains a complete specification of the referenced test procedure, including the referenced year version of the test procedure.
4. Replacement unit shall be factory *labeled* as follows: "MANUFACTURED FOR REPLACEMENT APPLICATIONS ONLY: NOT TO BE INSTALLED IN NEW CONSTRUCTION PROJECTS." Replacement efficiencies apply only to units with existing sleeves less than 16 inches (406 mm) in height and less than 42 inches (1067 mm) in width.

## 4.2 Chillers

Chillers: Equipment shall meet the requirements of ECCC NYS – See code reference C403.3.2(7) and C403.3.2(8) below.

Table C403.3.2(7) Water Chilling Packages – Efficiency Requirements [a,b,d]

| EQUIPMENT TYPE | SIZE CATEGORY | UNITS | BEFORE 1/1/2015 | | AS OF 1/1/2015 | | TEST PROCEDURE[c] |
|---|---|---|---|---|---|---|---|
| | | | Path A | Path B | Path A | Path B | |
| Air-cooled chillers | < 150 Tons | EER (Btu/W) | ≥ 9.562 FL | NA[c] | ≥ 10.100 FL | ≥ 9.700 FL | |
| | | | ≥ 12.500 IPLV | | ≥ 13.700 IPLV | ≥ 15,800 IPLV | |
| | ≥ 150 Tons | | ≥ 9.562 FL | NA[c] | ≥ 10.100 FL | ≥ 9.700 FL | |
| | | | ≥ 12.500 IPLV | | ≥ 14.000 IPLV | ≥ 16.100 IPLV | |
| Air cooled without condenser, electrically operated | All capacities | EER (Btu/W) | Air-cooled chillers without condenser shall be rated with matching condensers and complying with air-cooled chiller efficiency requirements. | | | | |
| | < 75 Tons | | ≤ 0.780 FL | ≤ 0.800 FL | ≤ 0.750 FL | ≤ 0.780 FL | |
| | | | ≤ 0.630 IPLV | ≤ 0.600 IPLV | ≤ 0.600 IPLV | ≤ 0.500 IPLV | |
| | ≥ 75 tons and < 150 tons | | ≤ 0.775 FL | ≤ 0.790 FL | ≤ 0.720 FL | ≤ 0.750 FL | |
| | | | ≤ 0.615 IPLV | ≤ 0.586 IPLV | ≤ 0.560 IPLV | ≤ 0.490 IPLV | |

**Table C403.3.2(7) Continued**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Water cooled, electrically operated positive displacement | ≥ 150 tons and < 300 tons | kW/ton | ≥ 0.680 FL | ≥ 0.718 FL | ≥ 0.660 FL | ≥ 0.680 FL | AHRI 550/590 |
| | | | ≥ 0.580 IPLV | ≥ 0.540 IPLV | ≥ 0.540 IPLV | ≥ 0.440 IPLV | |
| | ≥ 300 tons and < 600 tons | | ≤ 0.620 FL | ≤ 0.639 FL | ≤ 0.610 FL | ≤ 0.625 FL | |
| | | | ≤ 0.540 IPLV | ≤ 0.490 IPLV | ≤ 0.520 IPLV | ≤ 0.410 IPLV | |
| | ≥ 600 tons | | ≤ 0.620 FL | ≤ 0.639 FL | ≤ 0.560 FL | ≤ 0.585 FL | |
| | | | ≤ 0.540 IPLV | ≤ 0.490 IPLV | ≤ 0.500 IPLV | ≤ 0.380 IPLV | |
| Water cooled, electrically operated centrifugal | < 150 Tons | kW/ton | ≤ 0.634 FL | ≤ 0.639 FL | ≤ 0.610 FL | ≤ 0.695 FL | |
| | | | ≤ 0.596 IPLV | ≤ 0.450 IPLV | ≤ 0.550 IPLV | ≤ 0.440 IPLV | |
| | ≥ 150 tons and < 300 tons | | ≤ 0.634 FL | ≤ 0.639 FL | ≤ 0.610 FL | ≤ 0.635 FL | |
| | | | ≤ 0.596 IPLV | ≤ 0.450 IPLV | ≤ 0.550 IPLV | ≤ 0.400 IPLV | |
| | ≥ 300 tons and < 400 tons | | ≤ 0.576 FL | ≤ 0.600 FL | ≤ 0.560 FL | ≤ 0.595 FL | |
| | | | ≤ 0.549 IPLV | ≤ 0.400 IPLV | ≤ 0.520 IPLV | ≤ 0.390 IPLV | |
| | ≥ 400 tons and < 600 tons | | ≤ 0.576 FL | ≤ 0.600 FL | ≤ 0.560 FL | ≤ 0.585 FL | |
| | | | ≤ 0.549 IPLV | ≤ 0.400 IPLV | ≤ 0.500 IPLV | ≤ 0.380 IPLV | |

**Table C403.3.2(7) Continued**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | < 150 Tons | | ≤ 0.634 FL | ≤ 0.639 FL | ≤ 0.610 FL | ≤ 0.695 FL | |
| | | | ≤ 0.596 IPLV | ≤ 0.450 IPLV | ≤ 0.550 IPLV | ≤ 0.440 IPLV | |
| | ≥ 150 tons and < 300 tons | | ≤ 0.634 FL | ≤ 0.639 FL | ≤ 0.610 FL | ≤ 0.635 FL | |
| | | | ≤ 0.596 IPLV | ≤ 0.450 IPLV | ≤ 0.550 IPLV | ≤ 0.400 IPLV | |
| Air cooled, absorption, single effect | All capacities | COP | ≥ 0.600 FL | NA[c] | ≥ 0.600 FL | NA[c] | AHRI 560 |
| Water cooled absorption, single effect | All capacities | COP | ≥ 0.700 FL | NA[c] | ≥ 0.700 FL | NA[c] | |
| Absorption, double effect, indirect fired | All capacities | COP | ≥ 1.000 FL | NA[c] | ≥ 1.000 FL | NA[c] | |
| | | | ≥ 1.050 IPLV | | ≥ 1.050 IPLV | | |
| Absorption double effect direct fired | All capacities | COP | ≥ 1.000 FL | NA[c] | ≥ 1.000 FL | NA[c] | |
| | | | ≥ 1.000 IPLV | | ≥ 1.050 IPLV | | |

[a] The requirements for centrifugal chiller shall be adjusted for nonstandard rating conditions in accordance with Section C403.3.2.1 and are only applicable for the range of conditioners *listed* in Section C403.3.2.1. The requirements for air-cooled, water-cooled positive displacement and absorption chillers are at standard rating condition defined in the reference test procedure.

[b] Both the full-load and IPLV requirements shall be met of exceeded to comply with this standard. Where there is a Path B, compliance can be with either Path A or Path B for any application.

[c] NA means the requirements are not applicable for Path B and only Path A can be used for compliance.

[d] FL represents the full-load performance requirements and IPLV the part-load performance requirements.

# 5 Lighting

## 5.1 Lighting Controls

Lighting Controls: When replacing or upgrading lighting, occupant sensor controls must be installed in storage closets, compactor rooms, common area bathrooms, etc., as required by ECCC NYS – See code reference C405.2.1 and C405.2.1.1 below.

Dwelling units within multifamily buildings shall comply with Section R404.1. All other dwelling units shall comply with Section R404.1, or with Sections C405.2.4 and C405.3. Sleeping units shall comply with Section C405.2.4, and with Section R404.1 or C405.3.

C405.1 General (Mandatory)

This section covers lighting system controls, the maximum lighting power for interior and exterior applications and electrical energy consumption.

> *Dwelling units* within multifamily buildings shall comply with Section C404.1. All other *dwelling units* shall comply with Section R404.1, or with Sections C405.2.4 and C405.3. *Sleeping units* shall comply with Section C405.2.4, and with Section R404.1 or C405.3.

C405.2 Lighting Controls (mandatory)

Lighting systems shall be provided with controls that comply with one of the following.

1. Lighting controls as specificed in Sections C405.2.1 through C405.2.6.
2. Luminaire level lighting controls (LLLC) and lighting controlas as specificed in Sections C405.2.1 C405.2.4 and C405.2.5. The LLLC luminaire shall be independently capable of:

   2.1 Monitoring Occupant Activity to brighten of dim lighting when occupied or unoccupied, respectively.

   2.2 Monitoring ambient light, with electric light and daylight, and brighten or dim artificial light to maintain desired light level.

   2.3 For each control strategy, configuraton and reconfiguration of performance parameters including: bright and dim setpoints, timeouts, dimming fade rates, sensor sensitivity adjustments, and wireless zoning configurations.

   Exceptions: Lighting controls are not required for the following:

   - Areas designated as security or emergency areas that are required to be continuously lighted.
   - Interior exit stairways, interior exit ramps and exit passageways.
   - Emergency egress lighting that is normally off.

C405.2.1 Occupant Sensor Controls

Occupant sensor controls shall be installed to control lights in the following space types:

1. Classrooms/lecture/training rooms.
2. Conference/meeting/multipurpose rooms.
3. Copy/Print rooms.
4. Lounges/breakrooms.
5. Enclosed offices.
6. Open plan office areas.
7. Restrooms.
8. Storage Rooms.
9. Locker Rooms.
10. Other spaces 300 square feet (28m$^2$) or less that are enclosed by floor-to-ceiling height partitions.
11. Warehouse storage areas.

C405.2.1.1 Occupant Sensor Control Function

Occupant Sensor Controls in warehouses shall comply with Section C405.2.1.2. Occupant sensor controls in open plan office areas shall comply with Section C405.2.1.3. Occupant sensor controls for all other spaces specified in Section C405.2.1 shall comply with the following:

1. They shall automatically turn off lights within 20 minutes after all occupants have left the space.
2. They shall be manual on or controlled to automatically turn on the lighting to not more than 50-percent power.
   - Exception: Full automatic-on controls shall be permitted to control lighting in public corridors, stairways, restrooms, primary building entrance areas and lobbies, and areas where manual-on operation would endanger the safety of the room or building occupants.
3. They shall incorporate a manual control to allow occupants to turn off lights.

C405.2.2.1 Time-Switch Control Function

Each area of the building that is not provided with *occupant sensor controls* complying with Section C405.2.1.1 shall be provided with *time-switch controls* complying with Section C405.2.2.1.

Exception:

- Where a *manual control* provides light reduction in accordance with Section C405.2.2.2, *time-switch controls* shall not be required for the following:
  1. Spaces where patient care is directly provided
  2. Spaces where an automatic shutoff would endanger occupant safety or security
  3. Lighting intended for continuous operation.
  4. Shop and laboratory classrooms.

Each space provided with *time-switch controls* shall be provided with a *manual control* for light reduction in accordance with Section C405.2.2.2. Time-switch *controls* shall include an override switching device that complies with the following:

a. Have a minimum 7-day clock.
b. Be capable of being set for seven different day types per week.
c. Incorporate an automatic holiday "Shutoff" feature, which turns off all controlled lighting loads for not fewer than 24 hours and then resumes normally scheduled operations.
d. Have program backup capabilities, which prevent the loss of program and time settings for not fewer than 10 hours, if power is interrupted.
e. Include an override switch, that complies with the following:

5.1. the override switch shall be a manual control.

5.2. The override switch, when initiated, shall permit the controlled lighting to remain on for not more than 2 hours.

5.3. Any individual override switch shall control the lighting for an area not larger than 5,000 square feet (465$m^2$).

Exceptions:

1.Within mall concourses, auditoriums, sales areas, manufacturing facilities and sports arenas:

1.1 The time limit shall be permitted to be greater than 2 hours, provided that the switch is a captive key device.
1.2 The area controlled buy the override switch shall not be limited to 5,000 square feet (465 $M^2$) provided that such area is less than 20,000 square feet (1860$m^2$).

2. Where provided with *manual control* the following areas are not required to have light reduction control:

2.1 Spaces that have only one luminaire with a rated power of less than 100 watts.
2.2 Spaces that use less than 0.6 watts per square foot (6.5 W/m2).
2.3 Corridors, lobbies, electrical rooms and or mechanical rooms.

## 5.2 Exterior Lighting

Exterior Lighting: Exterior lighting shall have an efficacy of greater than or equal that specified in ECCC NYS – See code reference C405.2.6, C405.2.6.4, C405.4.2, C405.4.2(1), C405.4.2(2), C405.4.2(3), C405.4.2.1. Fixtures must include automatic switching on timers or photocell controls except fixtures intended for 24-hour operation, required for security, or located on apartment balconies.

C405.2.6 Exterior Lighting Controls

Exterior lighting systems shall be provided with controls that comply with Sections C405.2.6.1 through C405.2.6.4. Decorative lighting systems shall comply with Sections C405.2.6.1, C405.2.6.2 and C405.2.6.4.

Exceptions:

- Lighting for covered vehicle entrances and exits from buildings and parking structures where required for eye adaptation.
- Lighting controlled from within *dwelling units*.

C405.2.6.4 Exterior Time-switch Control Function

Time-switch controls for exterior lighting shall comply with the following:

1. They shall have a clock capable of being programmed for not fewer than 7 days.
2. They shall be capable of being set for seven different day types per week.
3. They shall incorporate an automatic holiday setback feature.
4. They shall have program backup capabilities that prevent the loss of program and time settings for a period of not less than 10 hours in the event that power in interrupted.

C405.4.2 Exterior Lighting Power Allowance

The total exterior lighting power allowance is the sum of the base site allowance plus the individual allowances for areas that are to be illuminated by lighting that is powered through the energy service for the building. Lighting power allowances are as specified in Table C405.4.2(2). The lighting zone for the building exterior is determined in accordance with Table C405.4.2(1) unless otherwise specified by the building official.

Table C405.4.2(1) Exterior Lighting Zones

| LIGHTING ZONE | DESCRIPTION |
|---|---|
| 1 | Developed areas of national parks, state parks, forest land, and rural areas |
| 2 | Areas predominantly consisting of residential zoning, neighborhood business districts, light industrial with limited nighttime use and residential mixed-use areas |
| 3 | All other areas not classified as lighting *zone* 1, 2 or 4 |
| 4 | High-activity commercial districts in major metropolitan areas as designated by the local land use planning authority |

**Table C405.4.2(2) Lighting Power Allowances for Building Exteriors**

| | LIGHTING ZONES | | | |
|---|---|---|---|---|
| | **Zone 1** | **Zone 2** | **Zone 3** | **Zone 4** |
| Base Site Allowance | 350 W | 400 W | 500 W | 900 W |
| **Uncovered Parking Areas** | | | | |
| Parking areas and drives | 0.03W/ft$^2$ | 0.04 W/ft$^2$ | 0.06 W/ft$^2$ | 0.08 W/ft$^2$ |
| **Building Grounds** | | | | |
| Walkways and ramps less than 10 feet wide | 0.5 W/linear foot | 0.5 W/linear foot | 0.6 W/linear foot | 0.7 W/linear foot |
| Walkways and ramps 10 feet wide or greater, plaza areas, special feature areas | 0.10 W/ft$^2$ | 0.10 W/ft$^2$ | 0.11 W/ft$^2$ | 0.14 W/ft$^2$ |
| Dining areas | 0.65 W/ft$^2$ | 0.65 W/ft$^2$ | 0.75 W/ft$^2$ | 0.95 W/ft$^2$ |
| Stairways | 0.6 W/ft$^2$ | 0.7 W/ft$^2$ | 0.7 W/ft$^2$ | 0.7 W/ft$^2$ |
| Pedestrian tunnels | 0.12 W/ft$^2$ | 0.12 W/ft$^2$ | 0.14 W/ft$^2$ | 0.21 W/ft$^2$ |
| Landscaping | 0.03 W/ft$^2$ | 0.04 W/ft$^2$ | 0.04 W/ft$^2$ | 0.04 W/ft$^2$ |
| **Building Entrances and Exits** | | | | |
| Pedestrian and vehicular entrances and exits | 14 W/linear foot of opening | 14 W/linear foot of opening | 21 W/linear foot of opening | 21 W/linear foot of opening |
| Entry canopies | 0.20 W/ft$^2$ | 0.25 W/ft$^2$ | 0.4 W/ft$^2$ | 0.4 W/ft$^2$ |
| Loading docks | 0.35 W/ft$^2$ | 0.35 W/ft$^2$ | 0.35 W/ft$^2$ | 0.35 W/ft$^2$ |
| **Sales Canopies** | | | | |
| Free-standing and attached | 0.40 W/ft$^2$ | 0.40 W/ft$^2$ | 0.6 W/ft$^2$ | 0.7 W/ft$^2$ |
| **Outdoor Sales** | | | | |
| Open areas (including vehicle sales lots) | 0.20 W/ft$^2$ | 0.20 W/ft$^2$ | 0.35 W/ft$^2$ | 0.50 W/ft$^2$ |
| Street frontage for vehicle sales lots in addition to "open area" allowance | No allowance | 7 W/linear foot | 7 W/linear foot | 21 W/linear foot |

For SI: 1 foot – 304.8 mm, 1 watt per square foot = W/0.0929 m$^2$.
W = watts.

Table C405.4.2(3) Individual Lighting Power Allowances for Building Exteriors

| LIGHTING ZONES | | | | |
|---|---|---|---|---|
| | **Zone 1** | **Zone 2** | **Zone 3** | **Zone 4** |
| Building facades | No allowance | 0.075 W/ft$^2$ of gross above-grade wall area | 0.113 W/ft$^2$ of gross above-grade wall area | 0.15 W/ft$^2$ of gross above-grade wall area |
| Automated teller machines (ATM) and night depositories | 135 W per location plus 45 W per additional ATM per location | | | |
| Uncovered entrances and gatehouse inspection stations at guarded facilities | 0.5 W/ft$^2$ of area | | | |
| Uncovered loading areas for law enforcement, fire, ambulance and other emergency service vehicles | 0.35 W/ft$^2$ of area | | | |
| Drive-up windows and doors | 200 W per drive through | | | |
| Parking near 24-hour retail entrances. | 400 W per main entry | | | |


| | | | | |
|---|---|---|---|---|
| Building facades | No allowance | 0.075 W/ft$^2$ of gross above-grade wall area | 0.113 W/ft$^2$ of gross above-grade wall area | 0.15 W/ft$^2$ of gross above-grade wall area |
| Automated teller machines (ATM) and night depositories | 135 W per location plus 45 W per additional ATM per location | | | |
| Uncovered entrances and gatehouse inspection stations at guarded facilities | 0.5 W/ft$^2$ of area | | | |
| Uncovered loading areas for law enforcement, fire, ambulance and other emergency service vehicles | 0.35 W/ft$^2$ of area | | | |
| Drive-up windows and doors | 200 W per drive through | | | |
| Parking near 24-hour retail entrances. | 400 W per main entry | | | |


For SI: 1 watt per square foot = W/0.0929m$^2$.
W = watts.

C405.4.2.1 Additional Exterior Lighting Power

Any increase in the exterior lighting power allowance is limited to the specific lighting applications indicated in Table C405.4.2(3). The additional power shall be used only for the luminaires that are serving these applications and shall not be used for any other purpose.

# 6 DHW Fixtures

## DHW Fixture Flow Rates: Faucets and showerheads must not exceed the flow rates specified in current NYS code and supplements - See Code Reference Table 604.4 below.

[NY]Table 604.4 Maximum Flow Rates and Consumption for Plumbing Fixtures and Fixture Fittings

| PLUMBING FIXTURE OR FIXTURE FITTING | MAXIMUM FLOW RATE OR QUANTITY[b] |
|---|---|
| Lavatory, private | 1.5 gpm at 60 psi |
| Lavatory, public (metering) | 0.25 gallon per metering cycle |
| Lavatory, public (other than metering) | 0.5 gpm at 60 psi |
| Shower head[a] | 2.0 gpm at 80 psi |
| Sink faucet | 2.2 gpm at 60 psi |
| Urinal | 0.5 gallon per flushing cycle |
| Water closet | 1.28 gallons per flushing cycle[c] |

For SI: 1 gallon = 3.785 L; 1 gallon per minute – 3.785L/m, 1 pound per square inch = 6.895 kPa.

[a] A hand-held shower spray is a shower head.

[b] Consumption tolerances shall be determined from referenced standards.

[c] [NY] the flush volume for a dual-flush water closet is defined as the composite, average flush volume of two reduced flushes and one full flush.


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