STATE OF NEW YORK
DEPARTMENT OF STATE
ONE COMMERCE PLAZA
99 WASHINGTON AVENUE
ALBANY, NY 12231-0001
HTTPS://DOS.NY.GOV

KATHY HOCHUL
GOVERNOR

WALTER T. MOSLEY
SECRETARY OF STATE

FINAL DRAFT

Proposed Changes to the 2020 New York State Energy Conservation Construction Code
Part 1 of 3 | ECCCNYS Commercial Provisions
July 26, 2024

This document is being developed for the purpose of posting a notice of rule in development for the New York State Fire Prevention and Building Code Council and the New York State Department of State. The purpose is to show the DRAFT proposed changes to the current version of the **New York State Energy Conservation Construction Code** (The State Energy Code). Separate parts of this documents are being issued on the same date: This Part 1 of 3 contains the proposed changes to the Commercial provisions of the document *Energy Conservation Construction Code of New York State* (ECCCNYS); Part 2 of 3 contains the proposed changes to the document *Energy Standard for Sites and Buildings Except Low-Rise Residential Buildings* published by the American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc., also known as ASHRAE 90.1-2022; and Part 3 of 3 contains the proposed changes to the Residential provisions of the ECCCNYS, all part of the State Energy Code.

This document **is not intended to include** all of the proposed code language; it only contains those sections of code that are proposed to be new or modified. Unaltered portions of the 2020 code books are not included within this document and should be considered to remain the same for this code update.

Separate incremental versions of this document have been issued for the Residential and Commercial provisions of the State Energy Code. This Version 3.0 is a compilation of all code changes proposed to date and include those proposed in Versions 1.0 and 2.0. Proposal numbers higher than EC 07-0099, as summarized in the Quick Reference Guide, indicate new changes made since Version 2.0, presented to the Code Council at the meeting of June 2023. The proposed changes are based on the following:

1. Revisions made to Article 11 of the NYS Energy Law on July 5, 2022 by Chapter 374 of the Laws of 2022 - Advanced Building Codes Act (included in Version 1.0 and presented at the meeting of March 31, 2023) and other necessary statutory requirements and statutory amendments (new in this Version 3.0).
2. Proposed changes and editorial modifications received after publication of the 2020 codes of New York State (previously included in Version 1.0 and presented at the meeting of March 31, 2023).
3. Changes consistent with the Climate Action Council's - Scoping Plan of December 2022 in accordance with the Climate Leadership and Community Protection Act (CLCPA)
4. Because the 2020 ECCCNYS is based, in part, on the 2018 International Energy Conservation Code (IECC), coordination and inclusion of:
    a. changes resulting from the 2021 IECC development cycle that were not anticipated to change further in the 2024 IECC development cycle (previously included in Version 2.0 and presented at the meeting of June 23, 2023).
    b. changes based on the IECC current development cycle that have been published in interim Public Comment Documents, Monographs, and Drafts intended to result in the publication of the 2024 IECC (new in this Version 3.0).
5. Incorporation of provisions of NYStretch 2020 that modify the 2020 ECCCNYS:
    a. those that were not anticipated to change further in the 2024 IECC cycle (previously included in Version 2.0 and presented at the meeting of June 23, 2023).
    b. balance of changes with modifications made during development of the 2024 IECC (new in this Version 3.0).

6. Provisions of NYStretch 2020 that modify ASHRAE 90.1 (new in this Version 3.0) are included in Part 2 of this document).

Please note:

- This document may not include grammatical, punctuation, and simple word clarifications that do not change the intent or meaning of a provision.
- The terms "(Prescriptive)" and "(Mandatory)" were removed in the 2021 version of the IECC. Code sections where the only change was the removal of those terms are not included in this document.
- Where a change is made by NYS, rather than an ICC level change, "[NY]" is added to the section numbers; however, grammatical and punctuation changes made by NYS that do not change the intent or meaning of a provision are not denoted by [NY]. Similarly, updates made by NYS where the only change is to the referenced code book (i.e. ~~International Plumbing Code~~ Plumbing Code of New York State) are not denoted by [NY].
- Changes to the existing text are denoted in the following manner:
  - Text insertions: TEXT
  - Text deletions: ~~TEXT~~
- Section numbers presently shown in this document may be based on the 2020 ECCCNYS or the 2024 IECC, **with publication pending as of the time of this issuance**. Cross-referenced code section numbers may not be accurate and/or may change based on ongoing development.
- Where multiple code changes deal with the same topic, they are listed together and consolidated into one proposal number.
- Some code changes involve complex tables, lists, or lengthy sections in which a small change was made to only a portion. In those instances, portions of the section, table, list, etc. that were unchanged may not be included. Conversely, when an exception or a subsection are proposed to be modified, the charging language might be shown for context, such as Chapter 1, which is here presented in its entirety, even where no changes or only purely editorial changes are being proposed.
- Sections that were presented in earlier version of this document might have been further modified as triggered by items 1 through 6 above, and if so, an explanation for the change has been added to the Quick Reference Guide.

Cover sheet - Quick reference guide

Proposal #	Code Section(s)	Section Title	Subject	Origin / Consistency*
Commercial				
EC 07-0001	C101.3	Scope	Remove the exceptions and consolidate with the exceptions listed in Sections C503.1 and C503.6.	ABCA
EC 07-0002	C101.4	Intent	1. Add the reference to “clean energy” and “greenhouse gas” to align with Energy Law. 2. Remove redundant language. 3. Remove language that is no longer part of the Energy Law.	ABCA
EC 07-0003	C101.7	Historic Buildings	Remove duplicate blanket exception for historic buildings.	ABCA
EC 07-0004	C102.2	Other laws and regulations	1. Add the terms “clean energy” and “greenhouse gas” to align with Energy Law. 2. Remove text that is no longer part of the Energy Law. 3. Align with Section R102.2.	ABCA
EC 07-0005	C202	Definitions, modified	Modify the definition for ASHRAE 90.1 so it aligns with the definition for ASHRAE 90.1 in Energy Law.	ABCA
EC 07-0006	C202	Definitions, new	Add a defined term for “character-defining features” which is referenced in Section C501.6.1, below.	ABCA
EC 07-0007	C202	Definitions, modified	1. Modify the definition for historic buildings to align with the definition for historic buildings in Energy Law.	ABCA
EC 07-0008	C501.6	Historic Buildings	1. Modify the exception for historic buildings. 2. Created a subsection identifying the historic building report requirements.	ABCA
EC 07-0009	C503.1	Existing Buildings	1. Consolidate exceptions deleted from Section C101.3. 2. Remove the exception relating to lighting that is a duplicate of and conflicts with the exception listed in Section C503.6.	ABCA
EC 07-0010	Replaced by EC 07-0186			
Residential				
EC 07-0011 to EC 07-0020	Refer to Part 3 of this document			
Items EC 07-0001 to 07-0020 are part of Version 1.0 and were presented to the Code Council at the meeting of March 31, 2023				

Commercial				
EC 07-0021	C101.2 C101.2.1	Title Amendments of New York State code publications	Add amendments section to create uniformity across all NYS code books.	CCP IECC 24
EC 07-0022	C103	Interpretations of Energy Code requirements	1. Modify to align with interpretation provisions as stated in Section 11-103(4) of the NYS Energy Law. 2. Italicize defined terms.	CCP IECC 24
EC 07-0023	C106.1 C106.1.1	General (Inspections) Required Approvals	1. Editorial correction of section reference and minor clarifications. 2. Italicize defined terms where the use is consistent with the definitions in Chapter 2.	CCP IECC 24
EC 07-0024	C202	Definitions, deleted	Delete the definition for the following terms: air-impermeable insulation and fan efficiency grade (FEG), humidistat.	IECC 21
EC 07-0025	C202	Definitions, new	Add new definitions for the following terms: biogas, data center, data center systems, direct digital control (DDC), embedded fan, fan array, fan energy index (FEI), fan nameplate electrical input power, fan system electrical input power, fault detection and diagnostics (FDD) system, information technology equipment (ITE), internal curtain system, thermal distribution efficiency (TDE), vegetative roof, and annual visible transmittance (VTannual).	IECC 21
EC 07-0026	C202	Definitions, modified	Modify the definitions for the following terms: computer room, demand recirculation water system, fenestration, general lighting, networked guestroom control system, on-site renewable energy, and residential building for clarity..	IECC 21 CLCPA
EC 07-0027	NOT USED			
EC 07-0028	Table C301.1	Climate Zones by County	Modify Climate Zone Table to align with the 2021 IECC, based on ASHRAE 169-2021.	IECC 21
EC 07-0029	Table C301.3	Thermal Climate Zone Definitions	Revision of thermal criteria range to align with the 2021 IECC, based on ASHRAE 169-2021.	IECC 21
EC 07-0030	C402.4.1.2	Increased skylight area with daylight responsive controls	1. Remove reference to Section C405.2.3.1. 2. Add the defined term “daylight zones” for clarity.	IECC 21
EC 07-0031	C402.4.2	Minimum skylight fenestration area	1. Add “visible transmittance, annual” values to the requirements. 2. Add exception for storm shelters.	IECC 21

EC 07-0032	C402.4.2.2	Haze factor	1. Expand exception to include tubular daylighting devices and optical diffuser components.	IECC 21
EC 07-0033	C402.4.5 C402.4.5.1 C402.4.5.2	Doors Opaque swinging doors Nonswinging doors	1. Add compliance requirements for opaque doors. 2. Editorial re-arrangement of provisions. 3. [NY] [Further editorial modifications for clarity and to remove redundancies.] 4. Italicize defined terms where the use is consistent with the definitions in Chapter 2.	IECC 21
EC 07-0034	C403.2	System design	Add additional mechanical system efficiency provisions.	IECC 21
EC 07-0035	C403.3.2.1	Water-cooled centrifugal chilling packages	1. Revise a constant in an equation 2. Revise full-load design ranges.	IECC 21
EC 07-0036	C403.4.1.1	Heat pump supplementary heat	Expand and clarify control sequence requirements for supplementary electric resistance heat.	IECC 21
EC 07-0037	C403.4.3.3.2	Heat rejection	Modify to include closed-circuit cooling tower with separate heat exchanger.	IECC 21
EC 07-0038	C403.4.3.3.3	Two-position valve	Add interlock requirement for hydronic heat pump valve control.	IECC 21
EC 07-0039	C403.6.5	Supply-air temperature reset controls	1. Add zone humidity to reset sequence. 2. Delete Exception 3 to align with NY climate zones. 3. Italicize defined terms where the use is consistent with the definitions in Chapter 4. [NY] [Simplified to remove climate zones not present in NY]	IECC 21
EC 07-0040	C403.7.6.1 C403.7.6.2	Automatic control of HVAC systems serving guestrooms Temperature setpoint controls Ventilation controls	1. Editorial arrangement of text into a numbered list. 2. Reduce duration of unoccupied time in guestrooms. 3. Clarify occupied and unoccupied setpoints.	IECC 21
EC 07-0041	C403.8.3	Fan efficiency	1. Replace FEG units with FEI units. 2. Replace AMCA 205 with AMCA 208. 3. Revised exceptions to increase stringency and include additional applications.	IECC 21
EC 07-0042	Tables C403.10.1(1) C403.10.1(2) C403.12.1 Sections C403.12	Minimum Efficiency Requirements: Commercial Refrigeration Minimum Efficiency Requirements: Commercial Refrigerators and Freezers	1. Minimum Efficiency Tables C403.10.1(1) and (2) were deleted and replaced with new Table C403.12.1 for consistency with DOE.	IECC 21 IECC 24

	C403.12.1 C403.12.2 C403.12.2.1	Refrigeration equipment performance Commercial refrigerators, refrigerator-freezers and refrigeration Walk-in coolers and walk-in freezers Performance standards	2. Section C403.12 was modified with references to subsections and a list of affected equipment. 3. Subsections C403.10.1, C403.10.2, and C403.10.2.1 were renumbered and simplified to rely on references to the applicable tables. 4. [NY] Further modified anticipating DOE updates	
EC 07-0043	Table C403.10.2.1(3)	Walk-in Cooler and Freezer Refrigeration System Efficiency Requirements	Table renumbered and modified to include additional equipment and test procedure consistent with DOE and AHRI 1250-2014.	IECC 21
EC 07-0044	C403.10.3	Refrigerated display cases	Deleted to eliminate conflict and rely on DOE standards.	IECC 21
EC 07-0045	C403.13.1	Duct and plenum insulation and sealing	Add requirements for underground/ducts buried beneath buildings.	IECC 21
EC 07-0046	Table C404.5.2.1	Internal volume of various water distribution tubing	New table detailing volume of water per foot of pipe as a function of pipe diameter and pipe material.	IECC 21
EC 07-0047	C404.5.2.1	Water volume determination	Revise by adding reference to new internal volume table.	IECC 21
EC 07-0048	C404.6.1.1	Demand recirculation controls	1. Editorial reorganization of text. 2. Remove high temperature control requirement for cold water.	IECC 21
EC 07-0049	C405.2.1.2	Occupant sensor control function in warehouse storage areas	1. Add 20-minute duration to 50% of occupied lighting setpoint during unoccupied times. 2. Add reference to Section C405.2.2.1. 3. Add manual control requirement.	IECC 21
EC 07-0050	C405.2.1.3	Occupant sensor control function in open plan office areas	1. Add exception for time switch controls complying with Section C405.2.2.1 in lieu of automatic controls in open plan office spaces. 2. Revise for clarity. Italicize defined terms where the use is consistent with the definitions in Chapter 2.	IECC 21
EC 07-0051	C405.2.1.4	Occupant sensor control function in corridors	Add section specifically for occupant sensor control sequence in corridors, with exception for corridors with lower light levels.	IECC 21 Strtch 20
EC 07-0052	C405.2.4.1	Daylight-responsive control function	1. Revise exception to include primary and secondary sidelit daylight zones. 2. Revise dimming controls from 40% to 15% of full light output.	IECC 21 Strtch 20

			3. Add control requirement to dim lights based on light levels during unoccupied times.	
EC 07-0053	C405.2.4.4 Figure C405.2.4.4	Atriums Daylight zones at multistory atriums	Add a section and figure for daylight zone requirements for atriums.	IECC 21
EC 07-0054	C405.3.2	Interior lighting power allowance	Revise to clarify how to use the tables and method whether projects involve entire buildings, only portions of a building, and/or unfinished spaces.	IECC 21
EC 07-0055	C405.8.1.1 C405.8.1.1.1 C405.8.1.1.2 C405.8.1.1.3	Elevator Cabs Power conversion system Motor Transmission Drive	Add requirement for power conversion system on new elevators with a rise of 75 feet or more; efficiency requirements for elevator motors and transmissions; and requirements for capture and reuse of energy released by elevators during motion.	Strtch 20
EC 07-0057	C405.10	Voltage drop	Revise to include additional conductors.	IECC 21
EC 07-0056	C405.10.2.1	Energy recovery	Remove combined weight requirement for escalator energy recovery and limit recovery to downward direction.	IECC 21
EC 07-0058	C405.11 C405.11.1	Automatic receptacle control Automatic receptacle control function	1. Add locations where automatic receptacle control is required. 2. Add provisions for automatic receptable control placement and sequence of operation, with exceptions.	IECC 21
EC 07-0059	C408.2.3.1	Equipment.	Revised to include all new tables located in Section C403.3.2.	IECC 21
EC 07-0060	C502.1	General. Additions	Remove and consolidate redundant and potentially incomplete compliance options.	IECC 21 IECC 24
EC 07-0061	C502.3.1 C502.3.2	Vertical fenestration area Skylight area	Editorial clarifications and re-formatting.	IECC 21
EC 07-0062	C502.3.3	Building mechanical systems	Add commissioning requirements for new mechanical systems and equipment in additions.	IECC 21
EC 07-0063	C502.3.6	Lighting power and systems	Add commissioning requirements for new lighting systems in additions.	IECC 21
EC 07-0064	C503.2.2.1	Application to replacement fenestration products	Add specific provisions for replaced fenestration in alterations, with exceptions.	IECC 21
EC 07-0065	NOT USED			
Items EC 07-0021 to 07-0088 were added in Version 2.0 and presented to the Code Council at the meeting of June 23, 2023				

Commercial				
Proposal #	**Code Section(s)**	**Section Title**	**Subject**	**Origin / Consistency***
EC 07-0099	Chapter 1	Scope and Application Administration and Enforcement	1. Re-organize, update, and consolidate language for consistency with 2024 IECC. 2. Modify for consistency with modifications made to the State Energy Law. 3. Other editorial modifications.	ABCA IECC 24
EC 07-0100	C201	Definitions, General	Clarification on the use of italics and defined terms consistent with the Preface and the Commentary.	CCP
EC 07-0101	C202	Definitions, deleted	NONE	
EC 07-0102	C202	Definitions, new	New definitions for the following terms: air leakage, approved source, automobile parking space, best efficiency point, biodiesel blend, biomass waste, chi-factor, clean water pump, common area, community renewable energy facility, congregate living, construction documents, dedicated outdoor air system, dehumidifier, demand control kitchen ventilation, demand response signal, demand responsive control, desiccant dehumidification system, DX-dedicated outdoor air system units, east-oriented, electric vehicle, electric vehicle capable space, electric vehicle ready space, electric vehicle supply equipment installed space, emittance, energy recovery-series, energy recovery ratio-series, energy storage system, energy use intensity, enthalpy recovery ratio, fan electrical input power, fan system (multiple), financial renewable energy power purchase agreement, fuel gas, fuel oil, green retail tariff, high-capacity gas-fired water heater, high-end trim, horticultural lighting, humidistatic controls, HVAC total system performance ratio, indoor growth, integrated HVAC system, large-diameter ceiling fan, liquid fuel, north-oriented, occupied-standby mode, owner, exterior parking area, interior parking area, parking garage section, photosynthetic photon efficacy, physical renewable energy power purchase agreement, process application, psi-factor, pump energy	IECC 24

			index, purchased energy, renewable energy certificate, renewable energy resources, sensible energy recovery ratio, simulated building performance, south-oriented, substantial improvement, substantially complete building permit application, testing unit enclosure area, thermal block, thermal bridge, total simulated building performance, west-oriented, work area.	
EC 07-0103	C202	Definitions, modified	Modify the definitions for the following terms: air curtain unit, building thermal envelope, fan system design conditions, fenestration, F-factor, greenhouse, low slope (roof), proposed design, roof replacement, sleeping unit, standard reference design, above-grade wall.	IECC 24
	Chapter 3	General Requirements		
EC 07-0105	C303.1.2 C303.1.3 Table C303.1.3(1)	Insulation mark installation Fenestration product rating Default glazed window, glass door and skylight *u*-factors	1. Requirement of an insulation certificate for products without an R-value mark. 2. Added fenestration rating standards for solar heat gain coefficient and visible transmittance.	IECC 24
	Chapter 4	Commercial Energy Efficiency		
EC 07-0106	NOT USED			
EC 07-0107	C401.3	Building thermal envelope certificate	New requirement for a permanent building thermal envelope certificate.	IECC 24
EC 07-0108	C402 C402.1 C402.1.1 Table C402.1.1.2	Building Thermal Envelope General Low-energy buildings and greenhouses Fenestration building thermal envelope maximum requirements	1. Modify low-energy buildings provisions. 2. Consolidate and clarify list of prescriptive building thermal envelope provisions.	IECC 24
EC 07-0109	C402.1.1.3	Equipment buildings	Increased square footage and heating system capacity for equipment buildings.	IECC 24
EC 07-0110	C402.1.2 Table C402.1.2	Assembly u-factor, c-factor or f-factor method Opaque building thermal envelope assembly maximum requirements, *u*-factor method	Improved efficiency for opaque building thermal envelope assemblies and editorial modifications.	IECC 21 IECC 24 Strtch 20 CLCPA
EC 07-0111	C402.1.2.1	Methods of determining U-, C-, and F-factors	Building thermal envelope compliance alternative. Includes new provisions for tapered above-deck insulation thickness, suspended ceilings, insulated concrete masonry	IECC 24

			units, mass walls and floors, and area-weighted averaging of above-grade wall U-factors.	
EC 07-0112	C402.1.2.1.6	Cold-formed steel assemblies	Formula and table to calculate the U-factor of cold-formed steel assemblies replaced with a modified version of the AISI S250 referenced standard.	IECC 24
EC 07-0113	C402.1.2.1.7 Table C402.1.2.1.7 C402.1.2.1.8	Spandrel panels Effective U-factors for spandrel panels Mechanical equipment penetrations	New provision detailing spandrel panel U-factors and method to compute U-factor for penetration areas that exceed 1%.	IECC 24
EC 07-0114	C402.1.3 Table C402.1.3	Insulation component R-value-based method Opaque building thermal envelope insulation component minimum requirements, R-value method	Improved efficiency for opaque building thermal envelope assemblies and editorial modifications.	IECC 21 IECC 24 Strtch 20
EC 07-0115	C402.1.3.1 C402.1.3.2 C402.1.3.3 C402.1.3.4	R-value of multi-layered insulation components Area-weighted averaging of R-values Suspended ceilings Mass walls and mass floors	R-value calculation method for multi-layered insulation components; area-weighted average of R-values only permitted for tapered above-deck roof insulation; exclusion of suspended ceiling insulation from R-value contribution moved from C402.2.1; insulation provisions for mass walls and mass floor	IECC 24
EC 07-0116	C402.1.4	Component performance method	Component performance method equation modified and new table added to include psi- and chi-factors accounting for thermal bridges.	IECC 24 IECC 24
EC 07-0117 EC 07-0118	NOT USED			
EC 07-0119	C402.1.5	Rooms containing fuel-burning appliances	New reference for insulation requirements of heating/cooling system piping. Suspended ceiling insulation provisions moved to C402.1.3.1. Editorial modifications to section references for insulation installation provisions.	IECC 24
EC 07-0120	C402.2.1	Roof ceiling construction	Modified insulation requirements for skylight curbs. New provision requiring layered continuous insulation on roof decking with joints staggered. Moved the requirements for tapered insulation to its own section instead of an exception.	IECC 21 IECC 24
EC 07-0121	C402.2.2 C402.2.3	Above-grade walls	Modifications to provisions for above-grade walls and for floors over unconditioned areas. Provisions	IECC 2024

		Floors over outdoor air or unconditioned space	for "mass walls" moved to new Sections C402.1.2.1.4 and C402.1.3.4	
EC 07-0122	C402.2.4 C402.2.5 C402.2.6 C402.2.7	Slabs-on-grade Below-grade walls Insulation of radiant heating system panels Airspaces	1. Revise insulation provisions for slabs-on-grade. 2. Removal of heated slabs insulation exception for radiant heating. 3. Revised provisions for airspaces to include volumes on masonry veneer.	IECC 2021 IECC 2024 Strtch 20
EC 07-0123	C402.5 Table C402.5 C402.5.1.1	Fenestration Building thermal envelope fenestration maximum U-Factor and SHGC requirements Increased vertical fenestration area with daylight responsive controls	Improved efficiency for fenestration and editorial modifications.	IECC 2021 IECC 2024 Strtch 20 CLCPA
EC 07-0124	C402.6	Air leakage—building thermal envelope	Language pertaining to acceptable air leakage testing procedure relocated to its own section. Modification of provisions for air barriers and additional documentation requirements.	IECC 21 IECC 24
EC 07-0125	C402.6.1.2	Air barrier construction	New air sealing provisions for electrical boxes and editorial modifications to air barrier requirements.	IECC 24
EC 07-0126	C402.6.2	Air leakage compliance	1. New provisions for air leakage testing and verification. 2. New provision for whole building air leakage test method, air leakage testing of dwelling/sleeping units, and building thermal envelope verification criteria.	IECC 21 IECC 24 CLCPA
EC 07-0127	C402.6.3 C402.6.6	Air leakage of fenestration and opaque doors Vestibules	Modifications to the air leakage requirements for fenestration and vestibules.	IECC 21 IECC 24
EC 07-0128	C402.7	Thermal bridging documentation and mitigation	New provisions for thermal bridges in above-grade walls, balconies, floor decks, parapets, structural members penetrating thermal envelope; and for vertical fenestration. New offset requirement for cladding supports.	IECC 24
EC 07-0129	C403 C403.1 C403.1.2	Building Mechanical Systems General Data centers	1. New provision for mechanical systems in Data Centers. 2. Clarification of compliance paths for HVAC systems and equipment.	IECC 21 IECC 24 CCP

	C403.1.3	Electric-resistance space heating	3. Limits on the use of electric resistance heat.	
EC 07-0130	C403.2.3	Fault detection and diagnostics	Revision of 2021 IECC provision for fault detection and diagnostics for HVAC systems.	IECC 21 IECC 24
EC 07-0131	C403.3.2 Tables C403.3.2(1) through (16)	HVAC equipment performance requirements	Replaced Minimum Efficiency tables for HVAC equipment based on DOE updates. Heat exchangers to comply with AHRI 400 instead of Table C403.3.2(10)	IECC 21 IECC 24 DOE
EC 07-0132	C403.3.4 C403.3.4.1 Table C403.3.4.1	Boilers Boiler oxygen concentration controls Boiler oxygen concentrations	New efficiency requirements for boiler systems.	IECC 24
EC 07-0133	C403.4.2.3	Optimum start and stop	Additional control requirements and setpoints for heating and cooling systems.	IECC 21 IECC 24
EC 07-0134	C403.4.6 C403.4.7 C403.4.8	Reserved. Heating and cooling system controls for operable openings to the outdoors. Humidification and dehumidification controls.	New requirements for heating and cooling systems: 1.Interlocked automatic controls systems serving conditioned spaces with large openings to the outdoors. 2. Humidification and dehumidification controls.	IECC 24
EC 07-0135	C403.5 C403.5.3.4 C403.6.1	Economizers Relief of excess outdoor air Variable air volume and multiple-zone systems	1. Modified to include an exception for some direct expansion fan coils. 2. Defined acceptable means to provide relief of excess outdoor air. 3. Modifications to variable air volume systems.	IECC 21 IECC 24
EC 07-0136	C403.7.1 C403.7.2 C403.7.3	Demand control ventilation Parking garage ventilation systems Ventilation air heating control	1. Modified requirements applicable to smaller spaces and new exceptions. 2. Modified requirements for parking garage ventilation.	IECC 21 IECC 24
EC 07-0137	C403.7.4 C403.7.4.1 C403.7.4.2	Energy recovery systems Nontransient dwelling units Spaces other than nontransient dwelling units	Modifies the requirements with specific provisions for non-transient dwelling units.	IECC 21 IECC 24
EC 07-0138	C403.7.5 C403.7.6	Kitchen exhaust systems Automatic control of HVAC systems serving guestrooms	1. Added provisions for systems serving Type I exhaust hoods with exceptions. 2. Modification to the requirement for guestroom controls.	IECC 21 IECC 24
EC 07-0139	C403.7.8 C403.7.8.1 C403.7.8.1.1 C403.7.9	Occupied standby controls Occupied standby zone controls Multiple zone system controls Dwelling unit ventilation system	1. New provision for occupied standby controls for ventilation 2. New provision for occupied standby zone controls for ventilation w/ time requirements 3. New provision for multiple zone controls for ventilation 4. New provision for dwelling unit ventilation	IECC 24

EC 07-0140	C403.8.1 C403.8.2	Allowable fan horsepower Motor nameplate horsepower	1. Editorial revision of allowable fan system power use. 2. New exceptions for fan brake power limits.	IECC 21 IECC 24
EC 07-0141	C403.8.5 C403.8.6.2 C403.9 C403.9.1	Low-capacity ventilation fans Intermittent exhaust control for bathrooms and toilet rooms Large-diameter ceiling fans Ceiling fan energy index (CFEI)	1. New requirements for low-capacity ventilation fans and large-diameter ceiling fans 2. New provision for intermittent exhaust control for bathrooms and toilet rooms New provision for ceiling fan efficiency metric – CFEI	IECC 21 IECC 24
EC 07-0142	C403.10 C403.10.1 C403.10.2	Buildings with high-capacity space-heating gas boiler systems Boiler Efficiency Hot-Water Distribution System Design	3. New requirements for high-capacity gas boilers and hot-water distribution system design	IECC 24
EC 07-0143	C403.11.6	Heat recovery for space conditioning in healthcare facilities	New provision for heat recovery for healthcare facility space conditioning.	IECC 21 IECC 24
EC 07-0144	Table C403.12.2.1(1) Table C403.12.2.1(2)	Walk-In cooler and freezer display door efficiency requirements Walk-In cooler and freezer non-display door efficiency requirements	Add a reference to the test procedure to the walk-in cooler and freezer efficiency requirements table	IECC 24
EC 07-0145	C403.13.3	Piping insulation	1. Addition of piping insulation exception for sections of radiant heat New requirement for insulation R-values in addition to pipe insulation thickness	IECC 21 IECC 24
EC 07-0146	C403.13.3.1	Protection of piping insulation	2. Revised requirements for pipe insulation protection.	IECC 24
EC 07-0147	C403.14.3	Roof and gutter deicing controls	New provision for roof and gutter deicing controls	IECC 24
EC 07-0148	C403.15 C403.16 C403.17	Dehumidification in spaces for plant growth and maintenance Service water pressure-booster systems Clean water pumps	1. New provision for dehumidification in spaces for plant growth 2. New provision for pressure booster systems New provision for clean water pumps	IECC 24
EC 07-0149	C404 Table C404.2	Service Water Heating Minimum performance of water-heating equipment	3. Update minimum performance efficiency of water-heating equipment.	IECC 24
EC 07-0150	C404.2.1	High input service water-heating systems	Modified thermal efficiency requirements.	IECC 24
EC 07-0151	C404.4	Service water heating system piping insulation	Revised insulation thickness and new installation requirements	IECC 24

	C404.4.1 Table C404.4.1	Installation requirements Minimum piping insulation thickness for service water heating systems		
EC 07-0152	C404.6.1	Circulation Systems	Revision to heated water circulation systems	IECC 21 IECC 24
EC 07-0153	C404.8.3	Covers	Revised exception for pool covers using renewable energy.	IECC 24
EC 07-0154	NOT USED			
EC 07-0155	NOT USED			
EC 07-0156	C405 C405.1 C405.2 C405.2.1 C405.2.1.1	Electrical Power and Lighting. General Lighting controls Occupant sensor controls Occupant sensor control function	Revision of lighting sensor control provisions	IECC 21 IECC 24 Strtch 20
EC 07-0157	C405.2.2 C405.2.2.1	Time-switch controls Time-switch control function	1. Revision to exceptions of time-switch controls 2. Added programming requirements and limits the uses where exceptions can be used.	IECC 21 IECC 24
EC 07-0158	C405.2.3	Dimming controls	New provision for dimming controls	IECC 21 IECC 24
EC 07-0159	C405.2.3.1 C405.2.4	Dimming control function Daylight-responsive controls	1. Lower output for dimmed lighting and modified exceptions. 2. New requirement for spaces within primary sidelit daylight zones, reduction in watt usage triggering compliance for spaces within sidelit zones, and modified exceptions.	IECC 21 IECC 24
EC 07-0160	C405.2.4.2 C405.2.4.3	Sidelit daylight zone Toplit daylight zone	Expansion and modification of parameters delineating daylight zones.	IECC 21 IECC 24
EC 07-0161	C405.2.5 C405.2.7 C405.2.7.2 C405.2.7.3	Specific application controls Exterior lighting controls Building façade and landscape lighting Lighting setback	1. Modified list of lighting where controls requirements apply. 2. Modification to exterior lighting control requirements. Modification lighting setback control requirements.	IECC 21 IECC 24 Strtch 20
EC 07-0162	C405.2.8 C405.2.9 C405.2.10	Demand responsive lighting controls function. Interior parking area lighting control Sleeping unit and dwelling unit lighting and switched receptacle controls	1. Minimal functional capability of demand responsive controls 2. Specific control requirement for interior parking area lighting 3. 3. Specific control requirement for Sleeping unit and dwelling unit lighting and switched receptacles	IECC 24

EC 07-0163	C405.3 C405.3.1	Interior lighting power requirements Total connected interior lighting power	1. Modifications to the total lighting power calculation. 2. New lighting power provisions for sleeping units, dwelling units, and horticultural lighting.	IECC 21 IECC 24
EC 07-0164	Table C405.3.2(1) Table C405.3.2(2) C405.3.2.1 C405.3.2.2.1	Interior lighting power allowances: building area method Interior lighting power allowances: space-by-space method Building area method Additional interior lighting power	1. Revision of lighting power density table values 2. Revision of interior lighting power allowances 3. Revision to building area method calculation Revision to additional interior lighting power	IECC 21 IECC 24 Strtch 20
EC 07-0165	C405.3.3 C405.4	Lighting power for sleeping units and dwelling units Horticultural lighting	4. New lighting power provisions for sleeping units, dwelling units, and horticultural lighting.	IECC 21 IECC 24
EC 07-0166	C405.5.1 C405.5.2 C405.5.2.1	Total connected exterior lighting power Exterior lighting power allowance Additional exterior lighting power	Modified requirements for exterior lighting power allowances.	IECC 21 IECC 24 Strtch 20
EC 07-0167	C405.7 Table C405.7 C405.8	Electrical transformers Minimum nominal efficiency levels for 10 CFR 431 low-voltage dry-type distribution transformers Electric motors	Modified efficiency requirements for low-voltage dry-type transformers and electric motors.	IECC 24 DOE
EC 07-0168	C405.9 C405.9.1 C405.9.2	Data centers and computer rooms Data centers Computer rooms	New electrical equipment provisions for data centers and computers rooms.	IECC 24
EC 07-0169	C405.13	Energy monitoring, Metering, Submetering, Reporting	New requirement for energy monitoring in buildings larger than 10,000 SF with exceptions.	IECC 21 IECC 24
EC 07-0171	C405.15	On-site renewable energy systems	New requirements for renewable energy.	IECC 24 CLCPA
EC 07-0172	C405.16 C405.17	Reserved. Inverters.	New requirements for inverters serving on-site renewable energy systems and on-site ESS.	IECC 24 CLCPA
EC 07-0170	C405.18	Electrification Ready	Pointer to the Uniform Code for specific provisions to be met where required.	Energy Law
EC 07-0173	C406 C406.1	Additional efficiency, renewable, and load management requirements Compliance	Complete replacement of Section C406 "Additional Efficiency" requirements to include specific credit options, by building	IECC 24 CLCPA

	C406.2 C406.3	Additional energy efficiency credits achieved Renewable and load management credits achieved	occupancy and size, in the following energy use areas: building envelop, HVAC, performance, hot water heating, energy monitoring, lighting, heat pumps, elevators, commercial kitchen equipment, fault detection, renewable energy, and load management	
EC 07-0174	C407 C407.1 C407.2 Table C407.2(1)	Simulated Building Performance Scope Mandatory requirements Requirements for total building performance	1. Editorial clarifications 2. Consolidation of "Mandatory" requirements and total building performance compliance requirements and exceptions.	IECC 21 IECC 24
EC 07-0175	Table C407.2(2)	Source energy conversion factors for electricity	New table for source energy conversion factors	IECC 24
EC 07-0176	Table C407.4.1(1)	Specifications for the standard reference and proposed designs	Revision and expansion of standard reference design table to include renewable energy	IECC 21 IECC 24
EC 07-0177	C407.5 C407.5.1	Calculation software tools Software tool approval	Revised section to relocate the software tool capabilities and testing criteria to new sub-sections.	IECC 24
EC 07-0178	C407.5.1.1 C407.5.1.2 C407.5.2	Software tool capabilities Testing required by software vendors Algorithms not tested	New provision listing necessary software tool modeling capabilities	IECC 24
EC 07-0179	C408 C408.2	Maintenance Information and Building Commissioning Mechanical systems and service water-heating systems commissioning and completion requirements	Revision to dwelling unit exemption.	IECC 24
EC 07-0180	C408.3 C408.3.1.4 C408.3.1.6	Functional testing of lighting and receptacle controls High-end trim controls Demand responsive lighting controls	1. Testing requirements expanded to apply to receptacles. 2. Sample testing allowed. 3. New requirements for "high-end trim" controls and for demand responsive controls.	IECC 24
EC 07-0181	C409	Calculation of Total System Performance Ratio	New provisions for the use of the HVAC TSPR method.	IECC 24
	Chapter 5	Existing Buildings		
EC 07-0182	C502.3.7 C502.3.8	Additional energy efficiency credits Renewable energy systems	1. New provisions for additional energy efficiency credits for *"additions."* New provision for renewable energy systems for "additions."	IECC 24
EC 07-0177	C503.2.1	Roof, ceiling, and attic alterations	2. Section modified to include specific requirements for roof, ceiling, and attic insulation.	IECC 24

EC 07-0178	NOT USED			
EC 07-0183	C503.2.4 C503.2.5 C503.2.6 C503.2.7	Above-grade wall alterations Floor alterations Below-grade wall alterations Air barrier	Consolidated and modified requirements for insulation and air barrier in components of the building thermal envelope applicable to *"alterations."*	IECC 24
EC 07-0184	C503.3.4 C503.3.5	Mechanical system acceptance testing Duct testing	New testing provisions for mechanical systems and ducts.	IECC 24
EC 07-0185	C503.3.4 C503.3.5 C503.3.6 C503.4.1	Controls System sizing Replacement or added roof mounted mechanical equipment Service hot water system acceptance testing	1.New provision for HVAC system controls and system sizing. 2.New provision for replacement or added roof mounted mechanical equipment. New provision service hot water system acceptance testing.	IECC 24
EC 07-0186	C503.5 C503.5.1 C503.5.2	Lighting Interior lighting and controls Exterior lighting and controls	3.Removed exception and new specific requirements for lighting systems applicable to "alterations."	IECC 24
EC 07-0187	C503.6	Additional credit requirements for alterations	New requirement for a reduced percentage of the “additional efficiency credits” applicable to new construction.	IECC 24 CLCPA
EC 07-0188	C505.1	Change of occupancy. General	1. New provisions for changes of occupancy where other classification of work is taking place and for partial changes of occupancy. 2. New specific criteria to demonstrate an increase in energy use or lack thereof. 3. Specific provisions for building thermal envelope, mechanical systems, lighting, and service water heating consistent with Sections C502 and C503.	IECC 24 CLCPA
EC 07-0189	C505.2 C505.2.1 C505.2.2 C505.2.3 C505.2.4	Energy use intensities Building thermal envelope Building mechanical systems Service water heating Lighting	1. New provisions for changes of occupancy where other classification of work is taking place and for partial changes of occupancy. 2. New specific criteria to demonstrate an increase in energy use or lack thereof. 3. Specific provisions for building thermal envelope, mechanical systems, lighting, and service water heating consistent with Sections C502 and C503.	IECC 24 CLCPA

Residential				
EC 07-0011 to 0020, EC 07-0066 to 0098, and EC 07-0200 to 0299		Refer to Part 3 of this document		
ASHRAE 90.1				
EC 07-8001 to EC 07-8050		Refer to Part 2 of this document		

(*) Key for "Origin [of] / Consistency [with]" Column

ABCA	Modifications to Article 11 of the Energy Law made by the Advanced Building Codes, Appliance and Equipment Efficiency Standards Act of 2022 and subsequent modifications
CCP	Code change proposals received by the DBSC since publication of the 2020 State Energy Code
CLCPA	Climate Action Council - Climate Leadership and Community Protection Act (**CLCPA**) - Scoping Plan, Dec. 2022.
IECC 21	2021 International Energy Conservation Code
IECC 24	2024 International Energy Conservation Code
Strtch 20	NYStretch 2020 – modifications to the ECCCNYS and ASHRAE 90.1
DOE	Department of Energy (DOE), Code of Federal Regulations, Minimum Efficiency Standards

EC 07-0099

Revise as follows:

PART 1- SCOPE AND APPLICATION

[NY] SECTION C101
SCOPE AND GENERAL REQUIREMENTS

[NY] C101.1 The Energy Code. The *New York State Energy Conservation Construction Code* promulgated pursuant to Article 11 of the New York State Energy Law (hereinafter referred to as the "*Energy Code*") is contained in Title 19 of the New York Codes, Rules and Regulations Part 1240 ("19 NYCRR Part 1240", and in the publications incorporated by reference in 19 NYCRR Part 1240.

This publication (the ~~2020~~2024 *Energy Conservation Construction Code of New York State*, hereinafter referred to as the "ECCCNYS") is one of the publications incorporated by reference in 19 NYCRR Part 1240. The provisions set forth in this publication are part of the *Energy Code*.

The ~~*Energy Conservation Construction Code of New York State*~~ ECCCNYS has two separate sets of provisions. This set of provisions (the "ECCCNYS—Commercial Provisions") includes provisions applicable to *commercial buildings*. The other set of provisions (the "ECCCNYS—Residential Provisions") includes provisions applicable to *residential buildings*.

EC 07-0021

Revise as follows:

[NY] C101.2 Title. This portion of the ECCCNYS shall be known as the "ECCCNYS—Commercial Provisions," and shall be cited as such. References in the ECCCNYS—Commercial Provisions to "this code" shall be construed as references to the ECCCNYS—Commercial Provisions.

[NY] C101.2.1 Amendments of New York State code publications. The codes of New York State shall include the following publications: the *Residential Code of New York State*, the *Building Code of New York State*, the *Plumbing Code of New York State*, the *Mechanical Code of New York State*, the *Fuel Gas Code of New York State*, the *Fire Code of New York State*, the *Property Maintenance Code of New York State*, the *Existing Building Code of New York State*, and the *Energy Conservation Construction Code of New York State* (i.e., this publication). Provisions in any one or more of these publications may be amended from time to time by provisions in 19 NYCRR Parts 1220 to 1227 or 19 NYCRR Part 1240, as currently in effect and as hereafter amended from time to time. If this publication is now or hereafter so amended, references in this publication to "this code" shall be deemed to be references to this publication as so amended. If any other of these publications is now or hereafter so amended, references in this code to such other publication shall be deemed to be references to such publication as so amended.

EC 07-0001

Revise as follows:

[NY] C101.3 Scope. This code ~~applies to~~ regulates the design and construction of new *commercial buildings*, commercial *accessory structures*, ~~and~~ *building~~s~~' sites* ~~sites~~ and associated systems and equipment~~.~~ and the *additions* to, and/or *alterations* ~~of,~~ thereto for the use and conservation of energy and clean energy features, including the reduction in greenhouse gas emissions, over the life of each such *commercial building*.

~~**Exception:**~~
~~The *Energy Code* shall not apply to any of the following, provided that the energy use of the building is not increased:~~
~~1. Storm windows installed over existing fenestration;~~

~~2. Glass only replacements in an existing sash and frame;~~
~~3. Existing ceiling, wall or floor cavities exposed during construction provided that these cavities are filled with insulation;~~
~~4. Construction where the existing roof, wall or floor cavity is not exposed;~~
~~5. Reroofing for roofs where neither the sheathing nor the insulation is exposed; roofs without insulation in the cavity and where the sheathing or insulation is exposed during reroofing shall be insulated either above or below the sheathing;~~
~~6. Replacement of existing doors that separate conditioned space from the exterior shall not require the installation of a vestibule or revolving door, provided, however, that an existing vestibule that separates such conditioned space from the exterior shall not be removed;~~
~~7. Alterations that replace less than fifty percent of the luminaries in a space, provided that such alterations do not increase the installed interior lighting power; or alterations that replace only the bulb and ballast within the existing luminaries in a space provided that the alteration does not increase the installed interior lighting power.~~

EC 07-0099

Revise as follows:

[NY] ~~**C101.6**~~ **C101.3.1 Statutory Limitations.** In the event of an *addition to,* or *alteration* of, an existing building or *building system* in an existing building, nothing in the ECCCNYS Commercial Provisions or in any other provision of the *Energy Code* shall be interpreted to require any unaltered portion of such existing building or *building system* to comply with the *Energy Code*.

[NY] ~~**C101.3.1**~~ **C101.3.2 Appendices.** ~~Provisions in the~~ The following ~~appendix~~ appendices have not been adopted and are included for informational purposes only:

Appendix ~~CA~~ ~~CB~~ Solar-Ready Zone – Commercial

Appendix CC Zero Energy Commercial Building Provisions

Appendix CD The 2030 Glide Path

Appendix CE Required HVAC TSPR

Appendix CF Energy Credits

Appendix CG All-Electric Commercial Building Provisions

Appendix CH Electric-Ready Commercial Building Provisions

EC 07-0002

Revise as follows:

[NY] C101.4 Intent. ~~The ECCCNYS—Commercial Provisions ECCCNYS—Commercial Provisions regulate the design and construction of new commercial buildings; additions to, alterations of, and/or renovations of existing residential buildings; and additions to, alterations of, and/or renovations of or building systems in existing residential buildings for the use and conservation of energy and clean energy features including the reduction in greenhouse gas emissions over the life of each such commercial building.~~
The ~~*ECCCNYS—Commercial Provisions*~~ *Energy Code* is ~~are~~ intended to provide flexibility to permit the use of innovative approaches and techniques to achieve the objectives set forth in ~~the preceding paragraph~~ Section C101.3. ~~However, nothing in this Section R101.4 shall be construed as permitting any building official, or any governmental unit or agency charged with the administration and enforcement of the Energy Code, to waive, vary, modify, or otherwise alter any standard or requirement of the ECCCNYS—Commercial Provisions ECCCNYS—Commercial Provisions or any other standard or requirement of the Energy Code. Standards or requirements of the Energy Code may be varied or modified only pursuant to Section 11-106 of the New York State Energy Law.~~

The ~~ECCCNYS—Residential Provisions are not intended to abridge safety, health or environmental requirements contained in other applicable statutes, laws, rules, regulations, codes or ordinances. However, nothing in Section R101.4~~

~~shall be construed as limiting the provisions of Section 11-103(3) of the New York State Energy Law, which provides that (1) any code, rule, or regulation promulgated or enacted prior to June 19, 1978 by any state agency other than the State Fire Prevention and Building Code Council, incorporating specific energy conservation requirements applicable to the construction of any building, is superseded by the Energy Code and (2) on and after June 19, 1978, the~~ State Fire Prevention and Building Code Council, in accordance with the mandate under Article 11 of the New York State Energy Law, shall have exclusive authority among state agencies to promulgate a construction code incorporating energy conservation and clean energy features, including but not limited to the reduction in greenhouse gas emissions. The Energy Code is adopted for the purpose of protecting the health, safety and security of the people of the state and to assure a continuing supply of energy for future generations, requiring that economically reasonable energy conservation techniques be used in the design and construction of all public and private buildings in the state.

EC 07-0099

Revise as follows:

[NY] C101.5 Compliance. *Commercial buildings* shall meet the ~~provisions of~~ ECCCNYS—Commercial Provisions. To the extent permitted by 19 NYCRR Part 1240, ~~commercial buildings~~ *commercial buildings* may comply with the *2024 NYS ASHRAE 90.1-~~2016~~* ~~(as amended)~~ in lieu of complying with the ECCCNYS—Commercial Provisions.

[NY] C101.5.1 Compliance software. Where chosen by the applicant, compliance ~~Compliance~~ with the ECCCNYS—Commercial Provisions, or portion thereof, or, if applicable, with the *2024 NYS ASHRAE 90.1- ~~2016~~* ~~(as amended)~~ can be demonstrated using~~:~~ either of the following:

1. Computer software that is developed by the United States Department of Energy ~~(~~, such as COMcheck~~)~~, specifically for the ECCCNYS—Commercial Provisions or, if applicable, specifically for the *2024 NYS ASHRAE 90.1-~~2016~~* ~~(as amended);~~ ~~including DOE-2 modeling software as allowed by Section C407,~~ or

2. Other software ~~that shall have been~~ expressly approved in writing by the New York Secretary of State as acceptable for demonstrating compliance with the ECCCNYS—Commercial Provisions or, if applicable, for demonstrating compliance with the *2024 NYS ASHRAE 90.1-~~2016~~* ~~(as amended)~~ .

Software programs used to demonstrate compliance must indicate compliance with the ECCCNYS—Commercial Provisions or, if applicable, compliance with the *2024 NYS ASHRAE 90.1-~~2016~~* ~~(as amended)~~, the applicable code year, the applicable compliance path(s), and ~~must~~ reflect ~~the actual~~ all applicable requirements of the ECCCNYS—Commercial Provisions or, if applicable, ~~the actual~~ all applicable requirements of the *2024 NYS ASHRAE 90.1-~~2016~~* ~~as amended~~.

[NY] C101.5.1.1 Other analysis tools. Other performance analysis tools used to document simulated building performance for a specified application or limited scope in accordance with Section C407, are subject to the approval of the *building official*.

~~**[NY] C101.5.2 Mandatory provisions.** The use of the software approach to demonstrate compliance with the ECCCNYS Commercial Provisions does not excuse compliance with any mandatory provision of the ECCCNYS Commercial Provisions. When using the software approach to demonstrate compliance with the provisions of the ECCCNYS Commercial Provisions, compliance with all applicable mandatory provisions of the ECCCNYS Commercial Provisions will still be required.~~

~~The use of the software approach to demonstrate compliance with *ASHRAE 90.1-2016* (as amended) does not excuse compliance with any mandatory provision of *ASHRAE 90.1-2016* (as amended). When using the software approach to demonstrate compliance with *ASHRAE 90.1-2016* (as amended), compliance with all applicable mandatory provisions of *ASHRAE 90.1-2016* (as amended), will still be required.~~

EC 07-0003

Delete:

~~**[NY] C101.7 Historic buildings.** *Historic buildings* are exempt from the *Energy Code*.~~

EC 07-0099

Revise as follows:

PART 2- ADMINISTRATION AND ENFORCEMENT

[NY] SECTION C102 APPLICABILITY

[NY] C102.1 Applicability. The ECCCNYS—Commercial Provisions apply to (1) the construction of new *commercial buildings* and building systems, (2*) additions* to and *alterations* of existing commercial buildings, and (3*) additions* to and *alterations* of building systems in existing *commercial buildings*.

Where, in any specific case, different sections of this code specify different materials, methods of construction or other requirements, the most restrictive shall govern. Where there is a conflict between a general requirement and a specific requirement, the specific requirement shall govern.

[NY] C102.1.1 Mixed residential and commercial buildings. Where a *building*, having not more than three stories above grade plane, includes both *residential building* and *commercial building* portions, each portion shall be ~~separately~~ considered separately and:

1. Each *commercial building* portion shall meet the applicable provisions of ~~*ECCCNYS—Commercial Provisions*~~ ECCCNYS—Commercial Provisions or, to the extent permitted by 19 NYCRR Part 1240, the applicable provisions of the *2024 NYS ASHRAE 90.1-~~2016~~* ~~(as amended)~~, and
2. Each *residential building* portion shall meet the applicable provisions of the ~~*ECCCNYS—Residential Provisions*~~ ECCCNYS—Residential Provisions.

EC 07-0004

Revise as follows:

[NY] ~~**C101.1.1**~~ **C102.2 Administration and enforcement.** The *Energy Code* shall be administered and enforced in accordance with this Chapter 1 [CE]; Chapter 1 [RE] of the ECCCNYS—Residential Provisions, as applicable, and the strictest provisions of ~~any of the following~~:

1. ~~the requirements of the~~ The code enforcement program established by the governmental unit or agency responsible for administration and enforcement of the Uniform Code and the *Energy Code* with respect to the building in question,
2. ~~the~~ The minimum requirements established by the regulations adopted by the Department of State pursuant to section 381(1) of the New York State Executive Law, ~~or~~.
3. ~~the requirements set forth in this Chapter 1 [CE] and, as applicable, in Chapter 1 [RE] of this publication.~~

EC 07-0099

Revise as follows:

[NY] ~~**C102.2**~~ **C102.3 Other laws and regulations.** The ~~*ECCCNYS Commercial Provisions*~~ provisions of this code shall not be deemed to abridge or nullify any provisions of local, state or federal law, statute, rule, regulation, code or ordinance relating to any matter as to which the ~~*ECCCNYS Commercial Provisions*~~ *Energy Code* does not provide.

[NY] ~~**C102.2.1**~~ **C102.3.1 Other agencies' regulations.** Pursuant to Section 11-103(3) of the New York State Energy Law, ~~(1)~~ any code, rule~~,~~ or regulation heretofore promulgated or enacted ~~prior to June 19, 1978~~ by any state agency other

than the State Fire Prevention and Building Code Council, incorporating specific energy conservation and clean energy requirements ~~applicant~~ applicable to the construction of any building, ~~is~~ shall be superseded by the *Energy Code* ~~and (2) on and after June 19, 1978, the State Fire Prevention and Building Code Council, in accordance with the mandate under Article 11 of the New York State Energy Law, shall have exclusive authority among state agencies to promulgate a construction code incorporating energy conservation features~~. However, nothing in this section shall be deemed to expand the powers of the State Fire Prevention and Building Code Council to include matters that are exclusively within the statutory jurisdiction of the NYS Public Service Commission, the NYS Department of Environmental Conservation, the NYS Office of Renewable Energy Siting, or another state entity.

[NY] ~~**C102.2.2**~~ **C102.3.2 More** ~~**stringent**~~ **restrictive local energy codes.** Pursuant to section 11-109 of the New York State Energy Law, and subject to the provisions and requirements of that section, any municipality has the power to promulgate a local energy conservation construction code that is more restrictive than the Energy Code.

[NY] ~~**C102.3**~~**C102.4 Application of references.** References to chapter or section numbers, or to provisions not specifically identified by number, shall be construed to refer to such chapter, section or provision of the ~~*ECCCNYS—Commercial Provisions*~~ ECCCNYS—Commercial Provisions.

[NY] ~~**C102.4**~~**C102.5 Referenced codes and standards.** The codes and standards referenced in the ~~*ECCCNYS—Commercial Provisions*~~ ECCCNYS—Commercial Provisions shall be those ~~*listed*~~ indicated in Chapter 6 [CE], and such codes and standards shall be considered ~~as~~ part of the requirements of the ~~*ECCCNYS—Commercial Provisions*~~ ECCCNYS—Commercial Provisions to the prescribed extent of each such reference and as further regulated in Sections ~~C102.4.1~~ C102.5.1 and ~~C102.4.2~~ C102.5.2.

[NY] ~~**C102.4.1**~~**C102.5.1 Conflicts.** Where conflicts occur between provisions of the ~~*ECCCNYS—Commercial Provisions*~~ ECCCNYS—Commercial Provisions and referenced codes and standards, the provisions of the ~~*ECCCNYS—Commercial Provisions*~~ ECCCNYS—Commercial Provisions shall apply.

[NY] ~~**C102.4.2**~~**C102.5.2 Provisions in referenced codes and standards.** Where the extent of the reference to a referenced code or standard includes subject matter that is within the scope of the ~~*ECCCNYS—Commercial Provisions*~~ ECCCNYS—Commercial Provisions, the provisions of the ~~*ECCCNYS—Commercial Provisions*~~ ECCCNYS—Commercial Provisions, as applicable, shall take precedence over the provisions in the referenced code or standard.

Exception: Where the energy efficiency, energy use, or water use of covered products or equipment is subject to federal preemption pursuant to the Energy Policy and Conservation Act (EPCA), the requirements set forth by the Department of Energy (DOE) in the Code of Federal Regulations (CFR) take precedence over any requirement in the ECCCNYS.

[NY] ~~**C102.5**~~ **C102.6 Partial invalidity.** If a portion of the *Energy Code* is held to be illegal or void by a court of competent jurisdiction, such a decision shall not affect the validity of the remainder of the *Energy Code*.

EC 07-0022

Revise as follows:

[NY] SECTION C103 INTERPRETATIONS OF ENERGY CODE REQUIREMENTS

[NY] C103.1 General. The Secretary of State is authorized by Section 11-103(4) of the New York State Energy Law to issue written interpretations of the *Energy Code* upon written request of a permit applicant or the ~~building official~~ *building official* responsible for the administration and enforcement of the provisions of the *Energy Code*.

[NY] C103.2 ~~Procedure~~ **Interpretation request.** A written request for an interpretation shall be signed by the building permit applicant ~~and~~ or the ~~building official~~ *building official*~~, or by one or the other, individually,~~ and shall include the following information in order to be considered complete:

1. Name, address, and telephone number of the party making the request ~~building permit applicant and the building official~~;
2. A detailed description of the proposed construction, if applicable ~~including a copy of the building permit application and plans and specifications that have been filed by the building permit applicant with the building~~

~~official, as well as any other floor plans, elevations, cross-sections, details specifications, or construction documents necessary to describe adequately the proposed construction~~;

3. Identification of each requirement of the *Energy Code* for which an interpretation is requested;
4. A concise summary of the disagreement or ambiguity concerning the application of each such requirement for which an interpretation is requested; and
5. A copy of the building permit application denial if one was issued by the ~~building official~~ *building official*.

[NY] C103.3 Incomplete information. If the request is incomplete or does not otherwise contain sufficient information necessary to issue an interpretation, the Secretary of State may request ~~clarification of the information provided or~~ additional information ~~necessary to issue the requested interpretation~~.

~~**[NY] C103.4 Notification.** Upon receipt of a complete request for an interpretation signed by only the building permit applicant or the building official, the Secretary of State shall provide written notification to the party who has not signed the request for an interpretation that such request for an interpretation has been filed with the Department of State. The party receiving such notification shall have 20 days from the date of such notification in which to provide, in writing, any comments or additional information pertaining to the request for an interpretation, provided that the Secretary of State may waive this deadline when warranted by extenuating circumstances.~~

~~**[NY] C103.5 Issuing interpretation.** The Secretary of State shall either issue the interpretation or provide notification of the intent not to issue an interpretation to the building permit applicant and the building official within 45 days of any of the following:~~

1. ~~Receipt of a complete request for an interpretation signed by both the building permit applicant and the building official,~~
2. ~~Receipt of comments when the request for an interpretation is signed by only one party, or~~
3. ~~The expiration of the 20-day comment period when the request for an interpretation is signed by only one party.~~

[NY] ~~**C103.6**~~**C103.4 Enforcement.** Subsequent enforcement of the ~~Energy Code~~ *Energy Code* shall be consistent with the written interpretations issued by the Secretary of State pursuant to Section 11-103(4) of the New York State Energy Law.

EC 07-0099

Revise as follows:

[NY] ~~**C103.7**~~**C103.5 Interpretation of more** ~~stringent~~ **restrictive local energy code provisions.** If a municipality has adopted a local energy code in accordance with the provisions of section 11-109 of the New York State Energy Law, and if such local energy code ~~shall have~~ has become effective in such municipality in accordance with the provisions of section 11-109 of the New York State Energy Law, such municipality or any official designated by such municipality is permitted to interpret those provisions of such local energy code that are (1) in addition to the provisions of *Energy Code* or (2) more stringent than the provisions of the *Energy Code*. However, no such interpretation shall be deemed to be an interpretation of the *Energy Code* by the Secretary of State pursuant to section 11-103(4) of the New York State Energy Law. In addition, if such municipality or an official designated by such municipality interprets a provision of a local energy code in a manner that makes such provision less stringent ~~that~~ than the corresponding provision of the *Energy Code*, the corresponding provision of the *Energy Code* shall supersede such provision of the local energy code.

EC 07-0099

Revise as follows:

[NY] SECTION C104
ALTERNATIVE MATERIALS, DESIGNS AND METHODS OF CONSTRUCTION ~~AND INSULATING SYSTEMS~~

[NY] C104.1 General. Provisions, standards, or requirements of the *Energy Code* may only be varied or modified, in whole or part, pursuant to Section 11-106 of the New York State Energy Law. A *building official*, governmental unit or agency responsible for administration and enforcement of the *Energy Code* or any other entity shall not be permitted to

waive, vary, modify, or otherwise alter any provision, standard, or requirement of the *Energy Code.*

However, the ~~*ECCCNYS Commercial Provisions* are~~ *Energy Code* is not intended to prevent the installation or use of any material~~,~~ or to prohibit any design or method of construction~~, or insulating system~~ not specifically prescribed by this code, provided that any such alternative has been *approved.* ~~shall have been approved by the building official, in writing,~~ When requesting approval of an alternative material, design or method of construction, the owner or the owner's authorized agent shall provide a written justification demonstrating that the proposed alternative is satisfactory and complies with ~~as (1) meeting~~ the intent of the provisions of this code and ~~(2) achieving energy savings that is equivalent or greater than that which would be achieved by the prescribed method of construction, design or insulating system~~ that the material, method or work offered is, for the purpose intended, not less than the equivalent of that prescribed in this code for strength, effectiveness, fire resistance, durability, energy conservation and safety. The *building official* shall respond to the applicant, in writing, stating the reasons why the alternative was *approved* or was not *approved*.

~~However, nothing in this section C102.1 shall be construed as permitting any building official or any governmental unit or agency responsible for administration and enforcement of the *Energy Code* to waive, vary, modify, or otherwise alter any provision, standard, or requirement of the *Energy Code*. Provisions, standards, or requirements of the *Energy Code* may be, varied, modified, or otherwise altered only pursuant to Section 11-106 of the New York State Energy Law.~~

[NY] SECTION C105
CONSTRUCTION DOCUMENTS

[NY] C105.1 General. ~~Construction documents~~ *Construction documents*, technical reports and other supporting data shall be submitted ~~in one or more sets~~ with each application for a permit in the format and quantity required by the *authority having jurisdiction*. ~~The construction documents shall be prepared by a registered design professional as~~ Where required by ~~the~~ New York State Education Law Articles 145 and 147, *construction documents* and technical reports shall be prepared by a *registered design professional* and contain evidence that such documents were prepared by a *registered design professional,* including the design professional's signature and seal that legibly shows their name and license number.

[NY] C105.2 Information on construction documents. ~~Construction documents~~ *Construction documents* shall be drawn to scale on suitable material. ~~Electronic media documents are permitted to be submitted where *approved* by the *building official.* Construction documents~~ *Construction documents* shall be of sufficient clarity to indicate the location, nature and extent of the work proposed, and show in sufficient detail pertinent data and features of the ~~building~~ *building*, systems and equipment as required by the applicable provisions of this code ~~as herein governed~~. Details shall include, but are not limited to, the following as applicable:

1. *Energy Code* compliance path.
2. ~~1~~ Insulation materials and their *R*-values.
3. ~~2~~ *Fenestration U-factor*s and solar heat gain coefficients (SHGCs).
4. ~~3~~ Area-weighted *U-factor* and solar heat gain coefficient (SHGC) calculations.
5. *Air barrier* and air sealing details, including the location of the *air barrier.*
6. *Thermal bridges* as identified in Section C402.7.
7. ~~4~~ Mechanical system design criteria.
8. ~~5~~ Mechanical and *service water heating* systems and equipment types, sizes and efficiencies.
9. ~~6~~ Economizer description.
10. ~~7~~ Equipment and system controls.
11. ~~8~~ Fan motor horsepower (hp) and controls.
12. ~~9~~ ~~Duct~~ *Duct* sealing, ~~duct~~ *duct* and pipe insulation and location.
13. ~~10~~ Lighting fixture schedule with wattage and control narrative.
14. ~~11~~ Location of *daylight zones* on floor plans.
15. ~~12. Air sealing details~~
16. Location of pathways for routing of raceways or cable from the *on-site renewable energy* system to the electrical distribution equipment, where provided.
17. Location reserved for inverters, metering equipment and energy storage system (ESS), and a pathway reserved for routing of raceways or conduit from the renewable energy system to the point of interconnection with the electrical service and the ESS, where provided.
18. Location and layout of a designated area for ESS, where provided.
19. Rated energy capacity and rated power capacity of the installed or planned ESS.

19. Other information required by the *building official* in accordance with local law.

[NY] C105.2.1 Building thermal envelope depiction. The *building thermal envelope* shall be graphically represented on the ~~construction documents~~ *construction documents*.

[NY] C105.2.2 Solar-ready system. Where a *solar-ready zone* is provided, the *construction documents* shall indicate the dedicated roof area for a *solar-ready zone*, roof dead load, roof live load, ground snow load, and routing of conduit or pre-wiring from *solar-ready zone* to electrical service panel or plumbing from *solar-ready zone* to *service water heating* system, as applicable.

[NY] ~~C105.2.2~~ C105.2.3 Written statement. When plans or specifications bear the seal and signature of a *registered design professional*, such *registered design professional* shall also include a written statement that to the best of ~~his or her~~ their knowledge, belief and professional judgment, such plans or specifications are in compliance with the *Energy Code*.

[NY] C105.3 Examination of documents. The *building official* shall examine or cause to be examined the application and accompanying ~~construction~~ documents and shall ascertain whether the construction indicated and described is in accordance with the requirements of this code and other pertinent laws or ordinances. The *building official* is authorized to utilize a *registered design professional*, or other *approved* entity not affiliated with the building design or construction, in conducting the review of the plans and specifications for compliance with the code, provided that the *authority having jurisdiction* shall satisfy itself that each individual performing such contracted-for services has qualifications comparable to those of a person who has met the requirements of 19 NYCRR Part 1208.

[NY] C105.3.1 Approval of construction documents. When the *building official* issues a permit where construction documents are required, the construction documents shall be endorsed by electronic marking or in writing and stamped as "Reviewed for Energy Code Compliance." Such *approved* construction documents shall not be changed, modified or altered without authorization from the *building official*. Work shall be done in accordance with the *approved* construction documents.

One set of construction documents so reviewed shall be retained by the *building official*. ~~The other~~ another set shall be returned to the applicant, and at least one set shall be kept at the site of work and ~~shall~~ be open to inspection by the *building official* or a duly authorized representative.

[NY] C105.3.2 Previous approvals. The *Energy Code* shall not require changes ~~in~~ to the construction documents, construction or designated occupancy of a structure to accommodate new or modified requirements of this code where ~~for which~~ a ~~lawful permit~~ *substantially complete building permit application* has been ~~issued~~ submitted prior to the effective date of the rule making the ECCCNYS part of the Energy Code, and the construction of which has been pursued in good faith within 180 days after the effective date of such rule and is thereafter diligently pursued through completion.

[NY] C105.3.3 Phased approval. The *building official* shall have the authority to issue a permit for the construction of part of an energy conservation system before the construction documents for the entire system have been submitted or *approved*, provided that adequate information and detailed statements have been filed complying with all pertinent requirements of this code. The holders of such permit shall proceed at their own risk without assurance that the permit for the entire energy conservation system will be granted or that subsequent permits will be based on the same version of the *Energy Code*.

[NY] C105.4 Amended construction documents. Work shall be performed in accordance with the *approved* construction documents and this code. An amended set of construction documents indicating any ~~Changes~~ changes made during construction that are not in compliance with the *approved* construction documents shall be resubmitted to the *building official* for approval ~~as an amended set of construction documents~~.

EC 07-0023

Revise as follows:

[NY] SECTION C106
INSPECTIONS

[NY] C106.1 General. Construction or work for which a permit is required shall be subject to inspection by the ~~building official~~ *building official* or an inspector who is ~~(i)~~ *approved* by the *building official* as being qualified to perform the inspections ~~(such qualifications to include~~ including, where required, completion of the training required by 19 NYCRR Part 1208~~) and (ii) approved by the building official~~.

[NY] C106.1.1 Required approvals. Work shall not be performed ~~done~~ beyond the point indicated in each successive inspection without first obtaining the approval of the ~~building official~~ *building official*. ~~The permit holder or the permit holder's agent shall notify the building official when work has progressed to the point where the next required inspection described in Section C106.2 can be made.~~
The ~~building official~~ *building official* (or other qualified inspector ~~approved~~ *approved* by the ~~building official~~ *building official* pursuant to Section ~~C105.1~~ C106.1), shall make such inspection, and the ~~building official~~ *building official* shall either indicate the portion of the construction that is satisfactory as completed, or notify the permit holder or the permit holder's agent wherein the same fails to comply with the *Energy Code*. Any portions that fail to ~~do not~~ comply shall be corrected and such portion shall not be covered or concealed until authorized by the ~~building official~~ *building official*.

In the case of a *building* that is subject to the New York City Construction Codes, such required approvals and inspections shall be subject to the provisions of Title 28 of the New York City Administrative Code.

EC 07-0099

Revise as follows:

[NY] ~~C106.5~~ C106.1.2 Inspection requests. It shall be the duty ~~of the holder~~ of the permit holder or their duly authorized agent to notify the *building official* when ~~work is ready for~~ the next required inspection described in Section C106.2 can be made. It shall be the duty of the permit holder to provide access to and ~~means for inspection of such work~~ maintain the work exposed until the *building official* has noted the work or a portion thereof to be satisfactory as completed, or the building permit holder shall be notified as to the manner in which the work fails to comply with this code..

[NY] C106.2 Required inspections. The *building official* (or other qualified inspector ~~approved~~ *approved* by the ~~building official~~ *building official* pursuant to Section ~~C105.1~~ C106.4), upon notification, shall make the inspections set forth in Sections C106.2.1 through ~~C106.2.6~~ C106.2.7.

[NY] C106.2.1 Footing and foundation ~~insulation inspection~~. Inspections associated with footings and foundations shall verify ~~the footing and foundation insulation R-value~~ compliance with the code as to the footing and foundation insulation rated values, location, thickness, depth of burial and protection of insulation as required by the code and~~,~~ *approved* ~~plans and specifications~~ *construction documents.*

[NY] C106.2.2 Thermal envelope. Inspections shall verify the ~~correct~~ type of insulation and values, ~~R-values~~, location of insulation, thermal bridge mitigation, ~~fenestration~~ *fenestration* values, location of *fenestration*~~U-factor, SHGC and VT~~, and that *air leakage* controls are ~~properly~~ installed, as required by the code and *approved* ~~plans and specifications~~ *construction documents.*

[NY] C106.2.3 Plumbing system. Inspections shall verify the type of insulation, *R*-values, protection required, controls and *heat traps* as required by the code and *approved* ~~plans and specifications~~ *construction documents.* Where a *solar-ready zone* is provided for a solar thermal system, inspections shall verify pathways for routing of plumbing from *solar-ready zone* to *service water heating* system.

[NY] C106.2.4 Mechanical system. Inspections shall verify the installed HVAC equipment for the correct type, ~~and~~ size and efficiency, controls, insulation, *R-values*, system and damper air leakage, ~~minimum fan efficiency,~~ energy recovery and economizer systems as required by the code and *approved* ~~plans and specifications.~~ *construction documents.*

[NY] C106.2.5 Electrical system. Inspections shall verify ~~lighting system controls, components, and meters~~ compliance as required by the code and the *approved construction documents* ~~plans and specifications~~ as to the locations, distribution, and capacity of the electrical system and lighting and controls. Where a *solar-ready zone* is installed for electricity generation, inspections shall verify conduit or pre-wiring from *solar-ready zone* to electrical panel.

[NY] C106.2.6 Insulation and fenestration inspection. Inspections of insulation and *fenestration* shall be made before application of interior finish and shall verify compliance with the code as to types of insulation, corresponding rated values, their correct location and proper installation and *fenestration* properties such as *U-factor, SHGC* and proper installation.

[NY] ~~**C106.2.6**~~ **C106.2.7 Final inspection.** The ~~*building* shall have a~~ final inspection ~~and shall not be occupied until approved by the *building official*. The final inspection~~ shall include verification of the installation and proper operation of all required building controls, and documentation verifying activities associated with ~~required~~ *building commissioning* have been conducted and findings of noncompliance corrected in accordance with Section C408, where required.

Buildings, or portions thereof, subject to the commissioning requirements of Section C408 shall not be considered for a final inspection until the ~~building official~~ *building official* has received a letter of transmittal from the ~~building~~ *building* owner acknowledging that the ~~building~~ *building* owner has received the Preliminary Commissioning Report as required in Section C408.2.4.

[NY] ~~**C106.2.6.1**~~ **C106.2.7.1 HVAC System certification.** A *registered design professional* or *approved agency* shall provide to the ~~building official~~ *building official* a written certification that ~~(1)~~ all required HVAC system inspections~~, HVAC system calibrations,~~ and ~~overall HVAC equipment functionality tests~~ functional testing have been performed in accordance with Section C408.2 and ~~(2)~~ in the professional opinion of the *registered design professional* or *approved agency*, the HVAC system is operating as designed. The *registered design professional* or *approved agency* shall retain copies of the inspection, calibration, and test reports, and shall provide copies of such reports to the ~~building official~~ *building official*~~, if requested~~ upon request.

In the case of a building that is subject to the New York City Construction Codes, all required HVAC system inspections, HVAC system calibrations, and overall HVAC equipment ~~functionality~~ functional tests shall be special or progress inspections and shall be performed by *approved agencies*.

[NY] C106.3 Reinspection and re-testing. Where any work or installation does not pass an initial test or inspection, or ~~A building shall be reinspected~~ where determined necessary by the *building official*~~.~~, the necessary corrections shall be made to achieve compliance with this code. The work or installation shall then be resubmitted to the *building official* for reinspection and re-testing.

[NY] C106.4 Approved third-party inspection agencies. The *building official* is authorized to accept reports ~~of~~ from *approved* third-party inspection agencies not affiliated with the *building* design or construction, provided that such agencies are *approved* as to qualifications and reliability relevant to the *building* components and *building* systems that they are inspecting or testing.

[NY] C106.4.1 Authorization of approved third-party inspection agency. An *approved* third-party inspection agency shall provide all requested information for the *building official* to determine that the agency meets the applicable requirements specified in Sections C106.4.1.1 through C106.4.1.3 and, as applicable, the *code enforcement program* of the *authority having jurisdiction.*

[NY] C106.4.1.1 Independence. An *approved* third-party inspection agency shall be an independent individual or business identity. The agency shall perform its duties in accordance with the scope of delegated responsibilities *approved*

by the *building official.* The agency shall disclose to the *building official* any conflicts of interest including where fees for service are derived.

[NY] C106.4.1.2 Equipment. An *approved* third-party inspection agency shall have adequate equipment to perform inspections and tests required by the *building official* and this code. All testing equipment shall be periodically calibrated as required by the manufacturer, testing standards used in this code, or certifications held by the *approved* third-party inspection agency.

[NY] C106.4.1.3 Personnel. Personnel assigned by an *approved* third-party inspection agency to perform inspections and testing shall be trained or credentialed and documentation of training or credentials shall be available to the *building official* upon request.

[NY] C106.4.1.4 Delegated authority. Where *approved,* a third-party inspection agency shall have the authority to perform delegated inspections and determine compliance or noncompliance of work with the *approved construction documents*.

[NY] C106.4.2 Approved third-party inspection agency reporting. An *approved* third-party inspection agency shall keep records of delegated inspections, tests, and compliance documentation required by this code. The agency shall submit reports of delegated inspections and tests to the *building official* and to the owner or owner's representative. Reports shall indicate the compliance determination for the inspected or tested work based on *approved construction documents*. A final report documenting required delegated inspections and tests, and correction of any discrepancies noted in the inspections or tests, shall be submitted, with other required compliance documentation, at a time required by the *building official* prior to the issuance of a *certificate of occupancy.*

~~**[NY] C106.6 Reinspection and re-testing.** Where any work or installation does not pass an initial test or inspection, the necessary corrections shall be made to achieve compliance with the *Energy Code*. The work or installation shall then be resubmitted to the *building official* for reinspection and retesting.~~

[NY] SECTION C107
STOP WORK ORDER

[NY] C107.1 Authority. The *building official* shall issue a stop work order in accordance with the *code enforcement program* of the *authority having jurisdiction* for any work regulated by this code being performed in a manner contrary to the provisions of this code, in a dangerous or unsafe manner, without obtaining a required building permit or when a building permit has been issued in error.

[NY] C107.2 Issuance. The stop work order shall be issued in writing and shall be given to the owner, the owner's authorized agent or the person performing the work. The stop work order shall state the reason for the order and the conditions under which the cited work is authorized to resume. Upon issuance of a stop work order, the cited work shall immediately cease.

[NY] C107.3 Emergencies. Where an emergency exists, the *building official* shall not be required to give a written notice prior to stopping the work.

[NY] C107.4 Penalty. Any person, taking part or assisting in the construction or use of any *building* in violation of the provisions of this code, who after having been served with an order to remedy issued in accordance with the *code enforcement program* of the *authority having jurisdiction,* fails to comply within thirty days or within the time fixed by such order to remedy, whichever is greater, shall be subject to the penalties prescribed in Section 11-108 of the New York State Energy Law.

[NY] SECTION C108
CERTIFICATE OF OCCUPANCY

[NY] ~~**C106.7**~~ **C108.1** ~~**Approval**~~ **Certificate of occupancy.** After the prescribed tests and inspections indicate that the work for which a permit has been issued is complete and complies in all respects with this code, a ~~notice of approval~~

certificate of occupancy shall be issued by the *building official*. The *building* shall not be occupied until a *certificate of occupancy* has been issued by the *authority having jurisdiction*.

[NY] ~~**C106.7.1**~~ **C108.2 Revocation.** The *building official* is authorized to suspend or revoke~~, in writing,~~ a ~~notice of approval~~ *certificate of occupancy* ~~issued~~ wherever the ~~building official~~ *building official* determines the ~~notice~~ certificate is issued in error~~,~~ or on the basis of incorrect information supplied, or where it is determined that the *building* or structure, premise, or portion thereof is in violation of any provision of the *Energy Code*~~, any provision of the Uniform code or New York City Construction Codes, as applicable;~~ or any other ~~any~~ applicable code, law, statute, rule, regulation or ordinance if the relevant deficiencies are not corrected within a period of time specified by the *building official*. Any such suspension or revocation shall be in writing, signed by the ~~building official~~ *building official* or by ~~his or her~~ their designated agent.

Chapter C2. Definitions

EC 07-0099

Revise as follows:

SECTION 201
GENERAL

[NY] C201.1 Scope. Unless stated otherwise, ~~the following~~ the words and terms ~~in~~ provided in italics within the ECCCNYS—Commercial Provisions shall have the meanings ~~indicated in this Chapter 2[CE]~~ as defined in Section R202, C202 or as defined within the chapter or appendix where the word or term is found, except as provided in Sections C201.3 and C201.4.

[NY] C201.2 Interchangeability. Words and terms used in the present tense include the future; words and terms stated in the masculine gender include the feminine and neuter; the singular number includes the plural and the plural includes the singular.

[NY] C201.3 ~~Terms~~ Words and terms defined in other codes. ~~Terms that~~ Where italicized words and terms are not defined in this ~~Chapter 2 [CE]~~ publication but are defined in the *Building Code of New York State, Fire Code of New York State, Fuel Gas Code of New York State, Mechanical Code of New York State, Plumbing Code of New York State* or the *Residential Code of New York State*, such terms shall have the meanings ascribed to them in those codes.

[NY] C201.4 ~~Terms~~ Words and terms not defined. ~~Terms~~ Where words and terms are not italicized or are italicized but not defined in this ~~Chapter 2 [RE]~~ publication or in the ~~*Building Code of New York State, Fire Code of New York State, Fuel Gas Code of New York State, Mechanical Code of New York State, Plumbing Code of New York State,* or the *Residential Code of New York State*~~ publications listed in Section R201.3, such words and terms shall have the meanings defined in applicable referenced standards, statutes, or regulations or shall have the ordinarily accepted meanings such as the context implies.

EC 07-0005

Revise as follows:

[NY] 2024 NYS ASHRAE 90.1~~—2016~~. The New York State-specific version of the publication ~~entitled~~ titled "ANSI/ASHRAE/IES Standard 90.1~~—2016~~, Energy Standard for Buildings Except Low-rise Residential Buildings" ~~(October 2016 printing)~~ published by ASHRAE~~, formerly~~ (formally known as the American Society of Heating, Refrigerating and Air-Conditioning Engineers), ~~Inc. (ASHRAE 90.1—2016 is published by ASHRAE and~~ jointly sponsored by the Illuminating Engineering Society (IES) ~~of North America~~ and the American National Standards Institute (ANSI), and is also known as "ANSI/ASHRAE/IES 90.1~~—2016" or "ANSI/ASHRAE/IESNA 90.1—2016.")~~

EC 07-0024

Delete:

~~**[NY] AIR-IMPERMEABLE INSULATION.** An insulation having an air permeance equal to, or less than 0.02 L/s-m^2 at 75 Pa pressure differential tested according to ASTM E 2178 or E 283.~~

EC 07-0103

Revise as follows:

AIR CURTAIN UNIT. A device, installed at the building entrance, that generates and discharges a laminar air stream intended to prevent the *infiltration* of external, unconditioned air into the conditioned spaces, or the loss of interior, conditioned air to the outside.

EC 07-0102

Add new:

AIR LEAKAGE. The uncontrolled air flow through the building thermal envelope caused by pressure differences across the building thermal envelope. Air leakage can be inward (infiltration) or outward (exfiltration) through the building thermal envelope.

APPROVED SOURCE. An independent person, firm or corporation, approved by the building official, who is competent and experienced in the application of engineering principles to materials, methods or systems analyses.

EC 07-0103

Modify as follows:

[NY] AREA-WEIGHTED AVERAGE. A mathematical technique for combining different amounts of various components, based on proportional relevance, into a single number. Weighted averaging may be used where there is more than one ~~R-~~insulation or thermal resistance value for floor, wall, or ceiling insulation, or ~~more than one U-factor for~~ fenestration performance in a building. As an example, the area-weighted average for window fenestration U-factors equals (Area 1 x U-factor 1) + (Area 2 x U-factor 2) + …/ Total Area = maximum allowable fenestration U-factor.

EC 07-0102

Add new:

BEST EFFICIENCY POINT (BEP). The pump hydraulic power operating point (consisting of both flow and head conditions) that results in the maximum efficiency.

[NY] BIODIESEL BLEND. A homogeneous mixture of hydrocarbon oils and mono alkyl esters of long chain fatty acids.

EC 07-0025

Add new:

BIOGAS. A mixture of hydrocarbons that is a gas at 60°F (15.5°C) and 1 atmosphere of pressure that is produced through the anaerobic digestion of organic matter.

EC 07-0102

Add new:

BIOMASS WASTE. Organic non-fossil material of biological origin that is a byproduct or a discarded product. Biomass waste includes municipal solid waste from biogenic sources, landfill gas, sludge waste, agricultural crop byproducts,

straw, and other biomass solids, liquids, and biogases; but excludes wood and wood-derived fuels (including black liquor), biofuel feedstock, biodiesel, and fuel ethanol.

EC 07-0103

Revise as follows:

~~[NY]~~ **BUILDING THERMAL ENVELOPE.** The *basement walls,* *exterior walls* ~~(above and below grade)~~, floors, ceilings roofs and any other building element assemblies that enclose *conditioned space* or provide a boundary between *conditioned space* and exempt or unconditioned space.

EC 07-0006

Add new:

[NY] CHARACTER-DEFINING FEATURES. Those visual aspects and physical elements and spaces that comprise the appearance of a *historic building* and that are significant to the historical, architectural, and cultural values, including the overall shape of the *historic building* or property, its materials, craftsmanship, decorative details, interior spaces and features, as well as the various aspects of its site and environment.

EC 07-0102

Add new:

CHI-FACTOR (χ-FACTOR). The heat loss factor for a single *thermal bridge* characterized as a point element of a *building thermal envelope* (Btu/h x °F)[W/K].

CLEAN WATER PUMP. A device that is designed for use in pumping water with a maximum nonabsorbent free solid content of 0.016 lb/ft (0.256 kg/m) and with a maximum dissolved solid content of 3.1 lb/ft (49.66 kg/m), provided that the total gas content of the water does not exceed the saturation volume, and disregarding any additives necessary to prevent the water from freezing at a minimum of 14°F (-10°C).

COMMON AREA. All conditioned spaces within Group R occupancy buildings that are not dwelling units or sleeping units.

COMMUNITY RENEWABLE ENERGY FACILITY. A facility that produces energy harvested from renewable energy resources and is qualified as a community energy facility under applicable jurisdictional statutes and rules.

EC 07-0026

Revise as follows:

COMPUTER ROOM. A room whose primary function is to house equipment for the processing and storage of electronic data ~~and that~~ which has a design ~~electronic data~~ total *information technology equipment (ITE)* equipment power density of less than or equal to 20 watts per square foot (20 watts per 0.092 m^2) of conditioned ~~floor~~ area or a ~~connected~~ design ~~electronic data~~ total *ITE* equipment load of less than or equal to 10 kW.

EC 07-0102

Add new:

CONGREGATE LIVING. A building or part thereof that contains sleeping units where residents share bathroom or kitchen facilities, or both.

CONSTRUCTION DOCUMENTS. Written, graphic and pictorial documents prepared or assembled for describing the design, location, and physical characteristics of the elements of a project necessary for obtaining a building permit.

EC 07-0025

Add new:

DATA CENTER. A room or series of rooms that share *data center systems*, whose primary function is to house equipment for the processing and storage of electronic data and that has a design total *ITE* equipment power density exceeding 20 watts per square foot (20 watts per 0.092 m^2) of conditioned area and a total design *ITE* equipment load greater than 10 kW.

DATA CENTER SYSTEMS. HVAC systems and equipment, or portions thereof, used to provide cooling or *ventilation* in a *data center*.

EC 07-0102

Add new:

DEDICATED OUTDOOR AIR SYSTEM (DOAS). A ventilation system that supplies 100 percent outdoor air primarily for the purpose of ventilation, and that is a separate system from the zone space-conditioning system.

DEHUMIDIFIER. A self-contained, electrically operated, and mechanically encased product with the sole purpose of dehumidifying the space consisting of:

1. A refrigerated surface (evaporator) that condenses moisture from the atmosphere,
2. A refrigerating system, including an electric motor,
3. An air-circulating fan, and
4. A means for collecting or disposing of the condensate.

A dehumidifier does not include a portable air conditioner, room air conditioner, or packaged terminal air conditioner.

DEMAND CONTROL KITCHEN VENTILATION (DCKV). A system that provides automatic, continuous control over exhaust hood and, where provided, makeup air flows speed in response to one or more sensors that monitor cooking activity or through direct communication with cooking appliances.

EC 07-0026

Revise as follows:

DEMAND RECIRCULATION WATER SYSTEM. A water distribution system ~~having~~ where one or more ~~recirculation pumps that pump water from a heated water supply pipe back to the heated water source through a cold water supply pipe.~~ pumps prime the service hot water piping with heated water upon a demand for hot water.

EC 07-0102

Add new:

DEMAND RESPONSE SIGNAL. A signal that indicates a price or a request to modify electricity consumption for a limited time period.

DEMAND RESPONSIVE CONTROL. A control capable of receiving and automatically responding to a demand response signal.

DESICCANT DEHUMIDIFICATION SYSTEM. A mechanical dehumidification technology that uses a solid or liquid material to remove moisture from the air.

EC 07-0025

Add new:

DIRECT DIGITAL CONTROL (DDC). A type of control where controlled and monitored analog or binary data, such as temperature and contact closures, are converted to digital format for manipulation and calculations by a digital computer or microprocessor, then converted back to analog or binary form to control physical devices.

EC 07-0102

Add new:

DX-DEDICATED OUTDOOR AIR SYSTEM UNITS (DX-DOAS UNITS). A type of air-cooled, water-cooled or water source factory assembled product that dehumidifies 100 percent outdoor air to a low dew point and includes reheat that is capable of controlling the supply dry-bulb temperature of the dehumidified air to the designated supply air temperature. It may precondition outdoor air with an energy recovery ventilation system.

EAST-ORIENTED. Facing within 45 degrees of true east to the south and within less than 22.5 degrees of true east to the north in the northern hemisphere or facing within 45 degrees of true east to the north and within less than 22.5 degrees of true east to the south in the southern hemisphere.

EMITTANCE. The ratio of the radiant heat flux emitted by a specimen measured on a scale from 0 to 1, where a value of 1 indicates perfect release of thermal radiation.

ENERGY RECOVERY, SERIES. A three-step process in which the first step is to remove energy from a single airstream without the use of mechanical cooling. In the second step, the air stream is mechanically cooled for the purpose of dehumidification. In the third step, the energy removed in step one is reintroduced to the air stream.

ENERGY RECOVERY RATIO, SERIES (SERR). The difference between the dry bulb air temperatures leaving the series energy recovery unit and leaving the dehumidifying coil divided by the difference between 75˚F (24˚C) and the dry bulb temperature of the air leaving the dehumidifying cooling coil.

ENERGY STORAGE SYSTEM (ESS). One or more devices, assembled together, capable of storing energy in order to supply electrical energy at a future time.

ENERGY USE INTENSITY (EUI). The metric indicating the total amount of energy consumed by a building in one year divided by the gross floor area of the building.

ENTHALPY RECOVERY RATIO (ERR). Change in the enthalpy of the *outdoor air* supply divided by the difference between the *outdoor air* and entering exhaust air enthalpy, expressed as a percentage.

[NY] EXISTING BUILDING. A building that is legally occupied and/or for which a certificate of occupancy authorizing its use(s) has been issued, without regard to the date on which such legal occupancy began or the date on which such certificate of occupancy was issued.

EC 07-0025

Add new:

FAN, EMBEDDED. A fan that is part of a manufactured assembly where the assembly includes functions other than air movement.

FAN ARRAY. Multiple fans in parallel between two plenum sections in an air distribution system.

EC 07-0024

Delete:

~~**FAN EFFICIENCY GRADE (FEG).** A numerical rating identifying the fan's aerodynamic ability to convert shaft power, or impeller power in the case of a direct-driven fan, to air power.~~

EC 07-0102

Add new:

FAN ELECTRICAL INPUT POWER. The electrical input power in kilowatts required to operate an individual fan or fan array at design conditions. It includes the power consumption of motor controllers, where present.

EC 07-0025

Add new:

FAN ENERGY INDEX (FEI). The ratio of the electric input power of a reference fan to the electric input power of the actual fan as calculated in accordance with AMCA 208.

FAN NAMEPLATE ELECTRICAL INPUT POWER. The nominal electrical input power rating stamped on a fan assembly nameplate.

EC 07-0102

Add new:

FAN SYSTEM, COMPLEX. A fan system that combines a single-cabinet fan system with other supply fans, exhaust fans, or both.

FAN SYSTEM, EXHAUST OR RELIEF. A fan system dedicated to the removal of air from interior spaces to the outdoors.

FAN SYSTEM, RETURN. A fan system dedicated to removing air from the interior where some or all the air is to be recirculated except during economizer operation.

FAN SYSTEM, SINGLE-CABINET. A fan system where a single fan, single fan array, a single set of fans operating in parallel, or fans or fan arrays in series and embedded in the same cabinet that both supply air to a space and recirculate the air.

FAN SYSTEM, TRANSFER. A fan system that exclusively moves air from one occupied space to another.

FAN SYSTEM AIRFLOW. The sum of the airflow of all fans with fan electrical input power greater than 1 kW at fan system design conditions, excluding the airflow that passes through downstream fans with fan electrical input power less than 1 kW.

EC 07-0103

Revise as follows:

FAN SYSTEM DESIGN CONDITIONS. Operating conditions that can be expected to occur during normal system operation that result in the highest supply fan airflow ~~rate to conditioned spaces served by~~ of the system, other than during air economizer operation.

EC 07-0025

Add new:

FAN SYSTEM ELECTRICAL INPUT POWER. The sum of the fan electrical power of all fans that are required to operate at fan system design conditions to supply air from the heating or cooling source to the conditioned spaces and/or return it to the source or exhaust it to the outdoors.

FAULT DETECTION AND DIAGNOSTICS (FDD) SYSTEM. A software platform that utilizes building analytic algorithms to convert data provided by sensors and devices to *automatically* identify faults in building systems and provide a prioritized list of actionable resolutions to those faults based on cost or energy avoidance, comfort and maintenance impact.

EC 07-0026

Revise as follows:

FENESTRATION. Products classified as either skylights or vertical fenestration.

Skylights. Glass or other transparent or translucent glazing material installed at a slope of less than 60 degrees (1.05 rad) from horizontal, including unit skylights, tubular daylighting devices and glazing materials in solariums, sunrooms, roofs, greenhouses and sloped walls.

Vertical fenestration. Windows that are fixed or operable, ~~opaque doors, glazed~~ doors that are more than half glazed, glazed block and combination opaque and glazed doors composed of glass or other transparent or translucent glazing materials and installed at a slope of not less than 60 degrees (1.05 rad) from horizontal.

***F*-FACTOR.** The perimeter heat loss factor per unit perimeter length of ~~for~~ slab-on-grade floors (Btu/h • ft • °F) [W/(m • K)].

EC 07-0102

Add new:

FINANCIAL RENEWABLE ENERGY POWER PURCHASE AGREEMENT. A financial arrangement between a renewable electricity generator and a purchaser wherein the purchaser pays or guarantees a price to the generator for the project's renewable generation. Also known as a "financial power purchase agreement" and "virtual power purchase agreement."

[NY] FUEL GAS. A natural gas, manufactured gas, liquified petroleum gas or a mixture of these.

[NY] FUEL OIL. Kerosene or any hydrocarbon oil having a flash point not less than 100°F (38°C).

EC 07-0026

Revise as follows:

GENERAL LIGHTING. ~~Lighting~~ Interior lighting that provides a substantially uniform level of illumination throughout ~~an area. *General lighting* shall not include decorative lighting or lighting that provides a dissimilar level of illumination to serve a specialized application or feature within such area.~~ a space.

EC 07-0102

Add new:

GREEN RETAIL TARIFF. An electricity-rate structure qualified under applicable statutes or rules contracted by an electricity service provider to the *building* project *owner* to provide electricity generated with 100 percent *renewable energy resources* without the purchase of unbundled RECS.

EC 07-0103

Revise as follows:

[NY] GREENHOUSE. A structure or a thermally isolated area of a *building*, erected for a period of 180 days or more, that maintains a specialized sunlit environment with a skylight-to-roof ratio of 50 percent or more above the growing area exclusively used for, and essential to, the cultivation, protection or maintenance of plants.

EC 07-0102

Add new:

HIGH-CAPACITY GAS-FIRED WATER HEATER. Gas-fired instantaneous water heaters with a rated input greater than 200,000 Btu/h (58.6 kW) and not less than 4,000 Btu/h per gallon (310 W per litre) of stored water. Also, gas-fired storage water heaters with a rated input both greater than 105,000 Btu/h (30.8 kW) and less than 4,000 Btu/h per gallon (310 W per litre) of stored water.

HIGH-END TRIM. A lighting control setting which limits the maximum power to individual luminaires or groups of luminaires in a space.

EC 07-0007

Revise as follows:

[NY] HISTORIC BUILDING. ~~The term historic building means~~ An existing *building* ~~or structure~~ that is any of the following:

1. ~~is~~ Listed, or certified as eligible for listing, in the National Register of Historic Places or in the New York State Register of Historic Places~~, either individually or as a contributing building to a historic district; or~~.
2. ~~is listed in the National Register of Historic Places, either individually or as a contributing building to a historic district~~ Designated as historic under an applicable state or local law~~; or~~.
3. ~~has been determined to be eligible for listing in either the New York State or National Register of Historic Places, either individually or as a contributing building to a historic district, by the New York State Commissioner of Parks, Recreation and Historic Preservation; or~~
4. ~~has been determined to be eligible for listing in the National Register of Historic Places, either individually or~~ Certified as a contributing resource within a National Register-listed, State Register-listed, or locally designated ~~building to a~~ historic district~~, by the U.S. Secretary of the Interior~~.

EC 07-0102

Add new:

HORTICULTURAL LIGHTING. Electric lighting used for horticultural production, cultivation or maintenance.

EC 07-0024

Delete:

~~**HUMIDISTAT.** A regulatory device, actuated by changes in humidity, used for automatic control of relative humidity.~~

EC 07-0102

Add new:

HUMIDISTATIC CONTROLS. Automatic controls used to maintain humidity at a fixed or adjustable setpoint.

HVAC TOTAL SYSTEM PERFORMANCE RATIO (HVAC TSPR). The ratio of the sum of a building's annual heating and cooling load in thousands of Btus to the sum of annual site energy consumption of the building HVAC systems in BTU.

INDOOR GROW. a space, other than a greenhouse, used exclusively for, and essential to horticultural production, cultivation or maintenance.

EC 07-0025

Add new:

INFORMATION TECHNOLOGY EQUIPMENT (ITE). Items including computers, data storage devices, servers and network and communication equipment.

EC 07-0102

Add new:

INTEGRATED HVAC SYSTEM. An HVAC system designed to handle both sensible and latent heat removal. Integrated HVAC systems include, but are not limited to HVAC systems with a sensible heat ratio of 0.65 or less and the capability of providing cooling, dedicated outdoor air systems, single package air conditioners with at least one refrigerant circuit providing hot gas reheat, and dehumidifiers modified to allow external heat rejection.

EC 07-0025

Add new:

INTERNAL CURTAIN SYSTEM. A system consisting of movable panels of fabric or plastic film used to cover and uncover the space enclosed in a *greenhouse* on a daily basis.

EC 07-0102

Add new:

LARGE-DIAMETER CEILING FAN. A ceiling fan that is greater than or equal to 84.5 inches (2146 mm) in diameter. These fans are sometimes referred to as High-Volume, Low-Speed (HVLS) fans.

[NY] LIQUID FUEL. A *fuel oil* or *biodiesel blend*.

EC 07-0103

Revise as follows:

~~**LOW-SLOPED ROOF**~~ **LOW SLOPE.** A ~~roof having a~~ slope less than 2 units vertical in 12 units horizontal (17-percent slope) as applied to roofs.

EC 07- 0102

Add new:

MARKET VALUE. For the purposes of determining *substantial improvement, market value* pertains only to the *building* or structure in question before and after improvement is undertaken. *Market value* does not include the value of the land and site improvements including but not limited to landscaping, pavement, and detached structures or the value of the location of the property, the use and occupancy, or business income potential.

EC 07-0026

Revise as follows:

NETWORKED GUESTROOM CONTROL SYSTEM. A control system, ~~accessible~~ with access from the front desk or other central location associated with a *Group R-1* building, that is capable of identifying the ~~occupancy~~ rented and unrented status of each guestroom according to a timed schedule, and is capable of controlling HVAC in each hotel and motel guestroom separately.

EC 07- 0102

Add new:

NORTH-ORIENTED. Facing within 67.5 degrees of true north in the northern hemisphere or facing within 67.5 degrees of true south in the southern hemisphere.

OCCUPIED-STANDBY MODE. Mode of operation when an HVAC zone is scheduled to be occupied and an occupant sensor indicates no occupants are within the zone.

EC 07-0026

Revise as follows:

ON-SITE RENEWABLE ENERGY. Energy from *renewable energy resources* harvested at the building project site. ~~Energy derived from solar radiation, wind, waves, tides, landfill gas, biogas, biomass or the internal heat of the earth. The energy system providing on-site renewable energy shall be located on the project site.~~

EC 07-0102

Add new:

OWNER. Any person, agent, operator, entity, firm or corporation having any legal or equitable interest in the property; or recorded in the official records of the state, county or municipality as holding an interest or title to the property; or otherwise having possession or control of the property, including the guardian of the estate of any such person, and the executor or administrator of the estate of such person if ordered to take possession of real property by a court.

PARKING AREA, EXTERIOR. Parking spaces, drive aisles and ramps which are not located within a *building*, or which are located on a roof.

PARKING AREA, INTERIOR. Parking spaces, drive aisles, and ramps located within a *building*.

PARKING GARAGE SECTION. A part of an enclosed parking garage that is separated from all other parts of the garage by full-height solid walls or operable openings that are intended to remain closed during normal operation and where vehicles cannot pass to other parts of the garage. A parking garage can have one or more parking garage sections and parking garage sections can include multiple floors.

PHOTOSYNTHETIC PHOTON EFFICACY (PPE). Photosynthetic photon flux emitted by a light source divided by its electrical input power in units of micromoles per second per watt, or micromoles per joule (µmol/J) between 400-700nm as defined by ANSI/ASABE S640.

PHYSICAL RENEWABLE ENERGY POWER PURCHASE AGREEMENT. A contract for the purchase of renewable electricity from a specific renewable electricity generator to a purchaser of renewable electricity.

PROCESS APPLICATION. A manufacturing, industrial, or commercial procedure or activity where the primary purpose is other than conditioning spaces and maintaining comfort and amenities for the occupants of a building.

EC 07-0103

Revise as follows:

PROPOSED DESIGN. A description of the proposed building used to estimate annual energy use for determining compliance based on ~~total~~ simulated building performance and HVAC total system performance ratio.

EC 07-0102

Add new:

PSI-FACTOR (ψ-FACTOR). The heat loss factor per unit length of a *thermal bridge* characterized as a linear element of a *building thermal envelope* (Btu/h x ft x °F) [W/(m x K)].

PUMP ENERGY INDEX (PEI). The ratio of a pump's energy rating divided by the energy rating of a minimally compliant pump. For pumps with the constant load operating mode, the relevant PEI is PEICL. For pumps with the variable load operating mode, the relevant PEI is PEIVL.

PURCHASED ENERGY. Energy or power purchased for consumption and delivered to the *building* site.

RENEWABLE ENERGY CERTIFICATE (REC). A market-based instrument that represents and conveys the environmental, social, and other non-power attributes of one megawatt hour of renewable electricity generation and could be sold separately from the underlying physical electricity associated with renewable energy resources, also known as "energy attribute" and "energy attribute certificate" (EAC).

RENEWABLE ENERGY INVESTMENT FUND (REIF). A fund established by a jurisdiction to accept payment from *building* project owners to construct or acquire interests in qualifying renewable energy systems, together with their associated RECS, on the *building* project owners' behalf.

RENEWABLE ENERGY RESOURCES. Energy derived from solar radiation, wind, waves, tides, biomass waste or extracted from hot fluid or steam heated within the earth.

EC 07-0027

Revise as follows:

[NY] RESIDENTIAL BUILDING. For this code, includes the following:

1. Detached one- and two-family dwellings and *townhouses* having not more than three stories above grade plane;
2. ~~Detached two-family dwellings having not more than three stories above grade plane;~~
3. ~~Buildings that (i) consist of three or more attached *townhouse* units and (ii) have not more than three stories above grade plane;~~
4. ~~4.~~2. Buildings that ~~(i)~~ are classified in accordance with Chapter 3 of the *Building Code of New York State* ~~in~~ as Group R-2, R-3 or R-4 ~~and (ii) have~~ having not more than three stories above grade plane; and
5. ~~5.~~3. Factory manufactured homes [~~(~~as defined in Section 372(8) of the New York State Executive Law~~)~~]~~; and~~.
6. ~~Mobile homes (as defined in Section 372(13) of the New York State Executive Law).~~

~~For the purposes of this definition of the term "Residential building," the term "Townhouse unit" means a single-family dwelling unit constructed in a group of three or more attached units in which each unit (1) extends from the foundation to roof, (2) has open space on at least two sides, and (3) has a separate means of egress.~~

EC 07-0103

Revise as follows:

[NY] ROOF REPLACEMENT~~. The process of removing the~~ An *alteration* that includes the removal of any existing layer of roof material ~~covering, repairing any damaged substrate~~ and installing ~~a~~ new replacement material(s) above the existing roof ~~covering.~~ deck.

EC 07-0102

Add new:

SENSIBLE ENERGY RECOVERY RATIO. Change in the dry-bulb temperature of the outdoor air supply divided by the difference between the outdoor air and entering exhaust air dry-bulb temperatures, expressed as a percentage.

SIMULATED BUILDING PERFORMANCE. A process in which the proposed building design is compared to a standard reference design for the purposes of estimating relative energy use against a baseline to determine code compliance.

EC 07-0103

Revise as follows:

[NY] SLEEPING UNIT. ~~A room or space in which people sleep, that~~ A single unit that provides rooms or spaces for one or more persons, includes permanent provisions for sleeping and can include ~~permanent~~ provisions for living, eating, and either sanitation or kitchen facilities but not both. Such rooms and spaces that are part of a *dwelling unit* are not *sleeping units*.

EC 07-0102

Add new:

SOUTH-ORIENTED. Facing within 45 degrees of true south in the northern hemisphere or facing within 45 degrees of true north in the southern hemisphere.

EC 07-0103

Revise as follows:

STANDARD REFERENCE DESIGN. A version of the *proposed design* that meets the minimum ~~prescriptive and mandatory baseline~~ requirements of this code~~. The *standard reference design*, as the code baseline,~~ and is used to determine the maximum annual energy use requirement for compliance~~. The *proposed design* is measured against the *standard reference design* in an annual energy use simulation and is~~ based on ~~total building performance~~ *simulated building performance* and HVAC total system performance ratio. ~~Parameters of the *standard reference design* and the *proposed design* are specified in Tables contained in Section C407.~~

EC 07-0102

Add new:

[NY] SUBSTANTIAL IMPROVEMENT. Any *repair*, rehabilitation, *alteration*, *addition* or other improvement of a *building* or structure, the cost of which equals or exceeds 50 percent of the *market value* of the *building* or structure before the improvement. The cost of improvements to a *building* to correct health, sanitary or safety code violations issued by the *building official* does not need to be included in the calculation of *market value*.

[NY] SUBSTANTIALLY COMPLETE BUILDING PERMIT APPLICATION. A building permit application that, in the opinion of the authority having jurisdiction, includes sufficient information and documentation required by the stricter of either the authority having jurisdiction's Code Enforcement Program or the requirements set forth in 19 NYCRR Part 1203, such that the authority having jurisdiction can examine the application and make a determination as to whether the proposed work is in conformance with the requirements of the Uniform Code and Energy Code.

TESTING UNIT ENCLOSURE AREA. The area sum of all the boundary surfaces that define t h e *dwelling unit*, *sleeping unit* or *conditioned enclosed space* including top/ceiling, bottom/floor and all side walls. This does not include interior partition walls within the *dwelling unit*, *sleeping unit*, or *conditioned enclosed space*. Wall height shall be measured from the finished floor of the *conditioned space* to the finished floor or roof/ceiling air barrier above.

THERMAL BLOCK. A generic concept used in energy simulation. It can include one or more thermal zones. It represents a whole building or portion of a building with the same use type served by the same HVAC system type.

THERMAL BRIDGE. An element or interface of elements that has a higher thermal conductivity than the surrounding *building thermal envelope*, which creates a path of least resistance for heat transfer.

EC 07-0025

Add new:

THERMAL DISTRIBUTION EFFICIENCY (TDE). The resistance to changes in air heat as air is conveyed through a distance of air duct. TDE is a heat loss calculation evaluating the difference in the heat of the air between the air duct inlet and outlet caused by differences in temperatures between the air in the duct and the duct material. TDE is expressed as a percent difference between the inlet and outlet heat in the duct.

EC 07-0102

Add new:

TOTAL SIMULATED BUILDING PERFORMANCE. The process in which the total simulated performance of a proposed design is compared to that of a standard reference design for the purposes of estimating relative energy use in order to determine code compliance.

[NY] TOTAL SYSTEM PERFORMANCE RATIO (TSPR). The ratio of the sum of a *building's* annual heating and cooling load in kBtu to the sum of annual site energy input in kBtu of the *building* mechanical systems.

EC 07-0025

Add new:

VEGETATIVE ROOF. An assembly of interacting components designed to waterproof a building's top surface that includes, by design, vegetation and related landscape elements.

VISIBLE TRANSMITTANCE, ANNUAL (VT_{annual}). The ratio of visible light entering the space through the fenestration product assembly to the incident visible light during the course of a year, which includes the effects of glazing material, frame, and light well or tubular conduit, and is expressed as a number between 0 and 1.

EC 07-0103

Revise as follows:

[NY] WALL, ABOVE-GRADE. A wall associated with the *building thermal envelope* that is more than 15 percent above grade plane and is on the exterior of the building or any wall that is associated with the *building thermal envelope* that is not on the exterior of the building. This includes, but is not limited to, between-floor spandrels, peripheral edges of floors, roof knee walls, dormer walls, gable end walls, walls enclosing a mansard roof, mechanical equipment penetrations, and skylight shafts.

EC 07-0102

Add new:

WEST-ORIENTED. Facing within 45 degrees of true west to the south and within less than 22.5 degrees of true west to the north in the northern hemisphere or facing within 45 degrees of true west to the north and within less than 22.5 degrees of true west to the south in the southern hemisphere.

WORK AREA. That portion or portions of a building consisting of all reconfigured spaces as indicated on the construction documents. Work area excludes other portions of the building where incidental work entailed by the intended work must be performed and portions of the building where work not initially intended by the owner is specifically required by this code.

Chapter C3. General Requirements

EC 07-0028

Revise as follows:

[NY] TABLE C301.1
NEW YORK STATE CLIMATE ZONES BY COUNTY

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

EC 07-0029

Revise as follows:

[NY] TABLE C301.3~~(2)~~
~~INTERNATIONAL~~ THERMAL CLIMATE ZONE DEFINITIONS

ZONE NUMBER	THERMAL CRITERIA	
	IP Units	SI Units
4	CDD50°F ≤ ~~4500~~ 6,300 AND 3,600 < HDD65°F ≤ 5,400	CDD10°C ≤ ~~2500~~ 3500 AND 2000 < HDD18°C ≤ 3000
5	CDD50°F < 6,300 AND 5400 < HDD65°F ≤ 7,200	CDD10°C < 3500 AND 3000 < HDD18°C ≤ 4000
6	7200 < HDD65°F ≤ 9000	4000 < HDD18°C ≤ 5000

For SI: °C = [(°F) – 32]/1.8.

EC 07-0105

Revise as follows:

C303.1.2 Insulation mark installation. Insulating materials shall be installed such that the manufacturer's *R-value* mark is readily observable upon inspection. For insulation materials that are installed without an observable manufacturer's *R-value* mark, such as blown or draped products, an insulation certificate complying with Section C303.1.1 shall be left immediately after installation by the installer, in a conspicuous location within the building, to certify the installed *R-value* of the insulation material.

Exception: For roof insulation installed above the deck, the *R-value* shall be labeled as specified by the material standards in Table 1508.2 of the Building Code of New York State.

C303.1.3 Fenestration product rating. *U-factor*s, *solar heat gain coefficient* (SHGC), and *visible transmittance* (VT) of *fenestration* products shall be determined as follows:

1. For windows, doors and skylights, *U-factor*, SHGC and VT ratings shall be determined in accordance with NFRC 100 and NFRC 200.
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-factor*s, SHGC and VT shall be determined by an accredited, independent laboratory, and *labeled* and certified by the manufacturer by a label affixed to the product or a label certificate specific to the products in the project.

Products lacking such a *labeled U-factor* shall be assigned a default *U-factor* from Table C303.1.3(1) or C303.1.3(2). ~~The solar heat gain coefficient (SHGC) and visible transmittance (VT) of glazed fenestration products (windows, glazed doors and skylights) shall be determined in accordance with NFRC 200 by an accredited, independent laboratory, and labeled and certified by the manufacturer.~~ Products lacking such a *labeled* SHGC or VT shall be assigned a default SHGC or VT from Table C303.1.3(3). For Tubular Daylighting Devices, VT_{annual} shall be measured and rated in accordance with NFRC 203.

TABLE C303.1.3(1)
DEFAULT GLAZED WINDOW,
GLASS DOOR AND SKYLIGHT *U*-FACTORS

FRAME TYPE	WINDOW AND GLASS DOOR		SKYLIGHT	
	Single	Double	Single	Double
Metal	1.20	0.80	2.00	1.30
Metal with Thermal Break	1.10	0.65	1.90	1.10
Nonmetal or Metal Clad	0.95	0.55	1.75	1.05
~~Glazed~~ Glass Block	0.60			

Chapter C4. Commercial Energy Efficiency

EC 07-0106

Revise as follows:

[NY] C401.2 Application. *Commercial buildings* shall comply with ~~one of the following:~~ Section C401.2.1 or C401.2.2.

~~1. ASHRAE Compliance Path: The requirements of ANSI/ASHRAE/IESNA 90.1, as amended by 19 NYCRR Part 1240.~~

C401.2.1 ECCCNYS - Commercial Provisions. *Commercial buildings* shall comply with one of the following:

1. Prescriptive Compliance. ~~Path:~~ The ~~requirements of~~ Prescriptive Compliance option requires compliance with Sections C402 through ~~C405~~ C406 and Section C408. ~~In addition, commercial buildings shall comply with~~

~~Section C406 and tenant spaces shall comply with Section C406.1.1.~~ *Dwelling units* and *sleeping units* in Group R-2 buildings shall be deemed to be in compliance with this chapter, provided that they comply with Section R406.

2. Simulated Building Performance. The *Simulated Building Performance* option requires compliance with Section C407.

~~3. The requirements of Sections C402.5, C403.2, C403.3 through C403.3.2, C403.4 through C403.4.2.3, C403.5.5, C403.7, C403.8.1 through C403.8.4, C403.10.1 through C403.10.3, C403.11, C403.12, C404, C405, C407 and C408. The building energy cost shall be equal to or less than 85 percent of the standard reference design building.~~
Exception: *Additions, alterations, repairs* and *changes of occupancy* to existing buildings complying with Chapter 5.

[NY] C401.2.2 ASHRAE 90.1. *Commercial buildings* shall comply with the requirements of the *2024 NYS ASHRAE 90.1*.

Delete without substitution:

~~**[NY] C401.2.1 Application to replacement fenestration products.** Where some or all of an existing *fenestration* unit is replaced with a new *fenestration* product, including sash and glazing, the replacement *fenestration* unit shall meet the applicable requirements for *U-factor* and *SHGC* in Table C402.4.~~

~~**Exception:** An area-weighted average of the U-factor of replacement fenestration products being installed in the building for each fenestration product category listed in Table C402.4 shall be permitted to satisfy the U-factor requirements for each fenestration product category listed in Table C402.4. Individual fenestration products from different product categories listed in Table C402.4 shall not be combined in calculating the area-weighted average U-factor.~~

EC 07-0107

Add new:

C401.3 Building thermal envelope certificate. A permanent *building thermal envelope* certificate shall be completed by an *approved* party. Such certificate shall be posted on a wall in the space where the space conditioning equipment is located, a utility room or other *approved* location. If located on an electrical panel, the certificate shall not cover or obstruct the visibility of the circuit directory label, service disconnect label or other required labels. A copy of the certificate shall also be included in the construction files for the project. The certificate shall include the following:

1. *R*-values of insulation installed in or on ceilings, roofs, walls, foundations and slabs, *basement walls*, crawl space walls and floors and ducts outside *conditioned spaces*.
2. *U*-factors and *solar heat gain coefficients* (SHGC) of fenestration.
3. Results from any *building thermal envelope* air leakage testing performed on the *building*.

Where there is more than one value for any component of the building envelope, the certificate shall indicate the area-weighted average value where available. If the area- weighted average is not available, the certificate shall list each value that applies to 10 percent or more of the total component area.

EC 07-0108

Revise as follows:

SECTION C402
BUILDING THERMAL ENVELOPE REQUIREMENTS

C402.1 General ~~(Prescriptive)~~. *Building thermal envelope* assemblies for *buildings* that are intended to comply with the code on a prescriptive basis in accordance with the compliance path described in Item ~~2~~ 1 of Section ~~C401.2~~ C401.2.1, shall comply with the following:

1. The opaque portions of the *building thermal envelope* shall comply with the specific insulation requirements of Section C402.2 and the thermal requirements of either ~~the R-value based method of~~ Section ~~C402.1.3~~C402.1.2;

~~the U-, C-and F-factor-based method of~~Section ~~C402.1.4~~C402.1.3; or ~~the component performance alternative of Section C402.1.5~~C402.1.4. Where the total area of through penetrations of mechanical equipment is greater than 1 percent of the opaque above-grade wall area, the building thermal envelope shall comply with Section C402.1.2.4.

2. Wall solar reflectance and thermal emittance shall comply with Section C402.3.

~~2~~3. Roof solar reflectance and thermal emittance shall comply with Section ~~C402.3~~C402.4.

~~3~~4. Fenestration in *building thermal envelope* assemblies shall comply with Section ~~C402.4~~C402.5. Where buildings have a vertical fenestration area or skylight area greater than that allowed in Section C402.5, the building and building thermal envelope shall comply with Item 2 of Section C401.2.1, Section C401.2.2, or Section C402.1.4.

~~4~~5. Air leakage of the *building thermal envelope* ~~assemblies~~ shall comply with Section ~~C402.5~~C402.6.

6. *Thermal bridges* in *above-grade walls* shall comply with Section C402.7.

5. Walk-in coolers, walk-in freezers, refrigerated warehouse coolers and refrigerated warehouse freezers shall comply with Section C403.12.

~~Alternatively, where buildings have a vertical fenestration area or skylight area exceeding that allowed in Section C402.4, the building and building thermal envelope shall comply with Section C401.2, Item 1 Item 2 of Section C401.2.1 or Section C401.2, Item 3 Section C401.2.2.~~

~~Walk-in coolers, walk-in freezers, refrigerated warehouse coolers and refrigerated warehouse freezers shall comply with Section C403.10.1 or C403.10.2 Section C403.11.~~

[NY] C402.1.1 Low-energy buildings and greenhouses. ~~The following low-~~Low-energy buildings and *greenhouses*, or portions thereof separated from the remainder of the *building* by *building thermal envelope* assemblies, and complying with ~~this section~~ Sections C402.1.1.1 or C402.1.1.2, shall be exempt from the *building thermal envelope* provisions of Section C402.

~~1. Those with a peak design rate of energy usage less than 3.4 Btu/h • ft^2 (10.7 W/m^2) or 1.0 watt per square foot (10.7 W/m^2) of floor area for space conditioning purposes.~~
~~2. Those that do not contain *conditioned space*.~~
~~3. *Greenhouses*.~~

[NY] C402.1.1.1 Low-energy buildings. *Buildings* and *greenhouses* that comply with either of the following shall be considered low-energy buildings:

1. Those with a peak design rate of energy usage less than 3.4 Btu/h × ft (10.7 W/m) or 1.0 watt per square foot (10.7 W/m) of floor area for space conditioning purposes.

2. Those that do not contain *conditioned space*.

[NY] C402.1.1.2 Greenhouses. *Greenhouses* that are mechanically heated or cooled and exempt from the building thermal envelope provisions in accordance with Section C402.1.1 shall comply with all the following:

1. Exterior opaque envelope assemblies comply with Sections C402.2 and C402.5.5.

2. Interior partition *building thermal envelope* assemblies that separate the greenhouse from *conditioned space* comply with Sections C402.2, C402.5.3 and C402.5.5.

3. Fenestration assemblies comply with the *building thermal envelope* requirements in Table C402.1.1.2. The *U*-factor for a roof shall be for the roof assembly or a roof that includes the assembly and an internal curtain system.

TABLE C402.1.1.2
FENESTRATION BUILDING THERMAL ENVELOPE MAXIMUM REQUIREMENTS

COMPONENT	*U-FACTOR* (BTU/h × ft^2 × °F)

Skylight	0.5
Vertical fenestration	0.7

EC 07-0109

Revise as follows:

[NY] ~~C402.1.2~~ C402.1.1.3 **Equipment buildings.** Buildings that comply with all the following shall be exempt from the *building thermal envelope* provisions of this code:

1. Are separate buildings with floor area not more than ~~500~~ 1,200 square feet (~~50~~ 110 m^2).
2. Are intended to house ~~electronic~~ electric equipment with installed equipment power totaling not less than 7 watts per square foot (75 W/m2) and not intended for human occupancy.
3. Have a heating system capacity not greater than ~~(17,000 Btu/hr) (5 kW)~~ (20,000 Btu/hr) (6kW) and a heating thermostat setpoint that is restricted to not more than 50°F (10°C).
4. Have an average wall and roof *U-factor* less than 0.200 in *Climate Zones* ~~1 through~~ 4 and 5 and less than 0.120 in *Climate Zones* 6 ~~through 8~~.
5. Comply with the roof solar reflectance and thermal emittance provisions for *Climate Zone* 1.

EC 07-0110

Revise as follows:

~~C402.1.4~~ C402.1.2 **Assembly 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~~ C402.1.2. *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 Table ~~C402.1.4~~ C402.1.2. *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~~ C402.1.2.

[NY] TABLE ~~C402.1.4~~C402.1.2
OPAQUE BUILDING THERMAL ENVELOPE ASSEMBLY MAXIMUM REQUIREMENTS, *U*-FACTOR METHOD[a, b]

CLIMATE ZONE	4 ~~EXCEPT MARINE~~		5 ~~AND MARINE 4~~		6	
	All other	Group R	All other	Group R	All other	Group R
Roofs						
Insulation entirely above roof deck	~~U-0.032~~ U-0.030	~~U-0.032~~ U-0.030	~~U-0.032~~ U-0.030	~~U-0.032~~ U-0.030	~~U-0.032~~ U-0.029	~~U-0.032~~ U-0.029
Metal buildings	U-0.035	U-0.035	U-0.035	U-0.035	~~U-0.031~~ U-0.029	~~U-0.031~~ U-0.029
Attic and other	U-~~0.027~~ U-0.020	~~U-0.027~~ U-0.020	U-~~0.027~~ U-0.020	~~U-0.021~~ U-0.020	~~U-0.021~~ U-0.019	~~U-0.021~~ U-0.019
Walls, above grade						
Mass~~g~~[f]	~~U-0.104~~ U-0.09	~~U-0.090~~ U-0.08	~~U-0.090~~ U-0.08	~~U-0.080~~ U-0.071	~~U-0.080~~ U-0.071	~~U-0.071~~ U-0.067
Metal building	~~U-0.052~~ U-0.048	~~U-0.052~~	~~U-0.052~~ U-0.048	~~U-0.052~~	~~U-0.052~~ U-0.048	~~U-0.052~~ U-0.048

		U-0.048		U-0.048		
Metal framed	~~U-0.064~~ U-0.061	~~U-0.064~~ U-0.061	~~U-0.064~~ U-0.052	~~U-0.064~~ U-0.052	~~U-0.064~~ U-0.047	~~U-0.064~~ U-0.043
Wood framed and other ~~e~~	~~U-0.064~~ U-0.061	~~U-0.064~~ U-0.061	~~U-0.064~~ U-0.048	~~U-0.064~~ U-0.048	~~U-0.051~~ U-0.048	~~U-0.051~~ U-0.046
Walls, below grade						
Below-grade wall[c]	C-0.119	~~C-0.119~~ C-0.092	C-0.119	~~C-0.119~~ C-0.092	~~C-0.119~~ C-0.092	~~C-0.119~~ C-0.063
Floors						
Mass[d]	~~U-0.076~~ U-0.057	~~U-0.074~~ U-0.051	~~U-0.074~~ U-0.057	~~U-0.064~~ U-0.051	~~U-0.064~~ U-0.051	~~U-0.064~~ U-0.051
Joist/framing	U-0.033	U-0.033	U-0.033	U-0.033	~~U-0.033~~ U-0.027	~~U-0.033~~ U-0.027
Slab-on-grade floors						
Unheated slabs	~~F-0.54~~ F-0.52	~~F-0.54~~ F-0.52	~~F-0.54~~ F-0.52	~~F-0.54~~ F-0.51	~~F-0.54~~ F-0.51	~~F-0.52~~ F-0.434
Heated slabs[f]	~~F-0.86 0.64~~ F-0.62	~~F-0.86 0.64~~ F-0.62	~~F-0.79 0.64~~ F-0.62	~~F-0.79 0.64~~ F-0.62	~~F-0.79 0.55~~ F-0.62	~~F-0.69 0.55~~ F-0.602
Opaque doors						
Nonswinging door	U-0.31	U-0.31	U-0.31	U-0.31	U-0.31	U-0.31
Swinging door[g]	~~U-0.61~~ U-0.37	~~U-0.61~~ U-0.37	U-0.37	U-0.37	U-0.37	U-0.37
Garage door <14% glazing[h]	U-0.31	U-0.31	U-0.31	U-0.31	U-0.31	U-0.31

For SI: 1 pound per square foot = 4.88 kg/m^2, 1 pound per cubic foot = 16 kg/m^3.

ci = *Continuous insulation*, NR = No Requirement, LS = *Liner System*.

a. Where assembly *U-factor*s, *C*-factors, and *F-factor*s are established in ~~ANSI/ASHRAE/IESNA 90.1~~ANSI/ASHRAE/IES 90.1 Appendix A, such opaque assemblies shall be a compliance alternative where those values meet the criteria of this table, and provided that the construction, excluding the cladding system on walls, complies with the appropriate construction details from ~~ANSI/ASHRAE/ISNEA 90.1~~ANSI/ASHRAE/IES 90.1 Appendix A.

b. Where *U-factor*s have been established by testing in accordance with ASTM C1363, such opaque assemblies shall be a compliance alternative where those values meet the criteria of this table. The *R-value* of *continuous insulation* shall be permitted to be added to or subtracted from the original tested design.

c. Where *heated slab*s are below grade, below-grade walls shall comply with the *U-factor* requirements for above-grade mass walls.

d. "Mass floors" shall be in accordance with Section ~~C402.2.3~~C402.1.3.4.

e. These *C*-, *F*- and *U-factor*s are based on assemblies that are not required to contain insulation.

f. ~~The first value is for perimeter insulation and the second value is for full slab insulation.~~ "Mass walls" shall be in accordance with Section C402.1.3.4.

g. ~~"Mass walls" shall be in accordance with Section C402.2.2.~~ Swinging door *U*-factors shall be determined in accordance with NFRC-100.

h. Garage doors having a single row of fenestration shall have an assembly *U*-factor less than or equal to 0.44, provided that the fenestration area is not less than 14 percent and not more than 25 percent of the total door area.

EC 07-0111

Add new:

C402.1.2.1 Methods of determining U-, C-, and F-factors. Where assembly *U-factors, C-factors* and *F-factors* and calculation procedures are established in ANSI/ASHRAE/IES 90.1 Appendix A for opaque assemblies, such opaque assemblies shall be a compliance alternative provided they meet the criteria of Table C402.1.2 and the construction, excluding cladding system on walls, complies with the applicable construction details from ANSI/ASHRAE/IES 90.1 Appendix A. Where *U-factors* have been established by testing in accordance with ASTM C1363, such opaque assemblies shall be a compliance alternative provided they meet the criteria of Table C402.1.4. The *R-value* of *continuous insulation* shall be permitted to be added to or subtracted from the original tested design. Air spaces used for assembly evaluations shall comply with Section C402.2.7.

C402.1.2.1.1 Tapered, above-deck insulation based on thickness. For tapered, above-deck roof insulation, area-weighted *U-factors* of non-uniform insulation thickness shall be determined by an approved method.

> **Exception:** The area-weighted U-factor shall be permitted to be determined by using the inverse of the average R-value determined in accordance with the exception to Section C402.1.3.2.

C402.1.2.1.2 Suspended ceilings. Insulation installed on suspended ceilings having removable ceiling tiles shall not be considered part of the assembly *U*- factor of the roof/ceiling construction.

C402.1.2.1.3 Concrete masonry units, integral insulation. In determining compliance with Table C402.1.2, the U-factor of concrete masonry units with integral insulation shall be permitted to be used.

C402.1.2.1.4 Mass walls and floors. Compliance with required maximum *U-factors* for mass walls and mass floors in accordance with Table C402.1.2 shall be permitted for assemblies complying with Section C402.1.3.6.

C402.1.2.1.5 Area-weighted averaging of above-grade wall U-factors. Where *above-grade walls* include more than one assembly type or a penetration of the opaque wall area, the area weighted *U-factor* of the *above-grade wall* is permitted to be determined by an *approved* method.

EC 07-0112

Revise as follows:

~~**C402.1.4.1**~~ **C402.1.2.1.6** ~~**Thermal resistance of cold**~~ **Cold-formed steel** ~~**walls**~~ **assemblies.** *U-factor*s ~~of walls with~~for *building thermal envelopes* containing cold-formed steel framed ceiling and walls shall be permitted to be determined in accordance with ~~Equation 4-1:~~ AISI S250 as modified herein.

1. Where the steel-framed wall contains no cavity insulation and uses continuous insulation to satisfy the U-factor maximum, the steel-framed wall member spacing is permitted to be installed at any on-center spacing.

2. Where the steel-framed wall contains framing at 24 inches (610 mm) on center with a 23 percent framing factor or framing at 16 inches (400 mm) on center with a 25 percent framing factor, the next lower framing member spacing input values shall be used when calculating using AISI S250.

3. Where the steel-framed wall contains less than 23 percent framing factors the AISI S250 shall be used without any modifications.

4. Where the steel-framed wall contains other than standard C-shape framing members the AISI S250 calculation option for other than standard C-shape framing is permitted to be used.

~~$U = 1/[R_s + (ER)]$~~ ~~**(Equation 4-1)**~~

~~where:~~

~~R_s = The cumulative R-value of the wall components along the path of heat transfer, excluding the cavity insulation and steel studs.~~

~~ER = The effective R-value of the cavity insulation with steel studs as specified in Table C402.1.4.1C402.1.4.2.~~

Delete:

~~**TABLE C402.1.4.1**~~
~~**EFFECTIVE R-VALUES FOR STEEL STUD WALL ASSEMBLIES**~~

~~NOMINAL STUD DEPTH (inches)~~	~~SPACING OF FRAMING (inches)~~	~~CAVITY *R*-VALUE (insulation)~~	~~CORRECTION FACTOR (F_e)~~	~~EFFECTIVE *R*-VALUE(ER) (Cavity *R*-Value × F_e)~~
~~3 1/2~~	~~16~~	~~13~~	~~0.46~~	~~5.98~~
		~~15~~	~~0.43~~	~~6.45~~
~~3 1/2~~	~~24~~	~~13~~	~~0.55~~	~~7.15~~
		~~15~~	~~0.52~~	~~7.80~~
~~6~~	~~16~~	~~19~~	~~0.37~~	~~7.03~~
		~~21~~	~~0.35~~	~~7.35~~
~~6~~	~~24~~	~~19~~	~~0.45~~	~~8.55~~
		~~21~~	~~0.43~~	~~9.03~~
~~8~~	~~16~~	~~25~~	~~0.31~~	~~7.75~~
	~~24~~	~~25~~	~~0.38~~	~~9.50~~

EC 07-0113

Add new:

C402.1.2.1.7 Spandrel Panels. *U-factors* of opaque assemblies within *fenestration* framing systems shall be determined in accordance with the default values in Table C402.1.2.1.7, ASTM C1363, or ANSI/NFRC 100.

C402.1.2.1.8 Mechanical equipment penetrations. Where the total area of through penetrations of mechanical equipment is greater than 1 percent of the opaque above grade wall area, such area shall be calculated as a separate wall assembly, in accordance with either Section C402.1.2.1.5 or Section C402.1.4 using a published and *approved* U-factor for that equipment or a default U-factor of 0.5.

TABLE C402.1.2.1.7
EFFECTIVE U-FACTORS FOR SPANDREL PANELS[a]

Rated R-value of Insulation between Framing Members		R-4	R-7	R-10	R-15	R-20	R-25	R-30
Frame Type	Spandrel Panel	Default U-factor						
Aluminum without Thermal Break[b]	Single glass pane, stone, or metal panel	0.285	0.259	0.247	0.236	0.230	0.226	0.224
	Double glazing with no low-e coatings	0.273	0.254	0.244	0.234	0.229	0.226	0.223
	Triple glazing or double glazing with low-e glass	0.263	0.249	0.241	0.233	0.228	0.225	0.223
Aluminum with Thermal Break[c]	Single glass pane, stone, or metal panel	0.243	0.212	0.197	0.184	0.176	0.172	0.169
	Double glazing with no low-e coatings	0.228	0.205	0.193	0.182	0.175	0.171	0.168
	Triple glazing or double glazing with low-e glass	0.217	0.199	0.189	0.180	0.174	0.170	0.167
Structural Glazing[d]	Single glass pane, stone, or metal panel	0.217	0.180	0.161	0.145	0.136	0.130	0.126
	Double glazing with no low-e coatings	0.199	0.172	0.157	0.143	0.135	0.129	0.126
	Triple glazing or double glazing with low-e glass	0.186	0.165	0.152	0.140	0.133	0.128	0.125
No framing or Insulation is Continuous[e]	Single glass pane, stone, or metal panel	0.160	0.108	0.082	0.058	0.045	0.037	0.031
	Double glazing with no low-e coatings	0.147	0.102	0.078	0.056	0.044	0.036	0.030
	Triple glazing or double glazing with low-e glass	0.139	0.098	0.076	0.055	0.043	0.035	0.030

a. Extrapolation outside of the table shall not be permitted. Assemblies with distance between framing less than 30 inches (762 mm), or not included in the default table, shall have a U-factor determined by testing in compliance with ASTM C1363 or modeling in compliance with ANSI/NFRC 100. Spandrel panel assemblies in the table do not include metal backpans. For designs with metal backpans, multiply the U-factor by 1.20.

b. This frame type shall be used for systems that do not contain a non-metallic element that separates the metal exposed to the exterior from the metal that is exposed to the interior condition.

c. This frame type shall be used for systems where a non-metallic element separates the metal exposed to the exterior from the metal that is exposed to the interior condition.

d. This frame type shall be used for systems that have no exposed mullion on the exterior.

e. This frame types shall be used for systems where there is no framing or the insulation is continuous and uninterrupted between framing.

EC 07-0114

Revise as follows:

C402.1.3 Insulation component R-value-based method. ~~Building thermal envelope opaque assemblies shall comply with the requirements of Sections C402.2 and C402.4 based on the climate zone specified in Chapter 3.~~ For opaque portions of the *building thermal envelope* ~~intended to comply on an insulation component R-value basis~~, the *R-value*s for cavity insulation and continuous insulation shall be not less than that specified in Table C402.1.3. ~~Commercial~~*Group R* occupancy *buildings* or portions of *commercial buildings* enclosing *Group R* occupancies shall use the *R-value*s from the "*Group R*" column of Table C402.1.3. *Commercial buildings* or portions of *commercial buildings* enclosing occupancies other than *Group R* shall use the *R-value*s from the "All other" column of Table C402.1.3.

[NY] TABLE C402.1.3
OPAQUE BUILDING 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
Roofs						
Insulation entirely above roof deck	~~R-30ci~~ R-33ci	~~R-30ci~~ R-33ci	~~R-30ci~~ R-33ci	~~R-30ci~~ R-33ci	~~R-30ci~~ R-34ci	~~R-30ci~~ R-34ci
Metal buildings [b]	R-19 + R-11 LS	R-19 + R-11 LS	R-19 + R-11 LS	R-19 + R-11 LS	~~R-25 + R-11 LS~~ R-30 + R-11 LS	~~R-25 + R-11 LS~~ R-30 + R-11 LS
Attic and other	~~R-38~~ R-53	~~R-38~~ R-53	~~R-38~~ R-53	~~R-49~~ R-53	~~R-49~~ R-55	~~R-49~~ R-55
Walls, above grade						
Mass ~~g~~[f]	~~R-9.5ci~~ R-11.4ci	~~R-11.4ci~~ R-13.3ci	~~R-11.4ci~~ R-13.3ci	~~R-13.3ci~~ R-15.2ci	~~R-13.3ci~~ R-15.2ci	~~R-15.2ci~~ R-17.5ci
Metal building	~~R-13 + R-13ci~~ R-13 + R-14.9ci	~~R-13 + R-13ci~~ R-13 + R-14.9ci	~~R-13 + R-13ci~~ R-13 + R-14.9ci	~~R-13 + R-13ci~~ R-13 + R-14.9ci	~~R-13 + R-13ci~~ R-13 + R-14.9ci	~~R-13 + R-13ci~~ R-13 + R-14.9ci
Metal framed [h, i]	~~R-13 + R-7.5ci~~ R-15 + R-8ci or R-21 + R-7ci	~~R-13 + R-7.5ci~~ R-15 + R-8ci or R-21 + R-7ci	~~R-13 + R-7.5ci~~ R-13 + R-11ci or R-19 + R-10ci	~~R-13 + R-7.5ci~~ R-13 + R-11ci or R-19 + R-10ci	~~R-13 + R-7.5ci~~ R-15 + R-13ci or R-19 + R12ci or R-21 + R12ci	~~R-13 + R-7.5ci~~ R-21+ R-14ci or R-24 + R-12ci
Wood framed and other [h, i]	~~R-13 + R-3.8ci or R-20~~ R-13 + R-4.5ci or R-19 + R-1.5ci	~~R-13 + R-3.8ci or R-20~~ R-13 + R-4.5ci or R-19 + R-1.5ci	~~R-13 + R-3.8ci or R-20~~ R-11 + R-10ci or R-19 + R-5ci or R-21 + R-4ci	~~R-13 + R-7.5ci or R-20 + R-3.8ci~~ R-11 + R-10ci or R-19 + R-5ci or R-21 + R-4ci	~~R-13 + R-7.5ci or R-20 + R-3.8ci~~ R-11 + R-10ci or R-19 + R-5ci or R-21 + R-4ci	~~R-13 + R-7.5ci or R-20 + R-3.8ci~~ R-11 + R-12ci or R-19 + R-7ci or R-21 + R-5ci
Walls, below grade						
Below-grade wall [d]	R-7.5ci	~~R-7.5ci~~ R-10ci	R-7.5ci	~~R-7.5ci~~ R-10ci	~~R-7.5ci~~ R-10ci	~~R-7.5ci~~ R-15ci
Floors						

Mass [e]	~~R-10ci~~ R-14.6ci	~~R-10.4~~ R-16.7ci	~~R-10ci~~ R-14.6ci	~~R-12.5ci~~ R-16.7ci	~~R-12.5ci~~ R-16.7ci	~~R-12.5ci~~ R-16.7ci
Joist/framing	R-30	R-30	R-30	R-30	~~R-30~~ R-38	~~R-30~~ R-38
Slab-on-grade floors						
Unheated slabs	~~R-10~~ R-15 for 24" below	~~R-10~~ R-15 for 24" below	~~R-10~~ R-15 for 24" below	~~R-10~~ R-20 for 24" below	~~R-10~~ R-20 for 24" below	~~R-15 for 24" below~~ R-20 for 48" below
Heated slabs ~~h~~g	~~R-15 for 24" below + R-5 full slab~~ R-20 for 48"+ R-5 full slab	~~R-15 for 24" below + R-5 full slab~~ R-20 for 48"+ R-5 full slab	~~R-15 for 36" below + R-5 full slab~~ R-20 for 48"+ R-5 full slab	~~R-15 for 36" below + R-5 full slab~~ R-20 for 48"+ R-5 full slab	~~R-15 for 36" below + R-5 full slab~~ R-20 for 48"+ R-5 full slab	R-20 for 48" below + R-5 full slab
~~**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 = 25.4 mm, 1 pound per square foot = 4.88 kg/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~~ANSI/ASHRAE/IES 90.1 Appendix A.

b. Where using *R*-value compliance method, a minimum R-3 thermal spacer block shall be provided, otherwise use the *U-factor* compliance method in Table ~~C402.1.4~~C402.1.2.

c. R-5.7ci is allowed to be substituted with concrete block walls complying with ASTM C90, ungrouted or partially grouted ~~at~~not less than 32 inches ~~or less~~ on center vertically and not less than 48 inches ~~or less~~ on center horizontally, with ungrouted cores filled with materials having a maximum thermal conductivity of 0.44 Btu-in/h-f2 °F.

d. Where *heated slab*s 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~~C402.1.3.4.

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

~~g.~~f. "Mass walls" shall be in accordance with Section ~~C402.2.2~~C402.1.3.4.

~~h.~~g. The first value is for perimeter insulation and the second value is for full, under- slab insulation. Perimeter insulation ~~is not required to extend below the bottom of the slab~~and full-slab insulation components shall be installed in accordance with Section C402.2.4.

~~i. Not applicable to garage doors. See Table C402.1.4.~~

h. The first value is *cavity insulation*; the second value is *continuous insulation*. Therefore, "R-0+R-12ci" means R-12 *continuous insulation* and no *cavity insulation*; "R-13+R-3.8ci" means R-13 *cavity insulation* and R-3.8 *continuous insulation*; "R-20" means R-20 *cavity insulation* and no *continuous insulation*. R-13, R-20, and R-27 *cavity insulation* as used in this table apply to a nominal 4-inch (101 mm), 6-inch (152 mm), and 8-inch (203 mm) deep wood or cold-formed steel stud cavities, respectively.

i. Where the required R-value in Table C402.1.3 is met by using continuous insulation such that cavity insulation is not required, the R-Value is applicable to any wall framing spacing.

EC 07-0115

Add new:

C402.1.3.1 R-value of multi-layered insulation components. Where cavity insulation is installed in multiple layers, the cavity insulation R-values shall be summed to determine compliance with the cavity insulation R-value requirements. Where continuous insulation is installed in multiple layers, the continuous insulation R-values shall be summed to determine compliance with the continuous insulation R-value requirements. Cavity insulation R-values shall not be used to determine compliance with the continuous insulation R-value requirements in Table C402.1.3.

C402.1.3.2 Area-weighted averaging of R-values. Area-weighted averaging shall not be permitted for R-value compliance.

Exception: For tapered above-deck roof insulation, compliance with the R-values required in Table C402.1.3 shall be permitted to be demonstrated by multiplying the rated R-value per inch of the insulation material by the average thickness of the roof insulation. The average thickness of the roof insulation shall equal the total volume of the roof insulation divided by the area of the roof.

C402.1.3.3 Suspended ceilings Insulation installed on suspended ceilings having removable ceiling tiles shall not be considered part of the thermal resistance (R-value) of roof insulation in roof-ceiling construction.

C402.1.3.4 Mass walls and mass floors. Compliance with required maximum *U-factors* for mass walls and mass floors in accordance with Table C402.1.2 and minimum R-values for insulation components applied to mass walls and mass floors in accordance with Table C402.1.3 shall be permitted for assemblies complying with the following:

1. Where used as a component of the building thermal envelope, mass walls shall comply with one of the following:
   - 1.1 Weigh not less that 35 pounds per square foot (171 kg/m2) of wall surface area.
   - 1.2 Weigh not less than 25 pounds per square foot (122 kg/m2) of wall surface area where the material weight is not more than 120 pcf (1900 kg/m3).
   - 1.3 Have a heat capacity exceeding 7 Btu/ft2 x °F (144 kJ/m2 x K).
   - 1.4 Have a heat capacity exceeding 5 Btu/ft2 x °F (103 kJ/m2 x K) where the material weight is not more than 120 pcf (1900 kg/m3).
2. Where used as a component of the building thermal envelope of a building, the minimum weight of mass floors shall comply with provide one of the following:
   - 2.1 35 pounds per square foot (171 kg/m2)of floor surface area.
   - 2.2 25 pounds per square foot (122 kg/m2) of floor surface area where the material weight is not more than 120 pcf (1900 kg/m3).

EC 07-0116

Revise as follows:

[NY] ~~C402.1.5~~C402.1.4 Component performance ~~alternative~~ method. *Building thermal envelope* values and *fenestration* areas determined in accordance with Equation ~~4-2~~4-1 shall be an alternative to compliance with the *U-*, *F-*, *psi-*, *chi-*, and *C-factors* in Tables ~~C402.1.4~~C402.1.2, C402.1.2.1.7, C402.1.4 and ~~C402.4~~C402.5 and the maximum allowable *fenestration* areas in Section ~~C402.4.1~~C402.5.1. *Fenestration* shall meet the applicable SHGC requirements of Section ~~C402.4.3~~C402.5.3.

~~A + B + C + D + E ≤ Zero **(Equation 4-2)**~~

~~where:~~

~~A = Sum of the (UA Dif) values for each distinct assembly type of the *building thermal envelope*, other than slabs on grade and below-grade walls.~~

~~UA Dif = UA Proposed – UA Table.~~

~~UA Proposed = Proposed *U* value × Area.~~

~~UA Table = (*U* factor from Table C402.1.3, C402.1.4 or C402.4) × Area.~~

~~B = Sum of the (FL Dif) values for each distinct slab on-grade perimeter condition of the building thermal envelope.~~

~~FL Dif = FL Proposed – FL Table.~~

~~FL Proposed = Proposed *F* value × Perimeter length.~~

~~FL Table = (*F factor* specified in Table C402.1.4) × Perimeter length.~~

~~C = Sum of the (CA Dif) values for each distinct below-grade wall assembly type of the building thermal envelope.~~

~~CA Dif = CA Proposed – CA Table.~~

~~CA Proposed = Proposed *C* value × Area.~~

~~CA Table = (Maximum allowable C-factor specified in Table C402.1.4) × Area.~~

~~Where the proposed vertical glazing area is less than or equal to the maximum vertical glazing area allowed by Section C402.4.1, the value of D (Excess Vertical Glazing Value) shall be zero. Otherwise:~~

~~D = (DA × UV) – (DA × U-Wall), but not less than zero.~~

~~DA = (Proposed Vertical Glazing Area) – (Vertical Glazing Area allowed by Section C402.4.1).~~

~~UA Wall = Sum of the (UA Proposed) values for each opaque assembly of the exterior wall.~~

~~U Wall = Area-weighted average *U*-value of all above-grade wall assemblies.~~

~~UAV = Sum of the (UA Proposed) values for each vertical glazing assembly.~~

~~UV = UAV/total vertical glazing area.~~

~~Where the proposed skylight area is less than or equal to the skylight area allowed by Section C402.4.1, the value of E (Excess Skylight Value) shall be zero. Otherwise:~~

~~E = (EA × US) – (EA × U-Roof), but not less than zero.~~

~~EA = (Proposed Skylight Area) – (Allowable Skylight Area as specified in Section C402.4.1).~~

~~U-Roof = Area-weighted average *U*-value of all roof assemblies.~~

~~UAS = Sum of the (UA Proposed) values for each skylight assembly.~~

~~US = UAS/total skylight area.~~

$$A_p + B_p + C_p + T_p \leq A_t + B_t + C_t + T_t - V_f - V_s \qquad \text{(Equation 4-1)}$$

Where:

AP = Sum of the (area x U-factor) for each proposed building thermal envelope assembly, other than slab-on-grade or below-grade wall assemblies

BP = Sum of the (length x F-factor) for each proposed slab-on-grade edge condition

CP = Sum of the (area x C-factor) for each proposed below-grade wall assembly

TP = Sum of the (ϕ LP) and (χ Np) values for each type of thermal bridge condition of the building thermal envelope as identified in Section C402.7 in the proposed building. For the purposes of this section, the (ϕ LP) and (χ NP) values for thermal bridges caused by materials with a thermal conductivity less than or equal to 3.0 Btu-in/h-ft2-F shall be assigned as zero.

ϕ LP= psi-factor × length of the thermal bridge elements in the proposed building thermal envelope.

χ NP= chi-factor x number of the thermal bridge point elements other than fasteners, ties, or brackets in the proposed building thermal envelope.

AT = Sum of the (area x U-factor permitted by Tables C402.1.2 and C402.5) for each proposed building thermal envelope assembly, other than slab-ongrade or below-grade wall assemblies

BT = Sum of the (length x F-factor permitted by Table C402.1.2 for each proposed slab-on-grade edge condition

CT = Sum of the (area x C-factor permitted by Table C402.1.2) for each proposed below-grade wall assembly

TT = Sum of the (ϕ LT) and (χ NT) values for each type of thermal bridge condition in the proposed building thermal envelope as identified in Section C402.7 with values specified as "compliant" in Table C402.1.4. For the purposes of this section, the (ϕ LT) and (χ NT) values for thermal bridges caused by materials with a thermal conductivity less than or equal to 3.0 Btu-in/h-ft2-F shall be assigned as zero.

ϕ LT= (psi-factor specified as "compliant" in Table C402.1.5) × length of the thermal bridge elements in the proposed building thermal envelope.

χ NT= (chi-factor specified as "compliant" in Table C402.1.5) x number of the thermal bridge point elements other than fasteners, ties, or brackets in the proposed building thermal envelope.

PF = Maximum vertical *fenestration* area allowable by Section C402.5.1, C402.5.1.1, or C402.5.1.2

QF = Proposed vertical *fenestration* area

RF = QF - PF, but not less than zero (excess vertical *fenestration* area)

SF = Area-weighted average U-factor permitted by Table C402.5 of all vertical *fenestration* assemblies

TF = Area-weighted average U-factor permitted by Table C402.1.2 of all exterior opaque wall assemblies

UF = SF - TF (excess U-factor for excess vertical *fenestration* area)

VF = RF x UF (excess UxA due to excess vertical *fenestration* area)

PS = Maximum skylight area allowable by Section C402.1.2

QS = Actual skylight area

RS = QS - PS, but not less than zero (excess skylight area)

SS = Area-weighted average U-factor permitted by Table C402.5 of all skylights

TS = Area-weighted average U-factor permitted by Table C402.1.2 of all opaque roof assemblies
US = SS - TS (excess U-factor for excess skylight area)
VS = RS x US (excess UxA due to excess skylight area)

A proposed psi- or chi-factor for each thermal bridge shall comply with one of the following as applicable:

1. Where the proposed mitigation of a thermal bridge is compliant with the requirements of Section C402.7, the "compliant" values in Table C402.1.4 shall be used for the proposed *psi-* or *chi-factors*.
2. Where a thermal bridge is not mitigated in a manner at least equivalent to Section C402.7, the "non-compliant" values in Table C402.1.4 shall be used for the proposed *psi-* or *chi-factors*.
3. Where the proposed mitigation of a thermal bridge provides a psi- or chi-factor less than the "compliant" values in Table C402.1.4, the proposed psi- or chi-factor shall be determined by thermal analysis, testing, or other approved sources.

TABLE C402.1.4
PSI- and CHI-FACTORS TO DETERMINE THERMAL BRIDGES FOR THE COMPONENT PERFORMANCE METHOD

Thermal Bridge per Section C402.7	Thermal Bridge Compliant with Section C402.6		Thermal Bridge Non- Compliant with Section C402.6	
	psi-factor (Btu/h-ft-°F)	chi-factor (Btu/h-°F)	psi-factor (Btu/h-ft-°F)	chi-factor (Btu/h-°F)
C402.7.1 Balconies and floor decks	0.2	n/a	0.5	n/a
C402.7.2 Cladding supports	0.2	n/a	0.3	n/a
C402.7.3 Structural beams and columns	n/a	1.0-carbon steel 0.3-concrete	n/a	2.0-carbon steel 1.0-concrete
C402.7.4 Vertical *fenestration*	0.15	n/a	0.3	n/a
C402.7.5 Parapets	0.2	n/a	0.4	n/a

For SI: W/m-K = 0.578 Btu/h-ft-°F; 1 W/K = 1.90 Btu/h-°F
n/a = not applicable

EC 07-0119

Revise as follows:

[NY] ~~**C402.5.3**~~ **C402.1.5 Rooms containing fuel-burning appliances.** ~~In *Climate Zones* 3 through 8, where~~ Where combustion air is supplied through openings in an *exterior wall* to a room or space containing a space-conditioning fuel-burning appliance, one of the following shall apply:

1. The room or space containing the appliance shall be located outside of the *building thermal envelope.*
2. The room or space containing the appliance shall be enclosed and isolated from conditioned spaces inside the *building thermal envelope*. Such rooms shall comply with all of the following:
   - 2.1. The walls, floors and ceilings that separate the enclosed room or space from conditioned spaces shall be insulated to be not less than equivalent to the insulation requirement of below-grade walls as specified in Table C402.1.3 or ~~C402.1.4~~Table C402.1.2.
   - 2.2. The walls, floors and ceilings that separate the enclosed room or space from conditioned spaces shall be sealed in accordance with Section ~~C402.5.1.1~~C402.6.1.2.
   - 2.3. The doors into the enclosed room or space shall be fully gasketed.
   - 2.4. ~~Water lines~~ Piping serving as part of a heating or cooling system and ducts in the enclosed room or space shall be insulated in accordance with Section C403. Service water piping shall be insulated in accordance with Section C404.

2.5. Where an air duct supplying combustion air to the enclosed room or space passes through conditioned space, the duct shall be insulated to an *R-value* of not less than R-8.

Exception: Fireplaces and stoves complying with Sections 901 through 905 of the *Mechanical Code of New York State*, and Section 2111.14 of the *Building Code of New York State* (or, in the case of a fireplace or stove located in a building that is subject to the New York City Constructions Codes, complying with the corresponding provisions of the New York City Construction Codes).

EC 07-0120

Revise as follows:

C402.2.1 Roof ~~assembly~~ ceiling construction. ~~The minimum thermal resistance (R-value) of the insulating material~~ Insulation materials in the roof-ceiling construction shall be installed ~~either~~ between the roof or ceiling framing, continuously below the ceiling framing, ~~or~~ continuously ~~on~~ above, below, or within the ~~*roof assembly*~~ roof deck ~~shall be as specified in Table C402.1.3, based on construction materials used in the *roof assembly*~~ or in any *approved* combination thereof. Insulation installed above the roof deck shall comply with Sections C402.2.1.1 through C402.2.1.3. ~~Insulation installed on a suspended ceiling having removable ceiling tiles shall not be considered as part of the minimum thermal resistance of the roof insulation. *Continuous insulation* board shall be installed in not less than 2 layers and the edge joints between each layer of insulation shall be staggered.~~

~~**Exceptions:**~~

~~1. Continuously insulated roof assemblies where the thickness of insulation varies 1 inch (25 mm) or less and where the area weighted *U-factor* is equivalent to the same assembly with the *R-value* specified in Table C402.1.3.~~

~~2. Where tapered insulation is used with insulation entirely above deck, the *R-value* where the insulation thickness varies 1 inch (25 mm) or less from the minimum thickness of tapered insulation shall comply with the *R-value* specified in Table C402.1.3.~~

~~3. Two layers of insulation are not required where insulation tapers to the roof deck, such as at roof drains.~~

~~4. The insulation thickness variation is not limited to 1" (25mm) or less where an alternative compliance method is chosen by roof assembly U-Factor (Section C402.1.4) or component performance alternative (C402.1.5).~~

C402.2.1.1 Joints staggered. Continuous, above deck insulation board located above the roof deck shall be installed in not less than two layers and the edge joints between each layer of insulation shall be staggered, except where insulation tapers to the roof deck at a gutter edge, roof drain or scupper.

~~C402.2.1.1~~C402.2.1.2 **Skylight curbs.** Skylight curbs shall be insulated to the level of roof~~s with~~ insulation ~~entirely above the deck~~ or R-5, whichever is less.

Exception: Unit skylight curbs included as a component of a skylight *listed* and *labeled* in accordance with NFRC 100 shall not be required to be insulated.

C402.2.1.3 Minimum thickness of tapered insulation. The thickness of tapered above-deck roof insulation at its lowest point, gutter edge, roof drain or scupper, shall be not less than 1 inch (25 mm).

EC 07-0121

Revise as follows:

C402.2.2 Above-grade walls. ~~The minimum thermal resistance (*R-value*) of materials installed in the wall cavity between framing members and continuously on the walls shall be as specified in Table C402.1.3, based on framing type and construction materials used in the wall assembly. The *R-value* of integral insulation installed in concrete masonry units shall not be used in determining compliance with Table C402.1.3 except as otherwise noted in the table. In determining compliance with Table C402.1.4, the use of the *U-factor* of concrete masonry units with integral insulation shall be permitted.~~

~~"Mass walls" where used as a component in the thermal envelope of a building shall comply with one of the following:~~

~~1. Weigh not less than 35 pounds per square foot (171 kg/m^2) of wall surface area.~~

~~2. Weigh not less than 25 pounds per square foot (122 kg/m^2) of wall surface area where the material weight is not more than 120 pcf (1900 kg/m^3).~~

~~3. Have a heat capacity exceeding 7 Btu/ft^2 • °F (144 kJ/m^2 • K).~~

~~4. Have a heat capacity exceeding 5 Btu/ft^2 • °F (103 kJ/m^2 • K), where the material weight is not more than 120 pcf (1900 kg/m^3).~~ Above-grade wall insulation materials shall be installed between the wall framing, be integral to the wall assembly, be continuous on the wall assembly, or be any combination of these insulation methods. Where continuous insulation is layered on the exterior side of a wall assembly, the joints shall be staggered.

C402.2.3 Floors over outdoor air or unconditioned space. ~~The thermal properties (component R-values or assembly U-, C- or F-factors) of floor assemblies over outdoor air or unconditioned space shall be as specified in Table C402.1.3 or C402.1.4 based on the construction materials used in the floor assembly~~ Floor insulation shall be installed between floor framing, be integral to the floor assembly, be continuous on the floor assembly, or be any combination of these insulation methods. Where continuous insulation is layered on the exterior side of a floor assembly, the joints shall be staggered. Floor framing *cavity insulation* or structural slab insulation shall be installed to maintain permanent contact with the underside of the subfloor decking or structural slabs.

~~"Mass floors" where used as a component of the thermal envelope of a building shall provide one of the following weights:~~

~~1. 35 pounds per square foot (171 kg/m^2) of floor surface area.~~

~~2. 25 pounds per square foot (122 kg/m^2) of floor surface area where the material weight is not more than 120 pounds per cubic foot. (1923 kg/m^3)~~

Exceptions:

1. The floor framing *cavity insulation* or structural slab insulation shall be permitted to be in contact with the top side of sheathing or *continuous insulation* installed on the bottom side of floor assemblies where. Floor framing or structural slab members at the perimeter of the floor assembly shall be insulated vertically for their full depth ~~combined~~ with insulation equivalent to that ~~meets or exceeds the minimum R-value in Table C402.1.3 for "Metal framed" or "Wood framed and other" values for "Walls, Above Grade" and extends from the bottom to the top of all perimeter floor framing or floor assembly members.~~required for the above grade wall construction.
2. Insulation applied to the underside of concrete floor slabs shall be permitted an airspace of not more than 1 inch (25 mm) where it turns up and is in contact with the underside of the floor under walls associated with the *building thermal envelope.*

EC 07-0122

Revise as follows:

[NY] C402.2.4 Slabs-on-grade ~~perimeter insulation~~. Where installed, ~~the slab on grade is in contact with the ground, the minimum thermal resistance (R-value) of the insulation around the perimeter of unheated or heated slab-on-grade floors designed in accordance with the R-value method of Section C402.1.3 shall be as specified in Table C402.1.3.~~ ~~The~~the perimeter insulation for slab on grade shall be placed on the outside of the foundation or on the inside of the foundation wall. ~~The~~ For installations complying with Table C402.1.3, the perimeter insulation shall extend downward from the top of the slab for the minimum distance shown in the table or to the top of the footing, whichever is less, or downward to not less than the bottom of the slab and then horizontally to the interior or exterior for the total distance shown in the table. Insulation extending away from the building shall be protected by pavement or by not less than of 10 inches (254 mm) of soil. Where installed, full slab insulation shall be continuous under the entire area of the slab-on-grade

floor, except at structural column locations and service penetrations. Insulation required at the heated slab perimeter shall not be required to extend below the bottom of the heated slab and shall be continuous with the full slab insulation.

Exception: Where the slab-on-grade floor is greater than 24 inches (61 mm) below the finished exterior grade, perimeter insulation is not required.

C402.2.5 Below-grade walls. ~~The C-factor for the below-grade exterior walls shall be in accordance with Table C402.1.4. The R-value of the insulating material installed continuously within or on the below-grade exterior walls of the building envelope shall be in accordance with Table C402.1.3. The C-factor or R-value required~~ Below-grade wall insulation shall be installed between framing members, be integral to the wall assembly, be continuous on the wall assembly, or be any combination of these insulation methods. For installations complying with Section C401.2.1, insulation shall extend to a depth of not less than 10 feet (3048 mm) below the outside finished ground level, or to the level of the lowest floor of the *conditioned space* enclosed by the below-grade wall, whichever is less.

C402.2.6 Insulation of radiant heating ~~systems~~**system panels.** *Radiant heating system* panels, and their associated components that are installed in interior or exterior assemblies shall be insulated to an *R-value* of not less than R-3.5 on all surfaces not facing the space being heated. *Radiant heating system* panels that are installed in the *building thermal envelope* shall be separated from the exterior of the building or unconditioned or exempt spaces by not less than the *R-value* of insulation installed in the opaque assembly in which they are installed or the assembly shall comply with Section ~~C402.1.4~~C402.1.2.

~~**Exception:** *Heated slabs* on grade insulated in accordance with Section C402.2.4.~~

C402.2.7 Airspaces. Where the ~~thermal properties of airspaces are used to comply with this code~~*R*-value of an airspace is used for compliance in accordance with Section ~~C401.2~~C402.1, ~~such~~the airspaces shall be enclosed in ~~an unventilated~~a cavity bounded on all sides by building components and constructed to minimize airflow into and out of the enclosed airspace. Airflow shall be deemed minimized where ~~the enclosed airspace is located on the interior side of the continuous air barrier and is bounded on all sides by building components.~~ one of the following conditions occur:

1. The enclosed airspace is unventilated.
2. The enclosed airspace is bounded on at least one side by an anchored masonry veneer, constructed in accordance with Chapter 14 of the *Building Code of New York State*, and vented by veneer weep holes located only at the bottom of the airspace and spaced not less than 15 inches (380 mm) on center with top of the cavity airspace closed.

Exception: ~~The thermal resistance~~ For ventilated cavities, the effect of the ventilation of airspaces located on the exterior side of the continuous *air barrier* and adjacent to and behind the *exterior wall*-covering material shall be determined in accordance with ASTM C1363 modified with an airflow entering the bottom and exiting the top of the airspace at an air movement rate of not less than 70 mm/second.

EC 07-0123

Revise as follows:

~~C402.4~~C402.5 Fenestration ~~(Prescriptive)~~. Fenestration shall comply with Sections ~~C402.4.1~~C402.5.1 through ~~C402.4.5~~C402.5.5 and Table ~~C402.4~~C402.5. Daylight responsive controls shall comply with this section and Section ~~C405.2.3.1~~C405.2.4.

[NY] TABLE ~~C402.4~~C402.5
BUILDING THERMAL ENVELOPE FENESTRATION MAXIMUM U-FACTOR AND SHGC REQUIREMENTS

CLIMATE ZONE	4	5	6
Vertical fenestration			
***U*-factor**			
Metal framing, fixed fenestration	~~0.38~~ 0.34	~~0.38~~ 0.34	~~0.36~~ 0.34

Metal framing, Operable fenestration	~~0.45~~ 0.43	~~0.45~~ 0.43	~~0.43~~ 0.41
Nonmetal framing, all fenestration	0.30	0.27	0.27
Entrance doors	~~0.77~~ 0.63	~~0.77~~ 0.63	~~0.77~~ 0.63
SHGC			
PF < 0.2	~~0.36~~ 0.33	~~0.38~~ 0.33	~~0.40~~ 0.34
0.2 ≤ PF < 0.5	~~0.43~~ 0.40	~~0.46~~ 0.40	~~0.48~~ 0.41
PF ≥ 0.5	~~0.58~~ 0.53	~~0.61~~ 0.53	~~0.64~~ 0.54
Skylights			
U-factor	~~0.50~~ 0.48	~~0.50~~0.48	~~0.50~~0.48
SHGC	~~0.40~~0.38	~~0.40~~0.38	~~0.40~~0.38

PF = Projection Factor.
a. U-factor and SHGC shall be rated in accordance with NFRC 100.

[NY] ~~C402.4.1.1~~ C402.5.1.1 **Increased vertical fenestration area with daylight responsive controls.** ~~In *Climate Zones* 10 through 6, not~~ Not more than 40 percent of the gross above-grade wall area shall be vertical *fenestration*, provided that all of the following requirements are met:

1. In buildings not greater than two stories above grade, not less than 50 percent of the net floor area is within a primary sidelit *daylight zone* or a *toplit daylight zone*.
2. In buildings three or more stories above grade, not less than 25 percent of the net floor area is within a primary sidelit *daylight zone* or a *toplit daylight zone*.
3. *Daylight responsive controls* ~~complying with Section C405.2.3.1~~ are installed in *daylight zones.*
4. *Visible transmittance* (VT) of vertical *fenestration* is not less than 1.1 times solar heat gain coefficient (SHGC).

   Exception: *Fenestration* that is outside the scope of NFRC 200 is not required to comply with Item 4.

EC 07-0030

Revise as follows:

~~C402.4.1.2~~C402.5.1.2 **Increased skylight area with daylight responsive controls.** The skylight area shall be not more than 6 percent of the roof area provided that *daylight responsive controls* ~~complying with Section C405.2.3.1~~ are installed in toplit *daylight zones*.

EC 07-0031

Revise as follows:

[NY] ~~C402.4.2~~C402.5.2 **Minimum skylight fenestration area.** ~~In an enclosed space~~ Skylights shall be provided in enclosed spaces greater than 2,500 square feet (232 m^2) in floor area, directly under a roof with not less than 75 percent of the ceiling area with a ceiling height greater than 15 feet (4572 mm), and used as an office, lobby, atrium, concourse, corridor, storage space, gymnasium/exercise center, convention center, automotive service area, space where manufacturing occurs, nonrefrigerated warehouse, retail store, distribution/sorting area, transportation depot or workshop~~, the~~. The total toplit *daylight zone* shall be not less than half the floor area and shall ~~provide~~ comply with one of the following:

1. A minimum skylight area to toplit *daylight zone* of not less than 3 percent where all skylights have a VT of not less than 0.40, or VT_{annual} of not less than 0.26, as determined in accordance with Section C303.1.3.
2. A minimum skylight effective aperture ~~of not less than 1 percent~~, determined in accordance with Equation ~~4-4~~4-3~~.~~, of:
   2.1. Not less than 1 percent, using a skylight's VT rating; or
   2.2. Not less than 0.66 percent using a Tubular Daylighting Device's VT_{annual} rating.

$$\text{Skylight Effective Aperture} = \frac{0.85 \times \text{Skylight Area} \times \text{Skylight VT} \times \text{WF}}{\text{Toplit Zone}}$$

(Equation ~~4-4~~4-3)

where:

Skylight area = Total *fenestration* area of skylights.
Skylight VT = Area-weighted average visible transmittance of skylights.
WF = Area-weighted average well factor, where well factor is 0.9 if light well depth is less than 2 feet (610 mm), or 0.7 if light well depth is 2 feet (610 mm) or greater, or 1.0 for Tubular Daylighting Devices with VT_{annual} ratings.
Light well depth = Measure vertically from the underside of the lowest point of the skylight glazing to the ceiling plane under the skylight.

Exception: Skylights above *daylight zones* of enclosed spaces are not required in:
1. Buildings in *Climate Zones* 6 ~~through 8~~.
2. Spaces where the designed *general lighting* power densities are less than 0.5 W/ft^2 (5.4 W/m^2).
3. Areas where it is documented that existing structures or natural objects block direct beam sunlight on not less than half of the roof over the enclosed area for more than 1,500 daytime hours per year between 8 a.m. and 4 p.m.
4. Spaces where the *daylight zone* under rooftop monitors is greater than 50 percent of the enclosed space floor area.
5. Spaces where the total area minus the area of ~~sidelight~~ sidelit *daylight zones* is less than 2,500 square feet (232 m^2), and where the lighting is controlled in accordance with Section C405.2.3.
6. Spaces designed as storm shelters complying with ICC 500

EC 07-0032

Revise as follows:

~~C402.4.2.2~~C402.5.2.2 **Haze factor.** Skylights in office, storage, automotive service, manufacturing, nonrefrigerated warehouse, retail store and distribution/sorting area spaces shall have a glazing material or diffuser with a haze factor greater than 90 percent when tested in accordance with ASTM D1003.

Exception: Skylights and tubular daylighting devices designed and installed to exclude direct sunlight entering the occupied space by the use of fixed or automated baffles, ~~or~~ the geometry of skylight and light well~~,~~ or the use of optical diffuser components.

EC 07-0033

Revise as follows:

[NY] ~~C402.4. 5~~ C402.5.5 **Doors.** ~~Opaque swinging doors shall comply with Table C402.1.4. Opaque nonswinging doors shall comply with Table C402.1.34.~~ Opaque doors shall be considered as part of the gross area of above-grade walls that are part of the *building thermal envelope*. Opaque doors shall comply with Section C402.4.5.1 or C402.4.5.2. Other doors shall comply with the provisions of Section ~~C402.4.3~~C402.5.3 for vertical ~~fenestration~~ *fenestration.*

Add new:

C402.5.5.1 Opaque swinging doors. Opaque swinging doors shall comply with Table C402.1.2.

[NY] C402.5.5.2 Nonswinging doors. Opaque nonswinging doors shall comply with Table C402.1.2. Opaque nonswinging doors that are horizontally hinged sectional doors with a single row of *fenestration* shall have an assembly

U-factor less than or equal to 0.440, provided that the *fenestration* area is not less than 14 percent and not more than 25 percent of the total door area.

Exception: Other doors shall comply with the provisions of Section C402.4.3 for vertical *fenestration*.

EC 07-0124

Revise as follows:

~~**C402.5**~~ **C402.6 Air leakage building thermal envelope ~~(Mandatory)~~.** The *building thermal envelope* ~~of buildings~~ shall comply with Sections ~~C402.5.1~~C402.6.1 through ~~C402.5.8~~C402.6.7. ~~or the *building thermal envelope* shall be tested in accordance with ASTM E 779 at a pressure differential of 0.3 inch water gauge (75 Pa) or an equivalent method approved by the *building official* and deemed to comply with the provisions of this section when the tested air leakage rate of the *building thermal envelope* is not greater than 0.40 cfm/ft^2 (2.0 L/s • m^2). Section C402.5.2 or C402.5.3. Where compliance is based on such testing, the *building* shall also comply with Sections C402.5.5, C402.5.6 and C402.5.7, C402.5.8 and C402.5.9.~~

[NY] ~~**C402.5.1**~~**C402.6.1 Air barriers.** A continuous *air barrier* shall be provided throughout the *building thermal envelope*. The ~~*air barriers* shall be permitted to be located on the inside or outside of the building envelope, located within the assemblies composing the *envelope*, or any combination thereof. *The air barrier* shall comply with Sections C402.5.1.1 and C402.5.1.2.~~ air barrier is permitted to be located at any combination of inside, outside, or within the *building thermal envelope*. The air barrier shall comply with Sections C402.6.1.1, and C402.6.1.2. The air leakage performance of the air barrier shall be verified in accordance with Section C402.6.2.

~~**Exception:** *Air barriers* are not required in buildings located in *Climate Zone* 2B.~~

C402.6.1.1 Air barrier design and documentation requirements. Design of the continuous air barrier shall be documented as follows:

1. Components comprising the continuous air barrier and their position within each building thermal envelope assembly shall be identified.
2. Joints, interconnections, and penetrations of the continuous air barrier components shall be detailed.
3. The continuity of the air barrier building element assemblies that enclose conditioned space or provide a boundary between conditioned space and unconditioned space shall be identified.
4. Documentation of the continuous air barrier shall detail methods of sealing the air barrier such as wrapping, caulking, gasketing, taping or other approved methods at the following locations:
    - 4.1 Joints around fenestration and door frames.
    - 4.2 Joints between walls and floors, between walls at building corners, between walls and roofs including parapets and copings, where above-grade walls meet foundations, and similar intersections.
    - 4.3 Penetrations or attachments through the continuous air barrier.
    - 4.4 Building assemblies used as ducts or plenums.
    - 4.5 Changes in continuous air barrier materials and assemblies.

5. Identify where testing will or will not be performed in accordance with Section C402.6.2 Where testing will not be performed, a plan for field inspections required by C402.6.2.3 shall be provided that includes the following:
    - 5.1 Schedule for periodic inspection,
    - 5.2 Continuous air barrier scope of work,
    - 5.3 List of critical inspection items,
    - 5.4 Inspection documentation requirements, and
    - 5.5 Provisions for corrective actions where needed.

EC 07-0125

Revise as follows:

~~**C402.5.1.1**~~ **C402.6.1.2 Air barrier construction.** The *continuous air barrier* shall be constructed to comply with the following:

1. The *air barrier* shall be continuous for all assemblies that ~~are~~ comprise the ~~thermal envelope of the building~~ *building thermal envelope* and across the joints and assemblies.
2. *Air barrier* joints and seams shall be sealed, including sealing transitions in places and changes in materials. The joints and seals shall be securely installed in or on the joint for its entire length so as not to dislodge, loosen or otherwise impair its ability to resist positive and negative pressure differentials such as those from wind, stack effect and mechanical *ventilation*.

3. Penetrations of the *air barrier* shall be caulked, gasketed or otherwise sealed in a manner compatible with the construction materials and location. Sealing shall allow for expansion, contraction and mechanical vibration. ~~Joints and seams associated with penetrations shall be sealed in the same manner or taped. Sealing materials shall be securely installed around the penetration so as not to dislodge, loosen or otherwise impair the penetrations' ability to resist positive and negative pressure from wind, stack effect and mechanical *ventilation*.~~ Sealing materials shall be securely installed around the penetration so as not to dislodge, loosen or otherwise impair the penetrations' ability to resist positive and negative pressure. Sealing of concealed fire sprinklers, where required, shall be in a manner that is recommended by the fire sprinkler manufacturer. Caulking or other adhesive sealants shall not be used to fill voids between fire sprinkler cover plates and walls or ceilings.
4. Recessed lighting fixtures shall comply with Section ~~C402.5.8~~C402.6.1.2.1. Where similar objects are installed that penetrate the air barrier, provisions shall be made to maintain the integrity of the *air barrier*.
5. Electrical and communication boxes shall comply with C402.6.1.2.2.

~~C402.5.8~~ **C402.6.1.2.1 Recessed lighting.** Recessed luminaires installed in the *building thermal envelope* shall be all of the following:

1. IC-rated.
2. *Labeled* as having an air leakage rate of not ~~more~~ greater than 2.0 cfm (0.944 L/s) ~~when~~where tested in accordance with ASTM E283 at a 1.57 psf (75 Pa) pressure differential.
3. Sealed with a gasket or caulk between the housing and interior wall or ceiling covering.

C402.6.1.2.2 Electrical and communication boxes. Electrical and communication boxes that penetrate the air barrier of the building thermal envelope, and that do not comply with C402.6.1.2.2.1, shall be caulked, taped, gasketed, or otherwise sealed to the air barrier element being penetrated. All openings on the concealed portion of the box shall be sealed. Where present, insulation shall rest against all concealed portions of the box.

C402.6.1.2.2.1 Air-sealed boxes. Where air-sealed boxes are installed, they shall be marked in accordance with NEMA OS 4. Air-sealed boxes shall be installed in accordance with the manufacturer's instructions.

EC 07-0126

Revise as follows:

[NY] ~~C402.5.1.2~~ C402.6.2 Air ~~barrier~~ leakage compliance ~~options~~. ~~A continuous air barrier for the opaque building envelope shall comply with Section C402.5.1.2.1 or C402.5.1.2.2.~~ *Air leakage* of the *building thermal envelope* shall be tested by an approved third party in accordance with C402.6.2.1. The measured air leakage shall not be greater than 0.35 cfm/ft (1.8 L/s x m) of the building thermal envelope area at a pressure differential of 0.3 inch water gauge (75 Pa) with the calculated *building thermal envelope* surface area being the sum of the above- and below-grade *building thermal envelope*.

Exceptions:

1. Where the measured air leakage rate is greater than 0.35 cfm/ft2 (1.8 L/s x m2) but is not greater than 0.45 cfm/ft2 (2.3 L/s x m2), the *approved* third party shall perform a diagnostic evaluation using smoke tracer or infrared imaging. The evaluation shall be conducted while the building is pressurized or depressurized along with a visual inspection of the air barrier in accordance with ASTM E1186. All identified leaks shall be sealed where such sealing can be made without damaging existing building components. A report specifying the corrective actions taken to seal leaks shall be deemed to establish compliance with the requirements of this section where submitted to the *building official* and the building owner. Where the measured *air leakage* rate is greater than 0.45 cfm/ft2 (2.3 L/s x m2), corrective actions must be made to the building and an additional test completed for which the results are 0.45 cfm/ft2 (2.3 L/s x m2), or less.
2. Buildings larger than 25,000 square feet (2300 m2) floor area in *Climate Zone* 4, other than Group R and I occupancies, that comply with C402.6.2.3.
3. As an alternative, *buildings* or portions of *buildings* containing Group R-2 and I-1 occupancies shall be permitted to be tested by an approved third party in accordance with C402.6.2.2. The reported *air leakage* of the *building*

thermal envelope shall not be greater than 0.27 cfm/ft2 (1.4 L/s x m2) of the testing unit enclosure area at a pressure differential of 0.2 inch water gauge (50 Pa).

C402.6.2.1 Whole building test method and reporting. The *building thermal envelope* shall be tested by an *approved* third party in accordance with ASTM E3158 or an equivalent *approved* method. A report that includes the tested surface area, floor area, air by volume, stories above grade, and *air leakage* rates shall be submitted to the *building official* and the *building owner*.

Exceptions:

1. For buildings less than 10,000 ft2 (1000 m2) the entire *building thermal envelope* shall be permitted to be tested in accordance with ASTM E779, ASTM E3158, or ASTM E1827 or an equivalent *approved* method.

2. For buildings greater than 50,000 ft2 (4645 m2), portions of the building shall be permitted to be tested and the measured air leakage shall be area-weighted by the surface areas of the building thermal envelope in each portion. The weighted average tested air leakage shall not be greater than the whole *building air leakage* limit. The following portions of the building shall be tested:

   2.1 The entire building thermal envelope area of stories that have any conditioned spaces directly under a roof.

   2.2 The entire building thermal envelope area of stories that have a building entrance, a floor over unconditioned space, a loading dock, or that are below grade.

   2.3 Representative above-grade portions of the building totaling not less than 25 percent of the wall area enclosing the remaining conditioned space.

C402.6.2.2 Dwelling and sleeping unit enclosure method and reporting. The *building thermal envelope* shall be tested for *air leakage* in accordance with ASTM E779, ANSI/RESNET/ICC 380, ASTM E1827 or an equivalent *approved* method. Where multiple *dwelling units* or *sleeping units* or other spaces are contained within one *building thermal envelope,* each shall be considered an individual testing unit, and the building *air leakage* shall be the weighted average of all tested unit results, weighted by each *testing unit enclosure area*. Units shall be tested without simultaneously testing adjacent units and shall be separately tested as follows:

1. Where buildings have less than eight total dwelling or sleeping units, each unit shall be tested.
2. Where buildings have eight or more dwelling or sleeping units, the greater of seven units or 20 percent of the units in the building shall be tested, including a top floor unit, a middle floor unit, a ground floor unit and a unit with the largest testing unit enclosure area. For each tested unit that exceeds the maximum air leakage rate, an additional three units shall be tested, including a mixture of testing unit types and locations.
3. Enclosed spaces with not less than one exterior wall in the building thermal envelope shall be tested in accordance with Section C402.6.2.1.

   Exception: Corridors, stairwells, and enclosed spaces having a conditioned floor area not greater than 1,500 ft (139 m2) shall be permitted to comply with Section C402.6.2.3 and either Section C402.6.2.3.1 or Section C402.6.2.3.2.

C402.6.2.3 Building thermal envelope verification criteria. Where Section C402.6.2.1 and C402.6.2.2 are not applicable the installation of the continuous air barrier shall be verified by the *building official*, a *registered design professional* or *approved agency* in accordance with the following:

1. A review of the construction documents and other supporting data shall be conducted to assess compliance with the requirements in Section C402.6.1.
2. Inspection of continuous air barrier components and assemblies shall be conducted during construction to verify compliance with the requirements of Sections C402.6.2.3.1 or C402.6.2.3.2. The air barrier shall be provided with access for inspection and repair.
3. A final inspection report shall be provided for inspections completed by the *registered design professional* or *approved agency*. The inspection report shall be provided to the building owner or owner's authorized agent and the *building official*. The report shall identify deficiencies found during inspection and details of corrective measures taken.

EC 07-0127

Revise as follows:

~~C402.5.2~~ C402.6.3 **Air leakage of fenestration and opaque doors.** The air leakage of *fenestration* and *opaque door* assemblies shall ~~meet~~ comply with ~~the provisions of~~ Table ~~C402.5.2~~ C402.6.3. Testing shall be ~~in accordance with the applicable reference test standard in Table C402.5.2~~ conducted by an accredited, independent testing laboratory in accordance with applicable reference test standards in Table C402.6.3 and *labeled* by the manufacturer.

Exceptions:

1. Field-fabricated *fenestration* assemblies that are sealed in accordance with Section ~~C402.5.1~~ C402.6.1.
2. *Fenestration* in buildings that ~~comply with the testing alternative of~~ are tested in accordance with ~~Section C402.5~~ C402.6.2 are not required to meet the air leakage requirements in Table ~~C402.5.2~~ C402.6.3.

[NY] ~~C402.5.7~~ C402.6.6 **Vestibules.** Building entrances shall be protected with an enclosed vestibule~~, with all doors~~ Doors opening into and out of the vestibule equipped with self-closing devices. Vestibules shall be designed so that in passing through the vestibule it is not necessary for the interior and exterior doors to open at the same time. The installation of one or more revolving doors in the building entrance shall not eliminate the requirement that a vestibule be provided on any doors adjacent to revolving doors.

Exceptions: Vestibules are not required for the following:

~~1. Buildings in *Climate Zones* 1 and 2.~~

~~2.~~1. Doors not intended to be used by the public, such as doors to mechanical or electrical *equipment rooms*, or intended solely for employee use.

~~3.~~2. Doors opening directly from a *sleeping unit* or *dwelling unit*.

~~4.~~3. Doors that open directly from a space less than 3,000 square feet (298 m^2) in area.

~~5.~~4. Revolving doors.

~~6.~~5. Doors used primarily to facilitate vehicular movement or material handling and adjacent personnel doors.

~~7.~~6. Doors that have an *air curtain* unit with a velocity of not less than 6.56 feet per second (2 m/s) at 6.0 inches (15 cm) above the floor that ~~have~~ has been tested in accordance with ANSI/AMCA 220 or ISO 27327-1 and installed in accordance with the manufacturer's instructions. Manual or automatic controls shall be provided that will operate the *air curtain* unit with the opening and closing of the door and comply with Section C403.4.1.4. *Air* ~~curtains~~ curtain units and their controls shall comply with Section C408.2.3.

EC 07-0128

Add new:

[NY] C402.7 Thermal bridges in above-grade walls. *Thermal bridges* in above-grade walls shall comply with this section or an *approved* design.

Exceptions:

1. Any *thermal bridge* with a material thermal conductivity not greater than 3.0 Btu/h-ft-°F.

2. Blocking, coping, flashing, and other similar materials for attachment of roof coverings.

3. *Thermal bridges* accounted for in the U-factor or C-factor for a building thermal envelope.

C402.7.1 Balconies and floor decks. Balconies and concrete floor decks shall not penetrate the *building thermal envelope*. Such assemblies shall be separately supported or shall be supported by structural attachments or elements that minimize thermal bridging through the *building thermal envelope*.

Exceptions: Balconies and concrete floor decks shall be permitted to penetrate the *building thermal envelope* where:

1. An area-weighted *U*-factor is used for *above-grade wall* compliance that includes a *U*-factor of 0.8 Btu/h-°F-ft2 for the area of the *above-grade wall* penetrated by the concrete floor deck in accordance with Section C402.1.2.1.5, or

2. An approved thermal break device with not less than R-10 insulation material is installed in accordance with the manufacturer's instructions, or

3. An *approved* design in accordance with Section 104.1 where the *above-grade wall* U-factor used for compliance accounts for all balcony and concrete floor deck *thermal bridges*.

C402.7.2 Cladding supports. Linear elements supporting opaque cladding shall be off-set from the structure with attachments that allow the continuous insulation, where present, to pass behind the cladding support element except at the point of attachment.

Exceptions:

1. An *approved* design in accordance with Section 104.1 where the above-grade wall *U*-factor used for compliance accounts for the cladding support element *thermal bridge*.

2. Anchoring for curtain wall and window wall systems where *curtain wall* and window wall systems comply with C402.7.4.

C402.7.3 Structural beams and columns. Structural steel and concrete beams and columns that project through the *building thermal envelope* shall be covered with not less than R-5 insulation for not less than 2 feet (610 mm) beyond the interior or exterior surface of an insulation component within the *building thermal envelope.*

Exceptions:

1. Where an approved thermal break device is installed in accordance with manufacturer's instructions.

2. An *approved* design in accordance with Section 104.1 where the above-grade wall U-factor used to demonstrate compliance accounts for the beam or column *thermal bridge*.

C402.7.4 Vertical fenestration. Vertical fenestration intersections with above grade walls shall comply with one or more of the following:

1. Where above-grade walls include continuous insulation, the plane of the exterior glazing layer or, for metal frame fenestration, a non-metal thermal break in the frame shall be positioned within 2 inches (610 mm) of the interior or exterior surface of the continuous insulation.

2. Where above-grade walls do not include continuous insulation, the plane of the exterior glazing layer or, for metal frame fenestration, a non-metal thermal break in the frame shall be positioned within the thickness of the integral or cavity insulation.

3. The surface of the rough opening, not covered by the fenestration frame, shall be insulated with insulation of not less than R-3 material or covered with a wood buck that is not less than 1.5 inches (457 mm) thick.

4. For the intersection between vertical fenestration and opaque spandrel in a shared framing system, manufacturer's data for the spandrel U-factor shall account for *thermal bridges*.

Exceptions:

1. Where an *approved* design in accordance with Section 104.1 for the above-grade wall U-factor used for compliance accounts for *thermal bridges* at the intersection with the vertical fenestration.
2. Doors

C402.7.5 Parapets. Parapets shall comply with one or more of the following as applicable:

1. Where continuous insulation is installed on the exterior side of the *above-grade wall* and the roof is insulated with insulation entirely above deck, the continuous insulation shall extend up both sides of the parapet not less than 2 feet (610 mm) above the roof covering or to the top of the parapet, whichever is less. Parapets that are an integral part of a fire-resistance rated wall, and the exterior continuous insulation applied to the parapet, shall comply with the fire resistance ratings of the building code.

2. Where continuous insulation is installed on the exterior side of the above-grade wall and the roof insulation is below the roof deck, the continuous insulation shall extend up the exterior side of the parapet to not less than the height of the top surface of the roof assembly.

3. Where continuous insulation is not installed on the exterior side of the *above-grade wall* and the roof is insulated with insulation entirely above deck, the wall cavity or integral insulation shall extend into the parapet up to the exterior face of the roof insulation or equivalent R-value insulation shall be installed not less than 2 feet (610 mm) horizontally inward on the underside of the roof deck.

4. Where continuous insulation is not installed on the exterior side of the *above-grade wall* and the roof insulation is below the roof deck, the wall and roof insulation components shall be adjacent to each other at the roof-ceiling-wall intersection.
5. Where a thermal break device with not less than R-10 insulation material aligned with the *above-grade wall* and roof insulation is installed in accordance with the manufacturer's instructions.

Exception: An *approved* design in accordance with Section 104.1 where the *above-grade wall U*-factor used for compliance accounts for the parapet *thermal bridge*.

[NY] C402.7.2.4 Vertical fenestration. Vertical fenestration intersections with above grade walls shall comply with one or more of the following:

1. Where above-grade walls include continuous insulation, the plane of the exterior glazing layer or, for metal frame fenestration, a non-metal thermal break in the frame shall be positioned within 2 inches (610 mm) of the interior or exterior surface of the continuous insulation.
2. Where above-grade walls do not include continuous insulation, the plane of the exterior glazing layer or, for metal frame fenestration, a non-metal thermal break in the frame shall be positioned within the thickness of the integral or cavity insulation.
3. The surface of the rough opening, not covered by the fenestration frame, shall be insulated with insulation of not less than R-3 material or covered with a wood buck that is not less than 1.5 inches (457 mm) thick.
4. For the intersection between vertical fenestration and opaque spandrel in a shared framing system, manufacturer's data for the spandrel U-factor shall account for *thermal bridges*.

Exceptions:

1. Where an *approved* design in accordance with Section 104.1 in accordance with Section 104.1 for the above-grade wall U-factor used for compliance accounts for *thermal bridges* at the intersection with the vertical fenestration.
2. Doors

EC 07-0129

Revise as follows:

C403.1 General. Mechanical systems and equipment serving the building heating, cooling, ventilating or refrigerating needs shall comply with ~~this section.~~ one of the following:

1. Sections C403.1.1 and Sections C403.2 through Section C403.17.
2. Data Centers shall comply with Section C403.1.1, Section C403.1.2 and Section C403.6 through Section C403.17.
3. Section C409.

Add new:

C403.1.2 Data centers. Data center systems shall comply with Sections 6 and 8 of ASHRAE 90.4.

[NY] C403.1.3 Electric-resistance space heating. *Dwelling units* and *sleeping units* using electric-resistance space heating shall limit the total installed heating capacity of all electric-resistance space heating to no more than 2.0 kW. All other *occupiable spaces* within the *building* using electric-resistance space heating shall limit the total installed heating capacity of all electric-resistance space heating to no more than 0.25 kW per square foot or 5 percent of the total building HVAC system heating capacity or serve less than 5 percent of the *conditioned floor area*, whichever is less.

Exceptions:

1. Portions of *buildings* that require greater electric resistance space heating capacity for health care, research, or commercial and industrial processes subject to the *approval* of the building official.
2. Redundant or emergency systems required by regulation in Groups I-2 and I-3 facilities.

3. Temporary electric resistance heating systems with a maximum setpoint of 40°F (4°C) in unfinished and unoccupied tenant spaces.

EC 07-0034

Revise as follows:

C403.2 System design ~~(Mandatory)~~. Mechanical systems shall be designed to comply with Sections C403.2.1 ~~and C403.2.2.~~ through C403.2.3. Where elements of a building's mechanical systems are addressed in Sections C403.3 through ~~C403.12~~ C403.14, such elements shall comply with the applicable provisions of those sections.

EC 07-0130

Add new:

C403.2.3 Fault detection and diagnostics. Buildings with gross conditioned floor area of not less than 100,000 square feet (9290 m2) served by one or more HVAC systems that are controlled by a direct digital control (DDC) system shall include a fault detection and diagnostics (FDD) system to monitor the HVAC system's performance and automatically identify faults. The FDD system shall:

1. Include permanently installed sensors and devices to monitor HVAC system's performance.
2. Sample HVAC systems performance at least once every 15 minutes.
3. Automatically identify and report HVAC system faults.
4. Automatically notify authorized personnel of identified HVAC system faults.
5. Automatically provide prioritized recommendations for repair of identified faults based on analysis of data collected from the sampling of HVAC system performance.
6. Be capable of transmitting the prioritized fault repair recommendations to remotely located authorized personnel.

Exception: R-1 and R-2 occupancies.

EC 07-0131

Revise as follows:

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)~~C403.3.2(16) 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)~~ AHRI 400. 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.

Delete entirely Tables C403.3.2(1) through (10) and replace them with new Tables C403.3.2(1) through (16) (found below):

~~**TABLE C403.3.2(1)**~~
~~**MINIMUM EFFICIENCY REQUIREMENTS:**~~
~~**ELECTRICALLY OPERATED UNITARY AIR CONDITIONERS AND CONDENSING UNITS**~~

~~**TABLE C403.3.2(2)**~~
~~**MINIMUM EFFICIENCY REQUIREMENTS:**~~
~~**ELECTRICALLY OPERATED UNITARY AND APPLIED HEAT PUMPS**~~

~~**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-CONDITIONER HEAT PUMPS**~~

~~**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**~~

~~**TABLE C403.3.2(5)**~~
~~**MINIMUM EFFICIENCY REQUIREMENTS: GAS- AND OIL-FIRED BOILERS**~~

~~TABLE C403.3.2(6)~~
~~MINIMUM EFFICIENCY REQUIREMENTS:~~
~~CONDENSING UNITS, ELECTRICALLY OPERATED~~

~~TABLE C403.3.2(7)~~
~~WATER CHILLING PACKAGES – EFFICIENCY REQUIREMENTS[a, b, d]~~

~~TABLE C403.3.2(8)~~
~~MINIMUM EFFICIENCY REQUIREMENTS: HEAT REJECTION EQUIPMENT~~

~~TABLE C403.3.2(9)~~
~~MINIMUM EFFICIENCY AIR CONDITIONERS AND CONDENSING UNITS SERVING COMPUTER ROOMS~~

~~TABLE C403.3.2(10)~~
~~HEAT TRANSFER EQUIPMENT~~

[NY] TABLE C403.3.2(1)
ELECTRICALLY OPERATED UNITARY AIR CONDITIONERS AND CONDENSING UNITS—MINIMUM EFFICIENCY REQUIREMENTS [c,d]

(This table is intended to be a restatement of the legally binding provisions found in Title 10 CFR Part 431 included here as a convenience to the users of this code)

EQUIPMENT TYPE	SIZE CATEGORY	HEATING SECTION TYPE	SUBCATEGORY OR RATING CONDITION	MINIMUM EFFICIENCY [e]	TEST PROCEDURE [a,e]
Air conditioners, air cooled	< 65,000 Btu/h[b]	All	Split system, three phase [b]	13.0 SEER before 1/1/2025 13.4 SEER2 after 1/1/2025	AHRI 210/ 240—2017 before 1/1/ 2025 AHRI 210/ 240—2023 after 1/1/2025
			Single-package, three phase [b]	14.0 SEER before 1/1/2025 13.4 SEER2 after 1/1/2025	
Space constrained, air cooled	< 30,000 Btu/h [b]	All	Split system, three phase [b]	12.0 SEER before 1/1/2025 12.7 SEER2 after 1/1/2025	AHRI 210/ 240—2017 before 1/1/ 2025 AHRI 210/ 240—2023 after 1/1/2025
			Single package, three phase [b]	12.0 SEER before 1/1/2025 13.9 SEER2 after 1/1/2025	
				12.0 SEER before 1/1/2025	AHRI 210/ 240—2017 before 1/1/ 2025

Small duct, high velocity, air cooled	< 65,000 Btu/h [b]	All	Split system, three phase [b]	13.0 SEER2 after 1/1/2025	AHRI 210/ 240—2023 after 1/1/2025
Air conditioners, air cooled	≥ 65,000 Btu/h and < 135,000 Btu/h	Electric resistance (or none)	Split system and single package	14.8 IEER	AHRI 340/360
		All other		14.6 IEER	
	≥ 135,000 Btu/hand < 240,000 Btu/h	Electric resistance (or none)		14.2 IEER	
		All other		14.0 IEER	
Air conditioners, air cooled *(continued)*	≥ 240,000 Btu/h and < 760,000 Btu/h	Electric resistance (or none)	Split system and single package	13.2 IEER	AHRI 340/360
		All other		13.0 IEER	
	≥ 760,000 Btu/h	Electric resistance (or none)		12.5 IEER	
		All other		12.3 IEER	
Air conditioners, water cooled	< 65,000 Btu/h	All	Split system and single package	12.1 EER 12.3 IEER	AHRI 210/240
	≥ 65,000 Btu/h and < 135,000 Btu/h	Electric resistance (or none)		12.1 EER 13.9 IEER	AHRI 340/360
		All other		11.9 EER 13.7 IEER	
	≥ 135,000 Btu/hand < 240,000 Btu/h	Electric resistance (or none)		12.5 EER 13.9 IEER	
		All other		12.3 EER 13.7 IEER	
	≥ 240,000 Btu/hand < 760,000 Btu/h	Electric resistance (or none)		12.4 EER 13.6 IEER	
		All other		12.2 EER 13.4 IEER	

	≥ 760,000 Btu/h	Electric resistance (or none)		12.2 EER 13.5 IEER	
		All other		12.0 EER 13.3 IEER	
Air conditioners, evaporatively cooled	< 65,000 Btu/h[b]	All	Split system and single package	12.1 EER 12.3 IEER	AHRI 210/240
	≥ 65,000 Btu/h and < 135,000 Btu/h	Electric resistance (or none)		12.1 EER 12.3 IEER	AHRI 340/360
		All other		11.9 EER 12.1 IEER	
	≥ 135,000 Btu/hand < 240,000 Btu/h	Electric resistance (or none)		12.0 EER 12.2 IEER	
		All other		11.8 EER 12.0 IEER	
	≥ 240,000 Btu/hand < 760,000 Btu/h	Electric resistance (or none)		11.9 EER 12.1 IEER	
		All other		11.7 EER 11.9 IEER	
	≥ 760,000 Btu/h	Electric resistance (or none)		11.7 EER 11.9 IEER	
		All other		11.5 EER 11.7 IEER	
Condensing units, air cooled	≥ 135,000 Btu/h	–	–	10.5 EER 11.8 IEER	AHRI 365
Condensing units, water cooled	≥ 135,000 Btu/h	–	–	13.5 EER 14.0 IEER	AHRI 365
Condensing units, evaporatively cooled	≥ 135,000 Btu/h	–	–	13.5 EER 14.0 IEER	AHRI 365

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

a. Chapter 6 contains a list of the referenced standards, which include test procedures, including the reference year version of the test procedure.

b. Single-phase, US air-cooled air conditioners less than 65,000 Btu/h are regulated as consumer products by the US Department of Energy Code of Federal Regulations DOE 10 CFR 430. SEER and SEER2 values for single-phase products are set by the US Department of Energy.

c. DOE 10 CFR 430 Subpart B Appendix M1 includes the test procedure updates effective 1/1/2023 that are documented in AHRI 210/240—2023.

d. This table is a restatement of information found in 10 CFR 430, 10 CFR 431, and ASHRAE 90.1 Table 6.8.1-1 Electrically Operated Unitary Air Conditioners and Condensing Units—Minimum Efficiency Requirements.

e. Where more than one efficiency requirement, test procedure and date are provided, it pertains to the date of equipment manufacture.

[NY] TABLE C403.3.2(2)
ELECTRICALLY OPERATED AIR-COOLED UNITARY HEAT PUMPS—MINIMUM EFFICIENCY REQUIREMENTS [c, d]

(This table is intended to be a restatement of the legally binding provisions found in DOE 10 CFR 431 included here as a convenience to the users of this code)

EQUIPMENT TYPE	SIZE CATEGORY	HEATING SECTION TYPE	SUBCATEGORY OR RATING CONDITION	MINIMUM EFFICIENCY [e]	TEST PROCEDURE [a]
Air cooled (cooling mode)	< 65,000 Btu/h	All	Split system, three phase [b]	14.0 SEER before 1/1/2025 14.3 SEER2after 1/1/2025	AHRI 210/ 240—2017 before 1/1/ 2025 AHRI 210/ 240—2023 after 1/1/2025
			Single package, three phase [b]	14.0 SEER before 1/1/2025 13.4 SEER2 after 1/1/2025	
Space constrained, air cooled (cooling mode)	≤ 30,000 Btu/h	All	Split system, three phase [b]	12.0 SEER before 1/1/2025 13.9 SEER2, after 1/1/2025	AHRI 210/ 240—2017 before 1/1/ 2025 AHRI 210/ 240—2023 after 1/1/2025
			Single package, three phase [b]	12.0 SEER before 1/1/2025 13.9 SEER2 after 1/1/2025	
Small duct, high velocity, air cooled (cooling mode)	< 65,000	All	Split system, three phase [b]	12.0 SEER before 1/1/2025 14.0 SEER2 after 1/1/2025	AHRI 210/ 240—2017 before 1/1/ 2025 AHRI 210/ 240—2023 after 1/1/2025
Air cooled (cooling mode)	≥ 65,000 Btu/h and < 135,000 Btu/h	Electric resistance (or none)	Split system and single package	14.1 IEER	AHRI 340/360
		All other		13.9 IEER	
	≥ 135,000 Btu/h and < 240,000 Btu/h	Electric resistance (or none)		13.5 IEER	
		All other		13.3 IEER	
	≥ 240,000 Btu/h	Electric resistance (or none)		12.5 IEER	
		All other		12.3 IEER	
Air cooled (heating mode)	< 65,000 Btu/h (cooling capacity)	_	Split system, three phase [b]	8.2 HSPF before 1/1/2025 7.5 HSPF2 after 1/1/2025	AHRI 210/ 240—2017 before 1/1/ 2025 AHRI 210/ 240—2023

			Single package, three phase [b]	8.0 HSPF before 1/1/2025 6.7 HSPF2 after 1/1/2025	after 1/1/2025
Space constrained, air cooled (heating mode)	≤ 30,000 Btu/h (cooling capacity)	–	Split system, three phase [b]	7.4 HSPF before 1/1/2025 7.0 HSPF2 after 1/1/2025	AHRI 210/ 240—2017 before 1/1/ 2025 AHRI 210/ 240—2023 after 1/1/2025
			Single package, three phase [b]	7.4 HSPF before 1/1/2025 6.7 HSPF2 after 1/1/2025	
Small duct, high velocity, air cooled (heating mode)	< 65,000 Btu/h	–	Split system, three phase [b]	7.2 HSPF before 1/1/2025 6.9 HSPF2 after 1/1/2025	AHRI 210/ 240—2017 before 1/1/ 2025 AHRI 210/ 240—2023 after 1/1/2025
Air cooled (heating mode)	≥ 65,000 Btu/h and < 135,000 Btu/h (cooling capacity)	–	47°F db/43°F wb outdoor air	3.40 COP_H	AHRI 340/360
			17°F db/15°F wb outdoor air	2.25 COP_H	
	≥ 135,000 Btu/h and < 240,000 Btu/h (cooling capacity)		47°F db/43°F wb outdoor air	3.30 COP_H	
			17°F db/15°F wb outdoor air	2.05 COP_H	
	≥ 240,000 Btu/h (cooling capacity)		47°F db/43°F wb outdoor air	3.20 COP_H	
			17°F db/15°F wb outdoor air	2.05 COP_H	

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

a. Chapter 6 contains a list of the referenced standards, which include test procedures, including the reference year version of the test procedure.
b. Single-phase, US air-cooled air conditioners less than 65,000 Btu/h are regulated as consumer products by the US Department of Energy Code of Federal Regulations DOE 10 CFR 430. SEER and SEER2 values for single-phase products are set by the US Department of Energy.
c. DOE 10 CFR 430 Subpart B Appendix M1 includes the test procedure updates effective 1/1/2023 that are documented in AHRI 210/240—2023.
d. This table is a restatement of information found in 10 CFR 430, 10 CFR 431, and ASHRAE 90.1 Table 6.8.1-1 Electrically Operated Unitary Air Conditioners and Condensing Units—Minimum Efficiency Requirements.
e. Where more than one efficiency requirement, test procedure and date are provided, it pertains to the date of equipment manufacture.

[NY] TABLE C403.3.2(3)
WATER-CHILLING PACKAGES—MINIMUM EFFICIENCY REQUIREMENTS [a, b, e, f]

EQUIPMENT TYPE	SIZE CATEGORY	UNITS	PATH A	PATH B	TEST PROCEDURE[c]
Air cooled	< 150 tons	EER (Btu/Wh)	≥ 10.100 FL	≥ 9.700 FL	AHRI 550/590
			≥ 13.700 IPLV.IP	≥ 15.800 IPLV.IP	
	≥ 150 tons		≥ 10.100 FL	≥ 9.700FL	
			≥ 14.000 IPLV.IP	≥ 16.100 IPLV.IP	
Air cooled without condenser, electrically operated	All capacities	EER (Btu/Wh)	Air-cooled without condenser must be rated with matching condensers and comply with air-cooled chiller efficiency requirements		AHRI 550/590
	< 75 tons		≤ 0.750 FL	≤ 0.780 FL	
			≤ 0.600 IPLV.IP	≤ 0.500 IPLV.IP	
	≥ 75 tons and < 150 tons		≤ 0.720 FL	≤ 0.750 FL	
			≤ 0.560 IPLV.IP	≤ 0.490 IPLV.IP	

Liquid-cooled, electrically operated positive displacement	≥ 150 tons and < 300 tons	kW/ton	≤ 0.660 FL	≤ 0.680 FL	AHRI 550/590
			≤ 0.540 IPLV.IP	≤ 0.440 IPLV.IP	
	≥ 300 tons and < 600 tons		≤ 0.610 FL	≤ 0.625 FL	
			≤ 0.520 IPLV.IP	≤ 0.410 IPLV.IP	
	≥ 600 tons		≤ 0.560 FL	≤ 0.585 FL	
			≤ 0.500 IPLV.IP	≤ 0.380 IPLV.IP	
Liquid-cooled, electrically operated centrifugal	< 150 tons	kW/ton	≤ 0.610 FL	≤ 0.695 FL	AHRI 550/590
			≤ 0.550 IPLV.IP	≤ 0.440 IPLV.IP	
	≥ 150 tons and < 300 tons		≤ 0.610 FL	≤ 0.635 FL	
			≤ 0.550 IPLV.IP	≤ 0.400 IPLV.IP	
	≥ 300 tons and < 400 tons		≤ 0.560 FL	≤ 0.595 FL	
			≤ 0.520 IPLV.IP	≤ 0.390 IPLV.IP	
	≥ 400 tons and < 600 tons		≤ 0.560 FL	≤ 0.585 FL	
			≤ 0.500 IPLV.IP	≤ 0.380 IPLV.IP	
	≥ 600 tons		≤ 0.560 FL	≤ 0.585 FL	
			≤ 0.500 IPLV.IP	≤ 0.380 IPLV.IP	
Air cooled absorption, single effect	All capacities	COP (W/W)	≥ 0.600 FL	NA[d]	AHRI 560
Liquid-cooled absorption, single effect	All capacities	COP (W/W)	≥ 0.700 FL	NA[d]	AHRI 560
Absorption double effect, indirect fired	All capacities	COP (W/W)	≥ 1.000 FL	NA[d]	AHRI 560
			≥ 0.150 IPLV.IP		
Absorption double effect, direct fired	All capacities	COP (W/W)	≥ 1.000 FL	NA[d]	AHRI 560
			≥ 1.000 IPLV		

a. Chapter 6 contains a list of the referenced standards, which include test procedures, including the reference year version of the test procedure.
b. The requirements for centrifugal chillers shall be adjusted for nonstandard rating conditions per Section C403.3.2.1 and are applicable only for the range of conditions listed there. The requirements for air-cooled, water-cooled positive displacement and absorption chillers are at standard rating conditions defined in the reference test procedure.
c. Both the full-load and IPLV.IP requirements must be met or exceeded to comply with this standard. When there is a Path B, compliance can be with either Path A or Path B for any application.
d. NA means the requirements are not applicable for Path B, and only Path A can be used for compliance.
e. FL is the full-load performance requirements, and IPLV.IP is for the part-load performance requirements.

[NY] TABLE C403.3.2(4)
ELECTRICALLY OPERATED PACKAGED TERMINAL AIR CONDITIONERS, PACKAGED TERMINAL HEAT PUMPS, SINGLE-PACKAGE VERTICAL AIR CONDITIONERS, SINGLE-PACKAGE VERTICAL HEAT PUMPS, ROOM AIR CONDITIONERS AND ROOM AIR-CONDITIONER HEAT PUMPS—MINIMUM EFFICIENCY REQUIREMENTS [e]

(This table is intended to be a restatement of the legally binding provisions found in Title 10 CFR 430 included here as a convenience to the users of this code)

EQUIPMENT TYPE	SIZE CATEGORY (INPUT)	SUBCATEGORY OR RATING CONDITION	MINIMUM EFFICIENCY[d]	TEST PROCEDURE[a]
PTAC (cooling mode) standard size	< 7,000 Btu/h	95°F db/75°F wb outdoor air[c]	11.9 EER	AHRI 310/380
	≥ 7,000 Btu/h and ≤ 15,000 Btu/h		14.0 – (0.300 × Cap/1,000) EER[d]	
	> 15,000 Btu/h		9.5 EER	
PTAC (cooling mode) nonstandard size[a]	< 7,000 Btu/h	95°F db/75°F wb outdoor air[c]	9.4 EER	AHRI 310/380
	≥ 7,000 Btu/h and ≤ 15,000 Btu/h		10.9 – (0.213 × Cap/1,000) EER[d]	
	> 15,000 Btu/h		7.7 EER	
PTHP (cooling mode) standard size	< 7,000 Btu/h	95°F db/75°F wb outdoor air[c]	11.9 EER	AHRI 310/380
	≥ 7,000 Btu/h and ≤ 15,000 Btu/h		14.0 – (0.300 × Cap/1,000) EER[d]	
	> 15,000 Btu/h		9.5 EER	
PTHP (cooling mode) nonstandard size[b]	< 7,000 Btu/h	95°F db/75°Fwb outdoor air[c]	9.3 EER	AHRI 310/380
	≥ 7,000 Btu/h and ≤ 15,000 Btu/h		10.8 – (0.213 × Cap/1,000) EER[d]	
	> 15,000 Btu/h		7.6 EER	
PTHP (heating mode) standard size	< 7,000 Btu/h	47°F db/43°Fwb outdoor air	3.3 COP_H	AHRI 310/380
	≥ 7,000 Btu/h and ≤ 15,000 Btu/h		3.7 – (0.052 × Cap/1,000) COP_H[d]	
	> 15,000 Btu/h		2.90 COP_H	
PTHP (heating mode) nonstandard size[b]	< 7,000 Btu/h	47°F db/43°Fwb outdoor air	2.7 COP_H	AHRI 310/380
	≥ 7,000 Btu/h and ≤ 15,000 Btu/h		2.9 – (0.026 × Cap/1000) COP_H[d]	
	> 15,000 Btu/h		2.5 COP_H	
SPVAC (cooling mode) single and three phase	< 65,000 Btu/h	95°F db/75°Fwb outdoor air[c]	11.0 EER	AHRI 390
	≥ 65,000 Btu/h and < 135,000 Btu/h		10.0 EER	
	≥ 135,000 Btu/h and ≤ 240,000 Btu/h		10.0 EER	
SPVHP (cooling mode)	< 65,000 Btu/h	95°F db/75°Fwb outdoor air[c]	11.0 EER	AHRI 390
	≥ 65,000 Btu/h and < 135,000 Btu/h		10.0 EER	
	≥ 135,000 Btu/h and ≤ 240,000 Btu/h		10.0 EER	
SPVHP (heating mode)	< 65,000 Btu/h	47°F db/43°Fwb outdoor air	3.3 COP_H	AHRI 390
	≥ 65,000 Btu/h and < 135,000 Btu/h		3.0 COP_H	
	≥ 135,000 Btu/h and < 240,000 Btu/h		3.0 COP_H	
	< 6,000 Btu/h	–	11.0 CEER	
	≥ 6,000 Btu/h and < 8,000 Btu/h	–	11.0 CEER	

Room air conditioners without reverse cycle with louvered sides for applications outside US	≥ 8,000 Btu/h and < 14,000 Btu/h	–	10.9 CEER	ANSI/AHAM RAC-1
	≥ 14,000 Btu/h and < 20,000 Btu/h	–	10.7 CEER	
	≥ 20,000 Btu/h and < 28,000 Btu/h	–	9.4 CEER	
	≥ 28,000 Btu/h	–	9.0 CEER	
Room air conditioners without louvered sides	< 6,000 Btu/h	–	10.0 CEER	ANSI/AHAM RAC-1
	≥ 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 conditioners with reverse cycle, with louvered sides for applications outside US[d]	< 20,000 Btu/h	–	9.8 CEER	ANSI/AHAM RAC-1
	≥ 20,000 Btu/h	–	9.3 CEER	
Room air conditioners with reverse cycle without louvered sides for applications outside US[d]	< 14,000 Btu/h	–	9.3 CEER	ANSI/AHAM RAC-1
	≥ 14,000 Btu/h	–	8.7 CEER	
Room air conditioners, casement only for applications outside US[d]	All	–	9.5 CEER	ANSI/AHAM RAC-1
Room air conditioners, casement slider for applications outside US[d]	All	–	10.4 CEER	ANSI/AHAM RAC-1

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 7,000 Btu/h, use 7,000 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 list of the referenced standards, which include test procedures, including the reference year version of the test procedure.

b. Nonstandard size units must be factory labeled as follows: "MANUFACTURED FOR NONSTANDARD SIZE APPLICATIONS ONLY; NOT TO BE INSTALLED IN NEW STANDARD PROJECTS." Nonstandard size efficiencies apply only to units being installed in existing sleeves having an external wall opening of less than 16 inches (406 mm) high or less than 42 inches (1067 mm) wide and having a cross-sectional area less than 670 square inches (0.43 m^2).

c. The cooling-mode wet bulb temperature requirement only applies for units that reject condensate to the condenser coil.

d. Room air conditioners are regulated as consumer products by 10 CFR 430.

e. "Cap" in EER and COPH equations for PTACs and PTHPs means cooling capacity in Btu/h at 95°F outdoor dry-bulb temperature.

f. This table is a restatement of information found in 10 CFR 430, 10 CFR 431, and ASHRAE 90.1 Table 6.8.1-4 Electrically Operated Packaged Terminal Air Conditioners, Packaged Terminal Heat Pumps, Single-Package Vertical Air Conditioners, Single-Package Vertical Heat Pumps, Room Air Conditioners, and Room Air- Conditioner Heat Pumps—Minimum Efficiency Requirements.

[NY] TABLE C403.3.2(5)
WARM-AIR FURNACES AND COMBINATION WARM-AIR FURNACES/AIR-CONDITIONING UNITS, WARM-AIR DUCT FURNACES AND UNIT HEATERS—MINIMUM EFFICIENCY REQUIREMENTS[g]

(This table is intended to be a restatement of the legally binding provisions found in Title 10 CFR Parts 430 & 431 included here as a convenience to the users of this code)

DESCRIPTION	FUEL	ELECTRIC POWER PHASE	HEATING CAPACITY (INPUT), Btu/h[b]	COMBO-UNIT COOLING CAPACITY, Btu/h	SUBTYPE	MINIMUM EFFICIENCY	TEST PROCEDURE[a]
Warm-air furnace	Gas	1	< 225,000	<65,000	Nonweatherized	80% AFUE	Appendix N[g]
					Weatherized	81% AFUE	
Warm-air furnace	Gas	1	< 225,000	≥65,000	Nonweatherized	80% AFUE	Appendix N[g]
					Weatherized	81% AFUE 80% E_t[c]	
Warm-air furnace	Gas	3	< 225,000	All	Nonweatherized	80% AFUE	Appendix N[g]
					Weatherized	81% AFUE	
Warm-air furnace	Gas	All	≥225,000 and ≤400,000	All	All	81% E_t[c]	ANSI Z21.47 before 5/8/2023 10 CFR 431.76 after 5/8/2023
Warm-air furnace	Gas	All	>400,000	All	All	81% E_t[c]	ANSI Z21.47 before 5/8/2023 10 CFR 431.76 after 5/8/2023
Warm-air furnace	Oil	1	<225,000	<65,000	Nonweatherized	83% AFUE $P_{W,SB} \leq 11$ W $P_{W,OFF} \leq 11$ W	Appendix N[g]
					Weatherized	78% AFUE	
Warm-air furnace	Oil	1	<225,000	≥65,000	Nonweatherized	83% AFUE	Appendix N[g]
					Weatherized	78% AFUE	
Warm-air furnace	Oil	3	<225,000	All	Nonweatherized	83% AFUE	Appendix N[g]
					Weatherized	78% AFUE	
Warm-air furnace	Oil	All	≥225,000	All	All	82%E_t[d]	Section 42 UL 727 before 5/8/2023 10 CFR 431.76 after 5/8/2023
Warm-air furnace	Electric	1	<225,000	<65,000	All	78% AFUE $P_{W,SB} \leq 10$ W $P_{W,OFF} \leq 10$ W	Appendix N[g]
Warm-air furnace	Electric	1	<225,000	≥65,000	All	78% AFUE	Appendix N[g]
Warm-air furnace	Electric	3	<225,000	All	All	78% AFUE	Appendix N[g]
Warm-air duct furnaces	Gas	All	All	All	All	80% E_c[d]	ANSI Z83.8
Warm-air unit heaters	Gas	All	All	All	All	80% E_c[d,e]	ANSI Z83.8

Warm-air unit heaters	Oil	All	All	All	All	80% E_c[d,e]	Section 40 UL 731

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

a. **Chapter 6** contains a list of the referenced standards, which include test procedures, including the reference year version of the test procedure. For this table, the following applies:
- Appendix N = 10 CFR 430 Appendix N
- ANSI Z21.47 = Section 2.39, Thermal Efficiency, ANSI Z21.47
- ANSI Z83.3 = Section 2.10, Efficiency, ANSI Z83.3
- UL 727 = Section 42, Combustion, UL 727
- UL 731 = Section 40, Combustion, UL 731

b. Compliance of multiple firing rate units shall be at the maximum firing rate.

c. *Et* = thermal efficiency. Units must also include an interrupted or intermittent ignition device (IID), have jacket losses 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* .

d. *Ec* = combustion efficiency (100 percent less flue losses). See test procedure for detailed discussion.

e. Units must also include an interrupted or intermittent ignition device (IID) and have either power venting or an *automatic* flue damper.

f. Includes combination units with cooling capacity <65,000 Btu/h. For U.S. applications of federally covered <225,000 Btu/h products, see 10 CFR 430.

g. 10 CFR 430 is limited to-single phase equipment that is not contained within the same cabinet with a central air conditioner whose rated cooling capacity is above 65,000 Btu/h but for the test and rating procedures are not impacted for three-phase and can be used for AFUE ratings for ASHRAE/IES Standard 90.1 three-phase products and single-phase products with a cooling capacity greater than 65,000 Btu/h.

h. This table is a restatement of information found in 10 CFR 430, 10 CFR 431, and ASHRAE 90.1 Table 6.8.1-5 Warm-Air Furnaces and Combination Warm-Air Furnaces/Air-Conditioning Units, Warm-Air Duct Furnaces, and Unit Heaters—Minimum Efficiency Requirements.

[NY] TABLE C403.3.2(6)
GAS- AND OIL-FIRED BOILERS—MINIMUM EFFICIENCY REQUIREMENTS

(This table is intended to be a restatement of the legally binding provisions found in Title 10 CFR Part 431 included here as a convenience to the users of this code)

EQUIPMENT TYPE[b]	SUBCATEGORY OR RATING CONDITION	SIZE CATEGORY (INPUT)	MINIMUM EFFICIENCY	TEST PROCEDURE[a]
Boilers, hot water	Gas fired	≥ 300,000 Btu/h and ≤ 2,500,000 Btu/h[c]	84% E_t [d]	DOE 10 CFR 431.86
		> 2,500,000 Btu/h[b] and ≤ 10,000,000 Btu/h[b]	82% E_c [c]	
		>10,000,000 Btu/h[b]	82% E_c [c]	
	Oil fired [f]	≥ 300,000 Btu/h and ≤ 2,500,000 Btu/h[c]	82% E_t [d]	DOE 10 CFR 431.86
		> 2,500,000 Btu/h[b] and ≤ 10,000,000 Btu/h[b]	84% E_c [c]	
		>10,000,000 Btu/h[b]	84% E_c [c]	
Boilers, steam	Gas fired—all, except natural draft	≥ 300,000 Btu/h and ≤ 2,500,000 Btu/h[c]	79% E_t [d]	DOE 10 CFR 431.86
		> 2,500,000 Btu/h[b] and ≤ 10,000,000 Btu/h[b]	79% E_t [d]	
		>10,000,000 Btu/h[b]	79% E_t [d]	
	Gas fired—natural draft	≥ 300,000 Btu/h and ≤ 2,500,000 Btu/h[c]	79% E_t [d]	
		> 2,500,000 Btu/h[b]	79% E_t [d]	

	Oil fired[f]	≥ 300,000 Btu/h and ≤ 2,500,000 Btu/h[e]	84% E_t[d]	DOE 10 CFR 431.86
		> 2,500,000 Btu/h[b] and < 10,000,000 Btu/h[b]	81% E_t[d]	
		>10,000,000 Btu/h[b]	81% E_t[d]	

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

a. Chapter 6 contains a list of the referenced standards, which include test procedures, including the reference year version of the test procedure.
b. These requirements apply to 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.
c. E_c = Combustion efficiency (100 percent less flue losses).
d. E_t = Thermal efficiency.
e. Maximum capacity—minimum and maximum ratings as provided for and allowed by the unit's controls.
f. Includes oil-fired (residual).
g. Boilers shall not be equipped with a constant burning pilot light.
h. 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.

[NY] TABLE C403.3.2(7)
PERFORMANCE REQUIREMENTS FOR HEAT REJECTION EQUIPMENT—MINIMUM EFFICIENCY REQUIREMENTS

EQUIPMENT TYPE	TOTAL SYSTEM HEAT-REJECTION CAPACITY AT RATED CONDITIONS	SUBCATEGORY OR RATING CONDITION	PERFORMANCE REQUIRED[b, c, d, f, g]	TEST PROCEDURE[a, e]
Propeller or axial fan open-circuit cooling towers	All	95°F entering water 85°F leaving water 75°F entering wb	≥ 40.2 gpm/hp	CTI ATC-105 and CTI STD-201 RS
Centrifugal fan open-circuit cooling towers	All	95°F entering water 85°F leaving water 75°F entering wb	≥ 20.0 gpm/hp	CTI ATC-105 and CTI STD-201 RS
Propeller or axial fan closed-circuit cooling towers	All	102°F entering water 90°F leaving water 75°F entering wb	≥ 16.1 gpm/hp	CTI ATC-105S and CTI STD- 201 RS
Centrifugal fan closed-circuit cooling towers	All	102°F entering water 90°F leaving water 75°F entering wb	≥ 7.0 gpm/hp	CTI ATC-105S and CTI STD- 201 RS
Propeller or axial fan dry coolers (air- cooled fluid coolers)	All	115°F entering water 105°F leaving water 95°F entering wb	≥ 4.5 gpm/hp	CTI ATC-105DS
Propeller or axial fan evaporative condensers	All	R-448A test fluid 165°F entering gas temperature 105°F condensing temperature 75°F entering wb	≥ 160,000 Btu/h × hp	CTI ATC-106

Propeller or axial fan evaporative condensers	All	Ammonia test fluid 140°F entering gas temperature 96.3°F condensing temperature 75°F entering wb	≥ 134,000 Btu/h × hp	CTI ATC-106
Centrifugal fan evaporative condensers	All	R-448A test fluid 165°F entering gas temperature 105°F condensing temperature 75°F entering wb	≥ 137,000 Btu/h × hp	CTI ATC-106
Centrifugal fan evaporative condensers	All	Ammonia test fluid 140°F entering gas temperature 96.3°F condensing temperature 75°F entering wb	≥ 110,000 Btu/h × hp	CTI ATC-106
Air-cooled condensers	All	125°F condensing temperature 190°F entering gas temperature 15°F subcooling 95°F entering db	≥ 176,000 Btu/h × hp	AHRI 460

For SI: °C = [(°F) – 32]/1.8, L/s × kW = (gpm/hp)/(11.83), COP = (Btu/h × hp)/(2550.7), db = dry bulb temperature, wb = wet bulb temperature.

a. **Chapter 6** contains a list of the referenced standards, which include test procedures, including the reference year version of the test procedure.

b. For purposes of this table, open-circuit cooling tower performance is defined as the water-flow rating of the tower at the thermal rating condition listed in the table divided by the fan motor nameplate power.

c. For purposes of this table, closed-circuit cooling tower performance is defined as the process water-flow rating of the tower at the thermal rating condition listed in the table divided by the sum of the fan motor nameplate power and the integral spray pump motor nameplate power.

d. For purposes of this table, dry-cooler performance is defined as the process water- flow rating of the unit at the thermal rating condition listed in the table divided by the total fan motor nameplate power of the unit, and air-cooled condenser performance is defined as the heat rejected from the refrigerant divided by the total fan motor nameplate power of the unit. The efficiencies and test procedures for both open- and closed-circuit cooling towers are not applicable to hybrid cooling towers that contain a combination of separate wet and dry heat exchange sections. The certification requirements do not apply to field-erected cooling towers.

e. All cooling towers shall comply with the minimum efficiency listed in the table for that specific type of tower with the capacity effect of any project-specific accessories and/or options included in the capacity of the cooling tower.

f. For purposes of this table, evaporative condenser performance is defined as the heat rejected at the specified rating condition in the table, divided by the sum of the fan motor nameplate power and the integral spray pump nameplate power.

g. Requirements for evaporative condensers are listed with ammonia (R-717) and R- 448A as test fluids in the table. Evaporative condensers intended for use with halocarbon refrigerants other than R-448A must meet the minimum efficiency requirements listed with R-448A as the test fluid. For ammonia, the condensing temperature is defined as the saturation temperature corresponding to the refrigerant pressure at the condenser entrance. For R-448A, which is a zeotropic refrigerant, the condensing temperature is defined as the arithmetic average of the dew point and the bubble point temperatures corresponding to the refrigerant pressure at the condenser entrance.

[NY] TABLE C403.3.2(8)
ELECTRICALLY OPERATED VARIABLE-REFRIGERANT-FLOW AIR CONDITIONERS— MINIMUM EFFICIENCY REQUIREMENTS

(This table is intended to be a restatement of the legally binding provisions found in Title 10 CFR Part 431 included here as a convenience to the users of this code)

EQUIPMENT TYPE	SIZE CATEGORY	HEATING SECTION TYPE	SUBCATEGORY OR RATING CONDITION	MINIMUM EFFICIENCY[c]	TEST PROCEDURE[a]
VRF air conditioners, air cooled	< 65,000 Btu/h three-phase[b]	All	VRF multisplit system	13.0 SEER before 1/1/2025 13.4 SEER2 after 1/1/2025	AHRI 210/240-2023
	≥ 65,000 Btu/h and < 135,000 Btu/h	Electric resistance (or none)	VRF multisplit system	11.2 EER before 1/1/2024 15.5 IEER after 1/1/2024	AHRI 1230-2021
		All other		11.0 EER before 1/1/2024 15.5 IEER after 1/1/2024	
	≥ 135,000 Btu/h and < 240,000 Btu/h	Electric resistance (or none)	VRF multisplit system	11.0 EER before 1/1/2024 14.9 IEER after 1/1/2024	
		All other		10.8 EER before 1/1/2024 14.9 IEER after 1/1/2024	
	≥ 240,000 Btu/h	Electric resistance (or none)	VRF multisplit system	10.0 EER before 1/1/2024 13.9 IEER after 1/1/2024	
		All other		9.8 EER before 1/1/2024 13.9 IEER after 1/1/2024	

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

a. Chapter 6 contains a list of the referenced standards, which include test procedures, including the reference year version of the test procedure.

b. Single-phase, US air-cooled air conditioners less than 65,000 Btu/h are regulated as consumer products by the US Department of Energy Code of Federal Regulations DOE 10 CFR 430. SEER and SEER2 values for single-phase products are set by the US Department of Energy.

c. Where more than one efficiency requirement is provided, the first value is for equipment manufactured before the date specified; the second value is for equipment manufactured after the date specified.

[NY] TABLE C403.3.2(9)
ELECTRICALLY OPERATED VARIABLE-REFRIGERANT-FLOW AND APPLIED HEAT PUMPS—MINIMUM EFFICIENCY REQUIREMENTS [b]

(This table is intended to be a restatement of the legally binding provisions found in Title 10 CFR Parts 430 & 431 included as a convenience to the users of this code)

EQUIPMENT TYPE	SIZE CATEGORY	HEATING SECTION TYPE[c]	SUBCATEGORY OR RATING CONDITION	MINIMUM EFFICIENCY	TEST PROCEDURE[a]
VRF air cooled (cooling mode)	< 65,000 Btu/h three-phase[b]	All	VRF multisplit system	13.0 SEER before 1/1/2025 13.4 SEER2 after 1/1/2025	AHRI 210/240-2023
	≥ 65,000 Btu/h and < 135,000 Btu/h	Electric resistance (or none)	VRF multisplit system	11.0 EER before 1/1/2024 14.6 IEER after 1/1/2024	AHRI 1230-2021
	≥ 135,000 Btu/h and< 240,000 Btu/h		VRF multisplit system	10.6 EER before 1/1/2024 13.9 IEER after 1/1/2024	
	≥ 240,000 Btu/h and < 760,000 Btu/h		VRF multisplit system	9.5 EER before 1/1/2024 12.7 IEER after 1/1/2024	
	≥ 65,000 Btu/h and < 135,000 Btu/h	All other	VRF multisplit system	10.8 EER before 1/1/2024 14.6 IEER after 1/1/2024	AHRI 1230-2021
			VRF multisplit system with heat recovery	10.8 EER before 1/1/2024 14.4 IEER after 1/1/2024	
	≥ 135,000 Btu/h and < 240,000 Btu/h		VRF multisplit system	10.4 EER before 1/1/2024 13.9 IEER after 1/1/2024	
			VRF multisplit system with heat recovery	10.4 EER before 1/1/2024 13.7 IEER after 1/1/2024	
	≥ 240,000 Btu/h and < 760,000 Btu/h after 1/1/2024		VRF multisplit system	9.5 EER before 1/1/2024 12.7 IEER after 1/1/2024	

	≥ 240,000 Btu/h after 1/1/2024		VRF multisplit system with heat recovery	9.3 EER before 1/1/2024 12.5 IEER after 1/1/2024	
VRF water source (cooling mode)	<17,000 Btu/h	All	VRF multisplit system	12.0 EER before 1/1/2024	ISO 13256-1
			VRF multisplit system with heat recovery	11.8 EER before 1/1/2024	
	≥ 17,000 Btu/h and < 65,000 Btu/h	All	VRF multisplit systems 86°F entering water	12.0 EER before 1/1/2024	ISO 13256-1
	< 65,000 Btu/h, three-phase[b]	All	VRF multisplit systems 86°F entering water	16.0 IEER after 1/1/2024	AHRI 1230-2021 Before 11/29/2024 AHRI 600–2023 after 11/29/2024
			VRF multisplit systems with heat recovery 86°F entering water	15.8 IEER after 1/1/2024	
	≥ 65,000 Btu/h and < 135,000 Btu/h	All	VRF multisplit system 86°F entering water	12.0 EER before 1/1/2024 16.0 IEER after 1/1/2024	
			VRF multisplit system with heat recovery 86°F entering water	11.8 EER before 1/1/2024 15.8 IEER after 1/1/2024	
	≥ 135,000 Btu/h and < 240,000 Btu/h		VRF multisplit system 86°F entering water	10.0 EER before 1/1/2024 14.0 IEER after 1/1/2024	
			VRF multisplit system with heat recovery 86°F entering water	9.8 EER before 1/1/2024 13.8 IEER after 1/1/2024	
	≥ 240,000 Btu/h and < 760,000 Btu/h		VRF multisplit system 86°F entering water	10.0 EER before 1/1/2024 12.0 IEER after 1/1/2024	
			VRF multisplit system with heat recovery 86°F entering water	9.8 EER before 1/1/2024 11.8 IEER after 1/1/2024	
VRF groundwater source (cooling mode)	< 135,000 Btu/h	All	VRF multisplit system 59°F entering water	16.2 EER	AHRI 1230-2014 with Addendum 1 before 1/1/2024 AHRI 1230-2021 on or after 1/1/2024
			VRF multisplit system with heat recovery 59°F entering water	16.0 EER	
	≥ 135,000 Btu/h		VRF multisplit system 59°F entering water	13.8 EER	

			VRF multisplit system with heat recovery 59°F entering water	13.6 EER	
VRF ground source (cooling mode)	< 135,000 Btu/h	All	VRF multisplit system 77°F entering water	13.4 EER	AHRI 1230-2014 with Addendum 1 before 1/1/2024 AHRI 1230-2021 on or after 1/1/2024
			VRF multisplit system with heat recovery 77°F entering water	13.2 EER	
	≥ 135,000 Btu/h		VRF multisplit system 77°F entering water	11.0 EER	
			VRF multisplit system with heat recovery 77°F entering water	10.8 EER	
VRF air cooled (heating mode)	< 65,000 Btu/h (cooling capacity) three-phase[b]		VRF multisplit system	7.5 HSPF2	AHRI 210/240-2023
	≥ 65,000 Btu/h and < 135,000 Btu/h (cooling capacity)		VRF multisplit system 47°F db/43°F wb outdoor air	3.3 COP_H	AHRI 1230-2014 with Addendum 1 before 1/1/2024 AHRI 1230-2021 on or after 1/1/2024
			17°F db/15°F wb outdoor air	2.25 COP_H	
	≥ 135,000 Btu/h and < 760,000 Btu/h (cooling capacity)		VRF multisplit system 47°F db/43°F wb outdoor air	3.2 COP_H	
			17°F db/15°F wb outdoor air	2.05 COP_H	
VRF water source (heating mode)	< 65,000 Btu/h (cooling capacity), three-phase[b]		VRF multisplit system 68°F entering water	4.2 COP_H before 1/1/2024 4.3 COP_H after 1/1/2024	AHRI 1230-2014 with Addendum 1 before 1/1/2024 AHRI 1230-2021 on or after 1/1/2024
	≥ 65,000 Btu/h and < 135,000 Btu/h (cooling capacity)		VRF multisplit system 68°F entering water	4.2 COP_H before 1/1/2024 4.3 COP_H after 1/1/2024	
	≥ 135,000 Btu/h and < 240,000 Btu/h (cooling capacity)		VRF multisplit system 68°F entering water	3.9 COP_H before 1/1/2024 4.0 COP_H after 1/1/2024	
	≥ 240,000 Btu/h and < 760,000 Btu/h (cooling capacity)		VRF multisplit system 68°F entering water	3.9 COP_H	
VRF groundwater source (heating mode)	< 135,000 Btu/h (cooling capacity)		VRF multisplit system 50°F entering water	3.6 COP_H	AHRI 1230-2014 with Addendum 1 before 1/1/2024 AHRI 1230-2021 on or after 1/1/2024
	≥ 135,000 Btu/h (cooling capacity)		VRF multisplit system 50°F entering water	3.3 COP_H	

VRF ground source (heating mode)	< 135,000 Btu/h (cooling capacity)		VRF multisplit system 32°F entering water	3.1 COP_H	AHRI 1230-2014 with Addendum 1 before 1/1/2024 AHRI 1230-2021 on or after 1/1/2024
	≥ 135,000 Btu/h (cooling capacity)		VRF multisplit system 32°F entering water	2.8 COP_H	

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

a. Chapter 6 contains a list of the referenced standards, which include test procedures, including the reference year version of the test procedure.

b. Single-phase, US air-cooled air conditioners less than 65,000 Btu/h are regulated as consumer products by the US Department of Energy Code of Federal Regulations DOE 10 CFR 430. SEER and SEER2 values for single-phase products are set by the US Department of Energy.

c. VRF multi-split heat pumps (air-cooled) with heat recovery fall under the category of "All Other Types of Heating" unless they also have electric resistance heating, in which case it falls under the category for "No Heating or Electric Resistance Heating."

[NY] TABLE C403.3.2(10)
FLOOR-MOUNTED AIR CONDITIONERS AND CONDENSING UNITS SERVING COMPUTER ROOMS—MINIMUM EFFICIENCY REQUIREMENTS [b]

EQUIPMENT TYPE	STANDARD MODEL	NET SENSIBLE COOLING CAPACITY	MINIMUM NET SENSIBLE COP	RATING CONDITIONS RETURN AIR (dry bulb/dew point)	TEST PROCEDURE[a]
Air cooled	Downflow	< 80,000 Btu/h	2.70	85°F/52°F (Class 2)	AHRI 1360
		≥ 80,000 Btu/h and < 295,000 Btu/h	2.58		
		≥ 295,000 Btu/h	2.36		
	Upflow—ducted	< 80,000 Btu/h	2.67		
		≥ 80,000 Btu/h and < 295,000 Btu/h	2.55		
		≥ 295,000 Btu/h	2.33		
	Upflow—nonducted	< 65,000 Btu/h	2.16	75°F/52°F (Class 1)	
		≥ 65,000 Btu/h and < 240,000 Btu/h	2.04		
		≥ 240,000 Btu/h	1.89		
	Horizontal	< 65,000 Btu/h	2.65	95°F/52°F (Class 3)	
		≥ 65,000 Btu/h and < 240,000 Btu/h	2.55		
		≥ 240,000 Btu/h	2.47		
Air cooled with fluid economizer	Downflow	< 80,000 Btu/h	2.70	85°F/52°F (Class 1)	AHRI 1360
		≥ 80,000 Btu/h and < 295,000 Btu/h	2.58		
		≥ 295,000 Btu/h	2.36		
	Upflow—ducted	< 80,000 Btu/h	2.67		
		≥ 80,000 Btu/h and	2.55		

		< 295,000 Btu/h			
		≥ 295,000 Btu/h	2.33		
	Upflow—nonducted	< 65,000 Btu/h	2.09	75°F/52°F (Class 1)	
		≥ 65,000 Btu/h and < 240,000 Btu/h	1.99		
		≥ 240,000 Btu/h	1.81		
	Horizontal	< 65,000 Btu/h	2.65	95°F/52°F (Class 3)	
		≥ 65,000 Btu/h and < 240,000 Btu/h	2.55		
		≥ 240,000 Btu/h	2.47		
Water cooled	Downflow	< 80,000 Btu/h	2.82	85°F/52°F (Class 1)	AHRI 1360
		≥ 80,000 Btu/h and < 295,000 Btu/h	2.73		
		≥ 295,000 Btu/h	2.67		
	Upflow—ducted	< 80,000 Btu/h	2.79		
		≥ 80,000 Btu/h and < 295,000 Btu/h	2.70		
		≥ 295,000 Btu/h	2.64		
	Upflow—nonducted	< 65,000 Btu/h	2.43	75°F/52°F (Class 1)	
		≥ 65,000 Btu/h and < 240,000 Btu/h	2.32		
		≥ 240,000 Btu/h	2.20		
	Horizontal	< 65,000 Btu/h	2.79	95°F/52°F (Class 3)	
		≥ 65,000 Btu/h and < 240,000 Btu/h	2.68		
		≥ 240,000 Btu/h	2.60		
Water cooled with fluid economizer	Downflow	< 80,000 Btu/h	2.77	85°F/52°F (Class 1)	AHRI 1360
		≥ 80,000 Btu/h and < 295,000 Btu/h	2.68		
		≥ 295,000 Btu/h	2.61		
	Upflow—ducted	< 80,000 Btu/h	2.74		
		≥ 80,000 Btu/h and < 295,000 Btu/h	2.65		
		≥ 295,000 Btu/h	2.58		
	Upflow—nonducted	< 65,000 Btu/h	2.35	75°F/52°F (Class 1)	
		≥ 65,000 Btu/h and < 240,000 Btu/h	2.24		
		≥ 240,000 Btu/h	2.12		
	Horizontal	< 65,000 Btu/h	2.71	95°F/52°F (Class 3)	
		≥ 65,000 Btu/h and < 240,000 Btu/h	2.60		

		≥ 240,000 Btu/h	2.54		
Glycol cooled	Downflow	< 80,000 Btu/h	2.56	85°F/52°F (Class 1)	AHRI 1360
		≥ 80,000 Btu/h and < 295,000 Btu/h	2.24		
		≥ 295,000 Btu/h	2.21		
	Upflow—ducted	< 80,000 Btu/h	2.53		
		≥ 80,000 Btu/h and < 295,000 Btu/h	2.21		
		≥ 295,000 Btu/h	2.18		
	Upflow, nonducted	< 65,000 Btu/h	2.08	75°F/52°F (Class 1)	
		≥ 65,000 Btu/h and < 240,000 Btu/h	1.90		
		≥ 240,000 Btu/h	1.81		
	Horizontal	< 65,000 Btu/h	2.48	95°F/52°F (Class 3)	
		≥ 65,000 Btu/h and < 240,000 Btu/h	2.18		
		≥ 240,000 Btu/h	2.18		
Glycol cooled with fluid economizer	Downflow	< 80,000 Btu/h	2.51	85°F/52°F (Class 1)	AHRI 1360
		≥ 80,000 Btu/h and < 295,000 Btu/h	2.19		
		≥ 295,000 Btu/h	2.15		
	Upflow—ducted	< 80,000 Btu/h	2.48		
		≥ 80,000 Btu/h and < 295,000 Btu/h	2.16		
		≥ 295,000 Btu/h	2.12		
	Upflow—nonducted	< 65,000 Btu/h	2.00	75°F/52°F (Class 1)	
		≥ 65,000 Btu/h and < 240,000 Btu/h	1.82		
		≥ 240,000 Btu/h	1.73		
	Horizontal	< 65,000 Btu/h	2.44	95°F/52°F (Class 3)	
		≥ 65,000 Btu/h and < 240,000 Btu/h	2.10		
		≥ 240,000 Btu/h	2.10		

For SI: 1 British thermal unit per hour = 0.2931 W, °C = [(°F) – 32]/1.8, COP = (Btu/h × hp)/(2,550.7).

a. Chapter 6 contains a list of the referenced standards, which include test procedures, including the reference year version of the test procedure.

[NY] TABLE C403.3.2(11)
VAPOR-COMPRESSION-BASED INDOOR POOL DEHUMIDIFIERS—MINIMUM EFFICIENCY REQUIREMENTS

EQUIPMENT TYPE	SUBCATEGORY OR RATING CONDITION	MINIMUM EFFICIENCY	TEST PROCEDURE[a]
Single package indoor (with or without economizer)	Rating Conditions: A or C	3.5 MRE	AHRI 910
Single package indoor water cooled (with or without economizer)	Rating Conditions: A, B or C	3.5 MRE	
Single package indoor air cooled (with or without economizer)	Rating Conditions: A, B or C	3.5 MRE	
Split system indoor air cooled (with or without economizer)	Rating Conditions: A, B or C	3.5 MRE	

a. Chapter 6 contains a list of the referenced standards, which include test procedures, including the reference year version of the test procedure.

[NY] TABLE C403.3.2(12)
ELECTRICALLY OPERATED DX-DOAS UNITS, SINGLE-PACKAGE AND REMOTE CONDENSER, WITHOUT ENERGY RECOVERY—MINIMUM EFFICIENCY REQUIREMENTS

EQUIPMENT TYPE	SUBCATEGORY OR RATING CONDITION	MINIMUM EFFICIENCY	TEST PROCEDURE [a]
Air cooled (dehumidification mode)	—	3.8 ISMRE2	**AHRI 920**
Air-source heat pumps (dehumidification mode)	—	3.8 ISMRE2	**AHRI 920**
Water cooled (dehumidification mode)	Cooling tower condenser water	4.7 ISMRE2	**AHRI 920**
Air-source heat pump (heating mode)	—	2.05 ISCOP2	**AHRI 920**
Water-source heat pump (dehumidification mode)	Ground source, closed loop and open loop [b]	4.6 ISMRE2	**AHRI 920**
	Water source	3.8 ISMRE2	
Water-source heat pump (heating mode)	Ground source, closed loop and open loop [b]	2.13 ISCOP2	**AHRI 920**
	Water source	2.13 ISCOP2	

a. **Chapter 6** contains a list of the referenced standards, which include test procedures, including the reference year version of the test procedure.
b. Open loop systems rated using closed-loop test conditions.

[NY] TABLE C403.3.2(13)
ELECTRICALLY OPERATED DX-DOAS UNITS, SINGLE-PACKAGE AND REMOTE CONDENSER, WITH ENERGY RECOVERY—MINIMUM EFFICIENCY REQUIREMENTS

(This table is intended to be a restatement of the legally binding provisions found in Title 10 CFR Part 431 included here as a convenience to the users of this code)

EQUIPMENT TYPE	SUBCATEGORY OR RATING CONDITION	MINIMUM EFFICIENCY	TEST PROCEDURE[a]
Air cooled (dehumidification mode)	—	5.0 ISMRE2	AHRI 920
Air-source heat pumps (dehumidification mode)	—	5.0 ISMRE2	AHRI 920
Water cooled (dehumidification mode)	Cooling tower condenser water	5.1 ISMRE2	AHRI 920
Air-source heat pump (heating mode)	—	3.3 ISCOP2	AHRI 920
Water-source heat pump (dehumidification mode)	Ground source, closed loop and open loop [b]	5.0 ISMRE2	AHRI 920
	Water source	4.8 ISMRE2	
Water-source heat pump (heating mode)	Ground source, closed loop and open loop [b]	3.5 ISCOP2	AHRI 920
	Water source	4.04 ISCOP2	

a. Chapter 6 contains a list of the referenced standards, which include test procedures, including the reference year version of the test procedure.
b. Open loop systems rated using closed-loop test conditions.

[NY] TABLE C403.3.2(14)
ELECTRICALLY OPERATED WATER-SOURCE HEAT PUMPS—MINIMUM EFFICIENCY REQUIREMENTS [b]

(This table is intended to be a restatement of the legally binding provisions found in Title 10 CFR Part 431 included here as a convenience to the users of this code)

EQUIPMENT TYPE	SIZE CATEGORY	HEATING SECTION TYPE	SUBCATEGORY OR RATING CONDITION	MINIMUM EFFICIENCY	TEST PROCEDURE[a]
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			13.0 EER	
	≥ 65,000 Btu/h and < 135,000 Btu/h			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	ISO 13256-2
Brine-to-water, ground loop (cooling mode)	< 135,000 Btu/h	All	77°F entering water	12.1 EER	ISO 13256-2
Water-to-water, water loop (heating mode)	< 135,000 Btu/h (cooling capacity)	—	68°F entering water	4.3 COP_H	ISO 13256-1
Water-to-air, ground water (heating mode)	< 135,000 Btu/h (cooling capacity)	—	50°F entering water	3.7 COP_H	ISO 13256-1
Brine-to-air, ground loop (heating mode)	< 135,000 Btu/h (cooling capacity)	—	32°F entering water	3.2 COP_H	ISO 13256-1
Water-to-water, water loop (heating mode)	< 135,000 Btu/h (cooling capacity)	—	68°F entering water	3.7 COP_H	ISO 13256-1
Water-to-water, ground water (heating mode)	< 135,000 Btu/h (cooling capacity)	—	50°F entering water	3.1 COP_H	ISO 13256-2
Brine-to-water, ground loop (heating mode)	< 135,000 Btu/h (cooling capacity)	—	32°F entering water	2.5 COP_H	ISO 13256-2

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

a. Chapter 6 contains a list of the referenced standards, which include test procedures, including the reference year version of the test procedure.

b. Single-phase, U.S. air-cooled heat pumps <65,000 Btu/h are regulated as consumer products by 10 CFR 430. SEER, SEER2, HPSF and HPSF2 values for single-phase products are set by the U.S. DOE. Informative Note: See Informative Appendix F for the U.S. DOE minimum.

TABLE C403.3.2(15)
HEAT-PUMP AND HEAT RECOVERY CHILLER PACKAGES—MINIMUM EFFICIENCY REQUIREMENTS[g]

EQUIPMENT TYPE	SIZE CATEGORY REFRIGERATING CAPACITY [n], ton_R	COOLING OPERATION EFFICIENCY[a,d,e,j] AIR-SOURCE EER (FL/IPLV), Btu/W × h LIQUID-SOURCE POWER INPUT PER CAPACITY (FL/IPLV), kW/ton_R		HEATING OPERATION EFFICIENCY [b,e,j]													Test Procedure [a]
				HEATING SOURCE CONDITIONS (leaving liquid) OR OAT (db/wb), °F	HEAT-PUMP HEATING FULLLOAD HEATING EFFICIENCY (COP_H)[f,h], W/W				SIMULTANEOUS COOLING AND HEATING FULL-LOAD EFFICIENCY (COP_{SHC}) [b,i], W/W				HEAT RECOVERY HEATING FULL-LOAD EFFICIENCY (COP_{HR})[c,i],W/W				
					Entering/Leaving Heating Liquid Temperature				Entering/Leaving Heating Liquid Temperature				Entering/Leaving Heating Liquid Temperature				
					Low	Medium	High	Boost	Low	Medium	High	Boost	Low	Medium	Hot-Water 1	Hot-Water 2	
		Path A	Path B		95°F/ 105°F	105°F/ 120°F	120°F/ 140°F	120°F/ 140°F	95°F/ 105°F	105°F/ 120°F	120°F/ 140°F	120°F/ 140°F	95°F/ 105°F	105°F/ 120°F	120°F/ 140°F	120°F/ 140°F	
Air source	<150.0	≥ 9.595 FL ≥ 13.02 IPLV.IP	≥ 9.215 FL ≥ 15.01 IPLV.IP	47 db 43 wb[l]	≥ 3.290	≥ 2.770	≥ 2.310	NA [p]	NA [p]	NA [p]	NA [p]	NA [p]	NA [p]	NA [p]	NA [p]	NA [p]	AHRI 550/590
				17 db 15 wb[l]	≥2.029	≥ 1.775	≥1.483	NA [p]	NA [p]	NA [p]	NA [p]	NA [p]	NA [p]	NA [p]	NA [p]	NA [p]	
	≥150.0	≥ 9.595 FL ≥ 13.30 IPLV.IP	≥ 9.215 FL ≥ 15.30 IPLV.IP	47 db 43 wb[l]	≥3.290	≥ 2.770	≥ 2.310	NA [p]	NA [p]	NA [p]	NA [p]	NA [p]	NA [p]	NA [p]	NA [p]	NA [p]	
				17 db 15 wb[l]	≥2.029	≥ 1.775	≥ 1.483	NA [p]	NA [p]	NA [p]	NA [p]	NA [p]	NA [p]	NA [p]	NA [p]	NA [p]	
Liquid-source electrically operated positive displacement	≥11.25[q] and < 150	≤ 0.7895 FL ≤ 0.6316 IPLV.IP	≤ 0.8211 FL ≤ 0.5263 IPLV.IP	44 [m]	≥ 4.640	≥ 3.680	≥ 2.680	NA [p]	≥8.330	≥6.410	≥4.420	NA [p]	≥8.330	≥6.410	≥4.862	≥4.420	AHRI 550/590
				65 [m]	NA [p]	NA [p]	NA [p]	≥ 3.550	NA [p]	NA [p]	NA [p]	≥ 6.150	NA [p]	NA [p]	NA [p]	NA [p]	
	≥ 150 and < 300	≤ 0.7579 FL ≤ 0.5895 IPLV.IP	≤ 0.7895 FL ≤ 0.5158 IPLV.IP	44 [m]	≥ 4.640	≥ 3.680	≥ 2.680	NA [p]	≥8.330	≥6.410	≥4.420	NA [p]	≥8.330	≥6.410	≥4.862	≥4.420	
				65 [m]	NA [p]	NA [p]	NA [p]	≥ 3.550	NA [p]	NA [p]	NA [p]	≥6.150	NA [p]	NA [p]	NA [p]	NA [p]	
	≥ 300 and < 400	≤ 0.6947 FL ≤ 0.5684 IPLV.IP	≤ 0.7158 FL ≤ 0.4632 IPLV.IP	44 [m]	≥ 4.640	≥ 3.680	≥ 2.680	NA [p]	≥8.330	≥6.410	≥4.420	NA [p]	≥8.330	≥6.410	≥4.862	≥4.420	
				65 [m]	NA [p]	NA [p]	NA [p]	≥ 3.550	NA [p]	NA [p]	NA [p]	≥6.150	NA [p]	NA [p]	NA [p]	NA [p]	

	≥ 400 and < 600	≤ 0.6421 FL ≤ 0.5474 IPLV.IP	≤ 0.6579 FL ≤ 0.4316 IPLV.IP	44 [m]	≥ 4.930	≥ 3.960	≥ 2.970	NA [p]	≥8.900	≥6.980	≥5.000	NA [p]	≥ 8.900	≥ 6.980	≥5.500	≥ 5.000	
				65 [m]	NA [p]	NA [p]	NA [p]	≥ 3.900	NA [p]	NA [p]	NA [p]	≥ 6.850	NA [p]	NA [p]	NA [p]	NA [p]	
	≥ 600	≤ 0.5895 FL ≤ 0.5263 IPLV.IP	≤ 0.6158 FL ≤ 0.4000 IPLV.IP	44 [m]	≥ 4.930	≥ 3.960	≥ 2.970	NA [p]	≥8.900	≥6.980	≥5.000	NA [p]	≥8.900	≥6.980	≥5.500	≥5.000	
				65 [m]	NA [p]	NA [p]	NA [p]	≥ 3.550	NA [p]	NA [p]	NA [p]	≥ 6.150	NA [p]	NA [p]	NA [p]	NA [p]	
Liquid-source electrically operated centrifugal	≥11.25[q] and <150	≤ 0.6421 FL ≤ 0.5789 IPLV.IP	≤ 0.7316 FL ≤ 0.4632 IPLV.IP	44 [m]	≥ 4.640	≥ 3.680	≥ 2.680	NA [p]	≥8.330	≥6.410	≥4.420	NA [p]	≥8.330	≥6.410	≥4.862	≥4.420	AHRI 550/590
				65 [m]	NA [p]	NA [p]	NA [p]	≥ 3.550	NA [p]	NA [p]	NA [p]	≥ 6.150	NA [p]	NA [p]	NA [p]	NA [p]	
	≥ 150 and < 300	≤ 0.6190 FL ≤ 0.5748 IPLV.IP	≤ 0.6684 FL ≤ 0.4211 IPLV.IP	44 [m]	≥ 4.640	≥ 3.680	≥ 2.680	NA [p]	≥8.330	≥6.410	≥4.420	NA [p]	≥8.330	≥6.410	≥4.862	≥4.420	
				65 [m]	NA [p]	NA [p]	NA [p]	≥ 3.550	NA [p]	NA [p]	NA [p]	≥ 6.150	NA [p]	NA [p]	NA [p]	NA [p]	
	≥ 300 and < 400	≤ 0.5895 FL ≤ 0.5526 IPLV.IP	≤ 0.6263 FL ≤ 0.4105 IPLV.IP	44 [m]	≥ 4.640	≥ 3.680	≥ 2.680	NA [p]	≥8.330	≥6.410	≥4.420	NA [p]	≥8.330	≥6.410	≥4.862	≥4.420	
				65 [m]	NA [p]	NA [p]	NA [p]	≥ 3.550	NA [p]	NA [p]	NA [p]	≥ 6.150	NA [p]	NA [p]	NA [p]	NA [p]	
	≥ 400 and < 600	≤ 0.5895 FL ≤ 0.5263 IPLV.IP	≤ 0.6158 FL ≤ 0.4000 IPLV.IP	44 [m]	≥ 4.930	≥ 3.960	≥ 2.970	NA [p]	≥8.900	≥6.980	≥5.000	NA [p]	≥8.900	≥6.980	≥5.500	≥5.000	
				65 [m]	NA [p]	NA [p]	NA [p]	≥ 3.900	NA [p]	NA [p]	NA [p]	≥ 6.850	NA [p]	NA [p]	NA [p]	NA [p]	
	≥ 600	≤ 0.5895 FL ≤ 0.5263 IPLV.IP	≤ 0.6158 FL ≤ 0.4000 IPLV.IP	44 [m]	≥ 4.930	≥ 3.960	≥ 2.970	NA [p]	≥8.900	≥6.980	≥5.000	NA [p]	≥8.900	≥6.980	≥5.500	≥5.000	
				65 [m]	NA [p]	NA [p]	NA [p]	≥ 3.900	NA [p]	NA [p]	NA [p]	≥ 6.850	NA [p]	NA [p]	NA [p]	NA [p]	

For SI: °C = [(°F) – 32]/1.8.

a. Cooling rating conditions are standard rating conditions defined in AHRI 550/590 (I-P), Table 4, except for liquid-cooled centrifugal chilling packages which can adjust cooling efficiency for nonstandard rating conditions using Kadj procedure in

accordance with ASHRAE 90.1 Section 6.4.1.2.1.

b. Heating full-load rating conditions are at standard rating conditions defined in AHRI 550/590 (I-P), Table 4; includes the impact of defrost for air source heating ratings.

c. For liquid-source heat recovery chilling packages that have capabilities for heat rejection to a heat recovery condenser and a tower condenser the COPHR applies to operation at full load with 100% heat recovery (no tower rejection). Units that only have capabilities for partial heat recovery shall meet the requirements of ASHRAE 90.1 Table 6.8.1-3.

d. For cooling operation, compliance with both the FL and IPLV is required, but only compliance with Path A or Path B cooling efficiency is required.

e. For units that operate in both cooling and heating, compliance with both the cooling and heating efficiency is required.

f. For applications where the chilling package is installed to operate only in heating, compliance only with the heating performance COPH is required at only one of the heating AHRI 550/590 (I-P) standard rating conditions of Low, Medium, High, or Boost. Compliance with cooling performance is not required.

g. For air source heat pumps, compliance with both the 47.00°F and 17.00°F heating source outdoor air temperature (OAT) rating efficiency is required for heating.

h. For heat-pump chilling package applications where the cooling capacity is not being used for conditioning, compliance with the heating performance COPH is only required at one of the four heating AHRI 550/590 standard ratings conditions of Low, Medium, High, or Boost. Compliance with the cooling performance is required as defined in footnotes (a) and (d), except as noted in footnote (f).

i. For simultaneous cooling and heating chillers applications where there is simultaneous cooling and heating, compliance with the simultaneous cooling performance heat recovery COPSHC is only required at one of the four simultaneous cooling and heating AHRI 550/590 (I-P) standard ratings conditions of Low, Medium, High, or Boost. Compliance with the cooling only performance is required as defined in footnotes (a) and (d).

j. For heat recovery heating chilling package applications where there is simultaneous cooling and heating, compliance with the heating performance heat recovery COPHR is only required at one of the four heating AHRI 550/590 (I-P) standard ratings conditions of Low, Medium, Hot-Water 1, or Hot-Water 2. Compliance with the cooling only performance is required as defined in footnotes a and d.

k. Chilling packages employing a freeze-protection liquid in accordance with ASHRAE 90.1 Section 6.4.1.2.2 shall be tested or rated with water for the purpose of compliance with the requirements of this table.

l. Outdoor air entering dry-bulb (db) temperature and wet-bulb (wb) temperature.

m. Source-leaving liquid temperature.

- The cooling evaporator liquid flow rate used for the heating rating for a reverse cycle air-to-water heat pump shall be the flow rate determined during the full-load cooling rating.
- The cooling evaporator liquid flow rate for the simultaneous cooling and heating and heat recovery liquid cooled chilling packages rating shall be the liquid flow rates from the cooling operation full load rating.
- For heating-only fluid-to-fluid chiller packages, the evaporator flow rate obtained with an entering liquid temperature of 54.00°F and a leaving liquid temperature of 44.00°F shall be used.

n. The size category is the full-load net refrigerating cooling mode capacity, which is the capacity of the evaporator available for cooling of the thermal load external to the chilling package. The size category is the full-load net refrigerating cooling mode capacity, which is the capacity of the evaporator available for cooling of the thermal load external to the chilling package.

o. A heat recovery condenser at its maximum load point must remove enough heat from the refrigerant to cool the refrigerant to remove all superheat energy and begin condensation of the refrigerant. A heat recovery system where only the superheat is reduced is not covered by ASHRAE 90.1 Table 6.8.1-16 and is considered a desuperheater, and the chiller package must comply with ASHRAE 90.1 Table 6.8.1-3.

p. "NA" means the requirements are not applicable.

q. Water-to-water heat pumps with a capacity less than 135,000 Btu/h are covered by ASHRAE 90.1 Table 6.8.1-15.

[NY] TABLE C403.3.2(16)
CEILING-MOUNTED COMPUTER-ROOM AIR CONDITIONERS—MINIMUM EFFICIENCY REQUIREMENTS

EQUIPMENT TYPE	STANDARD MODEL	NET SENSIBLE COOLING CAPACITY	MINIMUM NET SENSIBLE COP	RATING CONDITIONS RETURN AIR (dry bulb/dew point)	TEST PROCEDURE[a]
Air cooled with free air discharge condenser	Ducted	< 29,000 Btu/h	2.05	75°F/52°F (Class 1)	AHRI 1360
		≥ 29,000 Btu/h and < 65,000 Btu/h	2.02		
		≥ 65,000 Btu/h	1.92		
	Nonducted	< 29,000 Btu/h	2.08		
		≥ 29,000 Btu/h and < 65,000 Btu/h	2.05		
		≥ 65,000 Btu/h	1.94		
Air cooled with free air discharge condenser with fluid economizer	Ducted	< 29,000 Btu/h	2.01	75°F/52°F (Class 1)	AHRI 1360
		≥ 29,000 Btu/h and < 65,000 Btu/h	1.97		
		≥ 65,000 Btu/h	1.87		
	Nonducted	< 29,000 Btu/h	2.04		
		≥ 29,000 Btu/h and < 65,000 Btu/h	2.00		
		≥ 65,000 Btu/h	1.89		
Air cooled with ducted condenser	Ducted	< 29,000 Btu/h	1.86	75°F/52°F (Class 1)	AHRI 1360
		≥ 29,000 Btu/h and < 65,000 Btu/h	1.83		
		≥ 65,000 Btu/h	1.73		
	Nonducted	< 29,000 Btu/h	1.89		
		≥ 29,000 Btu/h and < 65,000 Btu/h	1.86		
		≥ 65,000 Btu/h	1.75		
Air cooled with fluid economizer and ducted condenser	Ducted	< 29,000 Btu/h	1.82	75°F/52°F (Class 1)	AHRI 1360
		≥ 29,000 Btu/h and < 65,000 Btu/h	1.78		
		≥ 65,000 Btu/h	1.68		
	Nonducted	< 29,000 Btu/h	1.85		
		≥ 29,000 Btu/h and < 65,000 Btu/h	1.81		
		≥ 65,000 Btu/h	1.70		
Water cooled	Ducted	< 29,000 Btu/h	2.38	75°F/52°F (Class	AHRI 1360
		≥ 29,000 Btu/h and < 65,000 Btu/h	2.28		
		≥ 65,000 Btu/h	2.18		
		< 29,000 Btu/h	2.41		

	Nonducted	≥ 29,000 Btu/h and < 65,000 Btu/h	2.31	1)	
		≥ 65,000 Btu/h	2.20		
Water cooled with fluid economizer	Ducted	< 29,000 Btu/h	2.33	75°F/52°F (Class 1)	AHRI 1360
		≥ 29,000 Btu/h and < 65,000 Btu/h	2.23		
		≥ 65,000 Btu/h	2.13		
	Nonducted	< 29,000 Btu/h	2.36		
		≥ 29,000 Btu/h and < 65,000 Btu/h	2.26		
		≥ 65,000 Btu/h	2.16		
Glycol cooled	Ducted	< 29,000 Btu/h	1.97	75°F/52°F (Class 1)	AHRI 1360
		≥ 29,000 Btu/h and < 65,000 Btu/h	1.93		
		≥ 65,000 Btu/h	1.78		
	Nonducted	< 29,000 Btu/h	2.00		
		≥ 29,000 Btu/h and < 65,000 Btu/h	1.98		
		≥ 65,000 Btu/h	1.81		
Glycol cooled with fluid economizer	Ducted	< 29,000 Btu/h	1.92	75°F/52°F (Class 1)	AHRI 1360
		≥ 29,000 Btu/h and < 65,000 Btu/h	1.88		
		≥ 65,000 Btu/h	1.73		
	Nonducted	< 29,000 Btu/h	1.95		
		≥ 29,000 Btu/h and < 65,000 Btu/h	1.93		
		≥ 65,000 Btu/h	1.76		

For SI: 1 British thermal unit per hour = 0.2931 W, °C = [(°F) – 32]/1.8, COP = (Btu/h × hp)/(2,550.7).

a. Chapter 6 contains a list of the referenced standards, which include test procedures, including the reference year version of the test procedure.

EC 07-0035

Revise as follows:

C403.3.2.1 Water-cooled centrifugal chilling packages ~~(Mandatory)~~. Equipment not designed for operation at AHRI Standard 550/590 test conditions of 44.00°F ~~(7°C)~~ leaving ~~chilled water temperature~~ and ~~2.4 gpm/ton evaporator fluid flow~~ 54.00°F entering chilled-fluid temperatures, and with 85°F (29°C) entering ~~condenser water temperature with 3 gpm/ton (0.054 l/s • kW) condenser water flow shall have maximum full-load kW/ton (FL) and part-load ratings requirements adjusted using Equations 4-6 and 4-7.~~and 94.30°F leaving condenser-fluid temperatures, shall have maximum full-load kW/ton (FL) and part-load rating requirements adjusted using the following equations:

$FL_{adj} = FL/K_{adj}$ (Equation 4-6)

$PLV_{adj} = IPLV.IP/K_{adj}$ (Equation 4-7)

where:

$K_{adj} = A \times B$

FL = Full-load kW/ton value as specified in Table C403.3.2~~(7)~~(3).

FL_{adj} = Maximum full-load kW/ton rating, adjusted for nonstandard conditions.

IPLV.IP = IPLV.IP ~~Value as specified in~~ value from Table C403.3.2~~(7)~~(3).

PLV_{adj} = Maximum NPLV rating, adjusted for nonstandard conditions.

$A = 0.00000014592 \times (LIFT)^4 - 0.0000346496 \times (LIFT)^3 + 0.00314196 \times (LIFT)^2 - 0.147199 \times (LIFT) + $ ~~3.9302~~ 3.93073

$B = 0.0015 \times L_{vg}E_{vap} + 0.934$
$LIFT = L_{vg}Cond - L_{vg}E_{vap}$
$L_{vg}Cond$ = Full-load condenser leaving fluid temperature (°F).
$L_{vg}E_{vap}$ = Full-load evaporator leaving temperature (°F).

The FL_{adj} and PLV_{adj} values are ~~only~~ applicable for centrifugal chillers meeting all of the following full-load design ranges:

~~1.~~ · ~~Minimum evaporator leaving temperature:~~ 36.00°F ≤ $L_{vg}E_{vap}$ ≤ 60.00°F~~.~~
~~2.~~ · ~~Maximum condenser leaving temperature:~~ $L_{vg}Cond$ ≤ 115.00°F~~.~~
~~3.~~ · 20°F ≤ LIFT ≤ 80°F~~.~~

Manufacturers shall calculate the FL_{adj} and PLV_{adj} before determining whether to label the chiller. Centrifugal chillers designed to operate outside of these ranges are not covered by this code.

EC 07-0132

Add new:

C403.3.4 Boilers. Boiler systems shall comply with the following:

1. Combustion air positive shut-off shall be provided on all newly installed boiler systems that meet one or more of the following conditions:

   1.1 The total input capacity is no less than of 2,500,000 Btu/h (732 kW) and one or more of the boilers are designed to operate with a nonpositive vent static pressure.

   1.2 Any stack serving the boiler system is connect to two or more boilers with a total combined input capacity of not less than 2,500,000 Btu/h (732 kW).

2. Newly installed boilers or boiler systems with a combustion air fan motor *nameplate horsepower* rating of 10 horsepower (7.46 kW) or larger more shall comply with meet one of the following:

   2.1 The fan motor shall be variable speed, or

   2.2 The fan motor shall include controls modulate fan airflow as a function of the load to a speed 50 percent or less of design air volume.

C403.3.4.1 Boiler oxygen concentration controls. Newly installed boilers with an input capacity of 5,000,000 Btu/h (1465 kW) and steady state full-load less than 90 percent shall maintain stack-gas oxygen concentrations not greater than the values specified in Table C403.3.4.1. Combustion air volume shall be controlled with respect to measured flue gas oxygen concentration. The use of a common gas and combustion air control linkage or jack shaft is not permitted prohibited.

Exception: These concentration limits do not apply where 50 percent or more of the *boiler system* capacity serves Group R-2 occupancies.

TABLE C403.3.4.1
BOILER OXYGEN CONCENTRATIONS

Boiler Application	Maximum stack-gas oxygen concentration[a]
Commercial boilers or where ≤ 10% of the boiler system capacity is used for process applications at design conditions	5%
Process boilers	3%

a. Concentration levels measured by volume on a dry basis over firing rates of 20 to 100 percent.

EC 07-0036

Revise as follows:

[NY] **C403.4.1.1 Heat pump supplementary heat ~~(Mandatory).~~** Heat pumps having supplementary electric resistance ~~heat~~, *fuel gas*, or *liquid fuel* heating systems shall have controls that~~, except during defrost, prevent supplementary heat operation where the heat pump can provide the heating load.~~ limit supplemental heat operation to only those times when one of the following applies:

1. The vapor compression cycle cannot provide the necessary heating energy to satisfy the *thermostat* setting.
2. The heat pump is operating in defrost mode.
3. The vapor compression cycle malfunctions.
4. The *thermostat* malfunctions.

EC 07-0133

Revise as follows:

C403.4.2.3 ~~Automatic~~ Optimum start and stop. ~~(Mandatory)~~ ~~Automatic~~Optimum start and stop controls shall be provided for each ~~HVAC~~ heating and cooling system with direct control of individual zones. The ~~automatic~~optimum start controls shall be configured to automatically adjust the daily start time of the ~~HVAC~~heating and cooling system in order to bring each space to the desired occupied temperature immediately prior to scheduled occupancy. The optimum stop controls shall be configured to reduce the heating and cooling system's heating temperature setpoint and increase the cooling temperature setpoint by not less than 2°F (-16.6ºC) before scheduled unoccupied periods based on the thermal lag and acceptable drift in space temperature that is within comfort limits.

Exception: Dwelling units and sleeping units are not required to have optimum start controls.

EC 07-0037

Revise as follows:

[NY] **C403.4.3.3.2 Heat rejection.** The following shall apply to hydronic water loop heat pump systems ~~in *Climate Zones* 3 through 8~~:

1. Where a closed-circuit cooling tower is used directly in the heat pump loop, either an automatic valve shall be installed to bypass the flow of water around the closed-circuit cooling tower, except for any flow necessary for freeze protection, or low-leakage positive-closure dampers shall be provided.
2. Where an open-circuit cooling tower is used directly in the heat pump loop, an automatic valve shall be installed to bypass all heat pump water flow around the open-circuit cooling tower.
3. Where an open-circuit or closed-circuit cooling tower is used in conjunction with a separate heat exchanger to isolate the open-circuit cooling tower from the heat pump loop, heat loss shall be controlled by shutting down the circulation pump on the cooling tower loop.

Exception: Where it can be demonstrated that a heat pump system will be required to reject heat throughout the year.

EC 07-0038

Revise as follows:

C403.4.3.3.3 Two-position valve. Each hydronic heat pump on the hydronic system having a total pump system power exceeding 10 hp (7.5 kW) shall have a two-position *automatic* valve interlocked to shut off the water flow when the compressor is off.

EC 07-0134

Add new:

[NY] C403.4.6 Demand responsive controls. Electric heating and cooling systems shall be provided with *demand responsive controls* capable of executing the following actions in response to a *demand response signal*:

1. Automatically increasing the zone operating cooling set point by the following values: 1°F (0.5°C), 2°F (1°C), 3°F (1.5°C), and 4°F (2°C).

2. Automatically decreasing the zone operating heating set point by the following values: 1°F (0.5°C), 2°F (1°C), 3°F (1.5°C), and 4°F (2°C) while maintaining the minimum room temperature requirements of Section 602.2 of the *Property Maintenance Code of New York State*.

Where a *demand response signal* is not present, the heating and cooling system controls shall be capable of performing all other functions. Where thermostats are controlled by direct digital control including, but not limited to, an energy management system, the system shall be capable of *demand responsive control* and capable of adjusting all thermal set-points to comply. The *demand responsive controls* shall comply with either Section C403.4.6.1 or Section C403.4.6.2.

Exceptions:

1. Group I occupancies in accordance with the *Building Code of New York State*.
2. Group H occupancies in accordance with the *Building Code of New York State*.
3. Controls serving *data center* systems.
4. Occupancies or uses requiring precision in indoor temperature control as *approved* by the *building official*.

C403.4.6.1 Air conditioners and heat pumps with two or more stages of control and cooling capacity of less than 65,000 Btu/h. Thermostats for Air conditioners and heat pumps with two or more stages of control and a cooling capacity less than 65,000 Btu/h (19 kW) shall be provided with a demand responsive control that complies with the communication and performance requirements of AHRI 1380.

C403.4.6.2 All other heating and cooling systems. Thermostats for heating and cooling systems shall be provided with a *demand responsive control* that complies with one of the following:

1. Certified OpenADR 2.0a VEN, as specified under Clause 11, Conformance.
2. Certified OpenADR 2.0b VEN, as specified under Clause 11, Conformance.
3. Certified by the manufacturer as being capable of responding to a *demand response signal* from a certified OpenADR 2.0b VEN by automatically implementing the control functions requested by the VEN for the equipment it controls.
4. IEC 62746-10-1.
5. The communication protocol required by a controlling entity, such as a utility or service provider, to participate in an automated demand response program.
6. The physical configuration and communication protocol of CTA 2045-A or CTA 2045-B.

C403.4.7 Heating and cooling system controls for operable openings to the outdoors. All doors from a *conditioned space* to the outdoors and all other operable openings from a *conditioned space* to the outdoors that are larger than 40 square feet (3.7 m2) when fully open, shall have *automatic* controls interlocked with the heating and cooling system. The controls shall be configured to do the following within 5 minutes of opening:

1. Disable mechanical heating to the zone or reset the space heating temperature setpoint to 55°F (12.7°C) or less.
2. Disable mechanical cooling to the zone or reset the space cooling temperature setpoint to 90°F (32°C) or more. Mechanical cooling can remain enabled if the outdoor air temperature is below the space temperature.

   Exceptions:

   1. *Building* entrances with automatic closing devices.
   2. Emergency exits with an automatic alarm that sounds when open.
   3. Operable openings and doors serving enclosed spaces without a thermostat or heating or cooling temperature sensor.
   4. Separately zoned areas associated with the preparation of food that contain appliances that contribute to the heating or cooling loads of a restaurant or similar type of occupancy.
   5. Warehouses that utilize operable openings for the function of the occupancy where *approved* by the *building official*.
   6. The first entrance doors where located in the exterior wall and are part of a vestibule system.
   7. Operable openings into spaces served by radiant heating and cooling systems.

8. Alterations where walls would have to be opened solely for the purpose of meeting this requirement and where approved.
9. Doors served by air curtains meeting the requirements of Section C402.6.6.

C403.4.8 Humidification and dehumidification controls. Humidification and dehumidification controls shall be in accordance with this section.

C403.4.8.1 Dehumidification. Humidistatic controls shall not use mechanical cooling to reduce the humidity below the lower of a dew point of 55° For relative humidity of 60 percent in the coldest zone served by the system. Lower humidity shall be permitted where mechanical cooling is being used for temperature control.

Exceptions:

1. Where approved, systems serving zones where specific humidity levels are required, such as museums and hospitals, and where humidistatic controls are capable of and configured to maintain a dead band of at least 10 percent relative humidity where no active humidification or dehumidification takes place.
2. Systems serving zones where humidity levels are required to be maintained with precision of not more than ±5 percent relative humidity to comply with applicable codes or accreditation standards or as approved by the authority having jurisdiction.

C403.4.8.2 Humidification. Humidistatic controls shall not use fossil fuels or electricity to produce relative humidity above 30 percent in the warmest zone served by the system.

Exceptions:

1. Where approved, systems serving zones where specific humidity levels are required, such as museums and hospitals, and where humidistatic controls are capable of and configured to maintain a dead band of at least 10 percent relative humidity where no active humidification or dehumidification takes place.
2. Systems serving zones where humidity levels are required to be maintained with precision of not more than ±5 percent relative humidity to comply with applicable codes or accreditation standards or as approved by the authority having jurisdiction.

C403.4.8.3 Control interlock. Where a zone is served by a system or systems with both humidification and dehumidification capability, means such as limit switches, mechanical stops, or, for DDC systems, software programming shall be provided capable of and configured to prevent simultaneous operation of humidification and dehumidification equipment.

Exception: Systems serving zones where humidity levels are required to be maintained with precision of not more than ±5 percent relative humidity to comply with applicable codes or accreditation standards or as approved by the authority having jurisdiction.

EC 07-0135

Revise as follows:

[NY] **C403.5 Economizers ~~(Prescriptive)~~.** Economizers shall comply with Sections C403.5.1 through C403.5.5.

An air or water economizer shall be provided for the following cooling systems:

1. Chilled water systems with a total cooling capacity, less cooling capacity provided with air economizers, as specified in Table C403.5(1).
2. Individual fan systems with cooling capacity greater than or equal to 54,000 Btu/h (15.8 kW) serving other than a *Group R* occupancies.

   The total supply capacity of all fan cooling units not provided with economizers shall not exceed 20 percent of the total supply capacity of all fan cooling units in the building or 300,000 Btu/h (88 kW), whichever is greater.
3. Individual fan systems with cooling capacity greater than or equal to 270,000 Btu/h (79.1 kW) serving *Group R* occupancies.

   The total supply capacity of all fan cooling units not provided with economizers shall not exceed 20 percent of the total supply capacity of all fan cooling units in the building or 1,500,000 Btu/h (440 kW), whichever is greater.

Exceptions: Economizers are not required for the following systems.

~~1. Individual fan systems not served by chilled water for buildings located in *Climate Zones* 0A, 0B, 1A and 1B.~~

~~2.~~1. Where more than 25 percent of the air designed to be supplied by the system is to spaces that are designed to be humidified above 35°F (1.7°C) dew-point temperature to satisfy process needs.

~~3.~~2. Systems expected to operate less than 20 hours per week.

~~4.~~3. Systems serving supermarket areas with open refrigerated casework.

~~5.~~4. Where the cooling efficiency is greater than or equal to the efficiency requirements in Table C403.5(2).

~~6.~~5. Systems that include a heat recovery system in accordance with Section ~~C403.9.5~~C403.11.5.

6. Direct-expansion fan coils or unitary equipment with a capacity less than 54,000 Btu/h (15.8 kW) and multiple stages of compressor capacity installed with a dedicated outdoor air system.

C403.5.3.4 Relief of excess outdoor air. Systems shall ~~be~~ provide one of the following means to relieve ~~capable of relieving~~ excess *outdoor air* during air economizer operation to prevent over pressurizing the building.

1. Return or relief fan(s) meeting the requirements of Section C403.11.1.
2. Barometric or motorized damper relief path with a total pressure drop at design relief airflow rate less than 0.10 inches water column (25 Pa) from the occupied space to outdoors. Design relief airflow rate shall be the design supply airflow rate minus any continuous exhaust flows, such as toilet exhaust fans, whose makeup is provided by the economizer system.

The relief air outlet shall be located to avoid recirculation into the building.

C403.6.1 Variable air volume and multiple-zone systems. Supply air systems serving multiple *zone*s shall be variable air volume (VAV) systems that have zone controls configured to reduce the volume of air that is reheated, recooled or mixed in each *zone* to one of the following:

1. ~~Twenty~~ Thirty percent of the *zone* design peak supply for systems ~~with~~ without ~~DDC~~direct digital control (DDC) ~~and 30 percent for other systems~~.
2. Systems with DDC where all of the following apply:
   2.1. The airflow rate in the deadband between heating and cooling does not exceed ~~20 percent of the *zone* design peak supply rate or higher~~ the highest of the allowed rates under Items 3, 4, ~~and~~ 5, or 6 of this section.
   2.2. The first stage of heating modulates the *zone* supply air temperature setpoint up to a maximum setpoint while the airflow is maintained at the deadband flow rate.
   2.3. The second stage of heating modulates the airflow rate from the deadband flow rate up to the heating maximum flow rate that is less than 50 percent of the *zone* design peak supply rate.
3. The outdoor airflow rate required to meet the minimum *ventilation* requirements of Chapter 4 of the *Mechanical Code of New York State.*

4. The minimum primary airflow rate required to meet the Simplified Procedure ventilation requirements of ASHRAE Standard 62.1 for the *zone* and is permitted to be the average airflow rate as allowed by ASHRAE Standard 62.1
5. Any higher rate that can be demonstrated to reduce overall system annual energy use by offsetting reheat/recool energy losses through a reduction in outdoor air intake for the system as approved by the *building official*.
6. The airflow rate required to comply with applicable codes or accreditation standards such as pressure relationships or minimum air change rates.

Exception: The following individual *zone*s or entire air distribution systems are exempted from the requirement for VAV control:

1. *Zones* or supply air systems where not less than 75 percent of the energy for reheating or for providing warm air in mixing systems is provided from a site-recovered, including condenser heat, or site-solar energy source.
2. Systems that prevent reheating, recooling, mixing or simultaneous supply of air that has been previously cooled, either mechanically or through the use of economizer systems, and air that has been previously mechanically heated.

EC 07-0039

Revise as follows:

[NY] C403.6.5 Supply-air temperature reset controls. Multiple-zone HVAC systems shall include controls that are capable of and configured to ~~automatically~~ *automatically* reset the supply-air temperature in response to representative building loads, or to outdoor air temperature. The controls shall be configured to reset the supply air temperature not less than 25 percent of the difference between the design supply-air temperature and the design room air temperature. Controls that adjust the reset based on zone humidity are allowed. HVAC zones that are expected to experience relatively constant loads, shall have maximum airflow designed to accommodate the fully reset supply-air temperature.

Exceptions:

1. Systems that prevent reheating, recooling or mixing of heated and cooled supply air.
2. Seventy-five percent of the energy for reheating is from site-recovered or site-solar energy sources.
3. ~~Zones with peak supply air quantities of 300 cfm (142 L/s) or less.~~

EC 07-0136

Revise as follows:

[NY] C403.7.1 Demand control ventilation ~~(Mandatory)~~. Demand control *ventilation* (DCV) shall be provided for ~~spaces larger than 500 square feet (46.5 m2) and with an average occupant load of 25 people or greater per 1,000 square feet (93 m2) of floor area, as established in Table 403.3.1.1 of the Mechanical Code of New York State, and served by systems with one or more of~~ the following:

1. ~~An~~ Spaces with *ventilation* provided by single-zone systems where an air-side economizer is provided in accordance with Section C403.5.
2. ~~Automatic modulating control of the outdoor air damper.~~ Spaces larger than 250 square feet (23.2 m2) in climate zones 5 and 6 and spaces larger than 500 square feet (46.5 m2) in climate zone 4 which have a design occupant load of 15 people or greater per 1,000 square feet (93 m2) of floor area, as established in Table 403.3.1.1 of the *Mechanical Code of New York State*, and are served by systems with one or more of the following:

~~3. A design outdoor airflow greater than 3,000 cfm (1416 L/s).~~

2.1 An air-side economizer.
2.2 Automatic modulating control of the outdoor air damper.
2.3 A design outdoor airflow greater than 3,000 cfm (1416 L/s)

Exceptions:

1. ~~Systems~~ Spaces served by systems with energy recovery ~~complying~~ in accordance with Section ~~C403.7.4~~C403.7.4.2. and that have a floor area less than 1000 square feet (90 m2).

2. Multiple-*zone* systems without direct digital control of individual *zone*s communicating with a central control panel.
3. ~~Systems~~ Spaces served by multiple-zone systems with a design outdoor airflow less than 1,200 cfm (566 L/s).
4. ~~Spaces where the supply airflow rate minus any makeup or outgoing transfer air requirement is less than 1,200 cfm (566 L/s).~~ Spaces where more than 75 percent of the space design outdoor airflow is required for makeup air that is exhausted from the space or transfer air that is required for makeup air that is exhausted from other spaces.
5. ~~*Ventilation* provided only for process loads.~~ Spaces with one of the following occupancy classifications as defined in Table 403.3.1.1 of the *Mechanical Code of New York State*: correctional cells, education laboratories, barber, beauty and nail salons, and bowling alley seating areas.
6. Spaces where the *registered design professional* demonstrates an engineered ventilation system design that:
    6.1 Prevents the maximum concentration of contaminants from being more than that obtainable by the required rate of outdoor air ventilation, and
    6.2 Allows the required minimum design rate of outdoor air to be reduced by no less than 15 percent.

C403.7.2 ~~Enclosed parking~~ Parking garage ventilation ~~controls~~ systems ~~(Mandatory)~~. ~~Enclosed~~ Ventilation systems employed in enclosed parking garages ~~used for storing or handling automobiles operating under their own power~~ shall ~~employ contamination-sensing devices and automatic controls configured to stage fans or modulate fan average airflow rates to 50 percent or less of design capacity, or intermittently operate fans less than 20 percent of the occupied time or as required to maintain acceptable contaminant levels in accordance with Mechanical Code of New York State provisions. Failure of contamination-sensing devices shall cause the exhaust fans to operate continuously at design airflow.~~ comply with Section 404.1 of the *Mechanical Code of New York State* and the following:

1. Separate ventilation systems and control systems shall be provided for each parking garage section.
2. Control systems for each parking garage section shall ~~automatically detect and control contaminant levels in accordance with the International Mechanical Code, and shall~~ be capable of and configured to reduce fan airflow to not less than 0.05 cfm per square foot [0.00025 m3 /(s x m2)] of the floor area served and not more than 20 percent of the design capacity.
3. The ventilation system for each parking garage section shall have controls and devices that result in fan motor demand of no more than 30 percent of design wattage at 50 percent of the design airflow.

~~Exceptions~~ Exception:

1. ~~Garages with a total exhaust capacity less than 22,5008,000 cfm (10 6203,755 L/s) with *ventilation* systems that do not utilize heating or mechanical cooling.~~
2. ~~Garages that have a garage area to ventilation system motor nameplate power ratio that exceeds 1125 cfm/hp (710 L/s/kW) and do not utilize heating or mechanical cooling.~~

Garage ventilation systems serving a single parking garage section having a total ventilation system motor nameplate horsepower (ventilation system motor nameplate kilowatt) not exceeding 5 hp (3.7 kW) at fan system design conditions and where the parking garage section has no mechanical cooling or mechanical heating.

Nothing in this section shall be construed to require more than one *parking garage section* in any parking structure.

[NY] C403.7.3 Ventilation air heating control ~~(Mandatory)~~. Units that provide *ventilation* air to multiple *zone*s and operate in conjunction with *zone* heating and cooling systems shall not use heating or heat recovery to warm supply air to a temperature greater than 60°F (16°C) when representative building loads or outdoor air temperatures indicate that the majority of *zone*s require cooling.

Exception: Units that heat the airstream using only series energy recovery when representative building loads or outdoor air temperature indicate that the majority of zones require cooling in Climate Zone 4.

EC 07-0137

Add new:

C403.7.4 Energy recovery systems. Energy recovery ventilation systems shall be provided as specified in either Section C403.7.4.1 or C403.7.4.2, as applicable.

[NY] C403.7.4.1 Nontransient dwelling units. Nontransient *dwelling units* shall be provided with outdoor air *energy recovery ventilation systems* complying with one of the following:

1. The system shall have an enthalpy recovery ratio of not less than 50 percent at cooling design condition and not less than 60 percent at heating design condition.
2. The system shall have a sensible recovery efficiency (SRE) that is not less than 65 percent at 32 °F (0 °C). SRE and NMT shall be determined from a *listed* value or from interpolation of *listed* values, at an airflow not less than the design airflow, based on testing in accordance with CAN/CSA C439.

Exception: Enthalpy recovery ratio requirements at cooling design condition.

[NY] ~~C403.7.4~~ C403.7.4.2 ~~Energy recovery ventilation systems (Mandatory).~~Spaces other than nontransient dwelling units.
Where the supply airflow rate of a fan system serving a space other than a nontransient *dwelling unit* exceeds the values specified in Tables ~~C403.7.4(1)~~ C403.7.4.2(1) and ~~C403.7.4(2)~~C403.7.4.2(2), the system shall include an energy recovery system. The energy recovery system shall ~~be configured to provide a change in the enthalpy of the outdoor air supply of~~ provide an enthalpy recovery ratio of not less than 50 percent ~~of the difference between the outdoor air and return air enthalpies,~~ at design conditions. Where an air economizer is required, the energy recovery system shall include a bypass or controls that permit operation of the economizer as required by Section C403.5.

Exception: An *energy recovery ventilation system* shall not be required in any of the following conditions:

1. Where energy recovery systems are prohibited by the *Mechanical Code of New York State*.
2. Laboratory fume hood systems that include not fewer than one of the following features:
   2.1. Variable-air-volume hood exhaust and room supply systems configured to reduce exhaust and makeup air volume to 50 percent or less of design values.
   2.2. Direct makeup (auxiliary) air supply equal to or greater than 75 percent of the exhaust rate, heated not warmer than 2°F (1.1°C) above room setpoint, cooled to not cooler than 3°F (1.7°C) below room setpoint, with no humidification added, and no simultaneous heating and cooling used for dehumidification control.
3. Systems serving spaces that are heated to less than 60°F (15.5°C) and that are not cooled.
4. ~~Where~~ Heating energy recovery where more than 60 percent of the outdoor heating energy is provided from site-recovered or site-solar energy in Climate Zones 5 and 6.

~~5. Heating energy recovery in Climate Zones 1 and 2.~~
~~6. Cooling energy recovery in Climate Zones 3C, 4C, 5B, 5C, 6B, 7 and 8.~~

~~7.~~ 5. Systems in Climate Zone 4 requiring dehumidification that employ series energy ~~recovery in series with the cooling coil~~ and have a minimum SERR of 0.40.

~~8.~~6. Where the largest source of air exhausted at a single location at the building exterior is less than 75 percent of the design *outdoor air* flow rate.

~~9.~~7. Systems expected to operate less than 20 hours per week at the *outdoor air* percentage covered by Table ~~C403.7.4(1)~~ C403.7.4.2(1).

~~10.~~8. Systems exhausting toxic, flammable, paint or corrosive fumes or dust.

~~11.~~9. Commercial kitchen hoods used for collecting and removing grease vapors and smoke.

EC 07-0138

Modify as follows:

C403.7.5 Kitchen exhaust systems ~~(Mandatory).~~ Replacement air introduced directly into the exhaust hood cavity shall not be greater than 10 percent of the hood exhaust airflow rate. Conditioned supply air delivered to any space shall not exceed the greater of the following:

1. The *ventilation* rate required to meet the space heating or cooling load.

2. The hood exhaust flow minus the available transfer air from adjacent space where available transfer air is considered to be that portion of outdoor ventilation air not required to satisfy other exhaust needs, such as restrooms, and not required to maintain pressurization of adjacent spaces.

~~Where~~ Kitchen exhaust hood systems serving Type I exhaust hoods shall be provided with demand control kitchen ventilation (DCKV) controls where a kitchen or kitchen/dining facility has a total Type I kitchen hood exhaust airflow rate ~~is~~ greater than 5,000 cfm (2360 L/s). DCKV systems shall be configured to provide a minimum of 50 percent reduction in exhaust and replacement air system airflow rates. Systems shall include controls necessary to modulate exhaust and replacement air system airflows in response to appliance operation and to maintain full capture and containment of smoke, effluent and combustion products during cooking and idle operation. ~~each~~Each hood shall be a factory-built commercial exhaust hood *listed* by a nationally recognized testing laboratory ~~in compliance with UL 710. Each hood~~ and shall have a maximum exhaust rate as specified in Table C403.7.5 ~~and shall comply with one of the following:.~~

~~1. Not less than 50 percent of all replacement air shall be transfer air that would otherwise be exhausted.~~
~~2. Demand ventilation systems on not less than 75 percent of the exhaust air that are configured to provide not less than a 50 percent reduction in exhaust and replacement air system airflow rates, including controls necessary to modulate airflow in response to appliance operation and to maintain full capture and containment of smoke, effluent and combustion products during cooking and idle.~~
~~3. *Listed* energy recovery devices with a sensible heat recovery effectiveness of not less than 40 percent on not less than 50 percent of the total exhaust airflow.~~

Where a single hood, or hood section, is installed over appliances with different duty ratings, the maximum allowable flow rate for the hood or hood section shall be based on the requirements for the highest appliance duty rating under the hood or hood section.

~~**Exception:** Where not less than 75 percent of all the replacement air is transfer air that would otherwise be exhausted.~~

Exceptions:

1. UL 710 listed exhaust hoods that have a design maximum exhaust flow rate not greater than 250 cfm per linear foot of hood that serve kitchen or kitchen/dining facilities with a total kitchen hood exhaust airflow rate less than 5000 cfm (2360 L/s).
2. Where allowed by the *Mechanical Code of New York State*, an energy recovery ventilation system is installed on the kitchen exhaust with a sensible heat recovery effectiveness of not less than 40 percent on not less than 50 percent of the total exhaust hood airflow.

C403.7.6 Automatic control of HVAC systems serving guestrooms ~~(Mandatory)~~. In *Group R*-1 buildings containing more than 50 guestrooms, each guestroom shall be provided with controls complying with the provisions of Sections C403.7.6.1 and C403.7.6.2. ~~Card key controls comply with these requirements.~~

EC 07-0040

Revise as follows:

C403.7.6.1 Temperature setpoint controls. Controls shall be provided on each HVAC system that are capable of and configured ~~to automatically raise the cooling setpoint and lower the heating setpoint by not less than 4°F (2°C) from the occupant setpoint within 30 minutes after the occupants have left the guestroom. The controls shall be capable of and configured to automatically raise the cooling setpoint to not lower than 80°F (27°C) and lower the heating setpoint to not higher than 60°F (16°C) when the guestroom is unrented or has not been continuously occupied for more than 16 hours or a networked guestroom control system indicates that the guestroom is unrented and the guestroom is unoccupied for more than 30 minutes. A networked guestroom control system that is capable of returning the thermostat setpoints to default occupied setpoints 60 minutes prior to the time a guestroom is scheduled to be occupied is not precluded by this section. Cooling that is capable of limiting relative humidity with a setpoint not lower than 65 percent relative humidity during unoccupied periods is not precluded by this section.~~with three modes of temperature control.

1. When the guestroom is rented but unoccupied, the controls shall automatically raise the cooling setpoint and lower the heating setpoint by not less than 4°F (2°C) from the occupant setpoint within 30 minutes after the occupants have left the guestroom.
2. When the guestroom is unrented and unoccupied, the controls shall automatically raise the cooling setpoint to not lower than 80°F (27°C) and lower the heating setpoint to not higher than 60°F (16°C). Unrented and unoccupied

guestroom mode shall be initiated within 16 hours of the guestroom being continuously occupied or where a *networked guestroom control system* indicates that the guestroom is unrented and the guestroom is unoccupied for more than 20 minutes. A *networked guestroom control system* that is capable of returning the thermostat setpoints to default occupied setpoints 60 minutes prior to the time a guestroom is scheduled to be occupied is not precluded by this section. Cooling that is capable of limiting relative humidity with a setpoint not lower than 65- percent relative humidity during unoccupied periods is not precluded by this section.

3. When the guestroom is occupied, HVAC setpoints shall return to their occupied setpoints once occupancy is sensed.

C403.7.6.2 Ventilation controls. Controls shall be provided on each HVAC system that are capable of and configured to automatically turn off the ventilation and exhaust fans within ~~30~~ 20 minutes of the occupants leaving the guestroom, or *isolation* devices shall be provided to each guestroom that are capable of automatically shutting off the supply of outdoor air to and exhaust air from the guestroom.

Exception: Guestroom *ventilation* systems are not precluded from having an automatic daily pre-occupancy purge cycle that provides daily outdoor air *ventilation* during unrented periods at the design *ventilation* rate for 60 minutes, or at a rate and duration equivalent to one air change.

EC 07-0139

Add new:

C403.7.8 Occupied standby controls. The following spaces shall be equipped with occupied-standby controls in accordance with C403.7.8.1, for each ventilation *zone*:

1. Post-secondary classrooms/lecture/training rooms
2. Conference/meeting/multipurpose rooms
3. Lounges/breakrooms
4. Enclosed offices
5. Open plan office areas
6. Corridors

Exception: Zones that are part of a multiple zone system without *automatic* zone flow control dampers.

C403.7.8.1 Occupied Standby Zone Controls. Within five (5) minutes of all rooms spaces in that *zone* entering *occupied-standby mode* , the *zone* control shall operate as follows:

1. Active heating set point shall be setback by not less than 1°F (0.55°C).
2. Active cooling set point shall be setup by not less than 1°F(0.55°C).
3. All airflow supplied to the *zone* shall be shut off whenever the space temperature is between the active heating and cooling set points.
4. Multiple *zone* systems shall comply with C403.7.8.1.1

C403.7.8.1.1 Multiple zone system controls. Multiple zone systems required to that can automatically reset the effective minimum outdoor air setpoint, per Section C403.6.6 shall reset the effective minimum outdoor air set-point based on a zone outdoor air requirement of zero for all zones in *occupied-standby mode*. Sequences of operation for system outside air reset shall comply with an approved method.

C403.7.9 Dwelling unit ventilation system. A fan that is the air mover for a heating or cooling system that serves an individual dwelling unit shall not be used to provide outdoor air.

Exception: Where the fan efficacy is not less than 1.2 cfm of outdoor airflow per watt when there is no demand for heating or cooling.

EC 07-0140

Revise as follows:

C403.8.1 Allowable fan horsepower. ~~(Mandatory).~~ ~~Each HVAC system having a total fan system motor nameplate horsepower exceeding 5 hp (3.7 kW) at fan system design conditions shall not exceed the allowable~~ Where the summed fan system motor nameplate horsepower of an HVAC fan system is greater than 5 hp (3.7 kW) at fan system design conditions , it shall not be greater than the allowable total *fan system motor nameplate hp* (Option 1) or *fan system bhp*

(Option 2) shown in Table C403.8.1(1). ~~This includes~~ Such summed HVAC fan system motor nameplate horsepower shall include supply fans, exhaust fans, return/relief fans, and fan-powered terminal units associated with systems providing heating or cooling capability. Single-zone variable air volume systems shall comply with the constant volume fan power limitation.

Exceptions:

1. Hospital, vivarium and laboratory systems that utilize flow control devices on exhaust or return to maintain space pressure relationships necessary for occupant health and safety or environmental control shall be permitted to use variable volume fan power limitation.
2. Individual exhaust fans with motor nameplate horsepower of 1 hp (0.746 kW) or less are exempt from the allowable fan horsepower requirement.

C403.8.2 Motor nameplate horsepower ~~(Mandatory)~~. For each fan, the *fan brake horsepower* shall be indicated on the construction documents and the selected motor shall be not larger than the first available motor size greater than the following:

1. For fans less than 6 bhp (4413 W), 1.5 times the *fan brake horsepower*.
2. For fans 6 bhp (4413 W) and larger, 1.3 times the *fan brake horsepower*.

~~3. Systems complying with Section C403.8.1 *fan system motor nameplate hp* (Option 1).~~

~~**Exception:** Fans with motor nameplate horsepower less than 1 hp (746 W) are exempt from this section.~~

Exceptions:

1. Fans equipped with electronic speed control devices to vary the fan airflow as a function of load.
2. Fans with a fan nameplate electrical input power of less than 0.89 kW.
3. Systems complying with **Section C403.8.1** fan system motor nameplate hp (Option 1).
4. Fans with motor nameplate horsepower less than 1 hp (746 W).

EC 07-0041

Revise as follows:

C403.8.3 Fan efficiency ~~(Mandatory)~~. ~~Fans~~ Each fan and fan array shall have a fan ~~efficiency grade (FEG)~~ energy index (FEI) of not less than ~~67~~ 1.00 at the design point of operation, as determined in accordance with ~~AMCA 205~~ AMCA 208 by an *approved*, independent testing laboratory and *labeled* by the manufacturer. ~~The total efficiency of the fan~~ Each fan and fan array used for a variable-air-volume system shall have an FEI of not less than 0.95 at the design point of operation, ~~shall be within 15 percentage points of the maximum total efficiency of the fan.~~ as determined in accordance with AMCA 208 by an *approved* independent testing laboratory and *labeled* by the manufacturer. The FEI for fan arrays shall be calculated in accordance with AMCA 208 Annex C.

~~**Exception:**~~ **Exceptions**: The following fans are not required to have a fan ~~efficiency grade~~ energy index:

1. Fans ~~of 5 hp (3.7 kW) or less as follows:~~ that are not embedded fans with motor nameplate horsepower of less than 1.0 hp (0.75 kW) or with a nameplate electrical input power of less than 0.89 kW.

~~1.1. Individual fans with a motor nameplate horsepower of 5 hp (3.7 kW) or less, unless Exception 1.2 applies.~~

~~1.2. Multiple fans in series or parallel that have a combined motor nameplate horsepower of 5 hp (3.7 kW) or less and are operated as the functional equivalent of a single fan.~~

2. Embedded fans that have a motor nameplate horsepower of 5 hp (3.7 kW) or less, or with a fan system electrical input power of 4.1 kW or less.
3. Multiple fans operated in series or parallel as the functional equivalent of a single fan that have a combined motor nameplate horsepower of 5 hp (3.7 kW) or less or with a fan system electrical input power of 4.1 kW or less.

~~2.~~ 4. Fans that are part of equipment covered in Section C403.3.2.

~~3.~~ 5. Fans included in an equipment package certified by an *approved agency* for air or energy performance.

~~4. Powered wall/roof ventilators.~~

6. Ceiling fans, which are defined as nonportable devices suspended from a ceiling or overhead structure for circulating air via the rotation of the blades.
7. Fans used for moving gases at temperatures above 482°F (250°C).
8. Fans used for operation in explosive atmospheres.
9. Reversible fans used for tunnel ventilation.

~~6.~~ 10. Fans that are intended to operate only during emergency conditions.
~~5.~~ 11. Fans outside the scope of AMCA ~~205~~ 208.

EC 07-0141

Add new:

C403.8.5 Low-capacity ventilation fans. Mechanical ventilation system fans with motors less than $^{1}/_{12}$ hp (0.062 kW) in capacity shall meet the efficacy requirements of **Table C403.8.5** at one or more rating points. Airflow shall be tested in accordance with the test procedure referenced by Table C403.8.5 and listed. The airflow shall be reported in the product listing or on the label. Fan efficacy shall be reported in the product listing or shall be derived from the input power and airflow values reported in the product listing or on the label. Fan efficacy for fully ducted HRV, ERV, balanced, and in-line fans shall be determined at a static pressure not less than 0.2 inch w.c. (49.85 Pa). Fan efficacy for ducted range hoods, bathroom, and utility room fans shall be determined at a static pressure not less than 0.1 inch w.c. (24.91 Pa).

Exceptions:

1. Where ventilation fans are a component of a listed heating or cooling appliance.
2. Dryer exhaust duct power ventilators, domestic range hoods, and domestic range booster fans that operate intermittently.
3. Fans in radon mitigation systems.
4. Fans not covered within the scope of the test methods referenced in Table C403.8.5.
5. Ceiling fans regulated under 10 CFR 430 Appendix U.

TABLE C403.8.5
LOW-CAPACITY VENTILATION FAN EFFICACY[a]

SYSTEM TYPE	AIRFLOW RATE (CFM)	MINIMUM EFFICACY (CFM/WATT)	TEST PROCEDURE
Balanced ventilation system without heat or energy recovery	Any	1.2[a]	ASHRAE Standard 51 (ANSI/AMCA Standard 210)
HRV, ERV	Any	1.2	CAN/CSA 439-18
Range hood	Any	2.8	ASHRAE 51 (ANSI/AMCA Standard 210)
In-line supply or exhaust fan	Any	3.8	
Other exhaust fan	<90	2.8	
	≥90 and <200	3.5	
	≥200	4.0	

For SI: 1 cfm/ft = 0.47 L/s.

a. For balanced systems, HRVs, and ERVs, determine the efficacy as the outdoor airflow divided by the total fan power.

C403.8.6.2 Intermittent exhaust control for bathrooms and toilet rooms. Where an exhaust system serving a bathroom or toilet room is designed for intermittent operation, the exhaust system shall be provided with manual-on capability and one or more of the following controls:

1. A timer control that has a minimum setpoint not greater than 30 minutes.
2. An occupant sensor control that automatically turns off exhaust fans within 30 minutes after all occupants have left the space.
3. A humidity control capable of manual or automatic adjustment from a minimum setpoint not greater than 50 percent to a maximum setpoint not greater than 80 percent relative humidity.
4. A contaminant control that responds to a particle or gaseous concentration.

Exception: Bathroom and toilet room exhaust systems serving as an integral component of an outdoor air ventilation system in Group R-2, R-3, and R-4 occupancies shall not be required to provide controls other than manual on capability.

An off setpoint shall not be used to comply with a minimum setpoint requirement.

C403.9 Large-diameter ceiling fans. Where provided, large-diameter ceiling fans shall be tested and labeled in accordance with AMCA 230 and shall meet the efficiency requirements of Table C403.9 and Section C403.9.1.

TABLE C403.9
CEILING FAN EFFICIENCY REQUIREMENTS[a]
(This table is intended to be a restatement of the legally binding provisions found in Title 10 CFR Part 430 included here as a convenience to the users of this code)

Equipment Type	Minimum Efficiency[b,c]	Test procedure
Large-diameter ceiling fan for applications outside the U.S.[c]	CFEI ≥ 1.00 at high (maximum) speed CFEI ≥ 1.31 at 40% of high speed or the nearest speed that is not less than 40% of high speed	10 CFR 430 Appendix U or AMCA Standard 230 and AMCA Standard 208 (for FEI calculations)
Large-diameter ceiling fan	CFEI ≥ 1.00 at high (maximum) speed; and CFEI ≥ 1.31 at 40% of high speed or the nearest speed that is not less than 40% of high speed	10 CFR 430 Appendix U

a. The minimum efficiency requirements at both high speed and 40% of maximum speed shall be met or exceeded to comply with this code.
b. Ceiling fans are regulated as consumer products by 10 CFR 430.
c. Chapter 6 contains a list of the referenced standards, which include test procedures, including the reference year version of the test procedure.

C403.9.1 Ceiling Fan Energy Index (CFEI). The Ceiling Fan Energy Index shall be calculated as the ratio of the electric input power of a reference large-diameter ceiling fan to the electric input power of the actual large-diameter ceiling fan as calculated in accordance with AMCA 208 with the following modifications to the calculations for the reference fan: using an airflow constant (Q) of 26,500 cfm (12.507 m3/s), a pressure constant (P) of 0.0027 in. of water (0.6719 Pa), and fan efficiency constant (η) of 42 percent.

EC 07-0142

Add new:

C403.10 Buildings with High-Capacity Space-Heating Gas Boiler Systems. Gas hot-water boiler systems for space heating with system input capacity capacities of not less than 1,000,000 Btu/h (293 kW) but not more and not greater than 10,000,000 Btu/h (2931 kW) in new *buildings* shall comply with Sections C403.10.1 and C403.10.2.

Exceptions:

1. Where 25 percent of the annual space heating requirement is provided by on-site renewable energy, site-recovered energy, or heat recovery chillers.
2. Space heating boilers installed in individual dwelling units.
3. Where 50 percent or more of the design heating load is served using perimeter convective heating, radiant ceiling panels, or both.
4. Individual gas boilers with input capacity less than 300,000 Btu/h (87 kW) shall not be included in the calculations of the total system input or total system efficiency.

C403.10.1 Boiler Efficiency Gas hot-water boilers shall have a thermal efficiency (Et) of not less than 90 percent where rated in accordance with the test procedures in Table C403.3.2(6). Systems with multiple boilers are allowed to meet this requirement where the space heating input provided by equipment with thermal efficiency (Et) above or below 90 percent provides an input capacity-weighted average thermal efficiency of not less than 90 percent. For boilers rated only for combustion efficiency, the calculation for the input capacity-weighted average thermal efficiency shall use the combustion efficiency value.

C403.10.2 Hot-Water Distribution System Design The hot-water distribution system shall be designed to meet the following:

1. Coils and other heat exchangers shall be selected so that at design conditions the hot water return temperature entering the boilers is 120°F (48.9ºC) or less.
2. Under all operating conditions, the water temperature entering the boiler is not greater than 120°F (48.9ºC), or the flow rate of supply hot water that recirculates directly into the return system, such as by three-way valves or minimum flow bypass controls, shall be no greater than 20 percent of the design flow of the boilers.

EC 07-0143

Add new:

C403.11.6 Heat recovery for space conditioning in healthcare facilities. Where heated water is used for space heating, a heat pump chiller meeting the requirements of Table C403.3.2(15) for heat recovery that uses the cooling system return water as the heat source shall be installed where the following are true:

1. The building is a Group I-2 Condition 2 occupancy.

2. The total design chilled water capacity for the Group I-2 Condition 2 occupancy, either air cooled or water cooled, required at cooling design conditions exceeds 3,600,000 Btu/h (1,100 kw) of cooling.

3. Simultaneous heating, including reheat, and cooling occurs above 60°F (16°C) outdoor air temperature.

The heat recovery system shall have a cooling capacity of not less than 7 percent of the total design chilled water capacity of the Group I-2 Condition 2 occupancy at peak design conditions.

Exception: Buildings that provide 60 percent or more of their reheat energy from *on-site renewable energy* or other site-recovered energy. *On-site renewable energy* used to meet Sections C405.15.1 or C406.3.1 shall not be used to meet this exception.

EC 07-0042

This provision includes multiple changes as described in each subheading.

Delete entirely the following two Tables and replace them with a new Table C403.12.1 (found below):

~~**TABLE C403.10.1(1)**~~
~~**MINIMUM EFFICIENCY REQUIREMENTS: COMMERCIAL REFRIGERATION**~~

~~**TABLE C403.10.1(2)**~~
~~**MINIMUM EFFICIENCY REQUIREMENTS: COMMERCIAL REFRIGERATORS AND FREEZERS**~~

Revise as follows:

~~**C403.10**~~ **C403.12 Refrigeration equipment performance.** Refrigeration equipment ~~shall have an energy use in kWh/day not greater than the values of Tables C403.10.1(1) and C403.10.1(2) when tested and rated in accordance with AHRI Standard 1200.~~ performance shall be determined in accordance with Sections C403.11.1 and C403.11.2 for commercial refrigerators, freezers, refrigerator-freezers, walk-in coolers, walk-in freezers and refrigeration equipment. The energy use shall be verified through certification under an *approved* certification program or, where a certification program does not exist, the energy use shall be supported by data furnished by the equipment manufacturer.

Exception: Walk-in coolers and walk-in freezers regulated under federal law in accordance with Subpart R of DOE 10 CFR 431.

Revise as follows:

[NY] ~~**C403.10.1**~~ **C403.12.1** ~~**Walk-in coolers, walk-in freezers, refrigerated warehouse coolers and refrigerated warehouse freezers (Mandatory).**~~ **Commercial refrigerators, refrigerator-freezers and refrigeration.** Refrigeration equipment, defined in DOE 10 CFR Part 431.62, shall have an energy use in kWh/day not greater than the values ~~of Table C403.11.1~~ established in the same regulation when tested and rated in accordance with AHRI Standard 1200. The applicable table is reproduced for convenience in Table C403.11.1. ~~*Refrigerated warehouse coolers* and refrigerated warehouse freezers shall comply with this section. Walk-in coolers and walk-in freezers that are neither site assembled nor site constructed shall comply with the following:~~

~~1. Be equipped with automatic door closers that firmly close walk-in doors that have been closed to within 1 inch (25 mm) of full closure. Exception: Automatic closers are not required for doors more than 45 inches (1143 mm) in width or more than 7 feet (2134 mm) in height.~~

~~2. Doorways shall have strip doors, curtains, spring hinged doors or other method of minimizing infiltration when doors are open.~~

~~3. Walk-in coolers and refrigerated warehouse coolers shall contain wall, ceiling, and door insulation of not less than R-25 and walk-in freezers and refrigerated warehouse freezers shall contain wall, ceiling and door insulation of not less than R-32. Exception: Glazed portions of doors or structural members need not be insulated.~~

~~4. Walk-in freezers shall contain floor insulation of not less than R-28.~~

~~5. Transparent reach-in doors for walk-in freezers and windows in walk-in freezer doors shall be of triple-pane glass, either filled with inert gas or with heatreflective treated glass.~~

~~6. Windows and transparent reach-in doors for walk-in coolers shall be of doublepane or triple-pane, inert gas-filled, heat-reflective treated glass.~~

~~7. Evaporator fan motors that are less than 1 hp (0.746 kW) and less than 460 volts shall use electronically commutated motors, brushless direct- current motors, or 3-phase motors.~~

~~8. Condenser fan motors that are less than 1 hp (0.746 kW) shall use electronically commutated motors, permanent split capacitor-type motors or 3-phase motors.~~

~~9. Where antisweat heaters without antisweat heater controls are provided, they shall have a total door rail, glass and frame heater power draw of not more than 7.1 W/ft2 (76 W/m2) of door opening for walk-in freezers and 3.0 W/ft2 (32 W/m2) of door opening for walk-in coolers .~~

~~10. Where antisweat heater controls are provided, they shall reduce the energy use of the antisweat heater as a function of the relative humidity in the air outside the door or to the condensation on the inner glass pane.~~

~~11. Lights in walk-in coolers, walk-in freezers, refrigerated warehouse coolers and refrigerated warehouse freezers shall either use light sources with an efficacy of not less than 40 lumens per watt, including ballast losses, or shall use light sources with an efficacy of not less than 40 lumens per watt, including ballast losses, in conjunction with a device that turns off the lights within 15 minutes when the space is not occupied.~~

Add new:

[NY] TABLE C403.12.1
MINIMUM EFFICIENCY REQUIREMENTS: COMMERCIAL REFRIGERATORS AND FREEZERS AND REFRIGERATION

(This table is intended to be a restatement of the legally binding provisions found in DOE 10 CFR Part 431.62 included as a convenience to the users of this code)

EQUIPMENT CATEGORY	CONDENSING UNIT CONFIGURATION	EQUIPMENT FAMILY	RATING TEMP., °F	OPERATING TEMP., °F	EQUIPMENT CLASSIFICATION[a, c]	MAXIMUM DAILY ENERGY CONSUMPTION, kWh/day[d, e]	TEST STANDARD
		Vertical open (VOP)	38 (M)	≥ 32	VOP.RC.M	0.64 × TDA + 4.07	
			0 (L)	< 32	VOP.RC.L	2.20 × TDA + 6.85	
		Semivertical open (SVO)	38 (M)	≥ 32	SVO.RC.M	0.66 × TDA + 3.18	
			0 (L)	< 32	SVO.RC.L	2.20 × TDA + 6.85	
		Horizontal open (HZO)	38 (M)	≥ 32	HZO.RC.M	0.35 × TDA + 2.88	
			0 (L)	< 32	HZO.RC.L	0.55 × TDA + 6.88	
			38 (M)	≥ 32	VCT.RC.M	0.15 × TDA + 1.95	

Remote condensing commercial refrigerators and commercial freezers	Remote (RC)	Vertical closed transparent (VCT)	0 (L)	< 32	VCT.RC.L	0.49 × TDA + 2.61	AHRI 1200
		Horizontal closed transparent (HCT)	38 (M)	≥ 32	HCT.RC.M	0.16 × TDA + 0.13	
			0 (L)	< 32	HCT.RC.L	0.34 × TDA + 0.26	
		Vertical closed solid (VCS)	38 (M)	≥ 32	VCS.RC.M	0.10 × V + 0.26	
			0 (L)	< 32	VCS.RC.L	0.21 × V + 0.54	
		Horizontal closed solid (HCS)	38 (M)	≥ 32	HCS.RC.M	0.10 × V + 0.26	
			0 (L)	< 32	HCS.RC.L	0.21 × V + 0.54	
		Service over counter (SOC)	38 (M)	≥ 32	SOC.RC.M	0.44 × TDA + 0.11	
			0 (L)	< 32	SOC.RC.L	0.93 × TDA + 0.22	
Self-contained commercial refrigerators and commercial freezers with and without doors	Self-contained(SC)	Vertical open (VOP)	38 (M)	≥ 32	VOP.SC.M	1.69 × TDA + 4.71	AHRI 1200
			0 (L)	< 32	VOP.SC.L	4.25 × TDA + 11.82	
		Semivertical open (SVO)	38 (M)	≥ 32	SVO.SC.M	1.70 × TDA + 4.59	
			0 (L)	< 32	SVO.SC.L	4.26 × TDA + 11.51	
		Horizontal open (HZO)	38 (M)	≥ 32	HZO.SC.M	0.72 × TDA + 5.55	
			0 (L)	< 32	HZO.RC.L	1.90 × TDA + 7.08	
		Vertical closed transparent (VCT)	38 (M)	≥ 32	VCT.SC.M	0.10 × V + 0.86	
			0 (L)	< 32	VCT.SC.L	0.29 × V + 2.95	
		Vertical closed solid (VCS)	38 (M)	≥ 32	VCS.SC.M	0.05 × V + 1.36	
			0 (L)	< 32	VCS.SC.L	0.22 × V + 1.38	
		Horizontal closed transparent (HCT)	38 (M)	≥ 32	HCT.SC.M	0.06 × V + 0.37	
			0 (L)	< 32	HCT.SC.L	0.08 × V + 1.23	
		Horizontal closed solid (HCS)	38 (M)	≥ 32	HCS.SC.M	0.05 × V + 0.91	
			0 (L)	< 32	HCS.SC.L	0.06 × V + 1.12	
		Service over counter (SOC)	38 (M)	≥ 32	SOC.SC.M	0.52 × TDA + 1.00	
			0 (L)	< 32	SOC.SC.L	1.10 × TDA + 2.10	
Self-contained commercial refrigerators with transparent doors for pull-down temperature applications	Self-contained(SC)	Pull-down (PD)	38 (M)	≥ 32	PD.SC.M	0.11 × V + 0.81	AHRI 1200
Commercial ice cream freezers	Remote (RC)	Vertical open (VOP)	-15 (I)	≤ -5[b]	VOP.RC.I	2.79 × TDA + 8.70	AHRI 1200
		Semivertical open (SVO)			SVO.RC.I	2.79 × TDA + 8.70	
		Horizontal open (HZO)			HZO.RC.I	0.70 × TDA + 8.74	
		Vertical closed transparent (VCT)			VCT.RC.I	0.58 × TDA + 3.05	
		Horizontal closed transparent (HCT)			HCT.RC.I	0.40 × TDA + 0.31	
		Vertical closed solid (VCS)			VCS.RC.I	0.25 × V + 0.63	
		Horizontal closed solid (HCS)			HCS.RC.I	0.25 × V + 0.63	
		Service over counter (SOC)			SOC.RC.I	1.09 × TDA + 0.26	
	Self-contained(SC)	Vertical open (VOP)			VOP.SC.I	5.40 × TDA + 15.02	AHRI 1200
		Semivertical open (SVO)			SVO.SC.I	5.41 × TDA + 14.63	
		Horizontal open (HZO)			HZO.SC.I	2.42 × TDA + 9.00	
		Vertical closed transparent (VCT)			VCT.SC.I	0.62 × TDA + 3.29	
		Horizontal closed transparent (HCT)			HCT.SC.I	0.56 × TDA + 0.43	
		Vertical closed solid (VCS)			VCS.SC.I	0.34 × V + 0.88	

		Horizontal closed solid (HCS)			HCS.SC.I	0.34 × V + 0.88
		Service over counter (SOC)			SOC.SC.I	1.53 × TDA + 0.36

For SI: 1 square foot = 0.0929 m^2, 1 cubic foot = 0.02832 m^3, °C = (°F – 32)/1.8.

a. The meaning of the letters in this column is indicated in the columns to the left.
b. Ice cream freezer is defined in DOE 10 CFR 431.62 as a commercial freezer that is designed to operate at or below -5 °F and that the manufacturer designs, markets or intends for the storing, displaying or dispensing of ice cream.
c. Equipment class designations consist of a combination [in sequential order separated by periods (AAA).(BB).(C)] of the following:
   - (AAA)—An equipment family code (VOP = vertical open, SVO = semivertical open, HZO = horizontal open, VCT = vertical closed transparent doors, VCS = vertical closed solid doors, HCT = horizontal closed transparent doors, HCS = horizontal closed solid doors, and SOC = service over counter);
   - (BB)—An operating mode code (RC = remote condensing and SC = self-contained); and
   - (C)—A rating temperature code [M = medium temperature (38°F), L = low temperature (0°F), or I = ice cream temperature (-15°F)].
   - For example, "VOP.RC.M" refers to the "vertical open, remote condensing, medium temperature" equipment class.
d. V is the volume of the case (ft^3) as measured in AHRI 1200, Appendix C.
e. TDA is the total display area of the case (ft^2) as measured in AHRI 1200, Appendix D.

Revise as follows:

~~**C403.10.2**~~**C403.12.2 Walk-in coolers and walk-in freezers ~~(Mandatory)~~.** *Walk-in cooler* and *walk-in freezer* refrigeration systems, except for walk-in process cooling refrigeration systems as defined in DOE 10 CFR 431.302, shall meet the requirements of Tables C403.11.2.1(1), C403.11.2.1(2), and C403.11.2.1(3). ~~Site-assembled or site-constructed *walk-in coolers* and *walk-in freezers* shall comply with the following:~~

~~1. Automatic door closers shall be provided that fully close walk-in doors that have been closed to within 1 inch (25 mm) of full closure.~~

~~**Exception:** Closers are not required for doors more than 45 inches (1143 mm) in width or more than 7 feet (2134 mm) in height.~~

~~2. Doorways shall be provided with strip doors, curtains, spring-hinged doors or other method of minimizing infiltration when the doors are open.~~

~~3. Walls shall be provided with insulation having a thermal resistance of not less than R-25, ceilings shall be provided with insulation having a thermal resistance of not less than R-25 and doors of walk-in coolers and walk-in freezers shall be provided with insulation having a thermal resistance of not less than R-32. Exception: Insulation is not required for glazed portions of doors or at structural members associated with the walls, ceiling or door frame.~~

~~4. The floor of walk-in freezers shall be provided with insulation having a thermal resistance of not less than R-28.~~

~~5. Transparent reach-in doors for and windows in opaque walk-in freezer doors shall be provided with triple-pane glass having the interstitial spaces filled with inert gas or provided with heat-reflective treated glass.~~

~~6. Transparent reach-in doors for and windows in opaque walk-in cooler doors shall be double-pane heat-reflective treated glass having the interstitial space gas filled.~~

~~7. Evaporator fan motors that are less than 1 hp (0.746 kW) and less than 460 volts shall be electronically commutated motors or 3-phase motors.~~

~~8. Condenser fan motors that are less than 1 hp (0.746 kW) in capacity shall be of the electronically commutated or permanent split capacitor-type or shall be 3-phase motors. Exception: Fan motors in walk-in coolers and walk-in freezers combined in a single enclosure greater than 3,000 square feet (279 m2) in floor area are exempt.~~

~~9. Antisweat heaters that are not provided with anti-sweat heater controls shall have a total door rail, glass and frame heater power draw not greater than 7.1 W/ft2 (76 W/m2) of door opening for walk-in freezers , and not greater than 3.0 W/ft2 (32 W/m2) of door opening for walk-in coolers .~~

~~10. Antisweat heater controls shall be configured to reduce the energy use of the antisweat heater as a function of the relative humidity in the air outside the door or to the condensation on the inner glass pane.~~

~~11. Light sources shall have an efficacy of not less than 40 lumens per Watt, including any ballast losses, or shall be provided with a device that automatically turns off the lights within 15 minutes of when the walk-in cooler or walk-in freezer was last occupied.~~

Revise as follows:

~~**C403.10.2.1**~~**C403.12.2.1 Performance standards ~~(Mandatory)~~.** ~~Effective January 1, 2020, walk-in~~ *Walk-in coolers* and *walk-in freezers* shall meet the requirements of ~~Tables C403.10.2.1(1), C403.10.2.1(2) and C403.10.2.1(3).~~ Tables C403.11.2.1(1), C403.11.2.1(2) and C403.11.2.1(3).

EC 07-0144

Revise as follows:

TABLE ~~C403.10.2.1(1)~~C403.12.2.1(1)
WALK-IN COOLER AND FREEZER DISPLAY DOOR EFFICIENCY REQUIREMENTS[a]

CLASS DESCRIPTOR	CLASS	MAXIMUM ENERGY CONSUMPTION (kWh/day)[a]	TEST PROCEDURE
Display door, medium temperature	DD, M	$0.04 \times A_{dd} + 0.41$	10 CFR 431
Display door, low temperature	DD, L	$0.15 \times A_{dd} + 0.29$	10 CFR 431

a. A_{dd} is the surface area of the display door.

TABLE ~~C403.10.2.1(2)~~C403.12.2.1(2)
WALK-IN COOLER AND FREEZER NONDISPLAY DOOR EFFICIENCY REQUIREMENTS[a]

CLASS DESCRIPTOR	CLASS	MAXIMUM ENERGY CONSUMPTION (kWh/day)[a]	TEST PROCEDURE
Passage door, medium temperature	PD, M	$0.05 \times A_{nd} + 1.7$	10 CFR 431
Passage door, low temperature	PD, L	$0.14 \times A_{nd} + 4.8$	10 CFR 431
Freight door, medium temperature	FD, M	$0.04 \times A_{nd} + 1.9$	10 CFR 431
Freight door, low temperature	FD, L	$0.12 \times A_{nd} + 5.6$	10 CFR 431

a. A_{nd} is the surface area of the nondisplay door.

EC 07-0043

Revise as follows:

TABLE ~~C403.10.2.1(3)~~ C403.11.2.1(3)
WALK-IN COOLER AND FREEZER REFRIGERATION SYSTEM EFFICIENCY REQUIREMENTS

CLASS DESCRIPTOR	CLASS	MINIMUM ANNUAL WALK-IN ENERGY FACTOR AWEF (Btu/W-h)[a]	Test Procedure
Dedicated condensing, medium temperature, indoor system	DC.M.I	5.61	AHRI 1250
~~Dedicated condensing, medium temperature, indoor system, > 9,000 Btu/h capacity~~	~~DC.M.I, > 9,000~~	~~5.61~~	
Dedicated condensing, medium temperature, outdoor system	DC.~~M.I~~M.O	7.60	
~~Dedicated condensing, medium temperature, outdoor system, > 9,000 Btu/h capacity~~	~~DC.M.I, > 9,000~~	~~7.6~~	
Dedicated condensing, low temperature, indoor system, net capacity (q_{net}) < 6,500 Btu/h	DC.L.I, < 6,500	9.091 × 10-5 × qnet + 1.81	
Dedicated condensing, low temperature, indoor system, net capacity (q_{net}) ≥ 6,500 Btu/h	DC.L.I, ≥ 6,500	2.40	
Dedicated condensing, low temperature, outdoor system, net capacity (q_{net}) < 6,500 Btu/h	DC.L.O, < 6,500	6.522 × 10-5 × qnet + 2.73	
Dedicated condensing, low temperature, outdoor system, net capacity (qnet) ≥ 6,500 Btu/h	DC.L.O, ≥ 6,500	3.15	
Unit cooler, medium	UC.M	9.00	

Unit cooler, low temperature, net capacity (qnet) < 15,500 Btu/h	UC.L, < 15,500	1.575 × 10-5 × qnet + 3.91	
Unit cooler, low temperature, net capacity (qnet) ≥ 15,500 Btu/h	UC.L, ≥ 15,500	4.15	

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

a. q_{net} is net capacity (Btu/h) as determined in accordance with AHRI 1250.

EC 07-0044

Delete:

~~**C403.10.3 Refrigerated display cases (Mandatory).** Site-assembled or site-constructed refrigerated display cases shall comply with the following:~~

~~1. Lighting and glass doors in refrigerated display cases shall be controlled by one of the following:~~

~~1.1 Time-switch controls to turn off lights during nonbusiness hours. Timed overrides for display cases shall turn the lights on for up to 1 hour and shall automatically time out to turn the lights off.~~

~~1.2 Motion sensor controls on each display case section that reduce lighting power by not less than 50 percent within 3 minutes after the area within the sensor range is vacated.~~

~~2. Low-temperature display cases shall incorporate temperature-based defrost termination control with a time limit default. The defrost cycle shall terminate first on an upper temperature limit breach and second upon a time limit breach.~~

~~3. Antisweat heater controls shall reduce the energy use of the antisweat heater as a function of the relative humidity in the air outside the door or to the condensation on the inner glass pane.~~

EC 07-0045

Revise as follows:

[NY] ~~C403.11.1~~ C403.13.1 **Duct and plenum insulation and sealing ~~(Mandatory)~~.** Supply and return air ducts and plenums shall be insulated with not less than R-6 insulation where located in unconditioned spaces and where located outside the building with not less than R-8 insulation in ~~*Climate Zones* 1 through~~ *Climate Zone* 4 and not less than R-12 insulation in *Climate Zones* 5 ~~through 8~~ and 6. Ducts located underground beneath buildings shall be insulated as required in this section or have an equivalent thermal distribution efficiency. Underground ducts utilizing the thermal distribution efficiency method shall be *listed* and *labeled* to indicate the *R*-value equivalency. Where located within a *building thermal envelope* assembly, the duct or plenum shall be separated from the building exterior or unconditioned or exempt spaces by not less than R-8 insulation in ~~*Climate Zones* 1 through~~ *Climate Zone* 4 and not less than R-12 insulation in *Climate Zones* 5 ~~through 8~~ and 6.

Exceptions:

1. Where located within equipment.
2. Where the design temperature difference between the interior and exterior of the duct or plenum is not greater than 15°F (8°C).

Ducts, air handlers and filter boxes shall be sealed. Joints and seams shall comply with Section 603.9 of the *Mechanical Code of New York State*.

EC 07-0145

Revise as follows:

~~**C403.11.3**~~ C403.13.3 **Piping insulation ~~(Mandatory)~~.**

Piping serving as part of a heating or cooling system shall be thermally insulated in accordance with Table ~~C403.11.3~~ C403.12.3(1) or TableC403.13.3(2).

Exceptions:

1. Factory-installed piping within HVAC equipment tested and rated in accordance with a test procedure referenced by this code.
2. 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.

3. Piping that conveys fluids that have a design operating temperature range between 60°F (15°C) and 105°F (41°C).
4. Piping that conveys fluids that have not been heated or cooled through the use of fossil fuels or electric power.
5. Strainers, control valves, and balancing valves associated with piping 1 inch (25 mm) or less in diameter.
6. Direct buried piping that conveys fluids at or below 60°F (15°C).
7. In radiant heating systems, sections of piping intended by design to radiate heat.

Revise as follows:

TABLE ~~C403.11.3~~ C403.13.3(1)

MINIMUM PIPE INSULATION THICKNESS (in inches OR R value)[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	Inches R Value	< 1	1 to < 1 1/2	1 1/2 to < 4	4 to < 8	☐ 8
				Minimum Insulation Thickness (inches)				
> 350	0.32 – 0.34	250	Inches	4.5	5.0	5.0	5.0	5.0
			R Value	R32	R36	R34	R26	R21
251 – 350	0.29 – 0.32	200	Inches	3.0	4.0	4.5	4.5	4.5
			R Value	R20	R29	R32	R24	R20
201 – 250	0.27 – 0.30	150	Inches	2.5	2.5	2.5	3.0	3.0
			R Value	R17	R17	R17	R15	R13
141 – 200	0.25 – 0.29	125	Inches	1.5	1.5	2.0	2.0	2.0
			R Value	R9	R9	R11	R10	R9
105 – 140	0.21 – 0.28	100	Inches	1.0	1.0	1.5	1.5	1.5
			R Value	R5	R9	R8	R8	R7
40 – 60	0.21 – 0.27	75	Inches	0.5	0.5	1.0	1.0	1.0
			R Value	R2	R2	R5	R5	R4
< 40	0.20 – 0.26	50	Inches	0.5	1.0	1.0	1.0	1.5
			R Value	R6	R9	R9	R8	R7

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

a. For piping smaller than $1\frac{1}{2}$ 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 1-1/2 inches (38 mm) shall be permitted (before thickness adjustment required in footnote b but not to thicknesses less than 1 inch.

Add new:

TABLE C403.13.3(2)
MINIMUM PIPE INSULATION R-Value[a]

FLUID OPERATING TEMPERATURE RANGE AND USAGE (°F)	NOMINAL PIPE OR TUBE SIZE (inches)				
	<1	1 TO <1 1/2	1 1/2 TO <4	4 TO <8	≥8
	Minimum Insulation R-Value				
>350	R32	R36	R34	R26	R21
251-350	R20	R29	R32	R24	R20
201-250	R17	R17	R17	R15	R13
141-200	R9	R9	R11	R10	R9
105-140	R5	R9	R8	R8	R7
40-60	R2	R2	R5	R5	R4
≤40	R6	R9	R9	R8	R7

For SI: R-1 = RSI-0.176228, °C = [(°F)-32]/1.8.

a. The R-value of cylindrical piping insulation shall be determined as follows:

$$R=(ro(\ln(ro/ri)))/k$$

where:

R = The interior R-value of the cylindrical piping insulation in Btu x ft2 x °F/h

ro = The outer radius of the piping insulation in inches

ri = The inner radius of the piping insulation in inches

k = the thermal conductivity of the insulation material in Btu x in/h x ft2 x °F

EC 07-0146

Revise as follows:

~~C403.11.3.1~~C403.13.3.1 **Protection of piping insulation ~~(Mandatory)~~.** Piping insulation exposed to the weather shall be protected from physical damage, including that caused by sunlight, moisture, equipment maintenance and wind~~, and~~. The protection shall provide shielding from solar radiation that can cause degradation of the material. The protection shall be removable and reusable for not less than 6 inches (150 mm) from the connection to the equipment piping for maintenance. Adhesive tape shall not be permitted as a means of insulation protection.

EC 07-0147

Add new:

C403.14.3 Roof and gutter deicing controls. Roof and gutter deicing systems, including but not limited to self-regulating cable, shall include automatic controls that are configured to shut off the system when the outdoor temperature is above 40°F (4°C) and that include one of the following:

1. A moisture sensor configured to shut off the system in the absence of moisture, or
2. A daylight sensor or other means configured to shut off the system between sunset and sunrise.

EC 07-0148

Add new:

C403.15 Dehumidification in spaces for plant growth and maintenance. Equipment that dehumidifies indoor grow and greenhouse spaces shall be one or more of the following:

1. Dehumidifiers tested in accordance with the test procedure listed in DOE 10 CFR 430 and DOE 10 CFR 430, Subpart B, Appendix X or X1.
2. Integrated HVAC system with on-site heat recovery designed to fulfill not less than 75 percent of the annual energy for dehumidification reheat;
3. Chilled water system with on-site heat recovery designed to fulfill not less than 75 percent of the annual energy for dehumidification reheat; or

4. Solid or liquid desiccant dehumidification system for system designs that require dewpoint of not more than 50°F (10°C).

C403.16 Service Water Pressure-Booster Systems. Service water pressure-booster systems shall be designed such that the following apply:

1. One or more pressure sensors shall be used to vary pump speed and/or start and stop pumps. The sensors shall either be located near the critical fixtures that determine the pressure required, or logic shall be employed that adjusts the set point to simulate operation of remote sensors.
2. No devices shall be installed for the purpose of reducing the pressure of all of the water supplied by any booster system pump or booster system, except for safety devices.
3. No booster system pumps shall operate when there is no service water flow.

C403.17 Clean water pumps. Clean water pumps meeting all the following criteria shall achieve a PEI rating not greater than 1.0:

1. Shaft input power is greater than or equal to 1.0 hp (0.75 kW) and less than or equal to 200 hp (149.1 kW) at its BEP.
2. Designated as either an End suction Close-coupled, End Suction Frame Mounted, In-line, Radially Split Vertical, or Submersible Turbine pump.
3. A flow rate of 25 gal/min (1.58 L/s) or greater at its best efficiency point (BEP) at full impeller Diameter.
4. Maximum head of 459 ft at its BEP at full impeller diameter and the number of stages required for testing.
5. Design temperature range from 14°F (-10°C) to 248°F (120°C).
6. Designed to operate with either:
    - 6.1 A 2- or 4-pole induction motor, or
    - 6.2 a non-induction motor with a speed of rotation operating range that includes speeds of rotation between 2880 and 4320 rpm and/or 1440 and 2160 rpm, and
    - 6.3 in either (1) or (2), the driver and impeller must rotate at the same speed.
7. For submersible turbine pumps, a 6 inches (152 mm) or smaller bowl diameter.
8. For end-suction close-coupled pumps and end-suction frame-mounted/own bearings pumps, specific speed less than or equal to 5000 rpm when calculated using U.S. customary units.

Exceptions: The following pumps are exempt from these requirements:

1. Fire pumps
2. Self-priming pumps
3. Prime-assisted pumps
4. Magnet-driven pumps
5. Pumps designed to be used in a nuclear facility subject to 10 CFR 50, “Domestic Licensing of Production and Utilization Facilities.”
6. Pumps meeting the design and construction requirements set forth in U.S. Military Specification MIL-P-17639F, “Pumps, Centrifugal, Miscellaneous Service, Naval Shipboard Use” (as amended); MIL-P-17881D, “Pumps, Centrifugal, Boiler Feed, (Multi- Stage)” (as amended); MIL-P-17840C, “Pumps, Centrifugal, Close-Coupled, Navy Standard (For Surface Ship Application)” (as amended); MIL-P-18682D, “Pump, Centrifugal, Main Condenser Circulating, Naval Shipboard” (as amended); MIL-P-18472G, “Pumps, Centrifugal, Condensate, Feed Booster, Waste Heat Boiler, And Distilling Plant” (as amended).

EC 07-0149

Replace table in its entirety as follows:

~~**TABLE C404.2**~~
~~**MINIMUM PERFORMANCE OF WATER-HEATING EQUIPMENT**~~

[NY] TABLE C404.2
MINIMUM PERFORMANCE OF WATER-HEATING EQUIPMENT

(This table is intended to be a restatement of the legally binding provisions found in Title 10 CFR Parts 430 & 431 included here as a convenience to the users of this code)

EQUIPMENT TYPE	SIZE CATEGORY	SUBCATEGORY OR RATING CONDITION	DRAW PATTERN	PERFORMANCE REQUIRED[a]	TEST PROCEDURE[b]
Electric Table-top water heaters[c]	≤12 kW	≥ 20 gal ≤ 120 gal[d]	Very small Low Medium High	UEF ≥ 0.6323 - (0.0058 × Vr) UEF ≥ 0.9188 - (0.0031 × Vr) UEF ≥ 0.9577 - (0.0023 × Vr) UEF ≥ 0.9884 - (0.0016 × Vr)	DOE 10 CFR Part 430 App. E
Electric Storage water heaters[e,f]: resistance and heat pump	≤12 kW	≥ 20 gal ≤ 55 gal[f]	Very small Low Medium High	UEF ≥ 0.8808 - (0.0008 × Vr) UEF ≥ 0.9254 - (0.0003 × Vr) UEF ≥ 0.9307 - (0.0002 × Vr) UEF ≥ 0.9349 - (0.0001 × Vr)	DOE 10 CFR Part 430 App. E
	≤12 kW	> 55 gal ≤120 gal[f]	Very small Low Medium High	UEF ≥ 1.9236 - (0.0011 × Vr) UEF ≥ 2.0440 - (0.0011 × Vr) UEF ≥ 2.1171 - (0.0011 × Vr) UEF ≥ 2.2418 - (0.0011 × Vr)	DOE 10 CFR Part 430 App. E
Electric Storage water heaters[e,f,l]	> 12 kW	-	-	(0.3 + 27/Vm), %h	DOE 10 CFR 431.106 App B
Grid-enabled water heaters[g]	-	>75 gal [d]	Very small Low Medium High	UEF ≥ 1.0136 - (0.0028 × Vr) UEF ≥ 0.9984 - (0.0014 × Vr) UEF ≥ 0.9853 - (0.0010 × Vr) UEF ≥ 0.9720 - (0.0007 × Vr)	10 CFR 430 Appendix E
Electric Instantaneous water heaters[h,l]	≤12 kW	< 2 gal[d]	Very small Low Medium High	UEF ≥ 0.91 UEF ≥ 0.91 UEF ≥ 0.91 UEF ≥ 0.92	DOE 10 CFR Part 430
	>12 kW & ≤ 58.6 kWi	≤ 2 gal & ≤180°F	All	UEF ≥ 0.80	DOE 10 CFR Part 430

Gas Storage water heaters[e,l]	≤ 75,000 Btu/h	20 gal & ≤ 55 gal[d]	Very small Low Medium High	UEF ≥ 0.3456 - (0.0020 × Vr) UEF ≥ 0.5982 - (0.0019 × Vr) UEF ≥ 0.6483 - (0.0017 × Vr) UEF ≥ 0.6920 - (0.0013 × Vr)	DOE 10 CFR Part 430 App. E
	≤ 75,000 Btu/h	> 55 gal & ≤ 100 gal[d]	Very small Low Medium High	UEF ≥ 0.6470 - (0.0006 × Vr) UEF ≥ 0.7689 - (0.0005 × Vr) UEF ≥ 0.7897 - (0.0004 × Vr) UEF ≥ 0.8072 - (0.0003 × Vr)	DOE 10 CFR Part 430 App. E
	> 75,000 Btu/h and ≤ 105,000 Btu/h [j,k]	≤ 120 gal & ≤180°F	Very small Low Medium High	UEF ≥ 0.2674-0.0009 x Vr UEF ≥ 0.5362-0.0012 x Vr UEF ≥ 0.6002-0.0011 x Vr UEF ≥ 0.6597-0.0009 x Vr	DOE 10 CFR Part 430 App. E
	> 105,000 Btu/h[k]	-	-	80% Et SL ≤ (Q/800 +110√V), Btu/h	DOE 10 CFR 431.106
Gas Instantaneous water heaters[i]	> 50,000 Btu/h and < 200,000 Btu/h[k]	< 2 gal[d]	Very small Low Medium High	UEF ≥ 0.80 UEF ≥ 0.81 UEF ≥ 0.81 UEF ≥ 0.81	DOE 10 CFR Part 430 App. E
	≥ 200,000 Btu/h[k]	< 10 gal	-	80% Et	DOE 10 CFR 431.106
	≥ 200,000 Btu/h[k]	≥10 gal	-	80% Et SL ≤ (Q/800 +110√V), Btu/h	

Oil Storage water heaters[e,l]	≤ 105,000 Btu/h	≤ 50 gal[d]	Very small Low Medium High	UEF = 0.2509 - (0.0012 × Vr) UEF = 0.5330 - (0.0016 × Vr) UEF = 0.6078 - (0.0016 × Vr) UEF = 0.6815 - (0.0014 × Vr)	DOE 10 CFR Part 430
	> 105,000 Btu/h and ≤ 140,000 Btu/h[l]	≤ 120 gal & ≤180°F	Very small Low Medium High	UEF ≥ 0.2932-0.0015 x Vr UEF ≥ 0.5596-0.0018 x Vr UEF ≥ 0.6194-0.0016 x Vr UEF ≥ 0.6740-0.0013 x Vr	DOE 10 CFR Part 430 App. E
	>140,000 Btu/h	All	-	80% Et SL ≤ (Q/800 +110√V), Btu/h	DOE 10 CFR 431.106
Oil Instantaneous water heaters[h,l]	≤ 210,000 Btu/h	< 2 gal	-	80% Et EF ≥ 0.59 - 0.0005 x V	DOE 10 CFR Part 430 App. E
	> 210,000 Btu/h	< 10 gal	-	80% Et	DOE 10 CFR 431.106
	> 210,000 Btu/h	≥ 10 gal	-	78% Et SL ≤ (Q/800 +110√V), Btu/h	DOE 10 CFR 431.106
Hot water supply boilers, gas and oil[h]	≥300,000 Btu/h and < 12,500,000 Btu/h	< 10 gal	-	80% Et	DOE 10 CFR 431.106
Hot water supply boilers, gas[i,l]	≥300,000 Btu/h and < 12,500,000 Btu/h	≥ 10 gal	-	80% Et SL ≤ (Q/800 +110√V), Btu/h	DOE 10 CFR 431.106
Hot water supply boilers, oil[h,l]	≥300,000 Btu/h and < 12,500,000 Btu/h	≥ 10 gal	-	78% Et SL ≤ (Q/800 +110√V), Btu/h	DOE 10 CFR 431.106
Pool heaters, gas[d]	All	-[f]	-	82% Et	DOE 10 CFR Part 430 App. P
Heat pump pool heaters	All	50°F db 44.2°F wb outdoor air 80.0°F entering water	-	4.0 COP	DOE 10 CFR Part 430 App. P
Unfired storage tanks	All	-	-	Minimum insulation requirement R-12.5 (hft2-°F)/Btu	(none)

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

a. Thermal efficiency (Et) is a minimum requirement, while standby loss is a maximum requirement. In the standby loss equation, V is the rated volume in gallons and Q is the nameplate input rate in Btu/h. Vm is the measured volume in the tank in gallons. Standby loss for electric water heaters is in terms of %/h and denoted by the term "S," and standby loss for gas and oil water heaters is in terms of Btu/h and denoted by the term "SL" Draw pattern (DP) refers to the water draw profile in the Uniform Energy Factor (UEF) test. UEF and Energy Factor (EF) are minimum requirements. In the UEF standard equations, Vr refers to the rated volume in gallons.

b. Chapter 6 contains a list of the referenced standards, which include test procedures, including the reference year version of the test procedure.

c. A tabletop water heater is a storage water heater that is enclosed in a rectangular cabinet with a flat top surface not more than three feet (0.91 m) in height and has a ratio of input capacity (Btu/h) to tank volume (gal) < 4000.

d. Water heaters or gas pool heaters in this category are regulated as consumer products by the USDOE as defined in 10 CFR 430.

e. Storage water heaters have a ratio of input capacity (Btu/h) to tank volume (gal)<4000.

f. Efficiency requirements for electric storage water heaters ≤ 12 kW apply to both electric resistance and heat pump water heaters. There are no minimum efficiency requirements for electric heat pump water heaters greater than 12kW or for gas heat pump water heaters.

g. A grid-enabled water heater is an electric resistance water heater that meets all of the following:

1. Has a rated storage tank volume of more than 75 gallons (284 L).
2. Is manufactured on or after April 16, 2015.
3. Is equipped at the point of manufacture with an activation lock.
4. Bears a permanent label applied by the manufacturer that complies with all of the following:
   - 4.1 Is made of material not adversely affected by water.
   - 4.2 Is attached by means of non-water soluble adhesive.
   - 4.3 Advises purchasers 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 a 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."

h. Instantaneous water heaters and hot water supply boilers have an input capacity (Btu/h) divided by storage volume (gal) ≥ 4000 Btu/h-gal.

i. Electric instantaneous water heaters with input capacity >12 kW and ≤58.6 kW that have either (1) a storage volume > gal (7.6L); or (2) is designed to provide outlet hot water at temperatures greater than 180°F(82oC); or (3) uses three-phase power has no efficiency standard.

j. Gas storage water heaters with input capacity >75,000 Btu/h (21.98 kW) and ≤105,000 Btu/h (30.77 kW) must comply with the requirements for the >105,000 Btu/h (30.77 kW) if the water heater either (1) has a storage volume >120 gal (454L); (2) is designed to provide outlet hot water at temperatures greater than 180°F (82oC); or (3) uses three-phase power.

k. Refer to Section C404.2.1 for additional requirements for gas storage and instantaneous water heaters and gas hot-water supply boilers.

l. Water heaters and hot water supply boilers with more than 140 gallons (530L) of storage capacity need not meet the standby loss requirement if: (1) The tank surface area is thermally insulated to R-12.5 or more; (2) there is no standing pilot light; and (3) for gas or oil-fired storage water heaters, the heater is equipped with a fire damper or fan-assisted combustion.

EC 07-0150

Revise as follows:

C404.2.1 High input service water-heating systems. Gas-fired ~~water-heating equipment~~ *water heaters* installed in new buildings where the total input capacity provided by *high-capacity gas-fired water heaters* is 1,000,000 Btu/h (293 kW) or greater shall ~~be in compliance~~ comply with ~~this section~~either or both of the following requirements. ~~Where a singular piece of water-heating equipment serves the entire building and the input rating of the equipment is 1,000,000 Btu/h (293 kW) or greater, such equipment shall have a thermal efficiency, E_t, of not less than 90 percent. Where multiple pieces of water-heating equipment serve the building and the combined input rating of the water-heating equipment is 1,000,000 Btu/h (293 kW) or greater, the combined input-capacity-weighted-average thermal efficiency, E_t, shall be not less than 90 percent.~~

1. Where a singular piece of *high-capacity gas-fired water heater* is installed, the *water heater* shall have a thermal efficiency, Et, of not less than 92 percent.

2. Where multiple pieces of *high-capacity gas-fired service water-heaters* equipment are connected to the same service water-heating system, the combined input-capacity-weighted- average thermal efficiency, Et, shall not be less than 90 percent and a minimum of 30 percent of the input to the *high-capacity gas-fired water heaters* in the service water-heating system shall have a thermal efficiency of not less than 92 percent.

Exceptions:

~~1. Where not less than 25 percent of the annual *service water-heating* requirement is provided by *on-site renewable energy* or site-recovered energy, the minimum thermal efficiency requirements of this section shall not apply.~~

~~2~~1. The input rating of water heaters installed in individual *dwelling unit*s shall not be required to be included in the total input rating of *service water-heating* equipment for a building.

~~3~~2. The input rating of water heaters with an input rating of not greater than ~~100,000~~105,000 Btu/h (~~29.3~~30.8 kW) shall not be required to be included in the total input rating of *service water-heating* equipment for a building.

3. Where not less than 25 percent of the annual service water heating requirement is provided by *on-site renewable energy* or site-recovered energy, the minimum thermal efficiency requirements of this section shall not apply. *On-site renewable energy* used to meet Sections C405.15.1 or C406.3.1 shall not be used to meet this exception.

EC 07-0151

C404.4 ~~Insulation of piping~~ Service water heating system piping insulation. ~~Piping from a water heater to the termination of the heated water fixture supply pipe shall be insulated in accordance with Table C403.11.3C403.12.3. On both the inlet and outlet piping of a storage water heater or heated water storage tank, the piping to a heat trap or the first 8 feet (2438 mm) of piping, whichever is less, shall be insulated. Piping that is heat traced shall be insulated in accordance with Table C403.11.3C403.12.3 or the heat trace manufacturer's instructions. Tubular pipe insulation shall be installed in accordance with the insulation manufacturer's instructions. Pipe insulation shall be continuous except where the piping passes through a framing member. The minimum insulation thickness requirements of this section shall not supersede any greater insulation thickness requirements necessary for the protection of piping from freezing temperatures or the protection of personnel against external surface temperatures on the insulation.~~ Service water heating system piping shall be surrounded by uncompressed insulation. The wall thickness of the insulation shall be not less than the thickness shown in Table C404.4.1. Where the insulation thermal conductivity is not within the range in the table, the following equation shall be used to calculate the minimum insulation thickness:

$$t = r * [(1 + t_{table}/r)\, k_{alt}/k_{upper} - 1]$$

(Equation 4-11)

t_{alt} = minimum insulation thickness of the alternate material (in.) (mm) (Equation 4-11)
r = actual outside radius of pipe (in.) (mm)
t_{table} = insulation thickness listed in this table for applicable fluid temperature and pipe size
k_{alt} = thermal conductivity of the alternate material at mean rating temperature indicated for the applicable fluid temperature [Btu · in/h · ft2 · °F] [W(m · °C)]
k_{upper} = the upper value of the thermal conductivity range listed in this table for the applicable fluid temperature [Btu · in/h · ft2 · °F] [W (m · °C)]
For nonmetallic piping thicker than Schedule 80 and having thermal resistance greater than that of steel pipe, reduced insulation thicknesses are permitted if documentation is provided showing that the pipe with the proposed insulation has no more heat transfer per foot (meter) than a steel pipe of the same size with the insulation thickness shown in the table.

Exception: Tubular pipe insulation shall not be required on the following:

1. ~~The tubing from the connection at the termination of the fixture supply piping to a plumbing fixture or plumbing appliance.~~ Factory-installed piping within water heaters and hot water storage tanks.
2. Valves, pumps, and strainers ~~and threaded unions~~ in piping that is not greater than 1 inch (25 mm) ~~or less~~ in nominal diameter.
3. Piping that conveys hot water that has not been heated through the use of fossil fuels or electricity.

~~3~~4. Piping from user-controlled shower and bath mixing valves to the water outlets.

~~4~~5. Cold-water piping of a *demand recirculation water system*.

~~5. Tubing from a hot drinking water heating unit to the water outlet.~~

6. Piping in existing buildings where alterations are made to existing service water heating systems where there is insufficient space or access to meet the requirements.

~~6~~7. Piping at locations where a vertical support of the piping is installed.

8. Where piping passes through a framing member if it requires increasing the size of the framing member.
~~7. Piping surrounded by building insulation with a thermal resistance (*R value*) of not less than R-3.~~

C404.4.1 Installation requirements. The following piping shall be insulated per the requirements of this section:

1. Recirculating system piping, including the supply and return piping
2. The first 8 feet (2.4m) of outlet piping from:
   - 2.1 Storage water heaters
   - 2.2 Hot water storage tanks
   - 2.3 Any water heater and hot water supply boiler containing not less than 10 gallons (37.9 L) of water heated by a direct heat source, an indirect heat source, or both a direct heat source and an indirect heat source.
3. The first 8 feet (2.4m) of branch piping connecting to recirculated, heat traced, or impedance heated piping.
4. The make-up water inlet piping between heat traps and the storage water heaters and the storage tanks they are serving, nonrecirculating service water heating storage system.
5. Hot water piping between multiple water heaters, between multiple hot water storage tanks, and between water heaters and hot water storage tanks.
6. Piping that is externally heated (such as heat trace or impedance heating).
7. For direct-buried service water heating system piping, reduction of these thicknesses by 1.5 inches (38.1 mm) shall be permitted (before thickness adjustment required in Section C404.4) but not to thicknesses less than 1 in (25.4 mm).

TABLE C404.4.1
MINIMUM PIPING INSULATION THICKNESS FOR SERVICE WATER HEATING SYSTEMS[a]

Service Hot-water Temperature Range	Insulation Thermal Conductivity		Nominal Pipe or Tube Size, in.				
	Conductivity, Btu-in/h-ft2-°F	Mean Rating Temperature,°F	≤1	1 to <1-1/2	1-1/2 to <4	4 to <8	≥8
			Insulation Thickness, in.				
105°F to 140°F	0.22 to 0.28	100	1.0	1.0	1.5	1.5	1.5
>140°F to 200°F	0.25 to 0.29	125	1.0	1.0	2.0	2.0	2.0
>200°F	0.27 to 0.30	150	1.5	1.5	2.5	3.0	3.0

a. These thicknesses are based on energy efficiency considerations only. Additional insulation may be necessary for safety.

EC 07-0046

Add new:

TABLE C404.5.2.1
INTERNAL VOLUME OF VARIOUS WATER DISTRIBUTION TUBING

OUNCES OF WATER PER FOOT OF TUBE									
Nominal Size (inches)	Copper Type M	Copper Type L	Copper Type K	CPVC CTS SDR 11	CPVC SCH 40	CPVC SCH 80	PE- RT SDR 9	Composite ASTM F1281	PEX CTS SDR 9
3/8	1.06	0.97	0.84	N/A	1.17	—	0.64	0.63	0.64
1/2	1.69	1.55	1.45	1.25	1.89	1.46	1.18	1.31	1.18
3/4	3.43	3.22	2.90	2.67	3.38	2.74	2.35	3.39	2.35
1	5.81	5.49	5.17	4.43	5.53	4.57	3.91	5.56	3.91
11/4	8.70	8.36	8.09	6.61	9.66	8.24	5.81	8.49	5.81
11/2	12.18	11.83	11.45	9.22	13.20	11.38	8.09	13.88	8.09
2	21.08	20.58	20.04	15.79	21.88	19.11	13.86	21.48	13.86

For SI: 1 foot = 304.8 mm, 1 inch = 25.4 mm, 1 liquid ounce = 0.030 L, 1 oz/f2t =305.15 g/m^2. N/A = Not Available.

EC 07-0047

Revise as follows:

C404.5.2.1 Water volume determination. The volume shall be the sum of the internal volumes of pipe, fittings, valves, meters and manifolds between the nearest source of heated water and the termination of the fixture supply pipe. The volume in the piping shall be determined from the "Volume" column in Table C404.5.1 or from Table C404.5.2.1. The volume contained within fixture shutoff valves, within flexible water supply connectors to a fixture fitting and within a fixture fitting shall not be included in the water volume determination. Where heated water is supplied by a recirculating system or heat-traced piping, the volume shall include the portion of the fitting on the branch pipe that supplies water to the fixture.

EC 07-0152

Revise as follows:

C404.6.1 Circulation systems. Heated-water circulation systems shall be provided with a circulation pump. Gravity and thermo-syphon circulation systems are prohibited. 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~~. Controls shall be configured to ~~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. Where a circulation pump serves multiple risers or piping zones, controls shall include self-actuating thermostatic balancing valves or another means of flow control to automatically balance the flow rate through each riser or piping zone.

EC 07-0048

Revise as follows:

~~**C404.7**~~ **C404.6.1.1 Demand recirculation controls.** *Demand recirculation water systems* shall have controls that ~~comply with both of the following:~~ 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 hot or tempered water to a fixture fitting or appliance.

~~1. 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 hot or tempered water to a fixture fitting or appliance.~~

~~2. The controls shall limit the temperature of the water entering the cold water piping to not greater than 104°F (40°C).~~

EC 07-0153

Revise as follows:

~~**C404.9.3**~~ **C404.8.3 Covers.** Outdoor heated pools and outdoor permanent spas shall be provided with a vapor-retardant cover or other *approved* vapor-retardant means.

Exception: Where more than 75 percent of the energy for heating, computed over an operating season of not fewer than 3 calendar months, is from ~~site recovered energy such as from~~ a heat pump or an on-site renewable energy system, covers or other vapor-retardant means shall not be required. *On-site renewable energy* used to meet Sections C405.15.1 or C406.3.1 shall not be used to meet this exception.

EC 07-0154

Add new:

C404.10 Demand responsive water heating. Electric storage water heaters with a rated water storage volume of 40 gallons (150L) to 120 gallons (450L) and a nameplate input rating equal to or less than 12kW shall be provided with demand responsive controls in accordance with Table C404.10.

Exceptions:

1. Water heaters that provide a hot water delivery temperature of 180°F (82°C) or greater.
2. Water heaters that comply with Section IV, Part HLW or Section X of the ASME Boiler and Pressure Vessel Code.
3. Water heaters that use 3-phase electric power.

TABLE C404.10
DEMAND RESPONSIVE CONTROLS FOR WATER HEATING

Equipment Type	Controls	
	Manufactured before 7/1/2025	Manufactured on or after 7/1/2025
Electric storage Water heaters	AHRI Standard 1430 or ANSI/CTA-2045-B Level 1 and also capable of initiating water heating to meet the temperature set point in response to a *demand response signal*.	AHRI Standard 1430

EC 07-0156

Revise as follows:

C405.1 General ~~(Mandatory)~~. ~~This section covers lighting system controls, the maximum lighting power for interior and exterior applications and electrical energy consumption~~ Electrical power and lighting systems and generation shall comply with this section. General lighting shall consist of all lighting included when calculating the total connected interior lighting power in accordance with Section C405.3.1 and which does not require specific application controls in accordance with Section C405.2.5.

~~*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. Lighting installed in walk-in coolers, *walk-in freezers*, refrigerated warehouse coolers and refrigerated warehouse freezers shall comply with the lighting requirements of Section C403.10.1 or C403.10.2.~~

Exception: Dwelling units and sleeping units that comply with Section C405.2.10, Section C405.3.3 and Section C405.6.

C405.2 Lighting controls ~~(Mandatory)~~. Lighting systems in *interior parking areas* shall be provided with controls that comply with Section C405.2.9. All other lighting systems powered through the energy service for the *building* and building site lighting for which the *building owner* is responsible shall be provided with controls that comply with Sections C405.2.1 through C405.2.8. ~~shall be provided with controls that comply with one of the following:~~

~~1. Lighting controls as specified in Sections C405.2.1 through C405.2.6.~~
~~2. Luminaire level lighting controls (LLLC) and lighting controls as specified 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 or dim lighting when occupied or unoccupied, respectively.~~
~~2.2. Monitoring ambient light, both electric light and daylight, and brighten or dim artificial light to maintain desired light level.~~
~~2.3. For each control strategy, configuration 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:

1. ~~Areas designated as security or emergency areas that are required to be continuously lighted.~~ Spaces where an automatic shutoff could endanger occupant safety or security.
2. Interior exit stairways, interior exit ramps and exit passageways.
3. Emergency ~~egress~~ lighting that is automatically off during normal operations.

4. Emergency lighting required by the *Building Code of New York State* in exit access components which are not provided with fire alarm systems.
5. Up to 0.02 watts per square foot (0.06 W/m2) of lighting in exit access components which are provided with fire alarm systems.

[NY] 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. Computer room , data center
~~2~~3. Conference/meeting/multipurpose rooms.
~~3~~4. Copy/print rooms.
~~4~~5. Lounges/breakrooms.
6. Dining areas.
~~6~~7. Medical supply room in a healthcare facility.
~~5~~8. Enclosed offices.
~~8~~9. Laundry/washing area.
~~6~~10. Open plan office areas.
~~7~~11. Restrooms.
~~8~~12. Storage rooms.
13. Telemedicine room in a healthcare facility.
~~9~~14. Locker rooms.
~~10~~15. ~~Other spaces 300 square feet (28 m^2) or less that are enclosed by floor-to-ceiling height partitions~~ Corridors/ transition areas.
~~11~~16. Warehouse storage areas.
~~12~~17. Other spaces 300 square feet (28 m2) or less that are enclosed by floor-to-ceiling height partitions.

Exception: Luminaires that are required to have specific application controls in accordance with Section C405.2.5.

[NY] C405.2.1.1 Occupant sensor control function. Occupant sensor controls in ~~warehouses~~warehouse storage areas 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 in corridors shall comply with Section C405.2.1.4. Occupant sensor control function for egress illumination shall comply with Section C405.2.1.5. 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.
3. They shall incorporate a manual control to allow occupants to turn off lights.

   Exception: Full automatic-on controls with no manual control shall be permitted ~~to control lighting~~ in ~~public corridors,~~ interior parking areas, stairways, restrooms, ~~primary building entrance areas and lobbies,~~ locker rooms, lobbies, library stacks and areas where manual ~~on~~ operation would endanger ~~the safety or security of the room or building occupants~~ occupant safety or security.

EC 07-0049

Revise as follows:

C405.2.1.2 Occupant sensor control function in ~~warehouses.~~warehouse storage areas. Lighting in warehouse storage areas shall be controlled as follows: ~~In warehouses, the lighting in aisleways and open areas shall be controlled with occupant sensors that automatically reduce lighting power by not less than 50 percent when the areas are unoccupied. The occupant sensors shall control lighting in each aisleway independently and shall not control lighting beyond the aisleway being controlled by the sensor.~~

1. Lighting in each aisleway shall be controlled independently of lighting in all other aisleways and open areas.
2. Occupant sensors shall automatically reduce lighting power within each controlled area to an unoccupied setpoint of not more than 50 percent within 20 minutes after all occupants have left the controlled area.
3. Lights that are not turned off by occupant sensors shall be turned off by time-switch control complying with Section C405.2.2.1.

4. A manual control shall be provided to allow occupants to turn off lights in the space.

EC 07-0050

Revise as follows:

C405.2.1.3 Occupant sensor control function in open plan office areas. Occupant sensor controls in open plan office spaces less than 300 square feet (28 m^2) in area shall comply with Section C405.2.1.1. Occupant sensor controls in all other open plan office spaces shall comply with all of the following:

1. The controls shall be configured so that *general lighting* can be controlled separately in control zones with floor areas not greater than 600 square feet (55 m^2) within the open plan office space.
2. *General lighting* in each control *zone* shall be permitted to automatically turn on upon occupancy within the control *zone*. *General lighting* in other unoccupied *zones* within the open plan office space shall be permitted to turn on to not more than 20 percent of full power or remain unaffected.
~~2.~~ 3. The controls shall automatically turn off *general lighting* in all control *zones* within 20 minutes after all occupants have left the open plan office space.

Exception: Where *general lighting* is turned off by time-switch control complying with Section C405.2.2.1.

~~3.~~ 4. ~~The controls shall be configured so that *general lighting* power~~ *General lighting* in each control *zone* ~~is reduced by not less than 80 percent of the full *zone general lighting* power in a reasonably uniform illumination pattern within 20 minutes of all occupants leaving that control *zone*. Control functions that switch control *zone* lights completely off when the *zone* is vacant meet this requirement.~~ shall turn off or uniformly reduce lighting power to an unoccupied setpoint of not more than 20 percent of full power within 20 minutes after all occupants have left the control *zone*.

~~4. The controls shall be configured such that any daylight responsive control will activate open plan office space *general lighting* or control *zone general lighting* only when occupancy for the same area is detected.~~

EC 07-0051

Add new:

C405.2.1.4 Occupant sensor control function in corridors. Occupant sensor controls in corridors shall uniformly reduce lighting power to not more than 50 percent of full power within 20 minutes after all occupants have left the space.

Exception: Corridors provided with less than two footcandles of illumination on the floor at the darkest point with all lights on.

[NY] C405.2.1.5 Occupant sensor control function for egress illumination. In new buildings, luminaires serving the exit access and providing means of egress illumination required by Section 1008.1 of the *Building Code of New York State*, including luminaires that function as both normal and emergency means of egress illumination, operating under normal conditions, shall be controlled by a combination of listed emergency relay and occupancy sensors, or by a signal from another building control system that automatically reduces the lighting power by 50 percent when unoccupied for longer than 15 minutes.

Exceptions:

1. Means of egress illumination serving the exit access that does not exceed 0.02 watts per square foot of building area.
2. Emergency lighting designated to meet Section 1008.3 of the *Building Code of New York State* operating under emergency conditions, including luminaires that function as both normal and emergency means of egress illumination.

EC 07-0157

Revise as follows:

C405.2.2 Time-switch controls. 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:~~

Exceptions:

1. Luminaires that are required to have specific application controls in accordance with Section C405.2.4.
2. Spaces where patient care is directly provided.
3. ~~Spaces where an automatic shutoff would endanger occupant safety or security.~~
4. ~~Lighting intended for continuous operation.~~
5. ~~Shop and laboratory classrooms.~~

C405.2.2.1 Time-switch control function. ~~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 con*trols* shall ~~include an override switching device that complies with~~ comply with all of the following:

1. Programmed to automatically turn off lights when the space is scheduled to be unoccupied.
2. Have a minimum 7-day clock.
3. Be capable of being set for seven different day types per week.
4. 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.
5. Have program backup capabilities, which prevent the loss of program and time settings for not fewer than 10 hours, if power is interrupted.
6. Include an override switch that complies with the following:
   6.1 The override switch shall be a manual control.
   6.2 The override switch, when initiated, shall permit the controlled lighting to remain on for not more than 2 hours.
   6.3 Any individual override switch shall control the lighting for an area not larger than 5,000 square feet (465 m^2).
7. For spaces where schedules are not available, time switch controls are programmed to a schedule that turns lights off not less than 12 hours per day.

~~Exceptions~~ **Exception:** Within mall concourses, auditoriums, sales areas, manufacturing facilities and sports arenas:

1. The time limit shall be permitted to be greater than 2 hours, provided that the switch is a captive key device.
2. The area controlled by 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).

EC 07-0158

Add new:

C405.2.3 Dimming controls. Dimming controls complying with Section C405.2.3.1 are required for general lighting in the following space types:

1. Classroom / lecture hall / training room.
2. Conference / multipurpose / meeting room.
3. In a dining area for bar/lounge or leisure, family dining.
4. Laboratory.
5. Lobby.
6. Lounge/ Break room.
7. Offices.
8. Gymnasium/ fitness center.
9. Library reading room.
10. In a health care facility for imaging rooms, exam rooms, nursery, and nurses' station.
11. Spaces not provided with occupant sensor controls complying with Section C405.2.1.1.

Exception:

Luminaires controlled by special application controls complying with Section C405.2.5.

EC 07-0159

Revise as follows:

[NY] ~~**C405.2.2.2**~~**C405.2.3.1** ~~Light reduction~~ **Dimming controls** ~~**function**~~**.** Spaces required to have ~~light reduction~~ dimming controls shall ~~have a~~ be provided with *manual* controls that allow~~s the occupant to reduce the connected lighting load in a reasonably uniform illumination pattern by not less than~~ lights to be dimmed from full output to ~~50~~ 10 percent of full power or lower with continuous dimming, as well as turning lights off. *Manual* control shall be provided within each room to dim lights. ~~Lighting reduction shall be achieved by one of the following or another approved method:~~

~~1. Controlling all lamps or luminaires.~~
~~2. Dual switching of alternate rows of luminaires, alternate luminaires or alternate lamps.~~
~~3. Switching the middle lamp luminaires independently of the outer lamps~~.
~~4. Switching each luminaire or each lamp.~~

~~**Exception:** Light reduction controls are not required in *daylight zones* with *daylight responsive controls* complying with Section C405.2.3.~~

Exception: *Manual* dimming control is not required in spaces where *high-end trim* lighting controls are provided which comply with the following:

1. The calibration adjustment equipment is located for ready access only by authorized personnel.
2. Lighting controls with ready access for users cannot increase the lighting power above the maximum level established by the high-end trim controls.

~~**C405.2.3**~~**C405.2.4 Daylight-responsive controls.** *Daylight-responsive controls* complying with Section ~~C405.2.3.1~~ C405.2.4.1 shall be provided to control the ~~electric lights~~ *general lighting* within *daylight zones* in the following spaces:

1. Spaces with a total of more than 75 watts of *general lighting* within primary sidelit *daylight zones* complying with Section C405.2.4.2.
2. Spaces with a total of more than 150 watts of *general lighting* within sidelit *zone*s complying with Section ~~C405.2.3.2~~C405.2.4.2 ~~*General lighting* does not include lighting that is required to have specific application control in accordance with Section C405.2.4~~.

3. Spaces with a total of more than ~~150~~75 watts of *general lighting* within toplit *daylight zone*s complying with Section ~~C405.2.3.3~~ C405.2.4.3.

Exceptions: *Daylight-responsive controls* are not required for the following:

1. Spaces in health care facilities where patient care is directly provided.
2. ~~Lighting that is required to have specific application control in accordance with Section C405.2.4.~~
2. Sidelit *daylight zone*s on the first floor above grade in Group A-2 and Group M occupancies.
3. ~~New buildings where the total connected lighting power calculated in accordance with Section C405.3.1 is not greater than the adjusted interior lighting power allowance (LPA_{adj}) calculated in accordance with Equation 4-9:~~ Enclosed office spaces less than 250 square feet (23.2 m2).

~~$$LPA_{adj} = [LPA_{norm} \times (1.0 - 0.4 \times UDZFA / TBFA)]$$~~ **~~(Equation 4-9)~~**

~~where:~~

~~LPA_{adj} = Adjusted building interior lighting power allowance in watts.~~

~~LPA_{norm} = Normal building lighting power allowance in watts calculated in accordance with Section C405.3.2 and reduced in accordance with Section C406.3 where Option 2 of Section C406.1 is used to comply with the requirements of Section C406.~~

~~*UDZFA* = Uncontrolled daylight *zone* floor area is the sum of all sidelit and toplit *zones*, calculated in accordance with Sections C405.2.3.2 and C405.2.3.3, that do not have daylight responsive controls.~~

~~*TBFA* = Total building floor area is the sum of all floor areas included in the lighting power allowance calculation in Section C405.3.2.~~

EC 07-0052

Revise as follows:

[NY] ~~**C405.2.3.1**~~ **C405.2.4.1 Daylight-responsive control function.** Where required, *daylight-responsive controls* shall be provided within each space for control of lights in that space and shall comply with all of the following:

1. Lights in toplit *daylight zones* in accordance with Section ~~C405.2.3.3~~ C405.2.4.3 shall be controlled independently of lights in sidelit *daylight zones* in accordance with Section ~~C405.2.3.2~~ C405.2.4.2.

2. Lights in the primary sidelit *daylight zone* shall be controlled independently of lights in the secondary sidelit *daylight zone*.

~~2.~~ 3. *Daylight-responsive controls* within each space shall be configured so that they can be calibrated from within that space by authorized personnel.

~~3.~~ 4. Calibration mechanisms shall be in a location with *ready access*.

~~4.~~ 5. *Daylight-responsive controls* shall dim lights continuously from full ~~*design*~~ light ~~power~~ output to ~~40~~ 15 percent of full ~~design~~ light output ~~power~~ or lower.

~~5.~~ 6. *Daylight-responsive controls* shall be configured to completely shut off all controlled lights.

7. When *occupant sensor controls* have reduced the lighting power to an unoccupied setpoint in accordance with Sections C405.2.1.2 through C405.2.1.4, *daylight-responsive controls* shall continue to adjust electric light levels in response to available daylight, but shall be configured to not increase the lighting power above the specified unoccupied setpoint.

~~6.~~ 8. Lights in sidelit *daylight zones* in accordance with Section ~~C405.2.3.2~~ C405.2.4.2 facing different cardinal orientations [within 45 degrees (0.79 rad) of due north, east, south, west] shall be controlled independently of each other.

~~**Exception:** Up to 150 watts of lighting in each space is permitted to be controlled together with lighting in a *daylight zone* facing a different cardinal orientation.~~

Exceptions:

1. Within each space, up to 100 watts of lighting within the primary sidelit *daylight zone* is permitted to be controlled together with lighting in a primary sidelit *daylight zone* facing a different cardinal orientation.

2. Within each space, up to 100 watts of lighting within the secondary sidelit *daylight zone* is permitted to be controlled together with lighting in a secondary sidelit *daylight zone* facing a different cardinal orientation.

EC 07-0160

Revise as follows:

~~C405.2.3.2~~C405.2.4.2 **Sidelit daylight zone.** The sidelit *daylight zone* is the floor area adjacent to vertical *fenestration* that complies with all of the following:

1. Where the fenestration is located in a wall, the primary sidelit *daylight zone* shall extend laterally to the nearest full-height wall, or up to 1.0 times the height from the floor to the top of the fenestration, and longitudinally from the edge of the fenestration to the nearest full-height wall, or up to ~~2 feet (610 mm)~~ 0.5 times the height from the floor to the top of the fenestration, whichever is less, as indicated in Figure ~~C405.2.3.2~~ C405.2.4.2(1).
2. Where the fenestration is located in a rooftop monitor, the primary sidelit *daylight zone* shall extend laterally to the nearest obstruction that is taller than 0.7 times the ceiling height, or up to 1.0 times the height from the floor to the bottom of the fenestration, whichever is less, and longitudinally from the edge of the fenestration to the nearest obstruction that is taller than 0.7 times the ceiling height, or up to 0.25 times the height from the floor to the bottom of the fenestration, whichever is less, as indicated in Figures C405.2.4.2(2) and C405.2.4.2(3).
3. Where the fenestration is located in a wall secondary sidelit *daylight zone* is directly adjacent to the primary sidelit *daylight zone* and shall extend laterally to 2.0 times the height from the floor to the top of the fenestration or to the nearest full height wall, whichever is less, and longitudinally from the edge of the fenestration to the nearest full height wall, or up to 0.5 times the height from the floor to the top of the fenestration, whichever is less, as indicated in Figure C405.2.4.2(1).
4. The area of the fenestration is not less than 24 square feet (2.23 m^2).
5. The distance from the fenestration to any building or geological formation that would block *access* to daylight is greater than one-half of the height from the bottom of the fenestration to the top of the building or geologic formation.
6. The *visible transmittance* of the fenestration is not less than 0.20.
7. The projection factor (determined in accordance with Equation 4-5) for any overhanging projection that is shading the fenestration is not greater than 1.0 for fenestration oriented 45 degrees or less from true north and not greater than 1.5 for all other orientations.

~~C405.2.3.3~~C405.2.4.3 **Toplit daylight zone.** The *toplit daylight zone* is the floor area underneath a roof fenestration assembly that complies with all of the following:

1. The *toplit daylight zone* shall extend laterally and longitudinally beyond the edge of the roof fenestration assembly to the nearest obstruction that is taller than 0.7 times the ceiling height, or up to 0.7 times the ceiling height, whichever is less, as indicated in Figure C405.2.3.3(1).

~~2. Where the fenestration is located in a *rooftop monitor*, the toplit *zone* shall extend laterally to the nearest obstruction that is taller than 0.7 times the ceiling height, or up to 1.0 times the height from the floor to the bottom of the fenestration, whichever is less, and longitudinally from the edge of the fenestration to the nearest obstruction that is taller than 0.7 times the ceiling height, or up to 0.25 times the height from the floor to the bottom of the fenestration, whichever is less, as indicated in Figures C405.2.3.3(2) and C405.2.3.3(3).~~

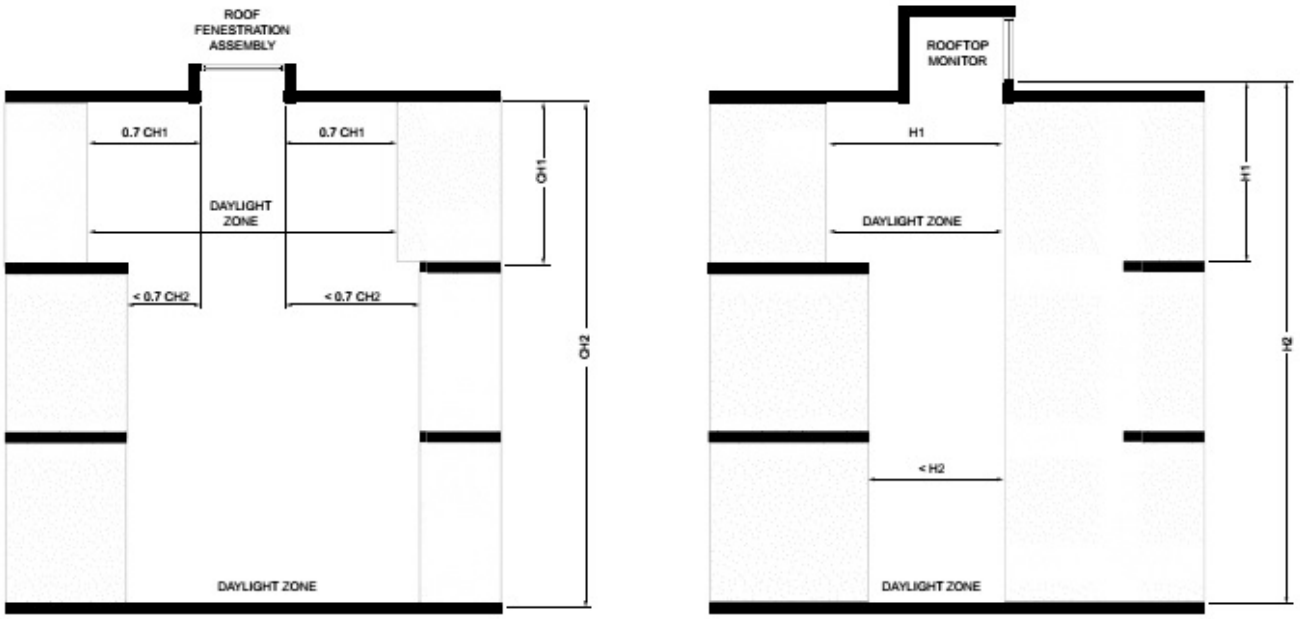
~~3~~2. Direct sunlight is not blocked from hitting the roof fenestration assembly at the peak solar angle on the summer solstice by buildings or geological formations.

~~4~~3. The product of the *visible transmittance* of the roof fenestration assembly and the area of the rough opening of the roof fenestration assembly divided by the area of the toplit *daylight zone* is not less than 0.008.

EC 07-0053

Add new:

C405.2.4.4 Atriums. *Daylight zones* at atrium spaces shall be established at the top floor surrounding the atrium and at the floor of the atrium space, and not on intermediate floors, as indicated in Figure C405.2.4.4.



(a) Section view of roof fenestration assembly at atrium

(b) Section view of roof monitor at atrium

FIGURE C405.2.4.4 DAYLIGHT ZONES AT A MULTISTORY ATRIUM

EC 07-0161

Revise as follows:

~~C405.2.4~~C405.2.5 **Specific application controls.** Specific application controls shall be provided for the following:

1. The following lighting shall be controlled by an occupant sensor complying with Section C405.2.1.1 or a time-switch control complying with Section C405.2.2.1. In addition, a manual control shall be provided to control such lighting separately from the *general lighting* in the space:
   1.1 Luminaires for which additional lighting power is claimed in accordance with Section C405.3.2.2.1.
   1.2 Display and accent lighting, including lighting in display cases.
   1.3 ~~Lighting in display cases~~ Supplemental task lighting, including permanently installed under-shelf or under-cabinet lighting.
   1.4 Lighting equipment that is for sale or demonstration in lighting education.
2. ~~*Sleeping units* shall have control devices or systems that are configured to automatically switch off all installed luminaires and switched receptacles within 20 minutes after all occupants have left the unit.~~
   ~~**Exceptions:**~~
   ~~1. Lighting and switched receptacles controlled by card key controls.~~
   ~~2. Spaces where patient care is directly provided.~~
3. Permanently installed luminaires within *dwelling units* shall be provided with controls complying with Section ~~C405.2.1.1 or C405.2.2.2~~ C405.2.3.1.
4. Lighting for nonvisual applications, such as plant growth and food warming, shall be controlled by a *Time switch control* complying with Section C405.2.2.1 that is independent of the controls for other lighting within the room or space.
5. Task lighting for medical and dental purposes that is in addition to general lighting shall be provided with a manual control.
6. Lighting integrated into range hoods and exhaust fans shall be controlled independently of fans.

~~C405.2.6~~C405.2.7 **Exterior lighting controls.** Exterior lighting systems shall be provided with controls that comply with Sections ~~C405.2.6.1~~ C405.2.7.1 through ~~C405.2.6.4~~C405.2.7.4. ~~Decorative lighting systems shall comply with Sections C405.2.6.1, C405.2.6.2 and C405.2.6.4.~~

Exceptions:

1. Lighting for ~~covered~~ vehicle entrances ~~and exits from~~to buildings ~~and parking structures~~ where required for eye adaptation.
2. Lighting controlled from within *dwelling unit*s.

~~**C405.2.6.2**~~**C405.2.7.2** ~~**Decorative lighting shutoff.**~~ **Building façade and landscape lighting.** Building facade and landscape lighting shall automatically shut off from not later than 1 hour after *building* or business closing to not earlier than 1 hour before *building* or business opening.

~~**C405.2.6.3**~~**C405.2.7.3** **Lighting setback.** Lighting that is not controlled in accordance with Section ~~C405.2.6.2~~C405.2.7.2 shall ~~be controlled so that the total wattage of such lighting is automatically reduced by not less than 30 percent by selectively switching off or dimming luminaires at one of the following times:~~ comply with the following:

1. ~~From not later than midnight to not earlier than 6 a.m.~~ Be controlled so that the total wattage of such lighting is automatically reduced by not less than 50 percent by selectively switching off or dimming luminaires at one of the following times:
   1.1. From not later than midnight to not earlier than 6 a.m.
   1.2. From not later than one hour after building or business closing to not earlier than one hour before building or business opening.
   1.3. During any time where activity has not been detected for 15 minutes or more.
2. ~~From not later than one hour after business closing to not earlier than one hour before business opening.~~ Luminaires serving exterior parking areas and having a rated input wattage of greater than 40 watts and a mounting height of 24 feet (7315 mm) or less above the ground shall be controlled so that the total wattage of such lighting is automatically reduced by not less than 50 percent during any time where activity has not been detected for 15 minutes or more. Not more than 1,500 watts of lighting power shall be controlled together.

~~3. During any time where activity has not been detected for 15 minutes or more.~~

~~4. Luminaires serving outdoor parking areas and having a rated input wattage of greater than 78 W and a mounting height of 24 ft or less above the ground shall be controlled to automatically reduce the power of each luminaire by a minimum of 50% when no activity has been detected in the area illuminated by the controlled luminaires for a time of no longer than 15 minutes. No more than 1500 W of lighting power shall be controlled together.~~

EC 07-0162

Add new:

C405.2.8 Demand responsive lighting controls. Interior general lighting in group B, E, M, and S occupancies shall have demand responsive controls complying with C405.2.8.1 in not less than 75 percent of the interior floor area.

Exceptions:

1. Where the combined interior floor area of group B, E, M, and S occupancies is less than 10,000 square feet.
2. Buildings where a demand response signal is not available from a controlling entity other than the owner.
3. Parking garages.
4. Ambulatory care facilities.
5. Outpatient clinics.
6. Physician or dental offices.

C405.2.8.1 Demand responsive lighting controls function. Demand responsive controls for lighting shall be capable of the following:

1. Automatically reducing the output of controlled lighting to 80 percent or less of full power or light output upon receipt of a demand response signal.
2. Where high end trim has been set, automatically reducing the output of controlled lighting to 80 percent or less of the high-end trim set point upon receipt of a demand response signal.
3. Dimming controlled lights gradually and continuously over a period of not longer than 15 minutes to achieve their demand response setpoint.
4. Returning controlled lighting to its normal operational settings at the end of the demand response period.

Exception: Storage rooms and warehouse storage areas shall be permitted to switch off 25 percent or more of *general lighting* power rather than dimming.

C405.2.9 Interior parking area lighting control. Interior parking area lighting shall be controlled by an *occupant sensor* complying with Section C405.2.1.1 or a *time-switch.*

control complying with Section C405.2.2.1. Additional lighting controls shall be provided as follows:

1. Lighting power of each luminaire shall be automatically reduced by not less than 30 percent when there is no activity detected within a lighting zone for 20 minutes. Lighting zones for this requirement shall be not larger than 3,600 square feet (334.5 m^2).

   Exception: Lighting zones provided with less than 1.5 footcandles of illumination on the floor at the darkest point with all lights on are not required to have automatic light-reduction controls.

2. Where lighting for eye adaptation is provided at vehicle entrances to buildings, such lighting shall be separately controlled by a device that automatically reduces lighting power by at least 50 percent from sunset to sunrise.
3. The power to luminaires within 20 feet (6096 mm) of perimeter wall openings shall automatically reduce in response to daylight by at least 50 percent.

   Exceptions:

   1. Where the opening-to-wall ratio is less than 40 percent as viewed from the interior and encompassing the vertical distance from the driving surface to the lowest structural element.
   2. Where the distance from the opening to any exterior daylight blocking obstruction is less than one-half the height from the bottom of the opening or fenestration to the top of the obstruction.
   3. Where openings are obstructed by permanent screens or architectural elements restricting daylight entering the interior space.

C405.2.10 Sleeping unit and dwelling unit lighting and switched receptacle controls. *Sleeping units* and *dwelling units* shall be provided with lighting controls and switched receptacles as specified in C405.2.10.1 and C405.2.10.2.

C405.2.10.1 Sleeping units and dwelling units in hotels, motels, and vacation timeshare properties. Sleeping units and *dwelling units* in hotels, motels and vacation timeshare properties shall be provided with the following:

1. Not less than two 125V, 15- and 20- amp switched receptacles in each room, except for bathrooms, kitchens, foyers, hallways, and closets.
2. Lighting controls that automatically turn off all lighting and switched receptacles within 20 minutes after all occupants have left the unit.

Exception: *Automatic* shutoff is not required where *captive key override* controls all lighting and switched receptacles in units with 5 or fewer permanently installed lights and switched receptacles.

C405.2.10.2 Sleeping units in congregate living facilities. *Sleeping units* in *congregate living facilities* shall be provided with the following controls:

1. Lighting in bathrooms shall be controlled by an *occupant sensor control* that automatically turns lights off within 20 minutes after all occupants have left the space.
2. Each unit shall have a *manual* control by the entrance that turns off all lighting and switched receptacles in the unit, except for lighting in bathrooms. The *manual* control shall be marked to indicate its function.

EC 07-0163

Revise as follows:

C405.3 Interior lighting power requirements ~~(Prescriptive)~~.
A building complies with this section where its total connected interior lighting power calculated under Section C405.3.1 is not greater than the interior lighting power allowance calculated under Section C405.3.2. *Sleeping units* and *dwelling units* shall comply with C405.3.3.

C405.3.1 Total connected interior lighting power. The total connected interior lighting power shall be determined in accordance with Equation 4-~~10~~9.

$$TCLP = [LVL + BLL + LED + TRK + \text{Other}] \qquad \textbf{(Equation 4-~~10~~9)}$$

where:

TCLP = Total connected lighting power (watts).
LVL = For luminaires with lamps connected directly to building power, such as line voltage lamps, the rated wattage of the lamp.
BLL = For luminaires incorporating a ballast or transformer, the rated input wattage of the ballast or transformer when operating that lamp.
LED = For light-emitting diode luminaires with either integral or remote drivers, the rated wattage of the luminaire.
TRK = For lighting track, cable conductor, rail conductor, and plug-in busway systems that allow the addition and relocation of luminaires without rewiring, the wattage shall be one of the following:
1. The specified wattage of the luminaires, but not less than 8 W per linear foot (25 W/lin m).
2. The wattage limit of the permanent current-limiting devices protecting the system.
3. The wattage limit of the transformer supplying the system.

Other = The wattage of all other luminaires and lighting sources not covered previously and associated with interior lighting verified by data supplied by the manufacturer or other *approved* sources.

The connected power associated with the following lighting equipment and applications is not included in calculating total connected lighting power.

~~1. Television broadcast lighting for playing areas in sports arenas.~~
~~2~~1. Emergency lighting automatically off during normal building operation.
~~3~~2. Lighting in spaces specifically designed for use by occupants with special lighting needs, including those with visual impairment and other medical and age-related issues.
~~4. Casino gaming areas.~~
~~5~~3. Mirror lighting in makeup or dressing ~~rooms~~areas used for video broadcasting, video or film recording, or live theatrical and music performance.
~~6~~4. Task lighting for medical and dental purposes that is in addition to *general lighting* ~~and controlled by an independent control device~~.
~~7~~5. Display lighting for exhibits in galleries, museums and monuments that is in addition to *general lighting* ~~and controlled by an independent control device~~.
~~8~~6. Lighting ~~for theatrical purposes, including performance, stage, film production and video production~~ in any location that is specifically used for video broadcasting, video or film recording, or live theatrical and music performance.
~~9~~7. Lighting for photographic processes.
~~10~~8. Lighting integral to equipment or instrumentation and installed by the manufacturer.
~~11~~9. Task lighting for plant growth or maintenance.
~~12~~10. Advertising signage or directional signage.
~~13~~11. Lighting for food warming.
~~14~~12. Lighting equipment that is for sale.
~~15~~13. Lighting demonstration equipment in lighting education facilities.
~~16~~14. Lighting approved because of safety considerations.
~~17~~15. Lighting in retail display windows, provided that the display area is enclosed by ceiling-height partitions.
~~18~~16. Furniture-mounted supplemental task lighting that is controlled by automatic shutoff.
~~19~~17. Exit signs.
~~20.~~18. Antimicrobial lighting used for the sole purpose of disinfecting a space.
19. Lighting in sleeping units and dwelling units.
20. For exit access and exit stairways, including landings, where the applicable code requires an illuminance of 10 footcandles or more on the walking surface, the power in excess of the allowed power calculated according to Section C405.3.2.2, is not included.

EC 07-0054

Revise as follows:

C405.3.2 Interior lighting power allowance. The total interior lighting power allowance (watts) ~~is~~ for an entire building shall be determined according to Table C405.3.2(1) using the Building Area Method or Table C405.3.2(2) using the Space-by-Space Method~~, for all areas of the building covered in this permit~~. The interior lighting power allowance for projects that involve only portions of a building shall be determined according to Table C405.3.2(2) using the Space-by-Space Method. Buildings with unfinished spaces shall use the Space-by-Space Method.

EC 07-0164

Revise as follows:

[NY] TABLE C405.3.2(1)
INTERIOR LIGHTING POWER ALLOWANCES:
BUILDING AREA METHOD

BUILDING AREA TYPE	LPD (w/ft^2)
Automotive facility	~~0.71~~0.64
Convention center	~~0.76~~0.64
Courthouse	~~0.90~~0.74
Dining: bar lounge/leisure	~~0.90~~0.69
Dining: cafeteria/fast food	~~0.79~~0.66
Dining: family	~~0.78~~0.61
Dormitory[a, b]	~~0.61~~0.52
Exercise center	0.65
Fire station[a]	~~0.53~~0.50
Gymnasium	~~0.68~~0.67
Health care clinic	~~0.82~~0.68
Hospital[a]	~~1.05~~0.86
Hotel/Motel[a, b]	~~0.75~~0.53
Library	~~0.78~~0.78
Manufacturing facility	~~0.90~~0.60
Motion picture theater	~~0.83~~0.43
Multifamily[c]	~~0.68~~0.46
Museum	~~1.06~~0.56
Office	~~0.79~~0.62
Parking garage	~~0.15~~0.12
Penitentiary	~~0.75~~0.65
Performing arts theater	~~1.18~~0.82
Police station	~~0.80~~0.62
Post office	~~0.67~~0.62
Religious building	~~0.94~~0.66
Retail	~~1.06~~0.78
School/university	~~0.81~~0.67
Sports arena	~~0.87~~0.73
Town hall	~~0.80~~0.67
Transportation	~~0.61~~0.51
Warehouse	~~0.48~~0.41
Workshop	~~0.90~~0.83

For SI: 1 watt per square foot = 10.76 ~~w/m2~~watts per square meter.

~~a. Where *sleeping units* are excluded from lighting power calculations by application of Section R405.1, neither the area of the *sleeping units* nor the wattage of lighting in the *sleeping units* is counted.~~

~~b. Where *dwelling units* are excluded from lighting power calculations by application of Section R405.1, neither the area of the *dwelling units* nor the wattage of lighting in the *dwelling units* is counted.~~

~~c. *Dwelling units* are excluded. Neither the area of the *dwelling units* nor the wattage of lighting in the *dwelling units* is counted.~~

[NY] TABLE C405.3.2(2)
INTERIOR LIGHTING POWER ALLOWANCES: SPACE-BY-SPACE METHOD

COMMON SPACE TYPES[a]	LPD (watts/~~sq.ft~~ft²)
Atrium	
Less than 40 feet in height	~~0.03 per foot in total height~~ 0.41
Greater than 40 feet in height	~~0.40 + 0.02 per foot in total height~~ 0.51
Audience seating area	
In an auditorium	~~0.63~~0.57
~~In a convention center~~	~~0.82~~
In a gymnasium	~~0.65~~0.23
In a motion picture theater	~~1.14~~0.27
In a penitentiary	~~0.28~~0.56
In a performing arts theater	~~2.03~~1.09
In a religious building	~~1.53~~0.72
In a sports arena	~~0.43~~0.27
Otherwise	~~0.43~~0.33
Banking activity area	~~0.86~~0.56
Breakroom (See Lounge/breakroom)	
Classroom/lecture hall/training room	
In a penitentiary	~~1.34~~0.74
Otherwise	~~0.96~~0.72
Computer room	~~1.33~~0.75
Conference/meeting/multipurpose room	~~1.07~~0.88
Copy/print room	~~0.56~~0.56
Corridor	
In a facility for the visually impaired (and not used primarily by the staff)[b]	~~0.92~~0.71
In a hospital	~~0.92~~0.61
~~In a manufacturing facility~~	~~0.29~~
Otherwise	~~0.66~~0.44
Courtroom	~~1.39~~1.06
Dining area	
In bar/lounge or leisure dining	~~0.93~~0.62
In cafeteria or fast food dining	~~0.63~~0.36
In a facility for the visually impaired (and not used primarily by the staff)[b]	~~2.00~~1.22
In family dining	~~0.71~~0.52
In a penitentiary	~~0.96~~0.35
Otherwise	~~0.63~~0.42
Electrical/mechanical room	~~0.43~~0.39
Emergency vehicle garage	~~0.41~~0.51
Food preparation area	~~1.06~~0.92
~~Guestroom~~ ~~c, d~~	~~0.77~~
Laboratory	
In or as a classroom	~~1.20~~1.04

Otherwise	~~1.45~~1.21
Laundry/washing area	~~0.43~~0.51
Loading dock, interior	~~0.58~~0.51
Lobby	
For an elevator	~~0.68~~0.52
In a facility for the visually impaired (and not used primarily by the staff)[b]	~~2.03~~1.44
~~In a hotel~~	~~1.06~~
In a motion picture theater	~~0.45~~0.20
In a performing arts theater	~~1.70~~0.82
Otherwise	~~1.0~~0.80
Locker room	~~0.48~~0.43
Lounge/breakroom	
In a healthcare facility	~~0.78~~0.53
Mother's Wellness Room	0.68
Otherwise	~~0.62~~0.44
Office	
Enclosed	~~0.93~~0.73
Open plan	~~0.81~~0.56
Parking area daylighting transition zone	1.06
Parking area, interior	~~0.14~~0.11
Patient room	0.78
Pharmacy area	~~1.34~~1.59
Restroom	
In a facility for the visually impaired (and not used primarily by the staff[b]	~~0.96~~0.81
Otherwise	~~0.85~~0.74
Sales area	~~1.22~~0.85
Seating area, general	~~0.42~~0.21
Security screening general areas	0.64
Security screening in transportation facilities	0.93
Security screening transportation waiting area	0.56
Stairway (see Space containing stairway)	
Stairwell	~~0.58~~0.47
Storage room	~~0.46~~0.35
Vehicular maintenance area	~~0.56~~0.53
Workshop	~~1.14~~1.09
BUILDING TYPE SPECIFIC SPACE TYPES[a]	**LPD (watts/~~sq.ft~~ft^2)**
Automotive (see Vehicular maintenance area)	
Convention Center—exhibit space	~~0.88~~0.50
~~Dormitory—living quarters~~[~~c, d~~]	~~0.54~~
Facility for the visually impaired[b]	
In a chapel (and not used primarily by the staff)	~~1.06~~0.58
In a recreation room (and not used primarily by the staff)	~~1.80~~1.20
~~Fire Station—sleeping quarters~~[~~c~~]	~~0.20~~
Gaming establishments	
High limits game	1.68

Slots	0.54
Sportsbook	0.82
Table Games	1.09
Gymnasium/fitness center	
In an exercise area	0.50
In a playing area	~~0.82~~0.75
Healthcare facility	
In an exam/treatment room	~~1.68~~1.16
In an imaging room	~~1.06~~0.94
In a medical supply room	~~0.54~~0.56
In a nursery	~~1.00~~0.87
In a nurse's station	~~0.81~~0.75
In an operating room	~~2.17~~ 2.26
In a patient room~~e~~	~~0.62~~0.78
In a physical therapy room	~~0.84~~0.82
In a recovery room	~~1.03~~1.18
In a telemedicine room	1.44
Library	
In a reading area	~~0.82~~0.77
In the stacks	~~1.20~~1.18
Manufacturing facility	
In a detailed manufacturing area	~~0.93~~0.75
In an *equipment room*	~~0.65~~0.61
In an extra-high-bay area (greater than 50 feet floor-to-ceiling height)	1.05
In a high-bay area (25-50 feet floor-to-ceiling height)	0.75
In a low-bay area (less than 25 feet floor-to- ceiling height)	~~0.96~~0.61
Museum	
In a general exhibition area	~~1.05~~0.31
In a restoration room	~~0.85~~1.24
Performing arts theater—dressing room	~~0.36~~0.35
Post office—sorting area	~~0.68~~0.66
Religious buildings	
In a fellowship hall	~~0.55~~0.50
In a worship/pulpit/choir area	~~1.53~~0.75
Retail facilities	
In a dressing/fitting room	~~0.50~~0.45
Hair salon	0.65
Nail salon	0.75
In a mall concourse	~~0.90~~0.57
Massage space	0.81
Sports arena—playing area	
For a Class I facility~~e~~c	~~2.47~~2.86
For a Class II facility~~f~~d	~~1.96~~1.98
For a Class III facility~~g~~e	~~1.70~~1.29
For a Class IV facility~~h~~f	~~1.13~~0.86

Sports arena-Pools	
For a Class I facility	2.20
For a Class II facility	1.47
For a Class III facility	0.99
For a Class IV facility	0.59
Transportation facility	
Airport hangar	1.36
Passenger loading area	0.71
In a baggage/carousel area	~~0.45~~0.28
In an airport concourse	~~0.31~~0.49
At a terminal ticket counter	~~0.62~~0.40
Warehouse—storage area	
For medium to bulky, palletized items	~~0.35~~0.33
For smaller, hand-carried items	0.69

a. In cases where both a common space type and a building area specific space type are *listed*, the building area specific space type shall apply
b. A 'Facility for the Visually Impaired' is a facility that is licensed or will be licensed by local or state authorities for senior long-term care, adult daycare, senior support or people with special visual needs.
~~c. Where *sleeping units* are excluded from lighting power calculations by application of Section R405.1~~R404.1~~, neither the area of the *sleeping units* nor the wattage of lighting in the *sleeping units* is counted.~~
~~d. Where *dwelling units* are excluded from lighting power calculations by application of Section R405.1~~R404.1~~, neither the area of the *dwelling units* nor the wattage of lighting in the *dwelling units* is counted.~~
~~e~~c. Class I facilities consist of professional facilities; and semiprofessional, collegiate, or club facilities with seating for 5,000 or more spectators.
~~f~~d. Class II facilities consist of collegiate and semiprofessional facilities with seating for fewer than 5,000 spectators; club facilities with seating for between 2,000 and 5,000 spectators; and amateur league and high-school facilities with seating for more than 2,000 spectators.
~~g~~e. Class III facilities consist of club, amateur league and high-school facilities with seating for 2,000 or fewer spectators.
~~h~~f. Class IV facilities consist of elementary school and recreational facilities; and amateur league and high-school facilities without provision for spectators.

C405.3.2.1 Building Area Method. For the Building Area Method, the interior lighting power allowance is ~~the floor area for each building area type *listed* in Table C405.3.2(1) times the value from Table C405.3.2(1) for that area. For the purposes of this method, an "area" shall be defined as all contiguous spaces that accommodate or are associated with a single building area type, as *listed* in Table C405.3.2(1). Where this method is used to calculate the total interior lighting power for an entire building, each building area type shall be treated as a separate area.~~calculated as follows:

1. For each building area type inside the building, determine the applicable building area type and the allowed lighting power density for that type from **Table C405.3.2(1)**. For building area types not listed, select the building area type that most closely represents the use of that area. For the purposes of this method, an "area" shall be defined as all contiguous spaces that accommodate or are associated with a single building area type.
2. Determine the floor area for each building area type listed in **Table C405.3.2(1)** and multiply this area by the applicable value from **Table C405.3.2(1)** to determine the allowed lighting power (watts) for each building area type. Sleeping units and dwelling units are excluded from lighting power allowance calculations by application of Section C405.3.3. The area of sleeping units and dwelling units is not included in the calculation.
3. The total interior lighting power allowance (watts) for the entire building is the sum of the lighting power from each building area type.

C405.3.2.2.1 Additional interior lighting power. Where using the Space-by-Space Method, an increase in the interior lighting power allowance is permitted for specific lighting functions. Additional power shall be permitted only where the specified lighting is installed and ~~automatically controlled separately from the *general lighting*, to be turned off during nonbusiness hours.~~ controlled in accordance with **Section C405.2.4**. ~~This~~These additional power allowances shall be used only for the ~~specified~~ luminaires serving the specific lighting function and shall not be used for any other purpose. An increase in the interior lighting power allowance is permitted in the following cases:

1. For lighting equipment to be installed in sales areas specifically to highlight merchandise, the additional lighting power allowance shall be the connected lighting power of the luminaires specifically highlighting merchandise, calculated in accordance with Equation 4-9, or the additional power allowance ~~determined~~calculated in accordance with Equation 4-~~11.~~10, whichever is less.

Additional interior lighting power allowance	1000 W + (Retail Area 1 × 0.45 W/ft^2) + (Retail Area 2 × 0.45W/ft^2) + (Retail Area 3 × 1.05 W/ft^2) + (Retail Area 4 × 1.87 W/ft^2)

(Equation 4-~~11~~10)

For SI units:

Additional interior lighting power allowance = 1000 W + (Retail Area 1 × 4.8 W/m^2) + (Retail Area 2 × 4.84 W/m2) + (Retail Area 3 × 11 W/m^2) + (Retail Area 4 × 20 W/m^2)

where:

Retail Area 1	=	The floor area for all products not *listed* in Retail Area 2, 3 or 4.
Retail Area 2	=	The floor area used for the sale of vehicles, sporting goods and small electronics.
Retail Area 3	=	The floor area used for the sale of furniture, clothing, cosmetics and artwork.
Retail Area 4	=	The floor area used for the sale of jewelry, crystal and china.

Exception: Other merchandise categories are permitted to be included in Retail Areas 2 through 4, provided that justification documenting the need for additional lighting power based on visual inspection, contrast, or other critical display is approved by the *building official*.

2. For spaces in which lighting is specified to be installed in addition to the *general lighting* for the purpose of decorative appearance or for highlighting art or exhibits, ~~provided that~~ the additional lighting power allowance for that space shall be ~~not more than 0.9 W/ft^2 (9.7W/m^2) in lobbies and not more than 0.75 W/ft^2 (8.1 W/m^2) in other spaces.~~the smallest of the following:

   2.1. 0.66 W/ft2 (7.1W/m2) in lobbies,
   2.2. 0.55 W/ft2 (5.9 W/m2) in other spaces, or
   2.3 the connected lighting power of the luminaires specifically for decorative appearance or for highlighting art or exhibits, calculated according to Equation 4-9.

EC 07-0165
Add new:

C405.3.3 Lighting power for sleeping units and dwelling units. *Sleeping units* in Group I-2 occupancies that are patient rooms shall comply with C405.3.1 and C405.3.2. For all other *sleeping units* and *dwelling units*, permanently installed lighting including lighting integrated into range hoods and exhaust fans, shall be provided by lamps capable of operating with an efficacy of not less than 65 lm/W or luminaires capable of operating with an efficacy of not less than 45 lm/W.

Exceptions:
1. Lighting integral to other appliances.
2. Antimicrobial lighting used for the sole purpose of disinfecting.
3. Luminaires with an input rating of less than 3W.

C405.4 Horticultural lighting. Permanently installed luminaires shall have a photosynthetic photon efficacy of not less than 1.7 µmol/J for horticultural lighting in greenhouses and not less than 1.9 µmol/J for all other horticultural lighting. Luminaires for horticultural lighting in greenhouses shall be controlled by a device that automatically turns off the luminaire when sufficient daylight is available. Luminaires for horticultural lighting shall be controlled by a device that automatically turns off the luminaire at specific programmed times.

EC 07-0166

Revise as follows:

~~C405.4.1~~C405.5.1 **Total connected ~~exterior building~~ exterior lighting power.** The total exterior connected lighting power shall be the total maximum rated wattage of all exterior lighting that is powered through the energy service for the *building* and *building site* lighting for which the building *owner* is responsible.

Exception: Lighting used for the following applications shall not be included.

1. Lighting *approved* because of safety considerations.
2. Emergency lighting that is automatically off during normal ~~business operation~~ operations.
3. Exit signs.
4. Specialized signal, directional and marker lighting associated with transportation.
5. Advertising signage or directional signage.
6. Integral to equipment or instrumentation and installed by its manufacturer.
7. ~~Theatrical purposes, including performance, stage, film production and video production.~~ Lighting in any location that is specifically used for video broadcasting, video or film recording, or live theatrical and music performance.
8. Athletic playing areas.
9. Temporary lighting.
10. Industrial production, material handling, transportation sites and associated storage areas.
11. Theme elements in theme/amusement parks.
12. Used to highlight features of art, public monuments, and the national flag.
13. Lighting for water features and swimming pools.
14. Lighting controlled from within *sleeping units* and *dwelling units*~~, where the lighting complies with Section R404.1~~.
15. Lighting of the exterior means of egress as required by the *Building Code of New York State*.

~~C405.4.2~~ C405.5.2 **Exterior lighting power allowance.** The ~~total~~ exterior lighting power allowance (watts) 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*.~~ calculated as follows:

1. Determine the Lighting Zone (LZ) for the building according to Table C405.5.2(1), unless otherwise specified by the *building official*.
2. For each exterior area that is to be illuminated by lighting that is powered through the energy service for the *building* and building site lighting for which the building owner is responsible, determine the applicable area type from Table C405.5.2(2). For area types not listed, select the area type that most closely represents the proposed use of the area.
3. Determine the total area or length of each area type and multiply by the value for the area type in Table C405.5.2(2) to determine the lighting power (watts) allowed for each area type.
4. The total exterior lighting power allowance (watts) is the sum of the base site allowance determined according to Table C405.5.2(2), plus the watts from each area type.

[NY] TABLE ~~C405.4.2(2)~~C405.5.2(2)
LIGHTING POWER ALLOWANCES FOR BUILDING EXTERIORS

	LIGHTING ZONES			
	Zone 1	**Zone 2**	**Zone 3**	**Zone 4**
Base Site Allowance	~~350 W~~ 160 W	~~400 W~~ 280 W	~~500 W~~ 400 W	~~900 W~~ 560 W
~~**Uncovered Parking Areas**~~				
Parking ~~areas and drives~~ area, exterior	~~0.03 W/ft²~~ 0.015 W/ft²	~~0.04 W/ft²~~ 0.026 W/ft²	~~0.06 W/ft²~~ 0.037 W/ft²	~~0.08 W/ft²~~ 0.05 W/ft²
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~~ Plaza areas~~, special feature areas~~	~~0.10 W/ft²~~ 0.028 W/ft²	~~0.10 W/ft²~~ 0.049 W/ft²	~~0.11 W/ft²~~ 0.070 W/ft²	~~0.14 W/ft²~~ 0.098 W/ft²

Dining areas	~~0.65 W/ft²~~ 0.156 W/ft²	~~0.65 W/ft²~~ 0.273 W/ft²	~~0.75 W/ft²~~ 0.390 W/ft²	~~0.95 W/ft²~~ 0.546 W/ft²
Stairways	~~0.6 W/ft²~~ Exempt	~~0.7 W/ft²~~ Exempt	~~0.7 W/ft²~~ Exempt	~~0.7 W/ft²~~ Exempt
Pedestrian tunnels	~~0.12 W/ft²~~ 0.063 W/ft²	~~0.12 W/ft²~~ 0.110 W/ft²	~~0.14 W/ft²~~ 0.157 W/ft²	~~0.21 W/ft²~~ 0.220 W/ft²
Landscaping	~~0.03~~ 0.014 W/ft²	~~0.04~~ 0.025 W/ft²	~~0.04~~ 0.036 W/ft²	0.04 W/ft²
Building Entrances and Exits				
Pedestrian and vehicular entrances and exits	~~14 W/linear foot of opening~~ 5.6 W/linear foot of opening	~~14 W/linear foot of opening~~ 9.8 W/linear foot of opening	~~21 W/linear foot of opening~~ 14 W/linear foot of opening	~~21 W/linear foot of opening~~ 19.6 W/linear foot of opening
Entry canopies	~~0.20 W/ft²~~ 0.072 W/ft²	~~0.25 W/ft²~~ 0.126 W/ft²	~~0.4 W/ft²~~ 0.180 W/ft²	~~0.4 W/ft²~~ 0.252 W/ft²
Loading docks	~~0.35 W/ft²~~ 0.104 W/ft²	~~0.35 W/ft²~~ 0.182 W/ft²	~~0.35 W/ft²~~ 0.260 W/ft²	0.35 W/ft²
Sales Canopies				
Free-standing and attached	~~0.40 W/ft²~~ 0.20 W/ft²	~~0.40 W/ft²~~ 0.35 W/ft²	~~0.6 W/ft²~~ 0.50 W/ft²	0.7 W/ft²
Outdoor Sales				
Open areas (including vehicle sales lots)	~~0.20 W/ft²~~ 0.072 W/ft²	~~0.20 W/ft²~~ 0.126 W/ft²	~~0.35 W/ft²~~ 0.180 W/ft²	~~0.50 W/ft²~~ 0.252 W/ft²
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~~ 14.4 W/linear foot

For SI: 1 foot = 304.8 mm, 1 watt per square foot = ~~W/0.0929 m²~~. 10.76 watts per square meter.
W = watts.

TABLE ~~C405.4.2(3)~~C405.5.2(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/ft² of gross above-grade wall area	0.113 W/ft² of gross above-grade wall area	0.15 W/ft² of gross above-grade wall area
Automated teller machines (ATM) and night depositories	~~135~~90 W per location plus ~~45~~35 W per additional ATM per location			
Uncovered entrances and gatehouse inspection stations at guarded facilities	~~0.5~~0.144 W/ft2 of area	~~0.5~~0.252 W/ft2 of area	~~0.5~~0.360 W/ft² of area	~~0.5~~0.504 W/ft2 of area
Uncovered loading areas for law enforcement, fire, ambulance and other emergency service vehicles	~~0.35~~0.104 W/ft2 of area	~~0.35~~0.182 W/ft2 of area	~~0.35~~0.260 W/ft² of area	~~0.35~~0.364 W/ft2 of area
Drive-up windows and doors	~~200~~53 W per drive through	~~200~~92 W per drive through	~~200~~132 W per drive through	~~200~~185 W per drive through
Parking area near 24-hour retail entrances.	~~400~~80 W per main entry	~~400~~140 W per main entry	~~400~~200 W per main entry	~~400~~280 W per main entry

For SI: 1 watt per square foot = ~~W/0.0929 m²~~. 10.76 watts per square meter.
W = watts.

~~C405.4.2.1~~C405.5.2.1 **Additional exterior lighting power.** ~~Any increase in the~~ Additional exterior lighting power ~~allowance is limited to~~ allowances are available for the specific lighting applications ~~indicated~~ listed in Table C405.4.2(3). ~~The~~ These additional power allowances shall be used only for the luminaires ~~that are~~ serving these specific applications and shall not be used ~~for~~ to increase any other ~~purpose~~ lighting power allowance.

EC 07-0167

~~C405.6~~C405.7 **Electrical transformers ~~(Mandatory)~~.** Low-voltage dry-type distribution electric transformers shall meet the minimum efficiency requirements of Table ~~C405.6~~C405.7 as tested and rated in accordance with the test procedure *listed* in DOE 10 CFR 431. 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 transformer manufacturer.

Exceptions: The following transformers are exempt in accordance with the DOE definition of Distribution Transformers found in 10 CFR 431.192:

~~1. Transformers that meet the *Energy Policy Act of 2005* exclusions based on the DOE 10 CFR 431 definition of special purpose applications.~~
~~2. Transformers that meet the *Energy Policy Act of 2005* exclusions that are not to be used in general purpose applications based on information provided in DOE 10 CFR 431.~~
~~3~~1. Transformers ~~that meet the *Energy Policy Act of 2005* exclusions with multiple voltage taps where the highest tap is not less than~~with tap range 20 percent or more ~~than the lowest tap~~.
~~4~~2. Drive (isolation) transformers.
~~5~~3. Rectifier transformers.
~~6~~4. Auto-transformers.
~~7~~5. Uninterruptible power ~~system~~supply transformers.
~~8~~6. ~~Impedance~~Special impedance transformers.
~~9~~7. Regulating transformers.
~~10~~8. Sealed and nonventilating transformers.
~~11~~9. Machine tool (control) transformers.
~~12~~10. Welding transformers.
~~13~~11. Grounding transformers.
~~14~~12. Testing transformers.
13. Nonventilated transformers

[NY] TABLE ~~C405.6~~ C405.7
MINIMUM NOMINAL EFFICIENCY LEVELS FOR 10 CFR 431 LOW-VOLTAGE DRY-TYPE DISTRIBUTION TRANSFORMERS
(This table is intended to be a restatement of the legally binding provisions found in Title 10 CFR Part 431 included here as a convenience to the users of this code)

SINGLE-PHASE TRANSFORMERS[a]		THREE-PHASE TRANSFORMERS[a]	
kVA ~~a~~[b]	Efficiency (%) ~~b~~[c]	kVA ~~a~~[b]	Efficiency (%) ~~b~~[c]
15	97.70	15	97.89
25	98.00	30	98.23
37.5	98.20	45	98.40
50	98.30	75	98.60
75	98.50	112.5	98.74
100	98.60	150	98.83
167	98.70	225	98.94
250	98.80	300	99.02
333	98.90	500	99.14
—	—	750	99.23
—	—	1000	99.28

a. A low-voltage dry-type distribution transformer with a kVA rating not listed in the table shall have its minimum efficiency level determined by linear interpolation of the kVA and efficiency values listed in the table immediately above and below its kVA rating. Extrapolation shall not be used below the minimum values or above the maximum values shown for single-phase transformers and three-phase transformers.

~~a.~~ b. kiloVolt-Amp rating

~~b.~~ c. Nominal efficiencies shall be established in accordance with the DOE 10 CFR 431 test procedure for low-voltage dry-type transformers.

~~C405.7~~C405.8 **Electric motors ~~(Mandatory)~~.** Electric motors shall meet the minimum efficiency requirements of Tables C405.7(1) through C405.7(4) when tested and rated in accordance with the DOE 10 CFR 431. 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 motor manufacturer.

Exception: The standards in this section shall not apply to the following exempt electric motors:

1. Air-over electric motors.
2. Component sets of an electric motor.
3. Liquid-cooled electric motors.
4. Submersible electric motors.
5. Inverter-only electric motors.
6. Definite purpose machines within the scope of ANSI/NEMA MG 1-2021, Part 18.

EC 07-0055

Add new:

[NY] C405.8.1.1 Power conversion system. New traction elevators with a rise of 75 feet or more in new buildings shall have a power conversion system that complies with Sections 405.8.1.1.1 through 405.8.1.1.3.

[NY] C405.8.1.1.1 Motor. Induction motors with a Class IE2 efficiency rating, as defined by IEC EN 60034-30, or alternative technologies, such as permanent magnet synchronous motors that have equal or better efficiency, shall be used.

[NY] C405.8.1.1.2 Transmission. Transmissions shall not reduce the efficiency of the combined motor/transmission below that shown for the Class IE2 motor for elevators with capacities below 4,000 lbs. Gearless machines shall be assumed to have a 100 percent transmission efficiency.

[NY] C405.8.1.1.3 Drive. Potential energy released during motion shall be recovered with a regenerative drive that supplies electrical energy to the building electrical system.

EC 07-0168

Add new:

C405.9 Data centers and computer rooms. Electrical equipment in data centers and computer rooms shall comply with this section.

C405.9.1 Data centers. Transformers, uninterruptable power supplies, motors and electrical power processing equipment in data centers shall comply with Section 8 of ASHRAE 90.4 in addition to this code.

C405.9.2 Computer rooms. Uninterruptable power supplies in computer rooms shall comply with the requirements in Tables 8.5 and 8.6 of ASHRAE 90.4 in addition to this code.

Exception: AC-output UPS that utilizes standardized NEMA 1-15P or NEMA 5-15P input plug, as specified in ANSI/NEMA WD-6-2016.

EC 07-0056

Revise as follows:

~~**C405.8.2.1 Regenerative drive (Mandatory).**~~ **C405.10.2.1 Energy recovery.** ~~An escalator~~ Escalators shall be designed to recover electrical energy when resisting overspeed in the down direction. ~~either for one-way down operation only or for reversible operation shall have a variable frequency regenerative drive that supplies electrical energy to the building electrical system when the escalator is loaded with passengers whose combined weight exceeds 750 pounds (340 kg).~~

EC 07-0057

Revise as follows:

~~**C405.9**~~C405.10 **Voltage drop** ~~**in feeders and branch circuits**~~**.** The total *voltage drop* across the combination of ~~feeders~~ customer-owned service conductors, feeder conductors and branch ~~circuits~~ circuit conductors shall not exceed 5 percent.

EC 07-0058

Add new:

C405.12 Automatic receptacle control. The following shall have automatic receptacle control complying with Section C405.11.1:

1. At least 50 percent of all 125V, 15- and 20-amp receptacles installed in enclosed offices, conference rooms, rooms used primarily for copy or print functions, breakrooms, classrooms, and individual workstations, including those installed in modular partitions and module office workstation systems.
2. At least 25 percent of branch circuit feeders installed for modular furniture not shown on the construction documents.

[NY] C405.12.1 Automatic receptacle control function. *Automatic* receptacle controls shall comply with the following:

1. Either split controlled receptacles shall be provided with the top receptacle controlled, or a controlled receptacle shall be located within 12 inches (304.8 mm) of each uncontrolled receptacle.
2. One of the following methods shall be used to provide control:

2.1. A scheduled basis using a time-of-day operated control device that turns receptacle power off at specific programmed times and can be programmed separately for each day of the week. The control device shall be configured to provide an independent schedule for each portion of the *building* of not more than 5,000 square feet (464.5 m^2) and not more than one floor. The occupant shall be able to manually override an area for not more than 2 hours. Any individual override switch shall control the receptacles in a portion of the *building* not more than 5,000 feet (1524 m).
2.2. An *occupant sensor control* that shall turn off receptacles within 20 minutes of all occupants leaving a space.
2.3. An automated signal from another control or alarm system that shall turn off receptacles within 20 minutes after determining that the area is unoccupied.

3. All controlled receptacles shall be permanently marked in accordance with NFPA 70 and be uniformly distributed throughout the space.
4. Plug-in devices shall not comply.

Exceptions: *Automatic* receptacle controls are not required for the following:

1. Receptacles specifically designated for equipment requiring continuous operation (24 hours per day, 365 days per year).
2. Spaces where an *automatic* control would endanger the safety or security of the room or *building* occupants.
3. Within a single modular office workstation, noncontrolled receptacles are permitted to be located more than 12 inches (304.8 mm), but not more than 72 inches (1828 mm) from the controlled receptacles serving that workstation.

EC 07-0169

Add new:

C405.13 Energy monitoring. New buildings with a gross conditioned floor area of not less than 10,000 square feet (929 m2) shall be equipped to measure, monitor, record and report energy consumption in accordance with Sections C405.13.1 through C405.13.6 for load categories indicated in Table C405.13.2 and Section C405.13.7 through C405.13.11 for end-use categories indicated in Table C405.13.8.

Exceptions:

1. Dwelling units in R-2 occupancies.
2. Individual tenant spaces are not required to comply with this section provided that the space has its own utility services and meters and has less than 5,000 square feet (464.5 m2) of conditioned floor area.

C405.13.1 Electrical energy metering. For electrical energy supplied to the *building* and its associated site, including but not limited to site lighting, parking, recreational facilities and other areas that serve the *building* and its occupants, meters or other measurement devices shall be provided to collect energy consumption data for each end-use category required by Section C405.13.2.

C405.13.2 End-use electric metering categories. Meters or other *approved* measurement devices shall be provided to collect energy use data for each end-use category indicated in Table C405.13.2. Where multiple meters are used to measure any end-use category, the data acquisition system shall total all of the energy used by that category. Not more than 5 percent of the design load for each of the end-use categories indicated in Table C405.13.2 shall be permitted to be from a load that is not within that category.

Exceptions:

1. HVAC and water heating equipment serving only an individual dwelling unit shall not require end-use metering.
2. End-use metering shall not be required for fire pumps, stairwell pressurization fans or any system that operates only during testing or emergency.
3. End-use metering shall not be required for an individual tenant space having a floor area not greater than 2,500 square feet (232 m^2) where a dedicated source meter complying with Section C405.13.3 is provided.

TABLE 405.13.2
ENERGY USE CATEGORIES

LOAD CATEGORY	DESCRIPTION OF ENERGY USE
Total HVAC system	Heating, cooling and ventilation, including but not limited to fans, pumps, boilers, chillers and water heating. Energy used by 120-volt equipment, or by 208/120-volt equipment that is located in a building where the main service is 480/277-volt power, is permitted to be excluded from total HVAC system energy use.
Interior lighting	Lighting systems located within the building.
Exterior lighting	Lighting systems located on the building site but not within the building.
Plug loads	Devices, appliances and equipment connected to convenience receptacle outlets.
Process load	Any single load that is not included in an HVAC, lighting or plug load category and that exceeds 5 percent of the peak connected load of the whole building, including, but not limited to data centers, manufacturing equipment and commercial kitchens.
Electric vehicle charging	*Electric vehicle* charging loads that are powered through the *building*'s electrical service.
Building operations and other miscellaneous loads	The remaining loads not included elsewhere in this table, including but not limited to vertical transportation systems, automatic doors, motorized shading systems, ornamental fountains, ornamental fireplaces, swimming pools, in-ground spas and snow-melt systems.
Electric hot water heating for uses other than space conditioning	Electricity used to generate hot water. **Exception:** Electric water heating with design capacity that is less than 10 percent of building service rating

C405.13.3 Electrical meters. Meters or other measurement devices required by this section shall be configured to automatically communicate energy consumption data to the data acquisition system required by Section C405.13.4. Source meters shall be allowed to be any digital-type meter. Lighting, HVAC or other building systems that can self-monitor their energy consumption shall be permitted instead of meters. Current sensors shall be permitted, provided that they have a tested accuracy of ±2 percent. Required metering systems and equipment shall have the capability to provide at least hourly data that is fully integrated into the data acquisition system and graphical energy report in accordance with Sections C405.13.4 and C405.13.5. Non-intrusive load monitoring (NILM) packages that extract energy consumption data from detailed electric waveform analysis shall be permitted to substitute for individual meters if the equivalent data is available for collection in Section C405.13.4 and reporting in Section C405.13.5.

C405.13.4 Electrical energy data acquisition system. A data acquisition system shall have the capability to store the data from the required meters and other sensing devices for a minimum of 36 months. The data acquisition system shall have the capability to store real-time energy consumption data and provide hourly, daily, monthly and yearly logged data for each end-use category required by Section C405.13.2. The data acquisition system shall have the capability of providing *building*

total peak electric demand and the time(s) of day and time(s) per month at which the peak occurs. Peak demand shall be integrated over the same time period as the underlying whole *building* meter reading rate.

C405.13.5 Graphical energy report. A permanent and readily available reporting mechanism shall be provided in the building for access by *building* operation and management personnel. The reporting mechanism shall have the capability to graphically provide the energy consumption for each end-use category required by Section C405.13.2 not less than every hour, day, month and year for the previous 36 months.

C405.13.6 Renewable energy. On-site renewable energy sources shall be metered with not less frequency than non-renewable energy systems in accordance with Section C405.13.3.

C405.13.7 Non-electrical energy submetering. For all non-electrical energy supplied to the building and its associated site that serves the building and its occupants, submeters or other measurement devices shall be provided to collect energy consumption data for each end-use category required by Section C405.13.8.

Exceptions:

1. HVAC and water heating equipment serving only an individual dwelling unit shall not require end-use submetering.
2. End-use submetering shall not be required for fire pumps, stairwell pressurization fans or any system that operates only during testing or emergency.
3. End-use submetering shall not be required for an individual tenant space having a floor area not greater than 2,500 square feet (232 m2) where a dedicated source meter complying with Section C405.13.9 is provided.
4. Equipment powered primarily by solid fuels serving loads other than building heating and service water heating loads.

C405.13.8 End-use non-electrical submetering categories. Submeters or other approved measurement devices shall be provided to collect energy use data for each end-use category indicated in Table C405.13.8. Where multiple submeters are used to measure any end-use category, the data acquisition system shall total all of the energy used by that category. Not more than 5 percent of the design load for each of the end-use categories indicated in Table C405.13.8 shall be permitted to be from a load that is not within that category.

TABLE C405.13.8
NON-ELECTRICAL ENERGY USE CATEGORIES

END USE CATEGORY	DESCRIPTION OF END USE
Total HVAC system	Heating and cooling systems, including but not limited to boilers, chillers and furnaces. District heating and cooling energy entering the buildings distribution system shall, be monitored at the point of entry to the building distribution system.
Process loads	Any single load that is not included in the HVAC or service water heating categories where the rated fuel gas or fuel oil input of the load and that is not less than 5 percent of the sum of the rated fuel gas or fuel oil input of all monitored equipment, including but not limited to manufacturing equipment, process equipment, commercial kitchens, and commercial laundry equipment.
Other miscellaneous loads	The remaining loads not included elsewhere in this table, including but not limited to fireplaces, swimming pools, spas, gas lighting, and snow-melt systems.
Service water heating	Fuel used to heat potable water **Exception:** Water heating with design capacity that is less than 10 percent of the sum of the rated fuel gas or fuel oil input of all monitored equipment.

C405.13.9 Non-electrical submeters. Submeters or other measurement devices required by this section shall be configured to automatically communicate energy consumption data to the data acquisition system required by Section C405.13.10. Source submeters shall be allowed to be any digital-type meter that can provide a digital output to the data acquisition system. Required submetering systems and equipment shall be fully integrated into the data acquisition system and graphical energy report that updates at least hourly in accordance with Sections

C405.13.10 Non-electrical energy data acquisition system. A data acquisition system shall have the capability to store the data from the required submeters and other sensing devices for not less than 36 months. The data acquisition system shall have the capability to store real time energy consumption data and provide hourly, daily, monthly and yearly logged data for each end-use category required by Section C405.13.8. The data acquisition system shall have the capability of providing building total non-electrical peak demand and the time(s) of day and time(s) per month at which the peak occurs. Where applicable as determined by the AHJ, peak demand shall be integrated over the same time period as the underlying whole building meter reading rate.

C405.13.11 Graphical energy report. A permanent and readily accessible reporting mechanism shall be provided in the building that is accessible by building operation and management personnel. The reporting mechanism shall have the capability to graphically provide the non-electrical energy consumption for each end-use category required by Section C405.13.8 not less than every hour, day, month and year for the previous 36 months. The graphical report shall incorporate natural gas interval data from the submeter or the ability to enter gas utility bills into the report.

EC 07-0171

Add new:

[NY] C405.15 On-site renewable energy systems *Buildings* shall be provided with on-site renewable electricity generation systems with a direct current (DC) nameplate power rating of not less than 0.75 W/ft2 (8.1 W/m2) multiplied by the sum of the gross conditioned floor area of all floors not to exceed the combined gross conditioned floor area of the three largest floors.

Exceptions:

1. A building site located where an unshaded flat plate collector oriented toward the equator and tilted at an angle from horizontal equal to the latitude receives an annual daily average incident solar radiation less than 1.1 kBtu/ft2 - day (3.5 kWh/m2 - day).
2. A *building* where more than 80 percent of the roof area is covered by any combination of permanent obstructions such as, but not limited to, mechanical equipment, vegetated space, access, pathways, or occupied roof terrace.
3. Any building where more than 50 percent of the roof area is shaded from direct-beam sunlight by natural objects or by structures that are not part of the building for more than 2500 annual hours between 8:00 a.m. and 4:00 p.m.
4. A *building* with gross conditioned floor area less than 5,000 square feet (465 m2).

EC 07-0172

Add new:

C405.17 Inverters. Direct-current-to-alternating-current inverters serving on-site renewable energy systems or on-site electrical energy storage systems shall be compliant with IEEE 1547-2018a and UL 1741-2021.

EC 07-0170

Add new:

[NY] C405.18 Electrification Ready. Where required by 19 NYCRR Part 1240, *buildings* that include fossil fuel equipment and *building systems* shall comply with Section 2703 of the *Building Code of New York State*.

EC 07-0173

Replace entirely as follows:

SECTION C406
ADDITIONAL EFFICIENCY ~~PACKAGE OPTIONS~~ REQUIREMENTS

~~**C406.1 Requirements.** *Buildings* shall comply with one or more of the following:~~

1. ~~More efficient HVAC performance in accordance with Section C406.2.~~
2. ~~Reduced lighting power in accordance with Section C406.3.~~
3. ~~Enhanced lighting controls in accordance with Section C406.4.~~
4. ~~On-site supply of renewable energy in accordance with Section C406.5.~~
5. ~~Provision of a dedicated outdoor air system for certain HVAC equipment in accordance with Section C406.6.~~
6. ~~High-efficiency *service water-heating* in accordance with Section C406.7.~~
7. ~~Enhanced envelope performance in accordance with Section C406.8.~~
8. ~~Reduced air *infiltration* in accordance with Section C406.9~~

~~**C406.1.1 Tenant spaces.** Tenant spaces shall comply with Section C406.2, C406.3, C406.4, C406.6 or C406.7. Alternatively, tenant spaces shall comply with Section C406.5 where the entire building is in compliance.~~

~~**Exception:** Previously occupied tenant spaces that comply with this code in accordance with Section C501.~~

~~**C406.2 More efficient HVAC equipment performance.** Equipment shall exceed the minimum efficiency requirements *listed* in Tables C403.3.2(1) through C403.3.2(7) by 10 percent, in addition to the requirements of Section C403. Where multiple performance requirements are provided, the equipment shall exceed all requirements by 10 percent. *Variable refrigerant flow systems* shall exceed the energy efficiency provisions of ANSI/ASHRAE/IESNA 90.1 by 10 percent. Equipment not *listed* in Tables C403.3.2(1) through C403.3.2(7) shall be limited to 10 percent of the total *building system* capacity.~~

~~**C406.3 Reduced lighting power**. The total connected interior lighting power calculated in accordance with Section C405.3.1 shall be less than 90 percent of the total lighting power allowance calculated in accordance with Section C405.3.2.~~

~~**C406.4 Enhanced digital lighting controls.** Interior lighting in the building shall have the following enhanced lighting controls that shall be located, scheduled and operated in accordance with Sections C405.2.1 through C405.2.3.~~

1. ~~Luminaires shall be configured for continuous dimming.~~
2. ~~Luminaires shall be addressed individually. Where individual addressability is not available for the luminaire class type, a controlled group of not more than four luminaries shall be allowed.~~
3. ~~Not more than eight luminaires shall be controlled together in a *daylight zone*.~~
4. ~~Fixtures shall be controlled through a digital control system that includes the following function:~~
   ~~4.1. Control reconfiguration based on digital addressability.~~
   ~~4.2. Load shedding.~~
   ~~4.3. Individual user control of overhead general illumination in open offices.~~
   ~~4.4. Occupancy sensors shall be capable of being reconfigured through the digital control system.~~
5. ~~Construction documents shall include submittal of a Sequence of Operations, including a specification outlining each of the functions in Item 4.~~
6. ~~Functional testing of lighting controls shall comply with Section C408.~~

~~**C406.5 On-site renewable energy.** The total minimum ratings of on-site renewable energy systems shall be one of the following:~~

1. ~~Not less than 1.71 Btu/h per square foot (5.4 W/m2) or 0.50 watts per square foot (5.4 W/m2) of *conditioned floor area*.~~
2. ~~Not less than 3 percent of the energy used within the building for building mechanical and *service water heating* equipment and lighting regulated in Chapter 4.~~

~~**C406.6 Dedicated outdoor air system.** Buildings containing equipment or systems regulated by Section C403.3.4, C403.4.3, C403.4.4, C403.4.5, C403.6, C403.8.4, C403.8.5, C403.8.5.1, C403.9.1, C403.9.2, C403.9.3 or C403.9.4 shall be equipped with an independent *ventilation* system designed to provide not less than the minimum 100 percent outdoor~~

~~air to each individual occupied space, as specified by the *Mechanical Code of New York State*. The *ventilation* system shall be capable of total energy recovery. The HVAC system shall include supply-air temperature controls that automatically reset the supply-air temperature in response to representative building loads, or to outdoor air temperatures. The controls shall reset the supply-air temperature not less than 25 percent of the difference between the design supply-air temperature and the design room-air temperature.~~

~~**C406.7 Reduced energy use in service water heating.** Buildings shall be of the following types to use this compliance method:~~

~~1. *Group R*-1: Boarding houses, hotels or motels.~~
~~2. Group I-2: Hospitals, psychiatric hospitals and nursing homes.~~
~~3. Group A-2: Restaurants and banquet halls or buildings containing food preparation areas.~~
~~4. Group F: Laundries.~~
~~5. *Group R*-2.~~
~~6. Group A-3: Health clubs and spas.~~
~~7. Buildings showing a service hot water load of 10 percent or more of total building energy loads, as shown with an *energy analysis* as described in Section C407.~~

~~**C406.7.1 Load fraction.** The building service water-heating system shall have one or more of the following that are sized to provide not less than 60 percent of the building's annual hot water requirements, or sized to provide 100 percent of the building's annual hot water requirements if the building shall otherwise comply with Section C403.9.5:~~

~~1. Waste heat recovery from service hot water, heat recovery chillers, building equipment, or process equipment.~~
~~2. *On-site renewable energy* water-heating systems.~~

~~**C406.8 Enhanced envelope performance.** The total UA of the *building thermal envelope* as designed shall be not less than 15 percent below the total UA of the *building thermal envelope* in accordance with Section C402.1.5.~~

~~**C406.9 Reduced air infiltration.** Air *infiltration* shall be verified by whole-building pressurization testing conducted in accordance with ASTM E779 or ASTM E1827 by an independent third party. The measured air-leakage rate of the building envelope shall not exceed 0.25 cfm/ft2 (2.0 L/s × m2) under a pressure differential of 0.3 inches water column (75 Pa), with the calculated surface area being the sum of the above- and below-grade building envelope. A report that includes the tested surface area, floor area, air by volume, stories above grade, and leakage rates shall be submitted to the *building official* and the building owner.~~

~~**Exception:** For buildings having over 250,000 square feet (25 000 m2) of *conditioned floor area*, air leakage testing need not be conducted on the whole building where testing is conducted on representative above-grade sections of the building. Tested areas shall total not less than 25 percent of the *conditioned floor area* and shall be tested in accordance with this section.~~

C406.1 Compliance. *Buildings* shall comply as follows:

1. *Buildings* with greater than 2000 square feet (190 m^2) of *conditioned floor area* shall comply with Section C406.1.1.
2. *Buildings* with greater than 5000 square feet (465 m^2) of *conditioned floor area* shall comply with Sections C406.1.1 and C406.1.2.
3. Build-out construction greater than 1000 square feet (93 m^2) of *conditioned floor area* that does not have final lighting or final HVAC systems installed under a prior building permit shall comply with Section C406.1.1.2.
   Exception: Core and shell *buildings* where no less than 20 percent of the *net floor area* is without final lighting or final HVAC that comply with all of the following:
4. *Buildings* with greater than 5000 (465 m^2) of *conditioned floor area* shall comply with Section C406.1.2.
5. Portions of the *building* where the *net floor area* is without final lighting or final HVAC shall comply with Section C406.1.1.2.
6. Portions of the *building* where the *net floor area* has final lighting and final HVAC systems shall comply with C406.1.1.

C406.1.1 Additional energy efficiency credit requirements. *Buildings* shall comply with measures from C406.2 to achieve not less than the number of required efficiency credits from Table C406.1.1(1) based on *building* occupancy group and *climate zone* including any energy credit adjustments in accordance with C406.1.1.1.

Where a project contains multiple occupancies, the total required energy credits from each *building* occupancy shall be weighted by the gross *conditioned floor area* to determine the weighted average project energy credits required. Accessory occupancies shall be included with the primary occupancy group for purposes of Section C406.

Exceptions:

1. Portions of buildings devoted to manufacturing or industrial use.
2. Where a building achieves more renewable and load management credits in Section C406.3 than are required in Section C406.1.2, surplus credits shall be permitted to reduce the required energy efficiency credits as follows:

$$EEC_{red} = EEC_{tbl} - \{the\ lesser\ of: (SRLM_{lim}, \quad SRLM_{adj} \times [RLM_{ach} - RLM_{req}])\}$$

EEC_{red} = Reduced required energy efficiency credits
EEC_{tbl} = Required energy efficiency credits from Table C406.1.1(1)
$SRLM_{lim}$ = Surplus renewable and load management credit limit from Table C406.1.1(2)
$SRLM_{adj}$ = 1.0 for all-electric or all-renewable buildings (excluding emergency generation) 0.7 for buildings with fossil fuel equipment (excluding emergency generation)
RLM_{ach} = Achieved renewable and load management credits from Section C406.3
RLM_{req} = Required renewable and load management credits from Section C406.1.2

C406.1.1.1 Reserved.

C406.1.1.2 Building Core/Shell and Build-Out Construction. Where separate permits are issued for core and shell buildings and build-out construction, compliance shall be in accordance with the following requirements:

1. Core and shell buildings or portions of buildings shall comply with one of the following:
   1.1. Where the permit includes a central HVAC system or service water heating system with chillers, heat pumps, boilers, service water heating equipment, or loop pumping systems with heat rejection, the project shall achieve not less than 50 percent of the energy credits required by Sections C406.1.1 and C406.1.1.1 in accordance with Section C406.2.
   1.2. Alternatively, the project shall achieve not less than 33 percent of the energy credits required by Sections C406.1.1 and C406.1.1.
2. For core and shell buildings or portions of buildings the energy credits achieved shall be subject to the following adjustments:
   2.1. Lighting measure credits shall be determined only for areas with final lighting installed.
   2.2. Where HVAC or service water heating systems are designed to serve the entire building, full HVAC or service water heating measure credits shall be achieved.
   2.3. Where HVAC or service water heating systems are designed to serve individual areas, HVAC or service water heating measure credits achieved shall be reduced in proportion to the floor area with final HVAC systems or final service water heating systems installed.
3. Build-out construction shall be deemed to comply with Section C406.1 where either:
   3.1. Where heating and cooling generation are provided by a previously installed central system, the energy credits achieved in accordance with Section C406.2 under the build-out project are not less than 33 percent of the credits required by Section C406.1.1 and C406.1.1.1.
   3.2. Where heating and cooling generation are provided by an HVAC system installed in the build out, the energy credits achieved in accordance with Section C406.2 under the build-out project are not less than 50 percent of the credits required by Section C406.1.1 and C406.1.1.1.
   3.3. Where the core and shell building was approved in accordance with C407 under 2021 IECC or later.

[NY] TABLE C406.1.1(1)
ENERGY CREDIT REQUIREMENTS BY BUILDING OCCUPANCY GROUP

Building Occupancy Group	Climate Zone		
	4	5	6
R-2, R-4, and I-1	86	86	70
I-2	36	43	46
R-1	81	85	83
B	70	71	71
A-2	69	67	60
M	80	79	75
E	61	64	65
S-1 and S-2	85	90	90
All Other	35	37	36

[NY] TABLE C406.1.1(2)
LIMIT TO ENERGY EFFICIENCY CREDIT CARRYOVER FROM RENEWABLE AND LOAD MANAGEMENT CREDITS

Building Occupancy Group	Climate Zone		
	4	5	6
R-2, R-4, and I-1	5	5	5
I-2	8	17	21
R-1	24	17	5
B	23	19	5
A-2	5	5	5
M	5	5	5
E	25	23	11
S-1 and S-2	5	5	5
All Other	5	5	5

C406.1.2 Additional renewable and load management credit requirements. Buildings shall comply with measures from C406.3 to achieve not less than the number of required renewable and load management credits from Table C406.1.2 based on *building* occupancy group and *climate zone*. Where a project contains multiple occupancies, credits in Table C406.1.2 from each *building* occupancy shall be weighted by the gross floor area to determine the weighted average project energy credits required. Accessory occupancies shall be included with the primary occupancy group for purposes of Section C406.

Exception: Where a *building* achieves more energy efficiency credits in Section C406.2 than are required in Section C406.1.1, the renewable and load management credits required in Table C406.1.2 shall be reduced by the amount of surplus energy efficiency credits.

[NY] TABLE C406.1.2
RENEWABLE AND LOAD MANAGEMENT CREDIT REQUIREMENTS BY BUILDING OCCUPANCY GROUP

Building Occupancy Group	Climate Zone		
	4	5	6
R-2, R-4, and I-1	31	26	23
I-2	25	25	26
R-1	32	28	25
B	44	38	38
A-2	8	8	8
M	42	38	42
E	42	38	42
S-1 and S-2	90	70	84
All Other	40	37	36

C406.2 Additional Energy Efficiency Credits Achieved. Each energy efficiency credit measure used to meet credit requirements for the project shall have efficiency that is greater than the requirements in Sections C402 through C405. Measures installed in the project that meet the requirements in Sections C406.2.1 through C406.2.7 shall achieve the base credits listed for the measure and occupancy type in Tables C406.2(1) through C406.2(9) or, where calculations required by Sections C406.2.1 through C406.2.7 create or modify the table credits, the credits achieved shall be based upon the calculations. Energy credits achieved for measures shall be determined by one of the following, as applicable:

1. The measure's energy credit shall be the base energy credit from Tables C406.2(1) through C406.2(9) for the measure where no adjustment factor or calculation is included in the description of the measure in Section C406.2.
2. The measure's energy credit shall be the base energy credit for the measure adjusted by a factor or equation as stated in the description of the measure in Section C406.2. Where adjustments are applied, each measure's energy credit shall be rounded to the nearest whole number.
3. The measure's energy credit shall be calculation as stated in the measures description in Section C406.2, where each individual measure credit shall be rounded to the nearest whole number.

Energy credits achieved for the project shall be the sum of the individual measure's energy credits. Credits are available for the measures listed in this Section. Where a project contains multiple *building* occupancy groups:

1. Credits achieved for each occupancy group shall be summed and then weighted by the *conditioned floor area* of each occupancy group to determine the weighted average project energy credits achieved.
2. Improved envelope efficiency (E01 through E06), HVAC Performance (H01) and lighting reduction (L06) measure credits shall be determined for the *building* or permitted *conditioned floor area* as a whole. Credits for other measures shall be determined for each occupancy separately. Credits shall be taken from applicable tables or calculations for each occupancy and weighted by the *building* occupancy group floor area.

[NY] TABLE C406.2(1)
BASE ENERGY CREDITS FOR GROUP R-2, R-4, AND I-1 OCCUPANCIES [a]

ID	Energy Credit Measure	Section	Climate Zone		
			4	5	6
E01	Envelope Performance	C406.2.1.1	Determined in accordance with Section C406.2.1.1		
E02	UA reduction (15%)	C406.2.1.2	22	29	32
E03	Reduced air leakage	C406.2.1.3	7	65	73
E04	Add Roof Insulation	C406.2.1.4	5	6	7
E05	Add Wall Insulation	C406.2.1.5	8	11	14
E06	Improve Fenestration	C406.2.1.6	22	27	41
H01	HVAC Performance	C406.2.2.1	13	15	18
H02	Heating efficiency	C406.2.2.2	6	10	14
H03	Cooling efficiency	C406.2.2.3	1	1	x
H04	Residential HVAC control	C406.2.2.4	21	23	21
H05	DOAS/fan control	C406.2.2.5	42	56	73
W01	SHW preheat recovery	C406.2.3.1a	103	102	93
W02	Heat pump water heater	C406.2.3.1b	88	88	81
W03	Efficient gas water heater	C406.2.3.1c	64	64	58
W04	SHW pipe insulation	C406.2.3.2	8	7	6
W05	Point of use water heaters	C406.2.3.3a	x	x	x
W06	Thermostatic valves	C406.2.3.3b	3	3	3
W07	SHW heat trace system	C406.2.3.3c	14	13	11
W08	SHW submeters	C406.2.3.4	19	19	17
W09	SHW flow reduction	C406.2.3.5	38	38	35
W10	Shower heat recovery	C406.2.3.6	27	27	25
P01	Energy monitoring	C406.2.4	2	2	3
L01	Lighting Performance	C406.2.5.1	x	x	x
L02	Lighting dimming & tuning	C406.2.5.2	1	1	1
L03	Increase occp. sensor	C406.2.5.3	2	1	1
L04	Increase daylight area	C406.2.5.4	x	x	x
L05	Residential light control	C406.2.5.5	6	4	3
L06	Light power reduction	C406.2.5.7	1	1	1
Q01	Efficient elevator	C406.2.6.1	4	4	4
Q02	Commercial kitchen equip.	C406.2.6.2	x	x	x
Q03	Residential kitchen equip.	C406.2.6.3	16	15	13
Q04	Fault detection	C406.2.6.4	2	1	3

a. "x" indicates credit is not available in that climate zone for that measure.

[NY] TABLE C406.2(2)
BASE ENERGY CREDITS FOR GROUP I-2 OCCUPANCIES [a]

ID	Energy Credit Measure	Section	Climate Zone		
			4	5	6
E01	Envelope Performance	C406.2.1.1	Determined in accordance with Section C406.2.1.1		
E02	UA reduction (15%)	C406.2.1.2	1	27	3
E03	Reduced air leakage	C406.2.1.3	6	7	9
E04	Add Roof Insulation	C406.2.1.4	1	2	2
E05	Add Wall Insulation	C406.2.1.5	4	3	3
E06	Improve Fenestration	C406.2.1.6	4	5	5
H01	HVAC Performance	C406.2.2.1	x	x	x
H02	Heating efficiency	C406.2.2.2	6	8	11
H03	Cooling efficiency	C406.2.2.3	1	1	x
H04	Residential HVAC control	C406.2.2.4	x	x	x
H05	DOAS/fan control	C406.2.2.5	49	56	65
W01	SHW preheat recovery	C406.2.3.1a	6	6	6
W02	Heat pump water heater	C406.2.3.1b	3	3	3
W03	Efficient gas water heater	C406.2.3.1c	3	3	3
W04	SHW pipe insulation	C406.2.3.2	1	1	1
W05	Point of use water heaters	C406.2.3.3a	x	x	x
W06	Thermostatic valves	C406.2.3.3b	1	1	1
W07	SHW heat trace system	C406.2.3.3c	2	2	1
W08	SHW submeters	C406.2.3.4	x	x	x
W09	SHW flow reduction	C406.2.3.5	x	x	x
W10	Shower heat recovery	C406.2.3.6	1	1	1
P01	Energy monitoring	C406.2.4	3	3	3
L01	Lighting Performance	C406.2.5.1	x	x	x
L02	Lighting dimming & tuning	C406.2.5.2	5	5	4
L03	Increase occp. sensor	C406.2.5.3	5	5	4
L04	Increase daylight area	C406.2.5.4	x	x	x
L05	Residential light control	C406.2.5.5	x	x	x
L06	Light power reduction	C406.2.5.7	7	6	5
Q01	Efficient elevator	C406.2.6.1	2	2	2
Q02	Commercial kitchen equip.	C406.2.6.2	x	x	x
Q03	Residential kitchen equip.	C406.2.6.3	x	x	x
Q04	Fault detection	C406.2.6.4	3	3	3

a. "x" indicates credit is not available in that climate zone for that measure.

[NY] TABLE C406.2(3)
BASE ENERGY CREDITS FOR GROUP R-1 OCCUPANCIES [a]

ID	Energy Credit Measure	Section	Climate Zone		
			4	5	6
E01	Envelope Performance	C406.2.1.1	Determined in accordance with Section C406.2.1.1		
E02	UA reduction (15%)	C406.2.1.2	5	7	9
E03	Reduced air leakage	C406.2.1.3	14	19	28
E04	Add Roof Insulation	C406.2.1.4	2	2	3
E05	Add Wall Insulation	C406.2.1.5	6	7	8
E06	Improve Fenestration	C406.2.1.6	6	9	13
H01	HVAC Performance	C406.2.2.1	11	11	13
H02	Heating efficiency	C406.2.2.2	2	3	6
H03	Cooling efficiency	C406.2.2.3	1	1	x
H04	Residential HVAC control	C406.2.2.4	x	x	x
H05	DOAS/fan control	C406.2.2.5	26	30	41
W01	SHW preheat recovery	C406.2.3.1a	34	37	36
W02	Heat pump water heater	C406.2.3.1b	29	31	30
W03	Efficient gas water heater	C406.2.3.1c	21	23	22
W04	SHW pipe insulation	C406.2.3.2	4	4	4
W05	Point of use water heaters	C406.2.3.3a	x	x	x
W06	Thermostatic valves	C406.2.3.3b	2	2	2
W07	SHW heat trace system	C406.2.3.3c	7	7	7
W08	SHW submeters	C406.2.3.4	x	x	x
W09	SHW flow reduction	C406.2.3.5	13	14	13
W10	Shower heat recovery	C406.2.3.6	9	10	9
P01	Energy monitoring	C406.2.4	2	2	2
L01	Lighting Performance	C406.2.5.1	x	x	x
L02	Lighting dimming & tuning	C406.2.5.2	1	1	1
L03	Increase occp. sensor	C406.2.5.3	4	2	2
L04	Increase daylight area	C406.2.5.4	x	x	x
L05	Residential light control	C406.2.5.5	x	x	x
L06	Light power reduction	C406.2.5.7	2	1	1
Q01	Efficient elevator	C406.2.6.1	3	3	2
Q02	Commercial kitchen equip.	C406.2.6.2	x	x	x
Q03	Residential kitchen equip.	C406.2.6.3	11	11	10
Q04	Fault detection	C406.2.6.4	2	2	2

a. "x" indicates credit is not available in that climate zone for that measure.

[NY] TABLE C406.2(4)
BASE ENERGY CREDITS FOR GROUP B OCCUPANCIES [a]

ID	Energy Credit Measure	Section	Climate Zone		
			4	5	6
E01	Envelope Performance	C406.2.1.1	Determined in accordance with Section C406.2.1.1		
E02	UA reduction (15%)	C406.2.1.2	13	21	13
E03	Reduced air leakage	C406.2.1.3	8	13	18
E04	Add Roof Insulation	C406.2.1.4	3	3	3
E05	Add Wall Insulation	C406.2.1.5	5	6	9
E06	Improve Fenestration	C406.2.1.6	8	10	21
H01	HVAC Performance	C406.2.2.1	15	16	19
H02	Heating efficiency	C406.2.2.2	3	5	9
H03	Cooling efficiency	C406.2.2.3	1	1	x
H04	Residential HVAC control	C406.2.2.4	x	x	x
H05	DOAS/fan control	C406.2.2.5	35	47	64
W01	SHW preheat recovery	C406.2.3.1a	13	13	12
W02	Heat pump water heater	C406.2.3.1b	5	5	5
W03	Efficient gas water heater	C406.2.3.1c	8	8	8
W04	SHW pipe insulation	C406.2.3.2	4	4	4
W05	Point of use water heaters	C406.2.3.3a	20	20	18
W06	Thermostatic valves	C406.2.3.3b	1	1	1
W07	SHW heat trace system	C406.2.3.3c	5	5	5
W08	SHW submeters	C406.2.3.4	x	x	x
W09	SHW flow reduction	C406.2.3.5	x	x	x
W10	Shower heat recovery	C406.2.3.6	x	x	x
P01	Energy monitoring	C406.2.4	3	3	3
L01	Lighting Performance	C406.2.5.1	x	x	x
L02	Lighting dimming & tuning	C406.2.5.2	6	5	4
L03	Increase occp. sensor	C406.2.5.3	6	5	4
L04	Increase daylight area	C406.2.5.4	6	6	6
L05	Residential light control	C406.2.5.5	x	x	x
L06	Light power reduction	C406.2.5.7	7	6	5
Q01	Efficient elevator	C406.2.6.1	5	5	4
Q02	Commercial kitchen equip.	C406.2.6.2	x	x	x
Q03	Residential kitchen equip.	C406.2.6.3	x	x	x
Q04	Fault detection	C406.2.6.4	2	2	3

a. "x" indicates credit is not available in that climate zone for that measure.

[NY] TABLE C406.2(5)
BASE ENERGY CREDITS FOR GROUP A-2 OCCUPANCIES [a]

ID	Energy Credit Measure	Section	Climate Zone		
			4	5	6
E01	Envelope Performance	C406.2.1.1	Determined in accordance with Section C406.2.1.1		
E02	UA reduction (15%)	C406.2.1.2	4	5	6
E03	Reduced air leakage	C406.2.1.3	24	33	42
E04	Add Roof Insulation	C406.2.1.4	1	2	2
E05	Add Wall Insulation	C406.2.1.5	2	2	2
E06	Improve Fenestration	C406.2.1.6	1	3	4
H01	HVAC Performance	C406.2.2.1	x	x	x
H02	Heating efficiency	C406.2.2.2	10	15	19
H03	Cooling efficiency	C406.2.2.3	1	1	x
H04	Residential HVAC control	C406.2.2.4	x	x	x
H05	DOAS/fan control	C406.2.2.5	51	67	84
W01	SHW preheat recovery	C406.2.3.1a	38	37	34
W02	Heat pump water heater	C406.2.3.1b	26	26	25
W03	Efficient gas water heater	C406.2.3.1c	24	23	21
W04	SHW pipe insulation	C406.2.3.2	3	2	2
W05	Point of use water heaters	C406.2.3.3a	x	x	x
W06	Thermostatic valves	C406.2.3.3b	1	1	1
W07	SHW heat trace system	C406.2.3.3c	4	3	3
W08	SHW submeters	C406.2.3.4	x	x	x
W09	SHW flow reduction	C406.2.3.5	x	x	x
W10	Shower heat recovery	C406.2.3.6	x	x	x
P01	Energy monitoring	C406.2.4	2	2	2
L01	Lighting Performance	C406.2.5.1	x	x	x
L02	Lighting dimming & tuning	C406.2.5.2	2	1	1
L03	Increase occp. sensor	C406.2.5.3	1	1	1
L04	Increase daylight area	C406.2.5.4	x	x	x
L05	Residential light control	C406.2.5.5	x	x	x
L06	Light power reduction	C406.2.5.7	2	2	1
Q01	Efficient elevator	C406.2.6.1	1	1	1
Q02	Commercial kitchen equip.	C406.2.6.2	26	24	21
Q03	Residential kitchen equip.	C406.2.6.3	x	x	x
Q04	Fault detection	C406.2.6.4	2	2	3

a. "x" indicates credit is not available in that climate zone for that measure.

[NY] TABLE C406.2(6)
BASE ENERGY CREDITS FOR GROUP M OCCUPANCIES [a]

ID	Energy Credit Measure	Section	Climate Zone		
			4	5	6
E01	Envelope Performance	C406.2.1.1	Determined in accordance with Section C406.2.1.1		
E02	UA reduction (15%)	C406.2.1.2	35	41	43
E03	Reduced air leakage	C406.2.1.3	44	56	64
E04	Add Roof Insulation	C406.2.1.4	19	21	24
E05	Add Wall Insulation	C406.2.1.5	27	25	23
E06	Improve Fenestration	C406.2.1.6	7	7	10
H01	HVAC Performance	C406.2.2.1	27	29	32
H02	Heating efficiency	C406.2.2.2	19	26	29
H03	Cooling efficiency	C406.2.2.3	1	1	x
H04	Residential HVAC control	C406.2.2.4	x	x	x
H05	DOAS/fan control	C406.2.2.5	98	120	134
W01	SHW preheat recovery	C406.2.3.1a	17	16	13
W02	Heat pump water heater	C406.2.3.1b	5	4	4
W03	Efficient gas water heater	C406.2.3.1c	9	8	7
W04	SHW pipe insulation	C406.2.3.2	4	4	4
W05	Point of use water heaters	C406.2.3.3a	x	x	x
W06	Thermostatic valves	C406.2.3.3b	1	1	1
W07	SHW heat trace system	C406.2.3.3c	5	5	5
W08	SHW submeters	C406.2.3.4	x	x	x
W09	SHW flow reduction	C406.2.3.5	x	x	x
W10	Shower heat recovery	C406.2.3.6	x	x	x
P01	Energy monitoring	C406.2.4	5	5	5
L01	Lighting Performance	C406.2.5.1	x	x	x
L02	Lighting dimming & tuning	C406.2.5.2	9	7	5
L03	Increase occp. sensor	C406.2.5.3	10	7	6
L04	Increase daylight area	C406.2.5.4	11	9	8
L05	Residential light control	C406.2.5.5	x	x	x
L06	Light power reduction	C406.2.5.7	8	6	6
Q01	Efficient elevator	C406.2.6.1	3	3	3
Q02	Commercial kitchen equip.	C406.2.6.2	x	x	x
Q03	Residential kitchen equip.	C406.2.6.3	x	x	x
Q04	Fault detection	C406.2.6.4	2	2	3

a. "x" indicates credit is not available in that climate zone for that measure.

TABLE C406.2(7)
BASE ENERGY CREDITS FOR GROUP E OCCUPANCIES [a]

ID	Energy Credit Measure	Section	Climate Zone		
			4	5	6
E01	Envelope Performance	C406.2.1.1	Determined in accordance with Section C406.2.1.1		
E02	UA reduction (15%)	C406.2.1.2	24	33	40
E03	Reduced air leakage	C406.2.1.3	1	1	2
E04	Add Roof Insulation	C406.2.1.4	14	18	23
E05	Add Wall Insulation	C406.2.1.5	6	5	7
E06	Improve Fenestration	C406.2.1.6	16	22	33
H01	HVAC Performance	C406.2.2.1	19	19	23
H02	Heating efficiency	C406.2.2.2	5	9	15
H03	Cooling efficiency	C406.2.2.3	1	1	x
H04	Residential HVAC control	C406.2.2.4	x	x	x
H05	DOAS/fan control	C406.2.2.5	43	57	79
W01	SHW preheat recovery	C406.2.3.1a	14	15	13
W02	Heat pump water heater	C406.2.3.1b	10	11	10
W03	Efficient gas water heater	C406.2.3.1c	9	9	8
W04	SHW pipe insulation	C406.2.3.2	5	5	4
W05	Point of use water heaters	C406.2.3.3a	5	5	4
W06	Thermostatic valves	C406.2.3.3b	2	2	1
W07	SHW heat trace system	C406.2.3.3c	6	6	5
W08	SHW submeters	C406.2.3.4	x	x	x
W09	SHW flow reduction	C406.2.3.5	x	x	x
W10	Shower heat recovery	C406.2.3.6	3	3	3
P01	Energy monitoring	C406.2.4	3	3	3
L01	Lighting Performance	C406.2.5.1	x	x	x
L02	Lighting dimming & tuning	C406.2.5.2	6	5	4
L03	Increase occp. sensor	C406.2.5.3	6	4	3
L04	Increase daylight area	C406.2.5.4	6	5	5
L05	Residential light control	C406.2.5.5	x	x	x
L06	Light power reduction	C406.2.5.7	7	6	5
Q01	Efficient elevator	C406.2.6.1	5	5	4
Q02	Commercial kitchen equip.	C406.2.6.2	x	x	x
Q03	Residential kitchen equip.	C406.2.6.3	x	x	x
Q04	Fault detection	C406.2.6.4	3	3	4

a. "x" indicates credit is not available in that climate zone for that measure.

TABLE C406.2(8)
BASE ENERGY CREDITS FOR GROUP S-1 AND S-2 OCCUPANCIES [a]

ID	Energy Credit Measure	Section	Climate Zone		
			4	5	6
E01	Envelope Performance	C406.2.1.1	Determined in accordance with Section C406.2.1.1		
E02	UA reduction (15%)	C406.2.1.2	37	44	43
E03	Reduced air leakage	C406.2.1.3	77	92	95
E04	Add Roof Insulation	C406.2.1.4	14	14	10
E05	Add Wall Insulation	C406.2.1.5	10	9	7
E06	Improve Fenestration	C406.2.1.6	4	5	3
H01	HVAC Performance	C406.2.2.1	x	x	x
H02	Heating efficiency	C406.2.2.2	33	41	44
H03	Cooling efficiency	C406.2.2.3	1	1	x
H04	Residential HVAC control	C406.2.2.4	x	x	x
H05	DOAS/fan control	C406.2.2.5	141	168	180
W01	SHW preheat recovery	C406.2.3.1a	5	4	3
W02	Heat pump water heater	C406.2.3.1b	1	1	1
W03	Efficient gas water heater	C406.2.3.1c	3	2	2
W04	SHW pipe insulation	C406.2.3.2	2	1	1
W05	Point of use water heaters	C406.2.3.3a	x	x	x
W06	Thermostatic valves	C406.2.3.3b	1	1	1
W07	SHW heat trace system	C406.2.3.3c	2	2	2
W08	SHW submeters	C406.2.3.4	x	x	x
W09	SHW flow reduction	C406.2.3.5	x	x	x
W10	Shower heat recovery	C406.2.3.6	x	x	x
P01	Energy monitoring	C406.2.4	5	5	5
L01	Lighting Performance	C406.2.5.1	x	x	x
L02	Lighting dimming & tuning	C406.2.5.2	6	3	3
L03	Increase occp. sensor	C406.2.5.3	7	5	4
L04	Increase daylight area	C406.2.5.4	7	5	4
L05	Residential light control	C406.2.5.5	x	x	x
L06	Light power reduction	C406.2.5.7	8	5	4
Q01	Efficient elevator	C406.2.6.1	9	7	5
Q02	Commercial kitchen equip.	C406.2.6.2	x	x	x
Q03	Residential kitchen equip.	C406.2.6.3	x	x	x
Q04	Fault detection	C406.2.6.4	5	5	6

a. "x" indicates credit is not available in that climate zone for that measure.

TABLE C406.2(9)
BASE ENERGY CREDITS FOR OTHER OCCUPANCIES [a, b]

ID	Energy Credit Measure	Section	Climate Zone		
			4	5	6
E01	Envelope Performance	C406.2.1.1	Determined in accordance with Section C406.2.1.1		
E02	UA reduction (15%)	C406.2.1.2	18	26	24
E03	Reduced air leakage	C406.2.1.3	28	36	41
E04	Add Roof Insulation	C406.2.1.4	7	9	9
E05	Add Wall Insulation	C406.2.1.5	9	9	9
E06	Improve Fenestration	C406.2.1.6	9	11	16
H01	HVAC Performance	C406.2.2.1	x	x	x
H02	Heating efficiency	C406.2.2.2	11	15	18
H03	Cooling efficiency	C406.2.2.3	x	x	x
H04	Residential HVAC control	C406.2.2.4	x	x	x
H05	DOAS/fan control	C406.2.2.5	61	75	90
W01	SHW preheat recovery	C406.2.3.1a	29	29	26
W02	Heat pump water heater	C406.2.3.1b	21	21	20
W03	Efficient gas water heater	C406.2.3.1c	18	18	16
W04	SHW pipe insulation	C406.2.3.2	4	4	3
W05	Point of use water heaters	C406.2.3.3a	13	13	11
W06	Thermostatic valves	C406.2.3.3b	1	1	1
W07	SHW heat trace system	C406.2.3.3c	6	5	5
W08	SHW submeters	C406.2.3.4	x	x	x
W09	SHW flow reduction	C406.2.3.5	x	x	x
W10	Shower heat recovery	C406.2.3.6	10	10	10
P01	Energy monitoring	C406.2.4	3	3	3
L01	Lighting Performance	C406.2.5.1	x	x	x
L02	Lighting dimming & tuning	C406.2.5.2	5	4	3
L03	Increase occp. sensor	C406.2.5.3	5	4	3
L04	Increase daylight area	C406.2.5.4	x	x	x
L05	Residential light control	C406.2.5.5	x	x	x
L06	Light power reduction	C406.2.5.7	5	4	4
Q01	Efficient elevator	C406.2.6.1	4	4	3
Q02	Commercial kitchen equip.	C406.2.6.2	18	26	24
Q03	Residential kitchen equip.	C406.2.6.3	28	36	41
Q04	Fault detection	C406.2.6.4	7	9	9

a. "x" indicates credit is not available in that climate zone for that measure.
b. Other occupancy groups include all Groups except for Groups A-2, B, E, I, M, S, and R.

C406.2.1 More efficient building thermal envelope. A project shall achieve credits for improved envelope performance by complying with one of the following measures:

1. Section C406.2. 1.1: E01
2. Section C406.2. 1.2: E02
3. Section C406.2. 1.3: E03
4. Both E02 and E03
5. Any combination of:
   - 5.1 Section C406.2. 1.3: E03
   - 5.2 Section C406.2. 1.4: E04
   - 5.3 Section C406.2. 1.5: E05
   - 5.4 Section C406.2. 1.6: E06

C406.2.1.1 EO1 Improved envelope performance 90.1 Appendix C. *Building thermal envelope* measures shall be installed to improve the energy performance of the project. The achieved energy credits shall be determined using Equation 4-12.

$$ECENV = 1000 \times (EPFB - EPFp)/EPFB \quad \text{(Equation 4-12)}$$

EC_{ENV}= E01 measure energy credits
EPF_B= base envelope performance factor calculated in accordance with ASHRAE 90.1-Appendix C.
EPF_P= proposed envelope performance factor calculated in accordance with ASHRAE 90.1-Appendix C.

C406.2.1.2 E02 Total UA envelope reduction. Energy credits shall be achieved where the total UA of the building thermal envelope as designed is not less than 15 percent below the total UA of the building thermal envelope in accordance with Section C402.1.5.

C406.2.1.3 E03 Reduced air leakage. Energy credits shall be achieved where tested building air leakage is not less than 10 percent less than the maximum leakage permitted by Section C402.6.2 provided the building is tested in accordance with the applicable method in Section C402.6.2. Energy credits achieved for measure E03 shall be determined as follows:

$$EC_{E03} = EC_B \times EC_{adj} \quad \text{(Equation 4-13)}$$

EC_{E03}= Energy effi ciency credits achieved for envelope leakage reduction
EC_B= C406.2.1.3 credits from Tables C406.2(1) through C406.2(9)
EC_{adj}= Ls/ECa
Ls = Leakage savings fraction: the lessor of [(Lr-Lm)/Lr] or 0.8
Lr = Maximum leakage permitted for tested buildings, by occupancy group, in accordance with Section C402.6.2
Lm = Measured leakage in accordance with Section C402.6. 2.1 or C402.6.2.2
EC_a= Energy Credit alignment factor: 0.37 for whole building tests in accordance with Section C402.6.2.1 or 0.25 for dwelling and sleeping unit enclosure tests in accordance with Section C402.6.2.2

C406.2.1.4 E04 Added Roof Insulation. Energy credits shall be achieved for insulation that is in addition to the required insulation in Table C402.1.3. All roof areas in the project shall have additional R-10 continuous insulation included in the roof assembly. For attics this is permitted to be achieved with fill or batt insulation rated at R-10 that is continuous and not interrupted by ceiling or roof joists. Where interrupted by joists, the added insulation shall be not less than R-13. Alternatively, one-half of the base credits shall be achieved where the added R-value is one-half of the additional R-value required by this section.

C406.2.1.5 E05 Added wall insulation. Energy credits shall be achieved for insulation applied to not less than 90 percent of all opaque wall area in the project that is in addition to the required insulation in Table C402.1.3. Opaque walls shall have additional R-5 continuous insulation included in the wall assembly. Alternatively, one-half of the base credits shall be achieved where the added R-value is R-2.5.

C406.2.1.6 E06 Improved fenestration. Energy credit shall be achieved for improved energy characteristics of all vertical fenestration in the project meeting the requirements in Table C406.2.1.6. The area-weighted average U-factor and SHGC of all vertical fenestration shall be equal to or less than the value shown in the table. Where vertical fenestration is located under a permanently attached shading projection with a projection factor PF not less than 0.2 as determined in accordance with Section C402.5.3, the SHGC for that fenestration shall be permitted to be divided by 1.2. The area-weighted average visible transmittance (VT) of all vertical fenestration shall be equal to or greater than the value shown in the table.

[NY] TABLE C406.2.1.6
Vertical Fenestration Requirements for Energy Credit E06

Applicable Climate Zone	Maximum U-Factor		Maximum SHGC	Minimum VT
	Fixed	Operable		
4-5	0.31	0.38	0.34	0.41
6	0.26	0.32	0.38	0.44

C406.2.2 More Efficient HVAC Equipment Performance. All heating and cooling systems shall meet the minimum requirements of Section C403 and efficiency improvements shall be referenced to minimum efficiencies listed in Tables referenced by Section C403.3.2. Where multiple efficiency requirements are listed, equipment shall meet the seasonal or part-load efficiencies including SEER, EER/integrated energy efficiency ratio (IEER), integrated part load value (IPLV), or AFUE. Equipment that is larger than the maximum capacity range indicated in Tables referenced by Section C403.3.2 shall utilize the values listed for the largest capacity equipment for the associated equipment type shown in the table. Where multiple individual heating or cooling systems serve the project, the improvement shall be the weighted average improvement based on individual system capacity. Systems are permitted to achieve HVAC energy credits by meeting the requirements of either:

1. C406.2.2.1 H01
2. C406.2.2.2 H02
3. C406.2.2.3 H03
4. C406.2.2.4 H04
5. C406.2.2.5 H05
6. Any combination of H02, H03, H04 and H05
7. The combination of H01 and H04

C406.2.2.1 H01 HVAC Performance (TSPR). H01 energy credits shall be earned where systems are permitted to use Section C409 and where the savings (TSPRs) based on the proposed TSPR (TSPRp) compared to the target TSPR is by 5 percent or more. If savings is greater than 5 percent, determine H01 earned credits using Equation 4-14. Energy credits for H01 shall not be combined with energy credits from HVAC measures H02, H03 or H05.

$$ECTSPR = ECBASE \times AREA_{TSPR} \times TSPRs/0.05 \quad \text{(Equation 4-14)}$$

ECTSPR= Energy credits achieved for H01

ECBASE = H01 base energy credits from Tables C406.2(1) through C406.2(9)
TSPRs = [the lessor of 0.20 and (1-(TSPRt/TSPRp)]
$AREA_{TSPR}$ = [floor area served by systems included in TSPR] / [total building *conditioned floor area*]
TSPRp = HVAC TSPR of the proposed design calculated in accordance with Sections C409.4, C409.5 and C409.6.
TSPRt = TSPRr / MPF
TSPRr = HVAC TSPR of the reference *building* design calculated in accordance with Sections C409.4, C409.5 and C409.6.
MPF = Mechanical Performance Factor from Table C409.4 based on *climate zone* and *building* use type
Where a *building* has multiple *building* use types, MPF shall be area weighted in accordance with Section C409.4

C406.2.2.2 H02 More efficient HVAC equipment heating performance. No less than 90 percent of the total HVAC capacity serving the total *conditioned floor area* of the entire *building* or tenant space in accordance with Section C406.1.1, shall comply with the requirements of this Section.

1. Equipment installed shall be types that have their efficiency listed in Tables referenced by Section C403.3.2. Electric resistance heating capacity shall be limited to 20 percent of system capacity, with the exception of heat pump supplemental heating.
2. Equipment shall exceed the minimum heating efficiency requirements listed in Tables referenced by Section C403.3.2 by at least 5 percent. Where equipment exceeds the minimum annual heating efficiency requirements by more than 5 percent, energy efficiency credits for heating shall be determined using Equation 4-15 rounded to the nearest whole number.

$$EEC_{HEH} = EEC_{H5} \times (HEI/0.05) \quad \text{(Equation 4-15)}$$

EECHEH= energy efficiency credits for heating efficiency improvement
EECH5=Section C406.2.2.2 credits from Tables C406.2(1) through C406.2(9)
HEI = the lesser of: the improvement (as a fraction) above minimum heating efficiency requirements, or 20 percent (0.20).

Where heating equipment with different minimum efficiencies are included in the *building* , a heating capacity weighted average improvement shall be used. Where electric resistance primary heating or reheat is included in the *building* it shall be included in the weighted average improvement with an HEI of 0. Supplemental gas and electric heat for heat pump systems shall be excluded from the weighted HEI. For heat pumps rated at multiple ambient temperatures, the efficiency at 47ºF (8.3ºC) shall be used.

For metrics that increase as efficiency increases, HEI shall be calculated as follows:

HEI = (HM DES /HM MIN)-1

Where:
HMDES= Design heating efficiency metric, part-load or annualized where available
HMMIN= Minimum required heating efficiency metric, part-load or annualized where available from Section C403.3.2

Exception: In low energy spaces complying with Section C402.1.1, no less than 90 percent of the installed heating capacity is provided by electric infrared or gas-fired radiant heating equipment for localized heating applications. Such spaces shall only achieve base energy credits for EEC H5 .

C406.2.2.3 H03 More efficient HVAC cooling equipment and fan performance. No less than 90 percent of the total HVAC cooling capacity serving the total *conditioned floor area* of the entire *building* or tenant space in accordance with Section C406.1.1, shall comply with all of the requirements of this section.

1. Equipment installed shall be types that are listed in Tables referenced by Section C403.3.2.
2. Equipment shall exceed the minimum cooling efficiency requirements listed in Tables referenced by Section C403.3.2 by at least 5 percent. For water-cooled chiller plants, heat rejection equipment performance in Table C403.3.2(7) shall also be increased by at least the chiller efficiency improvement. Where equipment exceeds both the minimum annual cooling efficiency and heat rejection efficiency requirements by more than 5 percent, energy efficiency credits for cooling shall be determined using Equation 4-16, rounded to the nearest whole number.

Where fan energy is not included in packaged equipment rating or it is and the fan size has been increased from the as-rated equipment condition, fan power or horsepower shall be less than 95 percent of the allowed fan power in Section C403.8.1.

$EEC_{HEC} = EEC_5 \times (CEI/0.05)$ (Equation 4-16)

EEC_{HEC}= energy efficiency credits for cooling efficiency improvement

EEC5 = C406.2.2.3 base energy credits from Tables C406.2(1) through C406.2(9) CEI= the lesser of: the improvement above minimum cooling efficiency and heat rejection performance requirements expressed as a fraction, or 0.20 (20percent). Where cooling equipment with different minimum efficiencies are included in the *building*, a cooling capacity weighted average improvement shall be used. Where multiple cooling efficiency or performance requirements are provided, the equipment shall exceed the annualized energy or part-load requirement. Meeting both part-load and full-load efficiencies is not required. For metrics that increase as efficiency increases, CEI shall be calculated as follows:

$CEI = (CM_{DES}/CM_{MIN}) - 1$For metrics that decrease as efficiency increases, CEI shall be calculated as follows:

$CEI = (CM_{MIN}/CM_{DES}) - 1$

Where:
CM_{DES}= Design cooling efficiency metric, part-load or annualized where available
CM_{MIN}= Minimum required cooling efficiency metric, part-load or annualized where available from Section C403.3.2
For Data Centers using ASHRAE Standard 90.4, CEI shall be calculated as follows:

$CEI = (AMLC_{MAX} / AMLC_{DES}) - 1$

Where:

$AMLC_{DES}$= As-Designed Annualized Mechanical Load Component calculated in accordance with ASHRAE Standard 90.4, Section 6.5
$AMLC_{MAX}$= Maximum Annualized Mechanical Load Component from ASHRAE Standard 90.4, Table 6.5

C406.2.2.4 H04 Residential HVAC control. HVAC systems serving *dwelling units* or *sleeping units* shall be controlled to automatically activate a setback at least 5°F (3°C) for both heating and cooling. The temperature controller shall be configured to provide setback during occupied sleep periods. The unoccupied setback mode shall be configured to operate in conjunction with one of the following:

1. A manual main control device by each *dwelling unit* main entrance that initiates setback and non-ventilation mode for all HVAC units in the *dwelling unit* and is clearly identified as "Heating/Cooling Master Setback."
2. Occupancy sensors in each room of the dwelling unit combined with a door switch to initiate setback and non-ventilation mode for all HVAC units in the dwelling within 20 minutes of all spaces being vacant immediately

after a door switch operation. Where separate room HVAC units are used, an individual occupancy sensor on each unit that is configured to provide setback shall meet this requirement.

3. An advanced learning thermostat or controller that recognizes occupant presence and automatically creates a schedule for occupancy and provides a dynamic setback schedule based on when the spaces are generally unoccupied.
4. An automated control and sensing system that uses geographic fencing connected to the dwelling unit occupants' cell phones and initiates the setback condition when all occupants are away from the *building*.

[NY] C406.2.2.5 H05 Dedicated Outdoor Air System. Credits for this measure are only allowed where single *zone* HVAC units are not required to have multi-speed or variable-speed fan control in accordance with Section C403.8.6.1. HVAC controls and *ventilation* systems shall include all of the following:

1. *Zone* controls shall cycle the heating/cooling unit fans off when not providing required heating and cooling or shall limit fan power to 0.12 watts/cfm of *zone* supply air.
2. Outdoor air shall be supplied by an independent *ventilation* system designed to provide no more than 130 percent of the minimum outdoor air to each individual occupied *zone* , as specified by the *Mechanical Code of New York State*.
   Exception: Outdoor airflow is permitted to increase during emergency or economizer operation implemented as described in item 4.
3. The *ventilation* system shall have energy recovery with an *enthalpy recovery ratio* of 65 percent or more at heating design conditions and an *enthalpy recovery ratio* of 65 percent or more at cooling design conditions. Energy recovery shall include latent recovery. Where no humidification is provided, heating energy recovery effectiveness is permitted to be based on *sensible energy recovery ratio*. Where energy recovery effectiveness is less than the 65 percent required for full credit, adjust the credits from Section C406.2 by the factors in Table C406.2.2.5.
4. Where the *ventilation* system serves multiple zones and the system is not in a latent recovery outside air dehumidification mode. partial economizer cooling through an outdoor air bypass or wheel speed control shall automatically do one of the following:
   4.1 Set the energy recovery leaving-air temperature 55°F (13°C) or 100 percent outdoor air bypass when a majority of zones require cooling and outdoor air temperature is below 70°F (21°C).
   4.2 HVAC *ventilation* system shall include supply-air temperature controls that automatically reset the supply-air temperature in response to representative building loads, or to outdoor air temperatures. The controls shall reset the supply-air temperature not less than 25 percent of the difference between the design supply-air temperature and the design room- air temperature.
5. Ventilation systems providing mechanical dehumidification shall use recovered energy for reheat within the limits of item 4. This shall not limit the use of latent energy recovery for dehumidification.

   Where only a portion of the *building* is permitted to be served by constant air volume units or the enthalpy recovery ratio or *sensible energy recovery ratio* is less than 65 percent, the base energy credits shown in Section C406.2 shall be prorated as follows:

$$EC_{DOAS} = EC_{BASE} \times FLOOR_{cav} \times ERE_{ADJ} \quad \textbf{(Equation 4-17)}$$

EC_{DOAS}= Energy credits achieved for H05

EC_{BASE}= H05 base energy credits in Section C406.2

$FLOOR_{CAV}$= Fraction of whole project gross conditioned floor area not required to have variable speed or multi-speed fan airflow control in accordance with Section C403.8.6.

ERE_{adj}= The energy recovery adjustment from Table C406.2.2.5 based on the lower of actual cooling or heating enthalpy recovery ratio or *sensible energy recovery ratio* where required for the *climate zone*. Where recovery ratios vary, use a weighted average by supply airflow.

TABLE C406.2.2.5
DOAS Energy Recovery Adjustments

ERE_{adj} based on lower of actual heating or cooling energy recovery effectiveness where required		
Cooling ERR is ≥ at least	**Heating enthalpy recovery ratio or sensible energy recovery ratio is ≥at least**	**Energy Recovery Effectiveness Adjustment (ERE_{adj})**
65%	65%	1
60%	60%	0.67
55%	55% [a]	0.33
50%	50% [a]	0.25

a. In climate zones where heating recovery is required in Section C403, for dwelling units a heating recovery effectiveness below 60 percent is not allowed.

C406.2.3 Reduced Energy Use In-service Water Heating. Projects with service water- heating equipment that serves the whole *building*, a *building addition* or a tenant space shall achieve credits through compliance with the requirements of this section. Systems are permitted to achieve energy credits by meeting the requirements of either:

1. C406.2.3.1 by selecting one allowed measure W01, W02, W03, or a combination in accordance with Section C406.2.3.1.4
2. C406.2.3.2 W04
3. C406.2.3.3 by selecting one allowed measure W05, W06, or W07
4. C406.2.3.4 W08
5. C406.2.3.5 W09
6. C406.2.3.6 W10
7. Any combination of measures in C406.2.3.1 through C406.2.3.6 as long no more than one allowed measure from C406.2.3.1 and C406.2.3.3 are selected.

C406.2.3.1 Service water-heating system efficiency. A project is allowed to achieve energy credits from only one of Sections C406.2.3.1.1 through C406.2.3.1.4.

C406.2.3.1.1 W01 Recovered or renewable water heating. The building service water-heating system shall have one or more of the following that are sized to provide not less than 30 percent of the building's annual hot water requirements, or sized to provide not less than 70 percent of the building 's annual hot water requirements if the building is required to comply with Section C403.11.5:

1. Waste heat recovery from SHW, heat recovery chillers, building equipment, or process equipment.
2. A water-to-water heat pump that precools chilled water return for building cooling while heating SHW.
3. On-site renewable energy water-heating systems.

C406.2.3.1.2 W02 Heat pump water heater. Air-source heat pump water heaters shall be installed according to manufacturer' s instructions and at least 30 percent of design end use *service water heating* requirements shall be met using only heat pump heating at an ambient condition of 67.5 °F (19.7 °C), db without supplemental electric resistance or fossil fuel heating. For a heat pump *water heater* with supplemental electric resistance heating, the heat pump only capacity shall be deemed at 40 percent of first hour draw. Where the heat pump only capacity exceeds 50 percent of the design end use load excluding recirculating system losses, the credits from the Section C406.2 tables shall be prorated as follows:

(Equation 4-18)

$$EC_{HPWH} = (EC_{BASE}/0.5) \text{ X } \{(CAP_{HPWH})/(ENDLOAD)[\text{not greater than } 2]\}$$

EC_{HPWH}= Energy credits achieved for W02

EC_{BASE}= W02 base energy credits from Tables C406.2(1) through C406.2(9)

ENDLOAD = End use peak hot water load, excluding load for heat trace or recirculation, Btu/hr or kW

CAP_{HPWH} = the heat pump only capacity at 50ºF (10ºC) entering air and 70ºF (21ºC) entering potable water without supplemental electric resistance or fossil fuel heat, Btu/hr or kW

The heat pump *service water heating* system shall comply with the following requirements:

1. For systems with an installed total output capacity of more than 100,000 Btu/ hr (30 kW) at an ambient condition of 67.5ºF (19.7ºC), db a preheat storage tank with greater than or equal 0.75 gallons per 1000 Btu/hr (≥9.7 L/kW) of design end use service water heating requirements shall be heated only with heat pump heating when the ambient temperature is greater than 45ºF (7.2ºC).
2. For systems with piping temperature maintenance, either a heat trace system or a separate water heater in series for recirculating system and final heating shall be installed.
3. Heat pump water heater efficiency shall meet or exceed one of the following:

   3.1 Output-capacity-weighted-average UEF of 3.0 in accordance with 10 CFR 430 Appendix E.

   3.2 Output-capacity-weighted-average COP of not less than 4.0 tested at 50ºF (10ºC) entering air and 70ºF (21ºC) entering potable water in accordance with AHRI standard 1300.

Where the heat pump capacity at 50°F (10°C) entering air and 70°F (21°C) entering water exceeds 50 percent of the design end-use load excluding recirculating system losses, the base credits from Section C406.2 shall be prorated based on Equation 4-19.

W02 credit = base W02 table credit x (HP_{LF}/50%) (Equation 4-19)

HP_{LF} = Heat pump capacity as a fraction of the design end-use SHW requirements excluding recirculating system losses, not to exceed 80 percent.

C406.2.3.1.3 W03 Efficient fossil fuel water heater. The combined input-capacity-weighted- average equipment rating of all gas water-heating equipment in the *building* shall be not less than 95 percent Et or 0.93 UEF. Adjustments shall apply as follows:

1. Where the *service water heating* system is required to comply with Section C404.2.1, this measure shall achieve 30 percent of the listed base W03 energy credits in Tables C406.2(1) through C406.2(9)
2. Where the installed building service water heating capacity is less than 200,000 Btu/hr (59 kW) and weighted UEF is less than 0.93 UEF and not less than 0.82 this measure shall achieve 25 percent of the base W03 credit in Tables C406.2(1) through C406.2(9).

C406.2.3.1.4 Combination service water heating systems. Shall achieve credits using one of the measure combinations as follows:

1. (W01 + W02) Where service water heating employs both energy recovery and heat pump water heating, W01 may be combined with W02 and receive the sum of both credits.
2. (W01 + W03) Where service water heating employs both energy recovery and efficient gas water heating, W01 may be combined with W03 and receive the sum of the W01 credit and the portion of the W03 credit based on item 4.
3. (W02 + W03) Where service water heating employs both heat pump water heating and efficient gas water heating, W02 may be combined with W03 and receive the sum of the W02 credit and the portion of the W03 credit based on item 4.

For items 2 and 3, the achieved W03 credit shall be the Section C406.2.3.1.3 W03 credit multiplied by the fractional share of total water heating installed capacity served by gas water heating that is not less than 95 percent Et or 0.93 UEF. In no case shall the achieved W03 credit exceed 60 percent of the W03 credit in Section C406.2 tables. In *Buildings* that have a *service water heating* design generating capacity greater than 900,000 Btu/h that proportioned W03 credit shall be further multiplied by 30 percent.

C406.2.3.2 W04: Service Hot Water Piping Insulation Increase. Where service hot water is provided by a central water heating system, the hot water pipe insulation thickness shall be at least 1.5 times the thickness required in Section C404.4. All service hot water piping shall be insulated from the hot water source to the fixture shutoff. Where 50 percent or more of hot water piping does not have increased insulation due to installation in partitions, the credit shall be prorated as a percentage of lineal feet of piping with increased insulation.

C406.2.3.3 Service water-heating distribution temperature maintenance. A project is allowed to claim energy credits from only one of the following SHW distribution temperature maintenance measures.

1. **W05 Point of use water heaters.** Credits are available for office or school buildings Group B or E buildings larger than 5,000 ft2 (460 m2) where service water heating systems meet the following requirements:

   1.1 Fixtures requiring hot water shall be supplied from a local water heater with no recirculating system or heat trace piping.

   Exception: Commercial kitchens or showers in locker rooms shall be permitted to have a local recirculating system or heat trace piping where water heaters are located not more than 50 lineal feet (15 m) from the furthest fixture served.

   1.2 Supply piping from the water heater to the termination of the fixture supply pipe shall be insulated to the levels shown in Table C404.4.1.

   Exceptions:

   1. Piping at locations where a vertical support of the piping is installed.

   2. Where piping passes through a framing member and insulation requires increasing the size of the framing member.

   1.3 The water volume in the piping from the water heater to the termination of any individual fixture shall be limited as follows:

   1.3.1 Non-residential public lavatory faucets that are available for use by members of the general public: not more than 2 oz (60 mL).

   1.3.2 Commercial kitchens or showers in locker rooms with recirculating systems or heat trace piping: not more than 24 oz (0.75 L) from the recirculating system or heat trace piping.

   1.3.3 All other plumbing fixtures or appliances: not more than 16 oz (0.95 0.5 L)

2. **W06 Thermostatic balancing valves.** Credits are available where *service water heating* is provided centrally and distributed throughout the *building* with a recirculating system. Each recirculating system branch return connection to the main SHW supply piping shall have an *automatic* thermostatic balancing valve set to a minimal return water flow when the branch return temperature is greater than 120ºF(49ºC).

3. **W07 Heat trace system.** Credits are available for projects with gross floor area greater than 10,000 square feet (930 m^2) and a central water-heating system. The energy credits achieved shall be from Tables C406.1.2(1) through C406.1.2(9). This system shall include self-regulating electric heat cables, connection kits, and electronic controls. The cable shall be installed directly on the hot water supply pipes underneath the insulation to replace standby losses.

C406.2.3.4 W08 Water-heating system submeters. Each individual *dwelling unit* in a Group R-2 occupancy served by a central service water-heating system shall be provided with a service hot water meter connected to a reporting system that provides individual *dwelling unit* reporting of actual domestic hot water use. Preheated water serving the cold water inlet to showers need not be metered.

C406.2.3.5 W09 Service hot water flow reduction. *Dwelling unit* , *sleeping unit* , and guest room plumbing fixtures that are connected to the service water-heating system shall have a flow or consumption rating less than or equal to the values shown in Table C406.2.3.5.

TABLE C406.2.3.5
Maximum Flow Rating for Residential Plumbing Fixtures with Heated Water

Plumbing Fixture	Maximum Flow Rate
Faucet for private lavatory,[a] hand sinks, or bar sinks	1.2 gpm at 60 psi (4.5 L/m at 410 kPa)
Faucet for residential kitchen sink [a,b,c]	1.8 gpm at 60 psi 6.8 L/m at 410 kPa)
Shower head (including hand-held shower spray) [a, b,d]	1.8 gpm at 80 psi (6.8 L/m at 550 kPa)

a. Showerheads, lavatory faucets and kitchen faucets are subject to U.S. Federal requirements listed in 10 CFR 430.32(o)- (p).

b. Maximum flow allowed is less than required by flow rates listed in U.S. 10 CFR 430.32(o)- (p) for showerheads and kitchen faucets.

c. Residential kitchen faucet may temporarily increase the flow above the maximum rate, but not above 2.2 gallons per minute at 60 psi (8.3 L/m at 410 kPa) and must default to the maximum flow rate listed.

d. When a shower is served by multiple shower heads, the combined flow rate of all shower heads controlled by a single valve shall not exceed the maximum flow rate listed or the shower shall be designed to allow only one shower head to operate at a time.

C406.2.3.6 W10 Shower drain heat recovery. Cold water serving *building* showers shall be preheated by shower drain heat recovery units that comply with Section C404.7. The efficiency of drain heat recovery units shall be 54 percent or greater measured in accordance with CSA B55.1. Full credits are applicable to the following *building* uses: I-2, I-4, R-1, R-2 and also group E where there are more than eight showers. Partial credits are applicable to buildings where all but ground floor showers are served where the base energy credit from Section C406.2 is adjusted by Equation 4-20.

(Equation 4-20)

W10 credits = W10 base energy credits x (showers with drain heat recovery/total showers in building

C406.2.4 P01 Energy Monitoring. A project not required to comply with C405.13 can achieve energy credits for installing an energy monitoring system that complies with all the requirements of C405.13.1 through C405.13.5.

C406.2.5 Energy Savings in Lighting Systems. Projects are permitted to achieve energy credits for increased lighting system performance by meeting the requirements of either:

1. C406.2.5.2 L02
2. C406.2.5.3 L03
3. C406.2.5.4 L04
4. C406.2.5.5 L05
5. C406.2.5.6 L06
6. Any combination of L03, L04, L05 and L06
7. Any combination of L02, L03 and L04

C406.2.5.1 L01 Lighting system performance (reserved).

C406.2.5.2 L02 high-end trim lighting controls. Measure credits shall be achieved where qualifying spaces are no less than 50 percent of the project interior floor area exclusive of *dwelling* and *sleeping units.* Qualifying spaces are those where *general lighting* is controlled by *high-end trim* lighting controls complying with the following:

1. The calibration adjustment equipment is located for *ready access* only by authorized personnel.
2. Lighting controls with *ready access* for users cannot increase the lighting power above the maximum level established by the *high-end trim* controls.
3. *Construction documents* shall state that maximum light output or power of *general lighting* in spaces contributing to the qualifying floor area shall be not greater than 85 percent of full power or light output.
4. *High-end trim* lighting controls shall be tested in accordance with Section C408.3.1.5.

The base credits from Tables C406.1.2(1) through C406.1.2(9) shall be prorated as follows:

HET × [Base energy credits for C406.2.5.2] / 50%

HET = Floor area of qualifying spaces where *general lighting* is provided with *high-end trim* lighting controls complying with this section, expressed as a percentage of total interior floor area excluding *dwelling* and *sleeping units* .

C406.2.5.3 L03 Increase occupancy sensor. Lighting controls shall comply with C406.2.5.3.1, C406.2.5.3.2 and C406.2.5.3.3.

C406.2.5.3.1 Occupant sensor controls. Occupant sensor controls shall be installed to control lights in the following space types:

1. Food preparation area
2. Laboratory
3. Elevator lobby
4. Pharmacy area
5. Vehicular maintenance area
6. Workshop.
7. Recreation room in a facility for the visually impaired
8. Exercise area in a fitness center
9. Playing area in a fitness center
10. Exam/treatment room in a healthcare facility
11. Imaging room in a healthcare facility
12. Physical therapy room in a healthcare facility
13. Library reading area
14. Library stacks
15. Detailed manufacturing area
16. *Equipment room* in a manufacturing facility
17. Low-bay area in a manufacturing facility
18. Post office sorting area
19. Religious fellowship hall
20. Hair salon
21. Nail salon
22. Banking activity area
23. Museum restoration room

C406.2.5.3.2 Occupant sensor control function. Occupant sensors in library stacks and laboratories shall comply with Section C405.2.1.2. Occupant sensors in elevator lobbies shall comply with Section C405.2.1.4. All other occupant sensors required by Section C406.2.5.3.1 shall comply with Section C405.2.1.1.

Exception: In spaces where an *automatic* shutoff could endanger occupant safety or security occupant sensor controls shall uniformly reduce lighting power to not more than 20 percent of full power within 10 minutes after all occupants have left the space. Time-switch controls complying with C405.2.2.1 shall automatically turn lights off.

C406.2.5.3.3 Occupant sensor time delay and setpoint. *Occupant sensor controls* installed in accordance with Sections C405.2.1.1, C405.2.1.2, C405.2.1.3, and C405.2.1.4 shall automatically turn lights off or reduce lighting power within 10 minutes after all occupants have left the space. Occupant sensor controls installed in accordance with Section C405.2.1.2 shall have an unoccupied setpoint of not greater than 20 percent of full power.

C406.2.5.4 L04 Increase daylight area. The total daylight area of the *building* (DLA_{BLDG}) determined by Equation 4-21 shall be at least 5 percent greater than the typical daylight area (DLA_{TYP}) from Table C406.2.5.4. Credits for measure L04 shall be determined by Equation 4-22 or Equation 4-23, whichever is less:

$$\mathbf{DLA_{BLDG} = DLZ/LFA} \qquad \textbf{(Equation 4-21)}$$

DLZ = The total *building* floor area located within sidelit and toplit *daylight zones* complying with Section C405.2.4.2 or Section C405.2.4.3 and provided with daylight responsive controls complying with Section C405.2.4.1, ft2 or m2.

LFA = The total *building* floor area used to determine the lighting power allowance inSection C405.3.2, ft2 or m2.

$$\mathbf{EC_{DL} = EC_{DL5} \times 20 \times (DLA_{BLDG} - DLA_{TYP})} \qquad \textbf{(Equation 4-22)}$$

where:

EC_{DL} = The lesser of actual area of daylight zones in the building with continuous daylight dimming, ft2 or m2 and (GLFA x DLA) see Table C406.2.5.4. Daylight zones shall meet the criteria in Sections C405.2.4.2 and C405.2.4.3 for primary sidelit daylight zones, secondary sidelit daylight zones,and toplit daylight zones.

DLA_{TYP} = Typical percent of building area with daylight control (as a fraction) from Table C406.2.5.4:

EC_{DL5} = Section C406.2.5.4 L04 base energy credits from Section C406.2

$EC_{DL} = EC_{DL5} \times 20 \times (DLA_{MAX} - DLA_{TYP})$ (Equation 4-23)

EC_{DL} = The number of credits achieved by this measure.

$EC_{DL}5$ = C406.2.5.4 L04 base energy credits from Section C406.2 Tables C406.2(4), C406.2(6), C406.2(7), and C406.2(8).

DLA_{TYP} = Typical % percent of building floor area with daylight control (as a fraction) from Table C406.2.5.4.

DLA_{MAX} = Maximum percent of building floor area with daylight control that can be counted for compliance with this measure, from Table C406.2.5.4.

TABLE C406.2.5.4
ADDED DAYLIGHTING PARAMETERS

Building use type	**DLA_{TYP}**	**DLA_{MAX}**
Group B; ≤ 5000 ft2 (460 m2)	10%	20%
Group B; > 5000 ft2 (460 m2)	21%	31%
Group M; with ≤ 1000 ft2 (900 m2) roof area	0%	20%
Group M; with > 1000 ft2 (900 m2) roof area	60%	80%
Group E;	42%	52%
Groups S-1 and S-2; Warehouse	50%	70%
Groups S-1 and S-2; Other than warehouse	NA	NA

C406.2.5.5 L05 Residential light control. In *buildings* with Group R-2 occupancy spaces, interior lighting systems shall comply with the following:

1. In common area, the following space types shall have automatic full OFF occupancy occupant sensor controls that comply with the requirements of Section C405.2.1.1.
   1.1 Laundry/washing areas,
   1.2 Dining areas,
   1.3 Food preparation areas,
   1.4 Seating areas,
   1.5 Exercise areas,
   1.6 Massage spaces
2. In dwelling units, not less than one receptacle in each living room and each sleeping room shall be controlled by a switch in that room.
3. Lights and switched receptacles in bathrooms and kitchens shall be controlled by an occupant sensor complying with Section C405.2.1.1. All other lights and switched receptacles in each dwelling unit shall be controlled by a switch at the main entrance. The switch shall be marked to indicate its function.
   Exception: Lighting and switched receptacles controlled by an occupant sensor complying with Section C405.2.1.1 are not required to be controlled by the switch at the main entrance.

C406.2.5.6 L06 Reduced lighting power. Interior lighting within all *building* areas shall comply with of this section.

1. The connected interior lighting power (LP) determined in accordance with C405.3.1 shall be 95 percent or less than the interior lighting power allowance (LPA) determined in accordance with Section C405.3.2 using the same method used to comply with Section C405.3. Energy credits shall not be greater than four times the L06 base credit from Section C406.2 and shall be determined using Equation 4-24.
2. All permanently installed lighting serving dwelling units and sleeping units, including ceiling fan light kits and lighting integrated into range hoods and exhaust fans shall be provided by lamps with an efficacy of not less than 90 lumens per watt or by luminaires that have an efficacy of not less than 65 lumens per watt.

Exceptions:

1. Lighting integral to other appliances
2. Antimicrobial lighting used for the sole purpose of disinfecting.

$$EC_{LPA} = EC_5 \times 20 \times (LPA - LP)/LPA \quad \text{(Equation 4-24)}$$

Where:

ECLPA= additional energy credit for lighting power reduction
LP= net connected interior lighting power calculated in accordance with Section C405.3.1, watts
LPA= interior lighting power allowance calculated in accordance with the requirements of Section C405.3.2, watts
EC5 = L06 base credit from Section C406.2

C406.2.6 Efficient Equipment Credits. Projects are permitted to achieve energy credits using any combination of Efficient Equipment Credits Q01 through Q04.

C406.2.6.1 Q01 Efficient Elevator Equipment. Qualifying elevators in the *building* shall be Energy efficiency class A per ISO 25745-2, Table 7. Only buildings 3 or more floors above grade may use this credit. Credits shall be prorated based on Equation 4-25, rounded to the nearest whole credit. Projects with a compliance ratio below 0.5 do not qualify for this credit.

$$EC_e = EC_t \times CR_e \quad \text{(Equation 4-25)}$$

EC_e= Elevator energy credit achieved for the *building*

EC_t= C406.2.7.1 Table energy credit

CR_e= Compliance Ratio = (FA/ FB)
F_A= Sum of floors served by class A elevators
F_B= Sum of floors served by all *building* elevators and escalators

[NY] C406.2.6.2 Q02 Efficient Commercial Kitchen Equipment. For *existing buildings* and spaces designated as Group A-2, or facilities whose primary use involves the use of a commercial kitchen, all fryers, dishwashers, steam cookers and ovens installed shall comply with all of the following:

1. Achieve performance levels in accordance with the equipment specifications listed in Tables C406.2.6.2 (1) through C406.2.6.2 (4) when rated in accordance with the applicable test procedure.
2. Associated performance levels shall be listed on the *construction documents* submitted for permitting.

TABLE C406.2.6.2(1)
Minimum Efficiency Requirements: Commercial Fryers

Fryer Type	Heavy-Load Cooking Energy Efficiency	Idle Energy Rate	Test Procedure
Standard Open Deep-Fat Gas Fryers	≥ 50%	≤ 9,000 Btu/hr (≤ 2,600 watts)	ASTM F1361
Standard Open Deep-Fat Electric Fryers	≥ 83%	≤ 800 watts	
Large Vat Open Deep-Fat Gas Fryers	≥ 50%	≤ 12,000 Btu/hr (≤ 3,500 watts)	ASTM F2144
Large Vat Open Deep-Fat Electric Fryers	≥ 80%	≤ 1,100 watts	

TABLE C406.2.6.2(2)
Minimum Efficiency Requirements: Commercial Steam Cookers

Fuel Type	Pan Capacity	Cooking Energy Efficiency [a]	Idle Energy Rate	Test Procedure
Electric Steam	3-pan	50%	400W	ASTM F1484
	4-pan	50%	530W	
	5-pan	50%	670W	
	6-pan and larger	50%	800W	
Gas Steam	3-pan	38%	6,250 Btu/h 1.83 kW	
	4-pan	38%	8,350 Btu/h 2.45 kW	
	5-pan	38%	10,400 Btu/h 3.05 kW	
	6-pan and larger	38%	12,500 Btu/h 3.66 kW	

a. Cooking Energy Efficiency is based on heavy-load (potato) cooking capacity.

TABLE C406.2.6.2(3)
Minimum Efficiency Requirements: Commercial Dishwashers

Machine Type	High Temperature Efficiency Requirements			Low Temperature Efficiency Requirements			Test Procedure
	Idle Energy Rate [a]	Washing Energy	Water Consumption [b]	Idle Energy Rate [a]	Washing Energy	Water Consumption [b]	
Under Counter	≤ 0.30 kW	0.35 kWh/rack	≤ 0.86 GPR (≤ 3.3 LPR)	≤ 0.25 kW	≤ 0.15 kWh/rack	≤ 1.19 GPR ≤ 4.5 LPR	ASTM F1696 ASTM F1920
Stationary Single Tank Door	≤ 0.55 kW	0.35 kWh/rack	≤ 0.89 GPR (≤ 3.4 LPR)	≤ 0.30 kW	≤ 0.15 kWh/rack	≤ 1.18 GPR ≤ 4.47 LPR	
Pot, Pan, and Utensil	≤ 0.90 kW	kWh/rack 0.55 + 0.05 SF_{rack} [c] (≤ 0.55 + 0.0046 × SM_{rack} [c])	≤ 0.58 GPSF (≤ 2.2 LPSM)	NA	NA	NA	
Single Tank Conveyor	≤ 1.20 kW	0.36 kWh/rack	≤ 0.70 GPR (≤ 2.6 LPR)	≤ 0.85 kW	≤ 0.16 kWh/rack	≤ 0.79 GPR ≤ 3.0 LPR	
Multiple Tank Conveyor	≤ 1.85 kW	0.36 kWh/rack	≤ 0.54 GPR (≤ 2.0 LPR)	≤ 1.00 kW	≤ 0.22 kWh/rack	≤ 0.54 GPR ≤ 2.0 LPR	
Single Tank Flight Type	Reported	Reported	GPH ≤ 2.975c + 55.0 (LPH ≤ 0.276d+ 208)	NA	NA	NA	
Multiple Tank Flight Type	Reported	Reported	GPH ≤ 4.96c+ 17.00 (LPH ≤ 0.461d + 787)	NA	NA	NA	

a. Idle results should be measured with the door closed and represent the total idle energy consumed by the machine including all tank heaters and controls. The most energy consumptive configuration in the product family shall be selected to test the idle energy rate. Booster heater (internal or external) energy consumption shall be measured and reported separately, if possible, per ASTM F1696 and ASTM F1920 Sections 10.8 and 10.9, respectively. However, if booster energy cannot be measured separately it will be included in the idle energy rate measurements.

b. GPR = gallons per rack, LPR = Liters per rack, GPSF = gallons per square foot of rack, LPSM = liters per square meter of rack, GPH = gallons per hour, c = [maximum conveyor belt speed (feet/minute)] × [conveyor belt width (feet)], LPH = liters per hour, d = [maximum conveyor belt speed (m/minute)] × [conveyor belt width (m)]

c. PPU Washing Energy is still in format kWh/rack when evaluated; SF_{rack} (SM_{rack}) is Square Feet of rack area (square meters of rack area), same as in PPU water consumption metric.

TABLE C406.2.6.2(4)
Minimum Efficiency Requirements: Commercial Ovens

Fuel	Classification	Idle Rate	Cooking Energy Efficiency, %	Test Procedure
Convection Ovens				
Gas	Full-Size	≤ 12,000 Btu/h (3.5 kW)	≥ 46	ASTM F1496
Electric	Half-size	≤ 1.0 kW	≥ 71	
Electric	Full-size	≤ 1.60 kW		
Combination Ovens				
Gas	Steam Mode	≤ 200 P [a] + 6,511 Btu/h (≤ 0.059 Pa + 1.9 kW)	≥ 41	ASTM F2861
	Convection Mode	≤ 150 P [a] + 5,425 Btu/h (≤ 0.044 Pa + 1.6 kW)	≥ 56	
Electric	Steam Mode	≤ 0.133 P [a] + 0.6400 kW	≥ 55	
	Convection Mode	≤ 0.080 P [a] + 0.4989 kW	≥ 76	
Rack Ovens				
Gas	Single	≤ 25,000 Btu/h (7.3 kW)	≥ 48	ASTM F2093
	Double	≤ 30,000 Btu/h (8.8 kW)	≥ 52	

a. P = Pan Capacity: the number of steam table pans the combination oven is able to accommodate in accordance with ASTM F1495

[NY] C406.2.6.3 Q03 Efficient Residential Kitchen Equipment. For projects with Group R-1 and R-2 occupancies, energy credits shall be achieved where all dishwashers, refrigerators, and freezers comply with all of the following:

1. Achieve the Energy Star Most Efficient 2021 label in accordance with the specifications current as of:
   1.1. Refrigerators and freezers 5.0, 9/15/2014
   1.2. Dishwashers 6.0, 1/29/2016
2. Be installed before the issuance of the certificate of occupancy.

For Group R-1 where only some *sleeping units* are equipped with both refrigerators and dishwashers, the table credits shall be prorated as follows:

[Section C406.2 base credit] x [floor area of *sleeping units* with kitchens] / [total floor area of *sleeping units*]
[NY] (Equation 4-26)

C406.2.6.4 Q04 Fault detection and diagnostics system. A project not required to comply with C403.2.3 can achieve energy credits for installing a fault detection and diagnostics system to monitor the HVAC system's performance and automatically identify faults. The installed system shall comply with items 1 through 6 in Section C403.2.3.

C406.3 Renewable and Load Management Credits achieved. Renewable energy and load management measures shall achieve credits as follows:

1. General measure requirements. Credits are achieved for measures installed in the *building* that comply with Sections C406.3.1 through C406.3.8
2. Achieved credits are determined as follows:
   2.1 Measure credits achieved shall be determined in one of two ways, depending on the measure:
      2.1.1 The measure credit shall be the base credit listed by occupancy group and *climate zone* for the measure in Tables C406.3(1) through C406.3(9) where no adjustment factor or formula is shown in the description of the measure in Section C406.3.
      2.1.2 The measure credit shall be the base energy credit for the measure adjusted by a factor or formula as stated in the description of the measure in Section C406.3. Where adjustments are applied, each energy credit shall be rounded to the nearest whole number.

2.2 Load management and renewable credits achieved for the project shall be the sum of credits for individual measures included in the project. Credits are available for the measures listed in this Section.

2.3 Where a project contains multiple *building* use groups, credits achieved for each *building* use group shall be summed and then weighted by the gross floor area of each *building* use group to determine the weighted average project energy credits achieved.

3. Load management control requirements. The load management measures in Sections C406.3.2 (G01) through C406.3.7 (G06) require load management control sequences that are capable of and configured to automatically provide the load management operation specified based on indication of a peak period related to high short-term electric prices, grid condition, or peak *building* load. Such a peak period shall, where possible, be initiated by a *demand response signal* from the controlling entity, such as a utility or service operator. When communications are disabled or unavailable, all demand responsive controls shall continue backup demand response based on a local schedule or *building* demand monitoring. The local *building* schedule shall be adjustable without programming and reflect the electric rate peak period dates and times. The load management control sequences shall be activated for peak period control by either:

3.1 A certified OpenADR 2.0a or OpenADR 2.0b Virtual End Node (VEN), as specified under Clause 11, Conformance, in the applicable OpenADR 2.0 Specification, or

3.2 A device certified by the manufacturer as being capable of responding to a *demand response signal* from a certified OpenADR 2.0b VEN by automatically implementing the control functions requested by the VEN for the equipment it controls, or

3.3 The physical configuration and communication protocol of CTA 2045-A or CTA 2045-B, or

3.4 For air conditioners and heat pumps with two or more stages of control and cooling capacity of less than 65,000 Btu/h (19 kW), thermostats with a *demand responsive control* that complies with the communication and performance requirements of AHRI 1380, or

3.5 A device that complies with IEC 62726-10-1, an international standard for the open automated demand response system interface between the appliance, system, or energy management system and the controlling entity, or

3.6 An interface that complies with the communication protocol required by a controlling entity, to participate in an automated demand response program, or

3.7 Where the controlling entity does not have a *demand response signal* available for the *building* type and size, local load management control shall be provided based on either:

3.7.1 *Building* demand management controls that monitor *building* electrical demand and initiate controls to minimize monthly or peak time period demand charges, or,

3.7.2 Where buildings are less than 25,000 gross square feet, a local *building* schedule that reflects the electric rate peak period dates and times. In this case a binary input to the control system shall be provided that activates the demand response sequence.

[NY] TABLE C406.3(1)
RENEWABLE AND LOAD MANAGEMENT CREDITS FOR GROUP R-2, R-4, AND I-1 OCCUPANCIES

ID	Energy Credit Abbreviated Title	Section	Climate Zone		
			4	5	6
R01	Renewable Energy	C406.3.1	10	9	9
G01	Lighting load management	C406.3.2	11	8	5
G02	HVAC load management	C406.3.3	17	20	10
G03	Automated shading	C406.3.4	2	10	1
G04	Electric energy storage	C406.3.5	16	14	14
G05	Cooling energy storage	C406.3.6	12	9	7
G06	SHW energy storage	C406.3.7	19	19	18
G07	Building thermal mass	C406.3.8	19	32	27

[NY] TABLE C406.3(2)
RENEWABLE AND LOAD MANAGEMENT CREDITS FOR GROUP I-2 OCCUPANCIES

ID	Energy Credit Abbreviated Title	Section	Climate Zone		
			4	5	6
R01	Renewable Energy	C406.3.1	6	6	6
G01	Lighting load management	C406.3.2	13	13	14
G02	HVAC load management	C406.3.3	11	12	12
G03	Automated shading	C406.3.4	x	x	x
G04	Electric energy storage	C406.3.5	14	14	13
G05	Cooling energy storage	C406.3.6	16	14	11
G06	SHW energy storage	C406.3.7	4	4	4
G07	Building thermal mass	C406.3.8	18	31	25

x = Credits excluded from this *building* use type and *climate zone*.

[NY] TABLE C406.3(3)
RENEWABLE AND LOAD MANAGEMENT CREDITS FOR GROUP R-1 OCCUPANCIES

ID	Energy Credit Abbreviated Title	Section	Climate Zone		
			4	5	6
R01	Renewable Energy	C406.3.1	9	9	8
G01	Lighting load management	C406.3.2	14	10	9
G02	HVAC load management	C406.3.3	x	x	x
G03	Automated shading	C406.3.4	3	1	1
G04	Electric energy storage	C406.3.5	14	14	13
G05	Cooling energy storage	C406.3.6	18	15	12
G06	SHW energy storage	C406.3.7	29	28	26
G07	Building thermal mass	C406.3.8	17	30	26

x = Credits excluded from this *building* use type and *climate zone*.

[NY] TABLE C406.3(4)
RENEWABLE AND LOAD MANAGEMENT CREDITS FOR GROUP B OCCUPANCIES

ID	Energy Credit Abbreviated Title	Section	Climate Zone		
			4	5	6
R01	Renewable Energy	C406.3.1	17	14	14
G01	Lighting load management	C406.3.2	10	10	10
G02	HVAC load management	C406.3.3	12	9	8
G03	Automated shading	C406.3.4	4	4	5
G04	Electric energy storage	C406.3.5	17	17	16

G05	Cooling energy storage	C406.3.6	17	15	12
G06	SHW energy storage	C406.3.7	7	7	6
G07	Building thermal mass	C406.3.8	4	9	8

[NY] TABLE C406.3(5)
RENEWABLE AND LOAD MANAGEMENT CREDITS FOR GROUP A-2 OCCUPANCIES

ID	Energy Credit Abbreviated Title	Section	Climate Zone		
			4	5	6
R01	Renewable Energy	C406.3.1	2	2	2
G01	Lighting load management	C406.3.2	4	4	4
G02	HVAC load management	C406.3.3	20	19	16
G03	Automated shading	C406.3.4	x	x	x
G04	Electric energy storage	C406.3.5	4	3	4
G05	Cooling energy storage	C406.3.6	5	3	2
G06	SHW energy storage	C406.3.7	16	16	15
G07	Building thermal mass	C406.3.8	6	8	6

x = Credits excluded from this *building* use type and *climate zone*.

[NY] TABLE C406.3(6)
RENEWABLE AND LOAD MANAGEMENT CREDITS FOR GROUP M OCCUPANCIES

ID	Energy Credit Abbreviated Title	Section	Climate Zone		
			4	5	6
R01	Renewable Energy	C406.3.1	11	10	9
G01	Lighting load management	C406.3.2	18	18	18
G02	HVAC load management	C406.3.3	23	17	14
G03	Automated shading	C406.3.4	7	8	8
G04	Electric energy storage	C406.3.5	11	10	11
G05	Cooling energy storage	C406.3.6	17	11	9
G06	SHW energy storage	C406.3.7	4	4	4
G07	Building thermal mass	C406.3.8	7	14	13

[NY] TABLE C406.3(7)
RENEWABLE AND LOAD MANAGEMENT CREDITS FOR GROUP E OCCUPANCIES

ID	Energy Credit Abbreviated Title	Section	Climate Zone		
			4	5	6
R01	Renewable Energy	C406.3.1	15	14	13
G01	Lighting load management	C406.3.2	12	10	16
G02	HVAC load management	C406.3.3	23	20	18
G03	Automated shading	C406.3.4	12	10	14
G04	Electric energy storage	C406.3.5	22	23	20
G05	Cooling energy storage	C406.3.6	24	20	16
G06	SHW energy storage	C406.3.7	7	7	7
G07	Building thermal mass	C406.3.8	21	37	31

[NY] TABLE C406.3(8)
RENEWABLE AND LOAD MANAGEMENT CREDITS FOR GROUP S-1 AND S-2 OCCUPANCIES

ID	Energy Credit Abbreviated Title	Section	Climate Zone		
			4	5	6
R01	Renewable Energy	C406.3.1	36	29	24
G01	Lighting load management	C406.3.2	31	32	36
G02	HVAC load management	C406.3.3	23	16	14
G03	Automated shading	C406.3.4	x	x	x
G04	Electric energy storage	C406.3.5	30	21	24
G05	Cooling energy storage	C406.3.6	5	2	1
G06	SHW energy storage	C406.3.7	3	3	2
G07	Building thermal mass	C406.3.8	18	28	20

x = Credits excluded from this *building* use type and *climate zone*.

[NY] TABLE C406.3(9)
RENEWABLE AND LOAD MANAGEMENT CREDITS FOR OTHER [a] OCCUPANCIES

ID	Energy Credit Abbreviated Title	Section	Climate Zone		
			4	5	6
R01	Renewable Energy	C406.3.1	13	12	11
G01	Lighting load management	C406.3.2	14	13	14
G02	HVAC load management	C406.3.3	18	16	13
G03	Automated shading	C406.3.4	5	5	5
G04	Electric energy storage	C406.3.5	16	15	14
G05	Cooling energy storage	C406.3.6	14	11	9
G06	SHW energy storage	C406.3.7	11	11	10
G07	Building thermal mass	C406.3.8	14	24	20

a. Other occupancy groups include all Groups except for Groups A-2, B, E, I, M, and R.

C406.3.1 R01 Renewable Energy. Projects installing *on-site renewable energy* systems with a capacity of at least 0.1 watts per gross square foot (1.08W/m2) of *building* area or securing off-site renewable energy shall achieve energy credits for this measure calculated as follows:.

$$EC_R = EC0.1 \times (R_t + R_{off} - R_{ex}) / (0.1 \times PGFA) \quad \text{(Equation 4-27)}$$

EC_R= C406.3.1 R01 energy credits achieved for this project
EC0.1= C406.3.1 R01 base credits from Tables C406.3(1) through C406.3(9)
R_t = Actual total rating of *on-site renewable energy* systems (W)
R_{OFF}= Actual total equivalent rating of off-site renewable energy contracts (W), calculated as follows:
R_{OFF}= TRE/(REN X 20)
where:
TRE = Total off-site renewable electrical energy in kilowatt-hours (kWh) that is procured in accordance with Sections C405.13.2.1 through C405.13.4
REN = Annual off-site renewable electrical energy from Table C405.13.2, in units of kilowatt-hours per watt of array capacity
Rex= Rating (W) of *renewable energy resources* capacity excluded from credit calculated as follows:
Rex= RRr+ RRx+ RRc
where:
RR_r= Rating of on-site renewable energy systems required by Section C405.13.1, without exception (W).
RR_x= Rating of *renewable energy resources* used to meet any exceptions of this code (W).
RR_c= Rating of *renewable energy resources* used to achieve other energy credits in Section C406 (W).
PGFA = Project gross floor area, ft2
Where renewable requirements, exceptions, or credits are expressed in annual kWh or Btu rather than Watts of output capacity, they shall be converted as3413 Btu = 1 kWh and converted to W equivalent capacity as follows:

RR_w= Actual total equivalent rating of renewable energy capacity (W), calculated as follows:
RR_w= TREx/ (REN × PGFA)
where:
TRE_x= Total renewable energy in kilowatt-hours (kWh) that is excluded from R01 energy credits

[NY] C406.3.2 G01 Lighting Load Management. A project can achieve energy credits for installing demand responsive lighting controls for interior general lighting that comply with C405.2.8. Energy credits can be earned where demand responsive lighting controls are installed for the following:

1. Not less than 10 percent of the interior floor area in Group R or I occupancies; or

2. Not less than 50 percent of the interior floor area in all other occupancies.

G01 credits shall be prorated using Equation 4-28 with no more than 75 percent of the interior floor area being counted.

[interior floor area with lighting load management, %] x [tabl credits for C406.3.2] / 75% (Equation 4-28)

C406.3.3 G02 HVAC Load Management. *Automatic* load management controls shall be configured as follows:

1. Cooling temperature shift: Where electric cooling is in use controls shall gradually increase the cooling setpoint by at least 3°F (1.7° C) over a minimum of three hours or reduce effective cooling capacity to 60% of installed capacity during the peak period or adjust cooling temperature setpoint as described in Section C403.6.1.
2. Heating temperature shift: Where electric heating is in use controls shall gradually decrease the heating setpoint by at least 3°F (1.7°C) over a minimum of three hours or reduce effective heating capacity to 60% of installed capacity during the peak period or adjust heating temperature setpoint as described in Section C403.6.1.
3. Ventilation shift: Where HVAC systems serve multiple zones and have less than 70 percent outdoor air required, include controls that provide excess outdoor air preceding the peak period and reduce outdoor air by at least 30 percent during the peak period, in accordance with ASHRAE Standard 62.1 Section 6.2.5.2 Short Term Conditions or provisions for *approved* engineering analysis in the *Mechanical Code of New York State* Section 403.3.1.1, Outdoor Airflow Rate.

Credits achieved for measure G02 shall be calculated as follows:

$$EC_{G02\_ach} = EC_{G02\_base} * EC_{g02\_adj} \quad \textbf{(Equation 4-29)}$$

where:
EC_{G02_ach} = *Demand responsive control* credit achieved for project
EC_{G02_base} = G02 Base energy credit from Section 406.3
EC_{G02_adj} = energy credit adjustment factor from Table C406.3.3

TABLE C406.3.3
ENERGY CREDIT ADJUSTMENT BASED ON USE OF VENTILATION SHIFT OR DEMAND RESPONSE

DEMAND RESPONSE SIGNAL AVAILABLE[a]	DEMAND RESPONSE REQUIRED BY SECTION C403.4.6.1[b]	INCLUDES VENTILATION SHIFT[c]	EC_{G02_Adj}
No	No	Yes	100%
No	Yes	Yes	80%
Yes	No	Yes	80%
Yes	Yes	Yes	40%
No	No	No	70%
No	Yes	No	50%
Yes	No	No	50%
Yes	Yes	No	0%

a. "Demand Response Signal Available" is "Yes" where a controlling entity other than the owner makes a demand response signal available to the building.
b. Where the exception is invoked in Section C403.4.6.1 for buildings that comply with Load Management measure G02, then "Demand Response Required" is "Yes".
c. Ventilation shift controls in accordance with Section C406.3.3, item 3.

C406.3.4 G03 Automated Shading Load Management. Where *fenestration* on east, south, and west exposures is greater than 20 percent of wall area, load management credits shall be achieved as follows:

1. *Automatic* exterior shading devices or *dynamic glazing* that are capable of reducing solar gain (SHGC) through sunlit *fenestration* by not less than 50 percent when fully closed shall receive the full credits in Tables C406.3(1) through C406.3(9). The exterior shades shall have fully open and fully closed SHGC determined in accordance with AERC 1.
2. *Automatic* interior shading devices with a solar reflectance of not less than 0.50 for the surface facing the *fenestration* shall receive 40 percent of the credits in Tables C406.3(1) through C406.3(9).
3. All shading devices, *dynamic glazing* , or shading attachments shall:
    - 3.1 Provide not less than 90 percent coverage of the total *fenestration* on east, south, and west exposures in the *building* to achieve the credits determined in items 1 or 2. Alternatively, provide not less than 70 percent coverage of the total *fenestration* on the south and west exposures in the *building* to achieve 50 percent of the credits determined in items 1 or 2.
    - 3.2 Be automatically controlled and shall modulate in multiple steps or continuously the amount of solar gain and light transmitted into the space in response to peak periods and either daylight levels or solar intensity.
    - 3.3 Include a *manual* override located in the same *enclosed space* as the shaded vertical *fenestration* that shall override operation of *automatic* controls for no longer than four hours. Such override shall be locked out during peak periods.

    For this section, directional exposures shall exclude *fenestration* that has an orientation deviating by more than 45 degrees of facing the cardinal direction. In the southern hemisphere, where the south exposure is referred to, it shall be replaced by the north exposure.

C406.3.5 G04 Electric Energy Storage. Electric storage devices shall be charged and discharged by *automatic* load management controls to store energy during non-peak periods and use stored energy during peak periods to reduce *building* demand. Electric storage devices shall have a minimum capacity of 1.5 Wh/ft2 (87 Wh/m2) of gross *building* area. Base credits in Tables C406.3(1) through C406.3(9) are based on installed electric storage of 5 Wh/ft2 (54 Wh/m2) and shall be prorated for actual installed storage capacity between 1.5 and 15 Wh/ft2 (16 to 160 Wh/m2), as follows:

[Installed electric storage capacity, Wh/ft^2] / 5 (54) x [C406.3.5 Credits from Tables] (Equation 4-30)

Larger energy storage shall be permitted however, credits are limited to the range of 1.5 to 15 Wh/ft2 (16 to 160 Wh/m2).

C406.3.6 G05 Cooling Energy Storage. *Automatic* load management controls shall be capable of activating ice or chilled water storage equipment to reduce demand during summer peak periods. Storage tank standby loss shall be demonstrated through analysis to be no more than 2 percent of storage capacity over a 24 hour period for the cooling design day. Base credits in Section C406.3 are based on storage capacity of the design peak hour cooling load with a 1.15 sizing factor. Credits shall be prorated for installed storage systems sized between 0.5 and 4.0 times the design day peak hour cooling load, rounded to the nearest whole credit. Larger storage shall be permitted but the associated credits are limited to the range above. Energy credits shall be determined as follows:

$EC_s = EC_{1.0} \times (1.44 \times SR + 0.71) / 2.15$ (Equation 4-31)

ECs = Cooling Storage credit achieved for Project

EC1.0 = G05 base energy credit for *building* use type and *climate zone* based on 1.0 ton-hours storage per design day ton (kWh/kW) of cooling load

SR = Storage ratio in ton-hours storage per design day ton (kWh/kW) of cooling load where $0.5 \le SR \le 4.0$

C406.3.7 G06 Service Hot Water Energy Storage. Where SHW is heated by electricity, *automatic* load management controls comply with ANSI/CTA-2045-B shall preheat stored SHW before the peak period and suspend electric water heating during the peak period. Storage capacity shall be provided by either:

1. Preheating water above 140°F (60°C) delivery temperature with at least 1.34 kWh of energy storage per kW of water-heating capacity. Tempering valves shall be provided at the *water heater* delivery location.
2. Providing additional heated water tank storage capacity above peak SHW demand with equivalent peak storage capacity to item 1.

Credits earned for measure G06 shall be calculated using Equation 4-32:

$EC_{G06ach} = EC_{G06base} \times EC_{G06adj}$ **(Equation 4-32)**

EC_{G06_ach} = SWH Energy Storage credit achieved for Project

EC_{G06_base} = G06 Base energy credit from Section 406.3

EC_{G06_adj} = energy credit adjustment factor from Table C406.3.7

TABLE C406.3.7

ENERGY CREDIT ADJUSTMENT BASED ON USE OF HEAT PUMP WATER HEATER OR DEMAND RESPONSE

DEMAND RESPONSE READY PER SECTION C404.10	DEMAND RESPONSE SIGNAL AVAILABLE[a]	HAS HPWH	$EC_{G06\ Adj}$[b]
No	NA	NO	100%
No	NA	YES	33%
Yes	No	NO	50%
Yes	No	YES	17%
Yes	Yes	NA	0%

a. "Demand Response Signal Available" is "Yes" where a controlling entity currently makes a demand response signal available to the building.

b. The lower values of $EC_{G06\ adj}$ in this column apply when no less than 67 percent of the whole building design end use service water heating requirements are met using only heat pump heating at the conditions described in Section C406.2.3.1.2.

[NY] C406.3.8 G07 Building Thermal Mass. The project shall have additional passive interior mass and a night flush control of the HVAC system. The credit is available to projects that have at least 80 percent of gross floor area unoccupied between midnight and 6:00 a.m. The project shall meet the following requirements:

1. Interior to the *building thermal envelope* insulation, provide 10 lb/ft(50 kg/m) of project *conditioned floor area* of passive thermal mass in the *building interior wall*, the inside of the *exterior wall* , or interior floor construction. Mass *construction* shall have mass surfaces directly contacting the air in *conditioned spaces* with directly attached gypsum panels allowed. Mass with carpet or furred gypsum panels or *exterior wall* mass that is on the exterior of the insulation layer (e.g., the portion of CMU block on the exterior of insulation filled cell cavities) shall not be included toward the *building* mass required.
2. HVAC units for 80 percent or more of the supply airflow in the project shall be equipped with outdoor air economizers and fans that have variable or low speed capable of operating at 66 percent or lower airflow and be included in the night flush *control* sequence.
3. Night flush controls shall be configured with the following sequence or another night flush strategy shall be permitted where demonstrated to be effective, avoids added morning heating, and is *approved* by the *authority having jurisdiction*.
   - 3.1. Summer mode shall be activated when outdoor air temperature exceeds 70°F (21°C) and shall continue uninterrupted until deactivated when outdoor air temperature falls below 45°F (7°C). During summer mode, the occupied cooling *set point* shall be set 1°F (0.6°C) higher than normal and the occupied heating *set point* shall be reset 2°F (1.1°C) lower than normal.
   - 3.2. When all the following conditions exist, night flush shall be activated:
     - 3.2.1. Summer mode is active in accordance with item 3.1.
     - 3.2.2. Outdoor air temperature is 5°F (2.8°C) or more below indoor average zone temperature.
     - 3.2.3. Indoor average zone temperature is greater than morning occupied heating *set point*.
     - 3.2.4. Local time is between 10:00 pm and 6:00 am.
   - 3.3 When night flush is active, *automatic* night flush controls shall operate outdoor air *economizers* at low fan speed not exceeding 66 percent during the unoccupied period with *mechanical cooling* and heating locked out.

EC 07-0174

Revise as follows:

SECTION C407
~~TOTAL~~SIMULATED BUILDING PERFORMANCE

C407.1 Scope.
This section establishes criteria for compliance using ~~total~~ simulated building performance. The following systems and loads shall be included in determining the ~~total~~ simulated building performance: heating systems, cooling systems, *service water heating*, fan systems, lighting power, receptacle loads and process loads.

Exception: Energy used to recharge or refuel vehicles that are used for on-road and off-site transportation purposes.

~~**C407.2 Mandatory requirements.** Compliance with this section requires compliance with Sections C402.5, C403.2, C403.3 through C403.3.2, C403.4 through C403.4.2.3, C403.5.5, C403.7, C403.8.1 through C403.8.4, C403.10.1 through C403.10.3, C403.11, C403.12, C404 and C405.~~

~~**C407.3**~~ **C407.2** ~~**Performance-based compliance.**~~ **Mandatory requirements.** Compliance based on ~~total~~ simulated building performance requires that a proposed ~~building (proposed~~ design~~)~~ meet all of the following:

1. The requirements of the sections indicated within Table C407.2.
2. An ~~be shown to have an~~ annual energy cost that is less than or equal to the percent of ~~the~~ annual energy cost (PAEC) ~~of~~ the *standard reference design* calculated in Equation 4-32. Energy prices shall be taken from a source *approved* by the *building official*, such as the Department of Energy, Energy Information Administration's "State Energy Price and Expenditure Report." *Building officials* shall be permitted to require time-of-use pricing in energy cost calculations. The reduction in energy cost of the *proposed design* associated with on-site ~~renewable energy~~ sources ~~shall be not~~ more than 5 percent of the total energy cost. The amount of renewable energy purchased from off-site sources shall be the same in the *standard reference design* and the *proposed design*.

~~**Exception**~~ **Exceptions:**

1. Jurisdictions that require site energy (1 kWh = 3413 Btu) rather than energy cost as the metric of comparison.
2. Where energy use based on source energy expressed in Btu or Btu per square foot of conditioned floor area is substituted for the energy cost, the energy use shall be calculated using source energy factors from Table C407.2(2) For electricity, U.S. locations shall use values eGRID subregions. Locations outside the United States shall use the value for "All other electricity" or locally derived values.

(Equation 4-32)

$$PAEC = 100 \times (0.80 + 0.025 - Ecr/1000)$$

PAEC = Percentage of annual energy cost applied to standard reference design

ECr= Energy efficiency credits required for the building in accordance with Section C406.1 (do not include load management and renewable credits).

TABLE C407.2(1)
REQUIREMENTS FOR TOTAL BUILDING PERFORMANCE

SECTION[a]	TITLE
Envelope	
C401.3	*Building thermal envelope* certificate
C402.2.1.1	Joints staggered
C402.2.1.2	Skylight curbs
C402.2.6	Insulation of radiant heating system panels
C402.5	Air leakage— *building thermal envelope*

Mechanical	
C403.1.1	Calculation of heating and cooling loads
C403.1.2	Data centers
C403.2	System design
C403.3	Heating and cooling equipment efficiencies
C403.4.1	Thermostatic controls
C403.4.2	Off-hour controls
C403.4.7	Heating and cooling system controls for operable openings to the outdoors
C403.5.5	Economizer fault detection and diagnostics
C403.7, except C403.7.4.1	Ventilation and exhaust systems
C403.8, except C403.8.6	Fan and fan controls
C403.9	Large-diameter ceiling fans
C403.11, except C403.11.3	Refrigeration equipment performance
C403.12	Construction of HVAC system elements
C403.13	Mechanical systems located outside of the building thermal envelope
C404	Service water heating
C405, except C405.3	Electrical power and lighting systems
C406.1.2	Additional renewable and load management credit requirements
C408	Maintenance information and system commissioning

a. Reference to a code section includes all the relative subsections except as indicated in the table.

EC 07-0175

Add new:

TABLE C407.2(2)
SOURCE ENERGY CONVERSION FACTORS FOR ELECTRICITY

Fossil Fuels Delivered to Buildings	
Natural Gas	1.092
LPG or propone	1.151
Fuel oil (residual)	1.191
Fuel oil (distillate)	1.158
Coal	1.048
Gasoline	1.187
Other fuels not specified in this table	1.048
Electricity	
AKGD-ASCC Alaska Grid	2.47

AKMS-ASCC Miscellaneous	1.35
AZNM-WECC Southwest	2.57
CAMX-WECC California	1.66
ERCT-ERCOT All	2.32
FRCC-FRCC All	2.78
HIMS-HICC Miscellaneous	3.15
HIOA-HICC Oahu	3.87
MROE-MRO East	2.92
MROW-MRO West	2.21
NEWE-NPCC New England	2.66
NWPP-WECC Northwest	1.48
NYCW-NPCC NYC/Westchester	2.89
NYLI-NPCC Long Island	2.84
NYUP-NPCC Upstate NY	1.81
PRMS-Puerto Rico Miscellaneous	3.27
RFCE-RFC East	2.90
RFCM-RFC Michigan	2.93
RFCW-RFC West	2.97
RMPA-WECC Rockies	2.16
SPNO-SPP North	2.21
SPSO-SPP South	2.05
SRMV-SERC Mississippi Valley	2.84
SRMW-SERC Midwest	3.09
SRSO-SERC South	2.89
SRTV-SERC Tennessee Valley	2.82
SRVC-SERC Virginia/Carolina	2.91
All other electricity	2.51
Thermal energy	
Chilled water	0.60
Steam	1.84
Hot water	1.73

EC 07-0176

Revise as follows:

[NY] TABLE ~~C407.5.1(1)~~C407.4.1(1)
SPECIFICATIONS FOR THE STANDARD REFERENCE AND PROPOSED DESIGNS

BUILDING COMPONENT CHARACTERISTICS	STANDARD REFERENCE DESIGN	PROPOSED DESIGN
Space use classification	Same as proposed	The space use classification shall be chosen in accordance with Table C405.5.2 for all areas of the building covered by this permit. Where the space use classification for a building is not known, the building shall be categorized as an office building.
Roofs	Type: Insulation entirely above deck	As proposed
	Gross area: same as proposed	As proposed
	U-factor: as specified in Table C402.1.4	As proposed
Walls, above-grade	Type: ~~Mass wall where proposed wall is mass; otherwise steel-framed wall~~same as proposed	As proposed
	Gross area: same as proposed	As proposed
	U-factor: as specified in Table C402.1.4	As proposed
	Thermal bridges: Account for heat transfer consistent with compliant *psi*- and *chi-factors* from Table C402.1.4 for thermal bridges as identified in Section C402.7 that are present in the proposed design.	As proposed; *psi*- and *chi-factors* for proposed thermal bridges shall be determined in accordance with requirements in Section C402.1.4.
	Solar ~~absorptance~~ reflectance: ~~0.75~~0.25	As proposed
	Emittance: 0.90	As proposed
Walls, below-grade	Type: Mass wall	As proposed
	Gross area: same as proposed	As proposed
	U-factor: as specified in Table C402.1.4 with insulation layer on interior side of walls	As proposed
Floors, above-grade	Type: joist/framed floor	As proposed
	Gross area: same as proposed	As proposed
	U-factor: as specified in Table C402.1.4	As proposed
Floors, slab-on-grade	Type: Unheated	As proposed
	F-factor: as specified in Table C402.1.4	As proposed
Opaque doors	Type: Swinging	As proposed
	Area: Same as proposed	As proposed
	U-factor: as specified in Table C402.1.4	As proposed
Vertical fenestration other than opaque doors	Area 1. The proposed vertical fenestration area; where the proposed vertical fenestration area is less than 40 percent of above-grade wall area. 2. 40 percent of above-grade wall area; where the proposed vertical fenestration area is 40 percent or more of the above-grade wall area.	As proposed
	U-factor: as specified in Table C402.4	As proposed
	SHGC: as specified in Table C402.4 except that for climates with no requirement (NR) SHGC = 0.40 shall be used	As proposed

	External shading and PF: None	As proposed
Skylights	Area 1. The proposed skylight area; where the proposed skylight area is less than that permitted by Section C402.1. 2. The area permitted by Section C402.1; where the proposed skylight area exceeds that permitted by Section C402.1	As proposed
	U-factor: as specified in Table C402.4	As proposed
	SHGC: as specified in Table C402.4 except that for climates with no requirement (NR) SHGC = 0.40 shall be used.	As proposed
Lighting, interior	The interior lighting power shall be determined in accordance with Section C405.3.2. Where the occupancy of the building is not known, the lighting power density shall be 1.0 Watt per square foot (10.7 W/m^2) based on the categorization of buildings with unknown space classification as offices.	As proposed
Lighting, exterior	The lighting power shall be determined in accordance with Table C405.4.2(2) and C405.4.2(3). Areas and dimensions of surfaces shall be the same as proposed.	As proposed
Internal gains	Same as proposed	Receptacle, motor and process loads shall be modeled and estimated based on the space use classification. End-use load components within and associated with the building shall be modeled to include, but not be limited to, the following: exhaust fans, parking garage *ventilation* fans, exterior building lighting, swimming pool heaters and pumps, elevators, escalators, refrigeration equipment and cooking equipment.
Schedules	Same as proposed **Exception:** Thermostat settings and schedules for HVAC systems that utilize radiant heating, radiant cooling and elevated air speed, provided that equivalent levels of occupant thermal comfort are demonstrated by means of equal Standard Effective Temperature as calculated in Normative Appendix B of ASHRAE Standard 55.	Operating schedules shall include hourly profiles for daily operation and shall account for variations between weekdays, weekends, holidays and any seasonal operation. Schedules shall model the time-dependent variations in occupancy, illumination, receptacle loads, thermostat settings, mechanical *ventilation*, HVAC equipment availability, service hot water usage and any process loads. The schedules shall be typical of the proposed building type as determined by the designer and approved by the jurisdiction.
~~Mechanical ventilation~~ Outdoor airflow	~~Same as proposed~~ Where the proposed design specifies mechanical ventilation: 1. For systems 1-4 as specified in Tables C407.4.1(2) and C407.4.1(3), the outdoor airflow rate shall be determined in accordance with Section C403.7 and *Mechanical Code of New York State* Section 403.3.1.1.2.3.4 Equation 4-8, using a system ventilation efficiency (Ev) of 0.75. 2.For systems 5-11 as specified in Tables C407.4.1(2) and C407.4.1(3), the outdoor airflow rate shall be determined in accordance with Section C403.7 and *Mechanical Code of New York State* Section 403.3.	As proposed, in accordance with Section C403.2.2.

	Where the proposed design specifies natural ventilation, as proposed.	
Heating systems	Fuel type: same as *proposed design*	As proposed
	Equipment type[a]: as specified in Tables ~~C407.5.1(2)~~C407.4.1(2) and ~~C407.5.1(3)~~C407.4.1(3)	As proposed
	Efficiency: as specified in ~~Tables C403.3.2(4) and C403.3.2(5)~~ the tables in Section C403.3.2	As proposed
	Capacity[b]: sized proportionally to the capacities in the proposed design based on sizing runs, and shall be established such that no smaller number of unmet heating load hours and no larger heating capacity safety factors are provided than in the *proposed design*.	As proposed
Cooling systems	Fuel type: same as *proposed design*	As proposed
	Equipment type[c]: as specified in Tables C407.5.1(2) and C407.5.1(3)	As proposed
	Efficiency: as specified in Tables C403.3.2(1), C403.3.2(2) and C403.3.2(3)	As proposed
	Capacity[b]: sized proportionally to the capacities in the *proposed design* based on sizing runs, and shall be established such that no smaller number of unmet cooling load hours and no larger cooling capacity safety factors are provided than in the *proposed design*.	As proposed
	Economizer[d]: same as proposed, in accordance with Section C403.5.	As proposed
Service water heating[e]	Fuel type: same as proposed	As proposed
	Efficiency: as specified in Table C404.2	For *Group R*, as proposed multiplied by SWHF. For other than *Group R*, as proposed multiplied by efficiency as provided by the manufacturer of the DWHR unit.
	Capacity: same as proposed	As proposed
	Where no service water hot water system exists or is specified in the *proposed design*, no service hot water heating shall be modeled.	
Energy Recovery	Where the proposed design specifies mechanical ventilation, as specified in Section C403.7.4 based on the standard reference design airflows. Where the proposed design specifies natural ventilation, as proposed.	As proposed
Fan power	As specified in Section C403.8 for the proposed design. **Exceptions:** 1. Where the fan power of the proposed design is exempted from the requirements of Section C403.8, as proposed. 2. Fan systems addressed by Section C403.8.1: Fan system BHP shall be as proposed or to the limits specified in Section C403.8.1, whichever is smaller. If the limit is reached, the power or each fan shall be reduced proportionally until the limit is met. 3. Fan systems serving areas where the mechanical ventilation is provided in accordance with an engineered ventilation system design of Section 403.2 of the *Mechanical Code of New York State* shall not use the particulate filtration or air cleaner pressure drop adjustment available in Table C403.8(1)	As proposed

	when calculating the fan system BHP limit for the portion of the airflow being treated to comply with the engineered ventilation system design.	
On-site Renewable Energy	Where a system providing on-site renewable energy has been modeled in the proposed design the same system shall be modeled identically in the standard reference design except the rated capacity shall meet the requirements of Section C405.15.1 Where no system is designed or included in the proposed design, model an unshaded photovoltaic system with the following characteristics: **Size:** Rated capacity per Section C405.15.1 **Module Type:** Crystalline Silicone Panel with glass cover, 19.1% nominal efficiency and temperature coefficient of -0.35%/°C, Performance shall be based on a reference temperature of 77°F (25°C), airmass of 1.5 atmosphere and irradiance of 317 Btu/h x ft2 (1000 W/m2). **Array Type:** Rack mounted array with installed nominal operating cell temperature (INOCT) of 103°F (45°C). Total System Losses (DC output to AC output): 11.3%. **Tilt:** 0-degrees (mounted horizontally). **Azimuth:** 180 degrees.	As proposed

SWHF = Service water heat recovery factor, DWHR = Drain water heat recovery.

a. Where no heating system exists or has been specified, the heating system shall be modeled as fossil fuel. The system characteristics shall be identical in both the *standard reference design* and *proposed design*.
b. The ratio between the capacities used in the annual simulations and the capacities determined by sizing runs shall be the same for both the *standard reference design* and *proposed design*.
c. Where no cooling system exists or no cooling system has been specified, the cooling system shall be modeled as an air-cooled single-*zone* system, one unit per thermal *zone*. The system characteristics shall be identical in both the *standard reference design* and *proposed design*.
d. If an economizer is required in accordance with Table C403.5(1) and where no economizer exists or is specified in the *proposed design*, then a supply-air economizer shall be provided in the *standard reference design* in accordance with Section C403.5.
e. The SWHF shall be applied as follows:
    1. Where potable water from the DWHR unit supplies not less than one shower and not greater than two showers, of which the drain water from the same showers flows through the DWHR unit then SWHF = [1 – (DWHR unit efficiency • 0.36)].
    2. Where potable water from the DWHR unit supplies not less than three showers and not greater than four showers, of which the drain water from the same showers flows through the DWHR unit then SWHF = [1 – (DWHR unit efficiency • 0.33)].
    3. Where potable water from the DWHR unit supplies not less than five showers and not greater than six showers, of which the drain water from the same showers flows through the DWHR unit, then SWHF = [1 – (DWHR unit efficiency • 0.26)].
    4. Where Items 1 through 3 are not met, SWHF = 1.0.

EC 07-0177

Revise as follows:

~~C407.6~~C407.5 **Calculation software tools.** Calculation procedures used to comply with ~~this section~~ Section C407 shall ~~be~~ apply an *approved* version of a performance analysis software tools capable of calculating the annual energy consumption of all building elements that differ between the *standard reference design* and the *proposed design* ~~and shall include the following capabilities.~~ The same *approved* version of the performance analysis tool shall be used to calculate

the *proposed design* and *standard reference design*.

~~1. Building operation for a full calendar year (8,760 hours).~~

~~2. Climate data for a full calendar year (8,760 hours) and shall reflect *approved* coincident hourly data for temperature, solar radiation, humidity and wind speed for the building location.~~

~~3. Ten or more thermal *zones*.~~

~~4. Thermal mass effects.~~

~~5. Hourly variations in occupancy, illumination, receptacle loads, thermostat settings, mechanical *ventilation*, HVAC equipment availability, service hot water usage and any process loads.~~

~~6. Part-load performance curves for mechanical equipment.~~

~~7. Capacity and efficiency correction curves for mechanical heating and cooling equipment.~~

~~8. Printed *building official* inspection checklist listing each of the *proposed design* component characteristics from Table C407.5.1(1) determined by the analysis to provide compliance, along with their respective performance ratings including, but not limited to, *R-value*, *U-factor*, SHGC, HSPF, AFUE, SEER, EF.~~

~~**C407.6.1**~~**C407.5.1 ~~Specific~~ Software tool approval.** ~~Performance~~ Any version of a performance analysis ~~tools complying with the applicable subsections~~ tool meeting the requirements of ~~Section C407~~Section C407.5.1.1 and C407.5.1.2 ~~and tested according to ASHRAE Standard 140~~ shall be permitted to be *approved.* Tools are permitted to be *approved* based on meeting a specified threshold for a jurisdiction. The *building official* shall be permitted to approve tools for a specified application or limited scope.

EC 07-0178

Add new:

C407.5.1.1 Software tool capabilities. *Approved* software tools shall include the following capabilities:

1. *Building* operation for a full calendar year (8,760 hours).
2. Climate data for a full calendar year (8,760 hours) and shall reflect *approved* coincident hourly data for temperature, solar radiation, humidity, and wind speed for the *building* location.
3. Ten or more thermal zones.
4. Thermal mass effects.
5. Hourly variations in occupancy, illumination, receptacle loads, *thermostat* settings, mechanical *ventilation*, HVAC equipment availability, service hot water usage and any process loads.
6. Part-load performance curves for mechanical equipment.
7. Capacity and efficiency correction curves for mechanical heating and cooling equipment.
8. Printed *building official* inspection checklist listing each of the *proposed design* component characteristics from Table C407.4.1(1) determined by the analysis to provide compliance, along with their respective performance ratings, including but not limited to R-value, U-factor, SHGC, HSPF, AFUE, SEER and EF.

C407.5.1.2 Testing required by software vendors Prior to *approval*, software tools shall be tested by the software vendor in accordance with ASHRAE Standard 140, except Sections 7 and 8. During testing, hidden inputs that are not normally available to the user shall be permitted to avoid introducing source code changes strictly used for testing. Software vendors shall publish, on a publicly available website, the following ASHRAE Standard 140 test results, input files, and modeler reports for each tested version of a software tool:

1. Test results demonstrating the software tool was tested in accordance with ASHRAE Standard 140 and that meet or exceed the values for "The Minimum Number of Range Cases within the Test Group to Pass" for all test groups in ASHRAE Standard 140, Table A3-14.

2. Test results of the performance analysis tool and input files used for generating the ASHRAE Standard 140 test cases along with the results of the other performance analysis tools included in ASHRAE Standard 140, Annexes B8 and B16.

3. The modeler report in ASHRAE Standard 140, Annex A2, Attachment A2.7. Report Blocks A and G shall be completed for results exceeding the maximum or falling below the minimum of the reference values shown in ASHRAE Standard 140 Table A3-1 through Table A3-13, and Report Blocks A and E shall be completed for any omitted results.

C407.5.2 Algorithms not tested Algorithms not tested in accordance with C407.5.1.2, including algorithms that are alternatives to those that were tested, and numerical settings not tested, such as timesteps and tolerances, shall be permitted to be used when modeling the *proposed design* and *standard reference design*.

SECTION C408 MAINTENANCE INFORMATION AND SYSTEM COMMISSIONING

EC 07-0179

Revise as follows:

C408.2 Mechanical systems and service water-heating systems commissioning and completion requirements. Prior to the final mechanical and plumbing inspections, the *registered design professional or approved agency* shall provide evidence of mechanical systems *commissioning* and completion in accordance with the provisions of this section.

Construction document notes shall clearly indicate provisions for *commissioning* and completion requirements in accordance with this section and are permitted to refer to specifications for further requirements. Copies of all documentation shall be given to the owner or owner's authorized agent and made available to the *building official* upon request in accordance with Sections C408.2.4 and C408.2.5.

Exceptions: The following systems are exempt:

1. Mechanical systems and service water heater systems in buildings where the total mechanical equipment capacity is less than 480,000 Btu/h (140.7 kW) cooling capacity and 600,000 Btu/h (175.8 kW) combined service water-heating and space-heating capacity.

2. ~~Systems included in Section C403.5 that serve individual *dwelling units* and *sleeping units*.~~ Components within *dwelling units* and *sleeping units* served by one of the following systems:

   2.1 Simple unitary or packaged HVAC equipment listed in Table C403.3.2(1), Table C403.3.2(2), Table C403.3.2(4), Table C403.3.2(5) each serving one zone and controlled by a single *thermostat* in the zone served.

   2.2 Two-pipe heating systems installed in the *dwelling* serving one or more zones.

EC 07-0059

Revise as follows:

C408.2.3.1 Equipment. Equipment functional performance testing shall demonstrate the installation and operation of components, systems, and system-to-system interfacing relationships in accordance with approved plans and specifications such that operation, function, and maintenance serviceability for each of the commissioned systems is confirmed. Testing shall include all modes and, sequence of operation, including under full-load, part-load and the following emergency conditions:

1. All modes as described in the. sequence of operation.
2. Redundant or automatic back-up mode.

3. Performance of alarms.
4. Mode of operation upon a loss of power and restoration of power.

Exception: Unitary or packaged HVAC equipment listed in ~~Tables C403.3.2(1) through C403.3.2(3)~~ the tables in Section C403.3.2 that do not require supply air economizers.

EC 07-0180

Revise as follows:

C408.3 Functional testing of lighting and receptacle controls. Automatic lighting and receptacle controls required by this code shall comply with this section.

C408.3.1 Functional testing. Prior to passing final inspection, the *registered design professional* or *approved agency* shall provide evidence that the lighting and receptacle control systems have been tested to ensure that control hardware and software are calibrated, adjusted, programmed and in proper working condition in accordance with the construction documents and manufacturer's instructions. Functional testing shall be in accordance with Sections C408.3.1.1 through C408.3.1.3 for the applicable control type.

C408.3.1.1 Occupant sensor controls. Where *occupant sensor controls* are provided, the following procedures shall be performed:

1. Certify that the *occupant sensor* has been located and aimed in accordance with manufacturer recommendations.
2. For projects with seven or fewer *occupant sensors*, each sensor shall be tested.
3. For projects with more than seven *occupant sensors,* testing shall be done for each unique combination of sensor type and space geometry. Where multiples of each unique combination of sensor type and space geometry are provided, not less than 10 percent and in no case fewer than one, of each combination shall be tested unless the *building official* or design professional requires a higher percentage to be tested. Where 30 percent or more of the tested controls fail, all remaining identical combinations shall be tested.

   For *occupant sensor controls* to be tested, verify the following:
   - 3.1. Where *occupant sensor controls* include status indicators, verify correct operation.
   - 3.2. The controlled lights and receptacles controlled by *occupant sensor controls* turn off or down to the permitted level within the required time upon vacancy of the space.
   - 3.3. For auto-on *occupant sensor controls*, the controlled lights and receptacles controlled by *occupant sensor controls* turn on to the permitted level when an occupant enters the space.
   - 3.4. For manual-on *occupant sensor controls*, the controlled lights and receptacles controlled by *occupant sensor controls* turn on only when manually activated.
   - 3.5. The lights are not incorrectly turned on by movement in adjacent areas or by HVAC operation.

C408.3.1.2 Time-switch controls. Where *time-switch controls* are provided, ~~the following procedures shall be performed:~~ items 1 through 5 shall be performed for all time-switch controls. For projects with more than seven spaces where lighting or receptacles are controlled by *time-switch controls*, not less than 10 percent of spaces and in no case fewer than one, shall be tested according to items 6 and 7 unless the *building official* or design professional requires a higher percentage to be tested. Where 30 percent or more of the tested spaces fail any of the requirements in items 6 and 7, all remaining spaces shall be tested.

1. Confirm that the *time-switch control* is programmed with accurate weekday, weekend and holiday schedules.
2. Provide documentation to the owner of *time-switch controls* programming including weekday, weekend, holiday schedules, and set-up and preference program settings.
3. Verify the correct time and date in the time switch.
4. Verify that any battery back-up is installed and energized.
5. Verify that the override time limit is set to not more than 2 hours.
6. Simulate occupied condition. Verify and document the following:
   - 6.1. All lights can be turned on and off by their respective area control switch.

6.2. The switch only operates lighting in the enclosed space in which the switch is located.
6.3. Receptacles in the space controlled by the time-switch controls turn on.

7. Simulate unoccupied condition. Verify and document the following:
7.1. Nonexempt lighting turns off.
7.2. Manual override switch allows only the lights and receptacles controlled by the *time-switch controls* in the enclosed space where the override switch is located to turn on ~~or remain on until the next scheduled shutoff occurs~~controlled lighting and receptacles for no more than 2 hours.
7.3 Receptacles controlled by the *time-switch controls* turn off.
8. Additional testing as specified by the *registered design professional*.

C408.3.1.4 High-end trim controls. Where lighting controls are configured for *high-end trim*, verify the following:

1. *High-end trim* maximum level has been set.
2. The calibration adjustment equipment is located for ready access only by authorized personnel.
3. Lighting controls with ready access for users cannot increase the lighting power above the maximum level established by the high-end trim controls.

C408.3.1.5 High end trim lighting control verification for Additional Efficiency Credit L02. For the qualifying spaces associated with the project receiving additional efficiency credits in Section C406.2.5.2, the following shall be documented while daylight responsive controls are not reducing lighting power:

1. The maximum setting for power or light output for each control group of *general lighting* luminaires.
2. The *high-end trim* setting for power or light output for each control group of *general lighting* luminaires.
3. For projects with seven or fewer claimed qualifying spaces, the reduction in light output or reduction in power due to *high-end trim* shall be tested in all spaces and shown to reduce the *general lighting* power or light output to not greater than 85 percent of full power or light output. For projects with more than seven claimed qualifying spaces, the reduction in light output or reduction in power due to *high-end trim* shall be tested in not less than 10 percent of spaces, and no less than seven spaces, and shown to reduce *general lighting* power or light output to not greater than 85 percent of full power or light output. Where more than 30 percent of the tested spaces fail, the remaining qualifying spaces shall be tested.
4. Summarize the reduction in *general lighting* power or light output resulting from the *high-end trim* setting for each qualifying space and the floor area of each qualifying space.
5. Summarize the fraction of total floor area for spaces where *high-end trim* reduces *general lighting* power or light output to not greater than 85 percent of full power or light output.

C408.3.1.6 Demand responsive lighting controls G01. For spaces associated with the project receiving Renewable and Load Management Credits in Section C406.3.2, the following procedures shall be performed:

1. Confirm the maximum set point upon receipt of the *demand response signal* has been established for each space.
2. For projects with seven or fewer spaces with controls, each space shall be tested.
3. For projects with more than seven spaces with controls, testing shall be done for each unique space type. Where multiple spaces of each space type exist, not less than 10 percent and in no case fewer than one space, of each space type shall be tested unless the *building official* requires a higher percentage to be tested. Where 30 percent or more of the tested controls fail in a space type, all remaining identical space types shall be tested.
4. For demand responsive controls to be tested, verify the following:
    4.1 Where *high-end trim* controls are used, the *high-end trim* shall be set before testing.
    4.2 Turn off all non-*general lighting* in the space.
    4.3 Set *general lighting* to its maximum illumination level. Where *high-end trim* is set, this will be the maximum illumination level at the *high-end trim* setpoint.
    4.4 An illumination measurement shall be taken in an area of the space not controlled by daylight responsive controlled lighting. If there is not an area without daylight responsive controls the daylight responsive controls shall be overridden from reducing the lighting level during the test.
    4.5 Measure and document the space maximum illumination level.
5. Simulate a *demand response signal* and measure the illumination level at the same location as for the measurement in Section C408.3.1.5.(4.5). Verify the illumination level has been reduced to no greater than 80 percent of the maximum illumination level documented in Section C408.3.1.5.(4.5).
6. Simulate the end of a demand event by turning off the *demand response signal*, confirm controls automatically return to their normal operational settings at the end of the demand response event.

EC 07-0181

Revise as follows:

SECTION C409

CALCULATION OF HVAC TOTAL SYSTEM PERFORMANCE RATIO

C409.1 Applicability. Use of the HVAC Total System Performance Ratio (TSPR) method shall comply with this section.

C409.2 Permitted uses. Only HVAC systems that serve building occupancies and uses in Table C409.4 and not excluded by Section C409.2.1 shall be permitted to use the TSPR method.

C409.2.1 Systems not permitted. The following HVAC systems are not permitted to use Section C403.1(3).

1. HVAC Systems using:
    1.1 District heating water, chilled water or steam;
    1.2 Small *duct* high velocity air cooled, space constrained air cooled, single package vertical air conditioner, single package vertical heat pump, or double-duct air conditioner or double-duct heat pump as defined in subpart F to 10CFR part 431;
    1.3 Packaged terminal air conditioners and packaged terminal heat pumps that have cooling capacity greater than 12,000 Btu/hr (3500 kW);
    1.4 A common heating source serving both HVAC and *service water heating* equipment, or
2. HVAC systems that provide recovered heat for *service water heating*.
3. HVAC systems not specified in Table C409.6.1.10.1.
4. HVAC systems specified in Table C409.6.1.10.1 with characteristics or parameters in Table C409.6.1.10.2(1), not identified as applicable to that HVAC system type.
5. HVAC systems with chilled water supplied by absorption chillers, heat recovery chillers, water to water heat pumps, air to water heat pumps, or a combination of air- and water-cooled chillers on the same chilled water loop.
6. HVAC systems served by heating water plants that include air to water or water to water heat pumps.
7. Underfloor air distribution and displacement *ventilation* HVAC systems.
8. Space conditioning systems that do not include mechanical cooling.
9. HVAC systems serving laundry rooms, elevator rooms, mechanical rooms, electrical rooms, data centers, and computer rooms.
10. HVAC systems serving *buildings* or areas of medical office buildings required to use ASHRAE Standard 170.
11. HVAC systems serving *buildings* or areas that are required by regulation to have continuous air handling unit operation.
12. HVAC systems serving laboratories with fume hoods.
13. HVAC systems serving locker rooms with more than 2 showers.
14. HVAC systems serving natatoriums and rooms with saunas
15. HVAC systems serving restaurants and commercial kitchens with total cooking capacity greater than 100,000 Btu/h (29 kW)
16. HVAC systems serving areas of *buildings* with commercial refrigeration equipment exceeding 100 kW of power input
17. HVAC systems serving cafeterias and dining rooms

C409.3 HVAC TSPR compliance. HVAC systems permitted to use TSPR shall comply with Section C409.4 and the following:

1. HVAC systems shall comply with applicable requirements of Section C403 as follows:
    1.1 Air economizers shall meet the requirements of Section C403.5.3.4 Relief of excess outdoor air and Section C403.5.5 Economizer fault detection and diagnostics.
    1.2 Variable-air-volume system systems shall meet requirements of Sections C403.6.5, C403.6.6, and C403.6.9.
    1.3 Hydronic systems shall meet the requirements of Section C403.4.4.
    1.4 Plants with multiple chillers or boilers shall meet the requirements of Section C403.4.5.
    1.5 Hydronic (Water Loop) Heat Pumps and Water-Cooled Unitary Air Conditioners shall meet the requirements of Section C403.4.3.3.

1.6 Cooling tower turn down shall meet requirements of Section C403.11.4.
1.7 Heating of unenclosed spaces shall meet the requirements of Section C403.14.1.
1.8 Hot-gas bypass shall meet the requirements of Section C403.3.3.
1.9 Systems shall meet the operable openings interlock requirements of Section C402.5.11.10. Refrigeration systems shall meet the requirements of Section C403.12.

2. Systems shall comply with the applicable provisions of Sections of Section C403 required by Table C407.2

C409.4 Performance target. For HVAC systems serving uses or portions of uses listed in Section C409.2 that are not served by systems listed in Section C409.2.1, the HVAC TSPR of the *proposed design* shall be greater than or equal to the HVAC TSPR of the *standard reference design* divided by the mechanical performance factor (MPF) using Equation 4-34.

$$TSPRp > TSPRr / MPF \quad \text{(Equation 4-34)}$$

TSPRp = HVAC TSPR of the proposed design calculated in accordance with Sections C409.4, C409.5 and C409.6.
TSPRr = HVAC TSPR of the reference building design calculated in accordance with Sections C409.4, C409.5 and C409.6.
MPF = Mechanical Performance Factor from Table C409.4 based on climate zone and building use type. Where a building has multiple building use types, MPF shall be area weighted using Equation 4-34.

$$MPF = (A1 \times MPF1 + A2 \times MPF2 + \ldots + An \times MPFn) / (A1 + A2 + \ldots + An) \quad \text{(Equation 4-35)}$$

MPF1, MPF2 through MPFn= Mechanical Performance Factors from Table C409.4 based on climate zone and building use types 1,2, through n.
A1, A2 through An= Conditioned floor areas for building use types 1, 2, through n.

[NY] TABLE C409.4 Mechanical Performance Factors

Climate Zone:		4	5	6
Building use	Occupancy Group			
Office (all other)[a]	B	0.805	0.845	0.865
Office (Large)[a]	B	0.67	0.71	0.73
Retail	M	0.45	0.46	0.50
Hotel/Motel	R-1	0.45	0.38	0.35
Multi-family/Dormitory	R-2	0.53	0.54	0.55
School/Education and Libraries	E (A-3)	0.73	0.82	0.89

a. Large office conditioned floor area > more than 150,000 ft2 (14,000 m2) or > more than 5 stories

C409.4.1 HVAC TSPR HVAC TSPR is calculated according to Equation 4-36.

$$HVAC\ TSPR = Heating\ and\ cooling\ load / building\ HVAC\ system\ energy \quad \text{(Equation 4-36)}$$

Building HVAC system energy = Sum of the annual site energy consumption for heating, cooling, fans, energy recovery, pumps, and heat rejection in thousands of Btus
Heating and cooling load = Sum of the annual heating and cooling loads met by the building HVAC system in thousands of Btus

C409.5 General Projects shall use the procedures of this Section when calculating compliance using HVAC Total System Performance Ratio.

C409.5.1 Simulation Program Simulation tools used to calculate HVAC TSPR of the Standard Reference Design shall comply with the following:

1. The simulation program shall calculate the HVAC TSPR based only on the input for the proposed design and the requirements of Section 409. The calculation procedure shall not allow the user to directly modify the building component characteristics of the standard reference design.
2. Performance analysis tools shall meet the applicable subsections of Section 409 and be tested n accordance with to ASHRAE Standard 140, except for Sections 7 and 8 of Standard 140. The required tests shall include building thermal envelope and fabric load test (Sections 5.2.1, 5.2.2, and 5.2.3), ground coupled slab-on-grade analytical verification tests (Section 5.2.4), space-cooling equipment performance tests (Section 5.3), space-heating equipment performance tests (Section 5.4), and airside HVAC equipment analytical verification test (Section 5.5), along with the associated reporting (Section 6).
3. The test results and modeler reports shall be posted on a publicly available website and shall include the test results of the simulation programs and input files used for generating the results along with the results of the other simulation programs included in ASHRAE Standard 140 Annexes B8 and B16. The modeler report in Standard 140 Annex A2 Attachment A2.7 shall be completed for results exceeding the maximum or falling below the minimum of the reference values and for omitted results.
4. The simulation program shall have the ability to explicitly model part-load performance curves or other part-load adjustment methods based on manufacturer's part-load performance data for mechanical equipment.
5. The *building official* shall be permitted to approve specific software deemed to meet these requirements in accordance with Section C101.5.1.

C409.5.2 Climatic Data. The simulation program shall perform the simulation using hourly values of climatic data for a full calendar year (8,760 hours) and shall reflect *approved* coincident hourly data for temperature, solar radiation, humidity and wind speed for the *building* location.

C409.5.3 Documentation. Documentation or web links to documentation conforming to the provisions of this section shall be provided to the *building official*.

C409.5.3.1 Compliance Report. Building permit submittals shall include:

1. A report produced by the simulation software that includes the following:
    1.1 Address of the building.
    1.2 Name of individual completing the compliance report.
    1.3 Name and version of the compliance software tool.
    1.4 The dimensions, floor heights and number of floors for each thermal block.
    1.5 By thermal block, the U-factor, C-factor, or F-factor for each simulated opaque envelope component and the U-factor and SHGC for each fenestration component.
    1.6 By thermal block or by surface for each block, the fenestration area.
    1.7 By thermal block, a list of the HVAC equipment simulated in the proposed design including the equipment type, fuel type, equipment efficiencies and system controls.
    1.8 Annual site HVAC energy use by end use for the proposed and baseline building.
    1.9 Annual sum of heating and cooling loads for the baseline building.
    1.10 The HVAC TSPR for both the standard reference design and the proposed design.
2. A mapping of the actual building HVAC component characteristics and those simulated in the proposed design showing how individual pieces of HVAC equipment identified above have been combined into average inputs as required by Section C409.6.1.10 including:
    2.1 Fans
    2.2 Hydronic pumps
    2.3 Air handlers
    2.4 Packaged cooling equipment
    2.5 Furnaces
    2.6 Heat pumps
    2.7 Boilers
    2.8 Chillers
    2.9 Heat rejection equipment (open and closed-circuit cooling towers; dry coolers)
    2.10 Electric resistance coils
    2.11 Condensing units
    2.12 Motors for fans and pumps
    2.13 Energy recovery devices

3. For each piece of equipment identified above include the following as applicable:
    3.1 Equipment name or tag consistent with that found on the design documents.
    3.2 Rated Efficiency level.
    3.3 Rated Capacity.
    3.4 Where not provided by the simulation program report in item a, documention of the calculation of any weighted equipment efficiencies input into the program.
    3.5 Electrical input power for fans and pumps (before any speed or frequency control device) at design condition and calculation of input value (W/cfm or W/gpm) or W/gpm (W/Lps).
4. Floor plan of the building identifying:
    4.1 How portions of the buildings are assigned to the simulated thermal blocks.
    4.2 Areas of the building that are not covered under the requirements of Section C403.1.1.

C409.6 Calculation Procedures Except as specified by this Section, the standard reference design and proposed design shall be configured and analyzed using identical methods and techniques.

C409.6.1 Simulation of the proposed building design. The proposed design shall be configured and analyzed as specified in this section.

C409.6.1.1 Thermal block Geometry. The geometry of buildings shall be configured using one or more thermal blocks. Each thermal block shall define attributes including block dimensions, number of floors, floor to floor height and floor to ceiling height. Simulation software may allow the use of simplified shapes (such as rectangle, L shape, H Shape, U shape or T shape) to represent thermal blocks. Where actual building shape does not match these pre-defined shapes, simplifications are permitted providing the following requirements are met:

1. The conditioned floor area and volume of each thermal block shall match the proposed design within 10 percent.
2. The area of each exterior envelope component from Table C402.1.4 is accounted for within 10 percent of the actual design.
3. The area of vertical fenestration and skylights is accounted for within 10 percent of the actual design.
4. The orientation of each component in 2 and 3 above is accounted for within 45 degrees of the actual design.

The creation of additional thermal blocks may be necessary to meet these requirements. A more complex zoning of the building shall be allowed where all thermal zones in the reference and proposed model are the same and rules related to thermal block geometry and HVAC system assignment to thermal blocks are met with appropriate assignment to thermal zones.

Exception: Portions of the building that are unconditioned or served by systems not covered by the requirements of Section C403.1.1 shall be omitted.

C409.6.1.1.1 Number of thermal blocks One or more thermal blocks may be required per *building* based on the following restrictions:

1. Each *thermal block* shall have no more than one building.
2. Each *thermal block* shall be served by no more than one type of HVAC system. A single block shall be created for each unique HVAC system and *building* use combination and multiple HVAC units or components of the same type shall be combined in accordance with Section C409.6.1.10.2.
3. Each thermal block shall have no more than a single defined floor to floor or floor to ceiling heights. Where floor heights differ by more than two feet, separate thermal blocks shall be created.
4. Each block shall include either above grade or below grade stories. For buildings with both above grade and below grade stories, separate blocks shall be created for each. Where blocks have exterior walls partially below grade, if greater than 50 percent of the *exterior wall* surface is below grade, then simulate the block as below grade; otherwise simulate as above grade.
5. Where a block includes multiple stories, separate blocks shall be created, if needed, to comply with both the following fenestration modeling requirements:
    5.1 The product of the proposed design U-factor times the area of windows (UA) on a given story of each facade shall not differ by more than 15 percent of the average UA for that modeled facade in each block.
    5.2 The product of the proposed design SHGC times the area of windows (SHGCA) on a given story of each façade shall not differ by more than 15 percent of the average SHGCA for that modeled facade in each block.
6. For a building model with multiple blocks, the blocks shall be configured together to have the same adjacencies as the actual building design.

C409.6.1.2 Thermal Zoning. Each story in a thermal block shall be modeled as follows:

1. Below grade stories shall be modeled as a single thermal zone.
2. Where any facade in the block is less than 45 feet (1371 cm) in length, it shall be modeled as a single thermal zone per story.
3. Otherwise, each story shall be modeled with five thermal zones. A perimeter zone shall be created extending from each façade to a depth of 15 feet (457 cm). Where facades intersect, the zone boundary shall be formed by a 45 degree angle with the two facades. The remaining area or each story shall be modeled as a core zone with no exterior walls.

C409.6.1.2.1 Core & Shell / Initial, Build-Out, and Future System Construction Analysis. Where the *building* permit applies to only a portion of the HVAC system in a *building* and the remaining components will be designed under a future building permit or were previously installed, such components shall be modeled as follows:

1. Blocks including existing or future HVAC zone served by independent systems and not part of the construction project shall not be modeled.
2. Where the HVAC zones that do not include complete HVAC systems in the permit are intended to receive HVAC services from systems that are part of the construction project, their proposed zonal systems shall be modeled with equipment that meets, but does not exceed, the requirements of Section C403.
3. Where existing HVAC systems serve permitted zone equipment in the existing systems shall be modeled with equipment matching the manufacturer's stated efficiency for the installed equipment or equipment that meets, but does not exceed the requirements of Section C403.
4. Where the central plant heating and cooling equipment is completely replaced and HVAC zones with existing systems receive HVAC services from systems in the permit, their proposed zonal systems shall be modeled with equipment that meets, but does not exceed, the requirements of Section C403.

C409.6.1.3 Occupancy Building occupancies modeled in the standard reference design and the proposed design shall comply with the following requirements.

C409.6.1.3.1 Occupancy Type. The occupancy type for each thermal block shall be consistent with the building occupancy and used specified in Table C409.4 shall not be included in the simulation. Surfaces adjacent to such excluded building portions shall be modeled as adiabatic in the simulation program.

C409.6.1.3.2 Occupancy schedule, density, and heat gain The occupant density, heat gain, and schedule shall be for multifamily, office, retail, library, hotel/motel or school as specified by ASHRAE Standard 90.1 Normative Appendix C.

C409.6.1.4 Building thermal envelope components. *Building thermal envelope* components modeled in the *standard reference design* and the *proposed design* shall comply with the requirements of this Section.

C409.6.1.4.1 Roofs. The roof U-factor and area shall be modeled as in the proposed design. If different roof thermal properties are present in a single thermal block, an area weighted U-factor shall be used. Roofs shall be modeled with insulation above a steel roof deck, with solar reflectance of 0.25 and emittance of 0.90.

C409.6.1.4.2 Above grade walls. The U-factor and area of above grade walls shall be modeled as in the proposed design. If different wall constructions exist on the facade of a thermal block an area-weighted U-factor shall be used. Walls will be modeled as steel frame construction.

C409.6.1.4.3 Below grade walls. The C-factor and area of below grade walls shall be modeled as in the proposed design. If different below grade wall constructions exist in a thermal block, perimeter-weighted C- factor shall be used.

C409.6.1.4.4 Above grade exterior floors. The U-factor and area of floors shall be modeled as in the proposed design. If different wall constructions exist in the block an area-weighted U-factor shall be used. Exterior floors shall be modeled as steel frame.

C409.6.1.4.5 Slab on grade floors. The F-factor and perimeter of slab on grade floors shall be modeled as in the proposed design. If different slab on grade floor constructions exist in a thermal block, perimeter-weighted F- factor shall be used.

C409.6.1.4.6 Vertical Fenestration The window area and area weighted U-factor and SHGC shall be modeled for each façade based on the proposed design. Each exterior surface in a thermal block must comply with Section C409.6.1.1.1 item 5. Windows shall be combined into a single window centered on each facade based on the area and sill height input by the user. When different U values, SHGC or sill heights exist on a single façade in a block, the area weighted average for each shall be input by the user.

C409.6.1.4.7 Skylights The skylight area and area weighted U-factor and SHGC shall be modeled for each roof based on the *proposed design*. Skylights shall be combined into a single skylight centered on the roof of each zone based on the area input by the user.

C409.6.1.4.8 Exterior Shading Permanent window overhangs shall be modeled. When windows with and without overhangs or windows with different overhang projection factors exist on a facade, window width weighted projection factors shall be input by the user as follows:

(Equation 4-37)

$$P_{avg} = (A1 \times L_{o1} + A2 \times L_{o2} \ldots + An \times L_{on}) / (L_{w1} + L_{w1} \ldots + L_{wn})$$

C409.6.1.5 Lighting Interior lighting power density shall be equal to the allowance in Table C405.4.2(1) for multifamily, office, retail, library, or school. The lighting schedule shall be for multifamily, office, retail, library, or school as specified by ASHRAE Standard 90.1 Normative Appendix C. The impact of lighting controls is assumed to be captured by the lighting schedule and no explicit controls shall be modeled. Exterior lighting shall not be modeled.

C409.6.1.6 Miscellaneous equipment The miscellaneous equipment schedule and power shall be for multifamily, office, retail, library, or school as specified by ASHRAE Standard 90.1 Normative Appendix C. The impact of miscellaneous equipment controls is assumed to be captured by the equipment schedule and no explicit controls shall be modeled.

Exceptions:

1. Multifamily dwelling units shall have a miscellaneous load density of 0.42 W/ft2.
2. Multifamily common areas shall have a miscellaneous load density of 0 W/ft2.

C409.6.1.7 Elevators. Elevators shall not be modeled.

C409.6.1.8 Service water heating equipment. Service water heating shall not be modeled.

C409.6.1.9 On-site renewable energy systems. On-site Renewable Energy Systems shall not be modeled.

C409.6.1.10 HVAC equipment. Where proposed or reference system parameters are not specified in Section C409, HVAC systems shall be modeled to meet the minimum requirements of Section C403 Mechanical Systems.

C409.6.1.10.1 Supported HVAC systems. At a minimum, the HVAC systems shown in Table C409.6.1.10.1 shall be supported by the simulation program.

TABLE C409.6.1.10.1
PROPOSED BUILDING HVAC SYSTEMS SUPPORTED BY HVAC TSPR SIMULATION SOFTWARE

System No.	System Name
1	Packaged Terminal Air Conditioner (with electric or hydronic heat)
2	Packaged Terminal Air Heat Pump
3	Packaged Single Zone Gas Furnace[a] and/or air-cooled Air Conditioner (includes split systems[b])
4	Packaged Single Zone Heat Pump (air to air only)(includes split systems[b] and electric or gas supplemental heat)
5	Variable Refrigerant Flow (air cooled only)
6	Variable Refrigerant Flow (air cooled only)
7	Water Source Heat Pump (Water Loop), water-source *Variable-Refrigerant-Flow- System*, or water-source air conditioner
8	Ground Source Heat Pump
9	Packaged Variable Air Volume (DX cooling)[a]

10	Variable Air Volume (hydronic cooling)[a]
11	Variable Air Volume with Fan Powered Terminal Units
12	Dedicated Outdoor Air System (in conjunction with systems 1-8)

a. Reheat or primary heat may be electric, hydronic, or gas furnace
b. Condensing units with DX air handlers are modeled as package furnace with air conditioners or heat pumps

C409.6.1.10.2 Proposed building HVAC system simulation. The HVAC systems shall be modeled as in the proposed design at design conditions unless otherwise stated with clarifications and simplifications as described in Tables C409.6.1.10.2(1) and C409.6.1.10.2(2). System parameters not described in the following sections shall be simulated to meet the minimum requirements of Section C403. All zones within a thermal block shall be served by the same HVAC system type as described in Section C409.6.1.1.1 item 2. Heat loss from ducts and pipes shall not be modeled. Table C409.6.1.10.2(1) Proposed Building System Parameters are based on input of full-load equipment efficiencies with adjustment using part-load curves integrated in the simulation program. Where other approaches to part-load adjustment are used, it is permitted for specific input parameter to vary. The simulation program shall model part-load HVAC equipment performance using either:

1. Full-load efficiency adjusted for fan power input that is modeled separately and typical part-load performance adjustments for the proposed equipment,
2. Part-load adjustments based on input of both full-load and part-load metrics, or
3. Equipment-specific adjustments based on performance data provided by the equipment manufacturer for the proposed equipment.

Where multiple system components serve a thermal block, average values weighed by the appropriate metric as described in this section shall be used.

1. Where multiple fan systems serve a single thermal block, fan power shall be based on weighted average using the design supply air cfm.
2. Where multiple cooling systems serve a single thermal block, COP shall be based on a weighted average using cooling capacity. DX coils shall be entered as multistage if more than 50 percent of coil capacity serving the thermal block is multi-stage with staged controls.
3. Where multiple heating systems serve a single thermal block, thermal efficiency or heating COP shall be based on a weighted average using heating capacity.
4. Where multiple boilers or chillers serve a heating water or chilled water loop, efficiency shall be based on a weighted average for using heating or cooling capacity.
5. When multiple cooling towers serving a condenser water loop are combined, the cooling tower efficiency, cooling tower design approach and design range are based on a weighted average of the design water flow rate through each cooling tower.
6. Where multiple pumps serve a heating water, chilled water or condenser water loop, pump power shall be based on a weighted average for using design water flow rate.
7. When multiple system types with and without economizers are combined, the economizer maximum outside air fraction of the combined system shall be based on weighted average of 100 percent supply air for systems with economizers and design outdoor air for systems without economizers.
8. Multiple systems with and without ERVs cannot be combined.
9. Systems with and without supply air temperature reset cannot be combined.
10. Systems with different fan control (constant volume, multi-speed or VAV) for supply fans cannot be combined.

[NY] TABLE C409.6.1.10.2(1)
PROPOSED BUILDING SYSTEM PARAMETERS

Category	Parameter	Fixed or User Defined	Required	Applicable Systems
HVAC System Type	System Type	User Defined	Selected from Table C409.6.1.10.1	All
System Sizing	Design Day Information	Fixed	99.6% heating design and 1% dry-bulb and 1% wet-bulb cooling design	All
	Zone Coil Capacity	Fixed	Sizing factors used are 1.25 for heating equipment and 1.15 for cooling equipment	All

	Supply Airflow	Fixed	Based on a supply-air-to-room-air temperature set-point difference of 20°F(11.11°C) or	1-11
		Fixed	Equal to required outdoor air ventilation	12
Outdoor Ventilation Air	Portion of supply air With proposed Filter ≥MERV 13	User defined	Percentage of supply air flow subject to higher filtration (Adjusts baseline Fan Power higher. Prorated)	All
	Outdoor Ventilation Air Flow Rate	Fixed	As specified in ASHRAE Standard 90.1 Normative Appendix C, adjusted for proposed DCV control	All
	Outdoor Ventilation Supply Air Flow Rate Adjustments	Fixed	Based on ASHRAE Standard 62.1 Section 6.2.4.3 System Ventilation Efficiency (Evs) is 0.75	9-11
		Fixed	System Ventilation Efficiency (Evs) is 1.0	1-8, 12
		Fixed	Basis is 1.0 Zone Air Distribution Effectiveness	All
System Operation	Space temperature set points	Fixed	As specified in ASHRAE Standard 90.1 Normative Appendix C, except -multifamily which shall use 68°F(20°C) heating and 76°F(24.4°C) cooling setpoints. -hotel/motel that shall be 70°F(21.1°C) heating and 72°F(22.2°C) cooling	1-11
	Fan Operation - Occupied	User defined	Runs continuously during occupied hours or cycles to meet load. Multispeed fans reduce airflow related to thermal loads.	1-11
	Fan Operation - Occupied	Fixed	Fan runs continuously during occupied hours	12
	Fan Operation - Night Cycle	Fixed	Fan cycles on to meet setback temperatures	1-11
Packaged Equipment Efficiency	DX Cooling Efficiency	User defined	Cooling COP without fan energy calculated in accordance with Section C409.6.1.10.2	1, 2, 3, 4, 5,7, 8, 9, 11,12
	DX Coil Number of Stages	User defined	Single Stage or Multistage	3, 4, 9, 10, 11, 12
	Heat Pump Efficiency	User defined	Heating COP without fan energy calculated in accordance with Section C409.6.1.10.2	2, 4, 5, 7, 8, 12
	Furnace Efficiency	User defined	Furnace thermal efficiency	3, 9, 11, 12
Heat Pump Supplemental Heat	Heat Source	User defined	Electric resistance or gas furnace	2, 4, 7, 8, 12
	Control	Fixed	Supplemental electric heat locked out above 40°F(4°C) OAT. Runs as needed in conjunction with compressor between 40°F(4°C) and 0°F(-17.8°C). Gas heat operates in place of the heat pump when the heat pump cannot meet load.	2, 4, 7, 8, 12
System Fan Power and Controls	Part-load Fan Controls -Constant Volume -Two Speed or three speed -VAV	User defined	Static pressure reset included for VAV.	1-8 (CAV, two or three speed), 9, 10, 11 (VAV), 12 (CAV and VAV)

	Design Fan Power (W/ cfm)	User defined	Input electric power for all fans required to operate at fan system design conditions divided by the supply airflow rate This is a "wire to air" value including all drive, motor efficiency and other losses.	All
	Low-speed and medium speed fan power	User defined	Low speed input electric power for all fans required to operate at low-speed conditions divided by the low speed supply airflow rate. This is a "wire to air" value including all drive, motor efficiency and other losses. Also provide medium speed values for three-speed fans.	1-8
Variable Air Volume Systems	Supply Air Temperature (SAT) Controls	User defined	If not SAT reset then constant at 55°F(12.8°C).Options for reset based on outside air temperature (OAT) or warmest zone. If warmest zone, then the user can specify the minimum and maximum temperatures. If OAT reset, SAT is reset higher to 60°F(15.6°C) at outdoor low of 50°F(10°C). SAT is 55°F(12.8°C) at outdoor high of 70°F(21.1°C).	9, 10, 11
	Minimum Terminal Unit Airflow percentage	User defined	Average minimum terminal unit airflow percentage for thermal block weighted by cfm or minimum required for outdoor air ventilation, whichever is higher.	9, 10, 11
	Terminal Unit Heating Source	User defined	Electric or hydronic	9, 10, 11
	Dual set point Minimum VAV damper position	User defined	Heating maximum airflow fraction	9, 10
	Fan Powered Terminal Unit (FPTU) Type	User defined	Series or parallel FPTU	11
	Parallel FPTU Fan	Fixed	Sized for 50% peak primary air at 0.35 W/cfm	11
	Series FPTU Fan	Fixed	Sized for 50% peak primary air at 0.35 W/cfm	11
Economizer	Economizer Presence	User defined	Yes or No	3, 4, 5, 6, 9, 10, 11
	Economizer Control Type	Fixed	Lockout on Differential dry-bulb temperature (OAT>RAT) in 6A, 5A, All B & C climate zones; fixed enthalpy>28 Btu/lb (47kJ/kg) or fixed dry-bulb OAT>75°F(24°C) in *Climate Zone* 4	3, 4, 5, 6, 9, 10, 11
Energy Recovery	Sensible Effectiveness	User defined	Heat exchanger sensible effectiveness at design heating and cooling conditions	3, 4, 9, 10, 11, 12
	Latent Effectiveness	User defined	Heat exchanger latent effectiveness at design heating and cooling conditions	3, 4, 9, 10, 11, 12
	Economizer Bypass	User defined	If ERV is bypassed or wheel rotation is slowed during economizer conditions (Yes/No)	3, 4, 9, 10, 11, 12
	Economizer Bypass	Fixed	If there is a bypass, it will be active between 45°F(7.2°C) and 75°F(23.9°C) outside air	3, 4, 9, 10, 11, 12

	active		temperature.	
	Bypass SAT Setpoint	User defined	If bypass, target supply air temperature	3, 4, 9, 10, 11, 12
	Fan Power Reduction during Bypass (W/cfm)	User defined	If ERV system include bypass, static pressure set point and variable speed fan, fan power can be reduced during economizer conditions	3, 4, 9, 10, 11, 12
Demand Controlled Ventilation	DCV Application on/off	User defined	Percent of thermal block floor area under occupied standby controls, ON/OFF only with occupancy sensor and no variable control	3, 4, 9, 10, 11, 12
	DCV Application CO2	User defined	Percentage of thermal block floor area under variable DCV control (CO2); may include both variable and ON/OFF control	3, 4, 9, 10, 11, 12
DOAS	DOAS Fan Power W/cfm	User defined	Fan electrical input power in W/cfm of supply airflow	12
	DOAS Supplemental Heating and Cooling	User defined	Heating source, cooling source, energy recovery and respective efficiencies	12
	Maximum SAT Set Point (Cooling)	User defined	SAT set point if DOAS includes supplemental cooling	12
	Minimum SAT Set Point (Heating)	User defined	SAT set point if DOAS includes supplemental heating	12
Heating plant	Boiler Efficiency	User defined	Boiler thermal efficiency	1, 6, 7, 9, 10, 11, 12
	Heating Water Loop Configuration	User defined	Constant flow primary only; Variable flow primary only; Constant flow primary - variable flow secondary, Variable flow primary and secondary	1, 6, 7, 9, 10, 11, 12
	Heating Water Primary Pump Power (W/gpm)	User defined	Heating water primary pump input W/gpm heating water flow	1, 6, 7, 9, 10, 11, 12
	Heating Water Secondary Pump Power (W/gpm)	User defined	Heating water secondary pump input W/gpm heating water flow (if primary/secondary)	1, 6, 7, 9, 10, 11, 12
	Heating Water Loop Temperature	User defined	Heating water supply and return temperatures, ° F(°C)	1, 6, 9, 10,11
	Heating Water Loop Supply Temperature Reset	Fixed	Reset HWS by 27.3% of design delta-T (HWS-70°F(21.1°C) Space Heating temperature set point) between 20°F(-6.7°C) and 50°F(10°C) OAT	1, 6, 7, 9, 10, 11, 12
	Boiler type	Fixed	Non-condensing boiler where input thermal efficiency is less than 86%; Condensing boiler otherwise	1, 6, 7, 9, 10, 11, 12
Chilled Water Plant	Chiller Compressor Type	User defined	Screw/Scroll, Centrifugal or Reciprocating	6, 10, 11, 12
	Chiller Condenser Type	User defined	Air cooled or water cooled	6, 10, 11, 12
	Chiller Full Load Efficiency	User defined	Chiller COP	6, 10, 11, 12
	Chilled Water Loop Configuration	User defined	Variable flow primary only, constant flow primary - variable flow secondary, variable flow primary and secondary	6, 10, 11,12

	Chilled Water Primary Pump Power (W/gpm)	User defined	Primary pump input W/gpm chilled water flow	6, 10, 11,12
	Chilled Water Secondary Pump Power (W/gpm)	User defined	Secondary Pump input W/gpm chilled water flow (if primary/secondary)	6, 10, 11,12
	Chilled Water Temperature Reset Included	User defined	Yes/No	6, 10, 11,12
Chilled Water Plant (cont.)	Chilled Water Temperature Reset Schedule (if included)	Fixed	Outdoor air reset: CHW supply temperature of 44°F(6.7°C) at 80°F(26.7°C) outdoor air dry bulb and above, CHW supply temperature of 54°F(12.2°C) at 60°F(15.6°C) outdoor air dry bulb temperature and below, ramped linearly between	6, 10, 11,12
	Condenser Water Pump Power (W/ gpm)	User defined	Pump input W/gpm condenser water flow	6, 7, 8, ,10, 11, 12
	Condenser Water Pump Control	User defined	Constant speed or variable speed	6, 7, 8, 10, 11,12
	Heat Rejection Equipment Efficiency	User defined	gpm/hp tower fan	6, 7, 10, 11, 12
	Heat Rejection Fan Control	User defined	Constant or variable speed	6, 7, 10, 11, 12
	Heat Rejection Approach and Range	User defined	Design cooling tower approach and range temperature	6, 7, 10, 11, 12
Heat Pump Loop	Loop flow and Heat Pump Control Valve	Fixed	Two position Valve with VFD on Pump. Loop flow at 3 gpm/ton	7, 8
	Heat Pump Loop minimum and maximum temperature control	User defined	User input: restrict to minimum 20°F(11.1°C) and maximum 40°F(22.2°C) temperature difference	7
GLHP Well Field	-	Fixed	Bore depth = 250 ft(76 m) Bore length 200 ft/ton (1.5 m/kW) for the greater of cooling or heating load Bore spacing = 15 ft(4.6 m) Bore diameter = 5 in (127 mm) .” (19 mm) Polyethylene pipe Ground and grout conductivity = 4.8 Btu-in/h-ft2-°F (0.69 W/(mK))	8

a. Part load fan power and pump power modified in accordance with Table C409.6.1.10.2(2)

TABLE C409.6.1.10.2(2)
FAN AND PUMP POWER CURVE COEFFICIENTS

Equation Term	Fan Power Coefficients	Pump Power Coefficients	
	VSD + SP reset	Ride Pump Curve	VSD + DP/valve reset
b	0.0408	0	0
x	0.088	3.2485	0.0205
x^2	-0.0729	-4.7443	0.4101
x^3	0.9437	2.5295	0.5753

C409.6.1.10.3 Demand Control Ventilation Demand Controlled Ventilation (DCV) shall be modeled using a simplified approach that adjusts the design outdoor supply air flow rate based on the floor area of the building that is covered by DCV. The simplified method shall accommodate both variable DCV and on/off DCV, giving on/off DCV on third the effective floor control area of variable DCV. Outdoor air reduction coefficients shall be as stated in Table C409.6.1.10.3.

Exception: On/off DCV shall receive full effective area adjustment for R-1 and R-2 occupancies.

TABLE C409.6.1.10.3
DCV OUTDOOR AIR REDUCTION CURVE COEFFICIENTS

Equation term	DCV OSA reduction (y) as a function of effective DCV control floor area (x)			
	Office	School	Hotel; Motel; Multi-Family; Dormitory	Retail
b	0	0	0	0
x	0.4053	0.2676	0.5882	0.4623
x^2	-0.8489	0.7753	-1.0712	-0.848
x^3	1.0092	-1.5165	1.3565	1.1925
x^4	-0.4168	0.7136	-0.6379	-0.5895

C409.6.2 Simulation of the standard reference design. The *standard reference design* shall be configured and analyzed as specified in this section.

C409.6.2.1 Utility Rates. Same as proposed design.

C409.6.2.2 Thermal blocks Same as proposed design.

C409.6.2.3 Thermal zoning. Same as proposed design.

C409.6.2.4 Occupancy type, schedule, density, and heat gain. Same as proposed design.

C409.6.2.5 Envelope components Same as proposed design

C409.6.2.6 Lighting Same as proposed design.

C409.6.2.7 Miscellaneous equipment. Same as proposed design.

C409.6.2.8 Elevators. Not modeled. Same as proposed design.

C409.6.2.9 Service water heating equipment. Not modeled. Same as proposed design.

C409.6.2.10 On-site renewable energy systems. Not modeled. Same as proposed design.

[NY] C409.6.2.11 HVAC equipment. The reference building design HVAC equipment consists of separate space conditioning systems as described in Table C409.6.2.11(1) through Table C409.6.2.11(3) for the appropriate building use types.

[NY] TABLE C409.6.2.11(1)
REFERENCE BUILDING DESIGN HVAC COMPLEX SYSTEMS

Parameter	Building Type	
	Large Office	School
System Type	VAV/ RH Water-cooled Chiller/ Gas Boiler	VAV/ RH Water-cooled Chiller/ Gas Boiler
Fan control	VSD (No SP Reset)	VSD (No SP Reset)
Main fan power (W/ CFM (W・s/L) Proposed ≥ MERV13	1.165 (2.468)	1.165 (2.468)
Main fan power (W/ CFM (W・s/L) proposed < MERV13	1.066 (2.259)	1.066 (2.259)
Zonal fan power (W/ CFM (W・s/L))	NA	NA
Minimum zone airflow fraction	1.5* Voz	1.2* Voz
Heat/cool sizing factor	1.25/1.15	1.25/1.15
Outdoor air economizer	Yes except 4A	Yes except 4A
Occupied OSA (= proposed)	Sum(Voz)/0.75	Sum(Voz)/0.65
Energy recovery ventilator efficiency ERR (Enthalpy Recovery Ratio) ERV bypass SAT set point	NA	50% 60°F(15.6 °C)except 4A
DCV	No	No
Cooling Source	(2) Water-cooled Centrifugal Chillers	(2) Water-Cooled Screw Chillers
Cooling COP (net of fan)	Path B for profile	Path B for profile
Heating source (reheat)	Gas Boiler	Gas Boiler
Furnace or boiler efficiency	75% Et	80% Et
Condenser heat rejection	Axial Fan Open Circuit Cooling Tower	
Cooling tower efficiency (gpm/fanhp (L/s・fan-kW))	38.2 (3.23)	38.2 (3.23)
Tower turndown (> 300 ton (1060 kW))	50%	50%
Pump (constant flow/ variable flow)	Constant Flow; 10°F (5.6°C) range	Constant Flow; 10°F (5.6°C) range
Tower approach	25.72 - (0.24 x WB), where WB WB is the 0.4% evaporation design wetbulb temperature (° F)	
Cooling condenser pump power (W/gpm (W・s/L))	19 (300)	19 (300)
Cooling primary pump power (W/gpm (W・s/L))	9 (142)	9 (142)
Cooling secondary pump power (W/gpm (W・s/L))	13 (205)	13 (205)
Cooling coil chilled water delta-T, °F (°C)	12 (6.7)	12 (6.7)
Design chilled water supply temperature, ° F (°C)	44 (6.7)	44 (6.7)
Chilled water supply temperature (CHWST) reset set point vs Outside Air Temperature OAT, °F (°C)	CHWST: 44-54/OAT 80-60 (6.7-12.2/ 26.7-15.6)	CHWST: 44-54/OAT 80-60 (6.7-12.2/ 26.7-15.6)
Building Type Parameter	Large Office (cold)	School (cold)
CHW cooling loop pumping control	2-way Valves & pump VSD	2-way Valves & pump VSD
Heating pump power (W/gpm (W・s/L))	16.1 (254)	16.1 (254)

Heating oil HW dT.° F (°C)	50 (10)	50 (10)
Design Hot Water Supply Temperature (HWST). °F (°C)	180 (82.2)	180 (82.2)
HWST reset set point vs OAT, °F (°C)	HWST: 180-150/ OAT 20-50 (82-65.6/ -6.7-10)	HWST: 180-150/ OAT 20-50 (82-65.6/ -6.7-10)
Heat loop pumping control	2-way Valves & pump VSD	2-way Valves & pump VSD

[NY] TABLE C409.6.2.11(2)
TSPR REFERENCE BUILDING DESIGN HVAC SIMPLE SYSTEMS

Parameter	Building Type		
	Medium Office	Small Office	Retail
System type	Package VAV - Hydronic Reheat	PSZ-AC	PSZ-AC
Fan Control	VSD (No SP Reset)	Constant Volume	Constant Volume
Main fan power (W/ CFM (W・s/L)) proposed ≥ MERV13	1.285 (2.723)	0.916 (1.941)	0.899 (1.905)
Main fan power (W/ CFM (W・s/L)) proposed < MERV13	1.176 (2.492)	0.850 (1.808)	0.835 (1.801)
Zonal fan power (W/ CFM (W・s/L))	NA	NA	NA
Minimum zone airflow fraction	30%	NA	NA
Heat/cool sizing factor	1.25/1.15	1.25/1.15	1.25/1.15
Supplemental heating availability	NA	NA	NA
Outdoor air economizer	Yes except 4A	Yes except 4A	Yes except 4A
Occupied OSA source	Packaged unit, occupied damper, all building use types		
Energy recovery ventilator	No	No	No
DCV	No	No	No
Cooling source	DX, multistage	DX, single stage	DX, single stage
Cooling COP (net of fan)	3.40	3.00	3.50
Heating source	Gas Boiler	Furnace	Furnace
Heating COP (net of fan) / furnace or boiler efficiency	75% Et	80% Et	80% Et

[NY] TABLE C409.6.2.11(3)
TSPR REFERENCE BUILDING DESIGN HVAC SIMPLE SYSTEMS

Parameter	Building Type	
	Hotel	Multifamily
System type	PTAC	PTAC
Fan Control	Constant volume	Constant Volume
Main fan power (W/ CFM (W・s/L))	0.300 (0.636)	0.300 (0.636)
Heat/cool sizing factor	1.25/1.15	1.25/1.15
Supplemental heating availability	NA	NA
Outdoor air economizer	No	No
Occupied OSA source	Packaged unit, occupied damper	Packaged unit, occupied damper
Energy recovery ventilator	No	No
DCV	No	No
Cooling source	DX, 1 stage	DX, 1 stage
Cooling COP (net of fan)	3.20	3.20
Heating source	(2) Hydronic Boiler	(2) Hydronic Boiler
Heating COP (net of fan) / furnace or boiler efficiency	75% Et	75% Et
Heating pump power (W/gpm (W・s/L))	19 (300)	19 (300)
Heating coil heating water delta-T, °F (°C)	50 (27.8)	50 (27.8)
Design HWST, °F (°C)	180 (82.2)	180 (82.2)
HWST reset set point vs OAT, °F (°C)	HWST: 180-150/OAT 20-50 (82-65.6/ -6.7-10)	HWST: 180-150/OAT 20-50 (82-65.6/ -6.7-10)
Heat loop pumping control	2-way Valves & ride pump curve	2-way Valves & ride pump curve

C409.7 Target Design HVAC Systems. Target system descriptions described in Tables C409.7(1) through C409.7(3) are provided as reference for Section C403.1.1 Exception 10. The target systems are used for developing MPF values and do not need to be programmed into TSPR software.

[NY] TABLE C409.7(1)
TARGET BUILDING DESIGN CRITERIA HVAC COMPLEX SYSTEMS

Parameter	Building Type	
	Large office	School
System type	VAV/RH	
	Water-cooled chiller/	Water-cooled chiller/
	Gas boiler	Gas boiler
Fan Control	VSD (No SP Reset)	VSD (No SP Reset)
Main fan power (W/CFM (W・s/L) Proposed ≥ MERV13	1.127 (2.388)	1.127 (2.388)
Zonal fan power (W/CFM (W・s/L))	NA	NA
Minimum zone airflow fraction	1.5* Voz	1.2* Voz
Heat/cool sizing factor	1.25/1.15	1.25/1.15
Outdoor air economizer	Yes	Yes

Occupied OSA (= proposed)	Sum(Voz)/0.75	Sum(Voz)/0.65
Energy recovery ventilator Efficiency ERR	NA	50%
(Enthalpy Recovery Ratio)		60°F(15.6°C) except 4A
ERV bypass SAT set point		-
DCV	Yes	Yes
% Area Variable Control	15%	70%
% Area On/Off Control	65%	20%
Cooling Source	(2) Water-cooled centrif chillers	(2) Water-cooled centrif chillers
Cooling COP (net of fan)	ASHRAE 90.1 Appendix G, Table G3.5.3	ASHRAE 90.1 Appendix G, Table G3.5.3
Heating source (reheat)	Gas boiler	Gas boiler
Furnace or boiler efficiency	90% Et	90% Et
Condenser heat rejection	Cooling Tower	Cooling Tower
Cooling tower efficiency (gpm/hp (L/s・kW) See G3.1.3.11	40.2 (3.40)	40.2 (3.40)
Tower turndown (> 300 ton (1060kW)	50%	50%
Pump (constant flow/ variable flow)	Constant Flow; 10°F (5.6°C) range	Constant Flow; 10°F (5.6°C) range
Tower approach	ASHRAE 90.1 Appendix G, Table G3.1.3.11	ASHRAE 90.1 Appendix G, Table G3.1.3.11
Cooling condenser pump power (W/gpm (W・s/L)	19 (300)	19 (300)
Cooling primary pump power (W/gpm (W・s/L)	9 (142)	9 (142)
Cooling secondary pump power (W/gpm (W・s/L)	13 (205)	13 (205)
Cooling coil chilled water delta-T, °F (°C)	18 (10)	18 (10)
Design chilled water supply temperature, ° F (°C)	42 (5.56)	42 (5.56)
Chilled water supply temperature (CHWST) reset set point vs OAT, °F (°C)	CHWS 44-54/OAT 80-60 (6.7-12.2)/26.7-15.6)	CHWS 44-54/OAT 80-60 (6.7-12.2)/26.7-15.6)
CHW cooling loop pumping control	2-way Valves & pump VSD	2-way Valves & pump VSD
Heating pump power (W/gpm (W・s/L)	16.1 (254)	19 (254)
Heating HW dT. °F (°C)	20 (11.11)	20 (11.11)
Design HWST. °F (°C)	140 (60)	140 (60)
Hot water supply temperature (HWST) range vs outside air temperature (OAT) range	HWST: 180-150/ OAT 20-50 (82-65.6/ -6.7-10)	HWST: 180-150/ OAT 20-50 (82-65.6/ -6.7-10)
Heat loop pumping control	2-way Valves & pump VSD	2-way Valves & pump VSD

[NY] TABLE C409.7(2)
TARGET BUILDING DESIGN CRITERIA HVAC SIMPLE SYSTEMS

Parameter	Building Type		
	Medium office	Small office	Retail
System type	Package VAV - Hydronic Reheat	PSZ-AC	PSZ-AC
Fan control	VSD (with SP Reset)	Constant volume	2-speed
Main fan power (W/CFM (W・s/L) proposed ≥ MERV13	0.634 (1.343)	0.486 (1.03)	0.585 (1.245)
Zonal fan power (W/ CFM (W・s/L)	NA	NA	NA
Minimum zone airflow fraction	1.5* Voz	NA	NA
Heat/cool sizing factor	1.25/1.15	1.25/1.15	1.25/1.15
Supplemental heating availability	NA	NA	NA
Outdoor air economizer	Yes	Yes	Yes
Occupied OSA source	Packaged unit, occupied damper, all building use types		
Energy recovery ventilator	No	No	No
ERR			50%
DCV	Yes	No	Yes
% Area Variable Control	15%		80%
% Area On/Off Control	65%		0%
Cooling source	DX, multistage	DX, single stage	DX, 2 stage
Cooling COP (net of fan)	3.83	3.8248	3.765
Heating source	Gas boiler	Furnace	Furnace
Heating COP (net of fan) / furnace or boiler efficiency	81% E_t	81% E_t	81% E_t
Heating coil HW dT. ° F (°C)	20 (11.11)	NA	NA
Design HWST. °F (°C)	140 (60)	NA	NA
HWST reset set point vs OAT, °F (°C)	HWST: 180-150/ OAT 20-50 (82-65.6/ -6.7-10)	NA	NA
Heat loop pumping control	2-way Valves & ride pump curve	NA	NA
Heating pump power (W/gpm (W・s/L))	16.1	NA	NA

[NY] TABLE C409.7(3)
TARGET BUILDING DESIGN CRITERIA HVAC SIMPLE SYSTEMS

Parameter	Building Type	
	Hotel	Multifamily
System type	PTAC with Hydronic Boiler	Split AC
Fan control	Cycling	Cycling
Main fan power (W/CFM (W ▪ s/L))	0.300 (0.638)	0.271 (0.576)
Heat/cool sizing factor	1.25/1.15	1.25/1.15
Supplemental heating availability	NA	NA
Outdoor air economizer	No	No
Occupied OSA source	DOAS	DOAS
Energy recovery ventilator	NA	Yes
ERR	NA	60%
DCV	Yes	No
% Area Variable Control	70%	
% Area Variable Control	0%	
Cooling source	DX, 1 stage	DX, 1 stage
Cooling COP (net of fan)	3.83	3.6504
Heating source	(2) Hydronic boiler	Furnace
Heating COP (net of fan) / furnace or boiler efficiency	81% E_t	80% AFUE
Heating pump power (W/gpm (W ▪ s/L)	16.1	NA
Heating coil heating water delta-T, °F (°C)	20 (11.11)	NA
Design HWST, °F (°C)	140 (60)	NA
HWST reset set point vs OAT, °F (°C)	HWST: 180-150/OAT 20-50 (82-65.6/ -6.7-10)	NA
Heat loop pumping control	2-way Valves & ride pump curve	NA

Chapter C5. Existing Buildings

EC 07-0008

Revise as follows:

[NY] ~~**C501.6**~~ **C501.5 Historic buildings.** The provisions ~~Provisions~~ of this ~~code~~ chapter shall control ~~relating to~~ the ~~construction,~~ *repair, alteration*, restoration and ~~movement~~ relocation of structures, and *change of occupancy* ~~shall not be mandatory~~ for *historic buildings*.

Exception: Compliance with the provisions of this code shall not be required for features of *historic buildings* where a *historic building* report, prepared in accordance with Section C501.6.1, has been submitted and *approved* by the *building official.*

[NY] C501.5.1 Historic building report. Written *historic building* reports shall be signed by a *registered design professional* or a representative of the State Historic Preservation Office or the historic preservation authority having jurisdiction. Such report shall identify each feature that is a *character-defining feature* of the historic form, fabric, or function of such *historic building* or historic district and shall demonstrate that compliance with a specific provision or provisions of this code would threaten, degrade or destroy the historic form, fabric or function of the *building* or historic district.

EC 07-0060

Revise as follows:

C502.1 General. *Additions* to an existing *building*, *building* system or portion thereof shall conform to the provisions of this code as those provisions relate to new construction without requiring the unaltered portion of the existing *building* or *building* system to comply with this code. *Additions* shall not create an unsafe or hazardous condition or overload existing building systems. An *addition* shall be deemed to comply with this code if the *addition* alone complies or if the existing building and *addition* comply with this code as a single building. ~~Additions shall comply with Sections C402, C403, C404, C405 and C502.3.~~

~~Additions complying with ANSI/ASHRAE/IESNA 90.1. need not comply with Sections C402, C403, C404 and C405.~~

EC 07-0061

Revise as follows:

~~**C502.2.1**~~**C502.3.1 Vertical fenestration area.** *Additions* shall comply with the following:

1. ~~New~~ Where an *addition* has a new *vertical fenestration* area that results in a total building *fenestration* area less than or equal to that ~~specified in~~ permitted by Section ~~C402.4.1~~C402.5.1, the *addition* shall comply with Section ~~C402.1.5~~C402.1.4, ~~C402.4.3~~C402.5.3 or C407.
2. ~~*Additions*~~ Where an *addition* with *vertical fenestration* that ~~result~~ results in a total building *fenestration* area greater than Section ~~C402.4.1~~C402.5.1 or ~~additions~~ an *addition* that exceeds the *fenestration* area greater than that permitted by Section ~~C402.4.1~~C402.5.1, the *fenestration* shall comply with Section ~~C402.4.1.1~~C402.5.1.1 for the *addition* only.
3. ~~*Additions*~~ Where an *addition* has *vertical fenestration* that results ~~that result~~ in a total building *vertical fenestration* area exceeding that ~~specified in~~ permitted by Section ~~C402.4.1.1~~C402.5.1.1 , the *addition* shall comply with Section ~~C402.1.5~~C402.1.4or C407.

~~**C502.2.2**~~ **C502.3.2 Skylight area.** Skylights shall comply with the following:

1. ~~New~~ Where an *addition* has new *skylight* area that results in a total building *fenestration* area less than or equal to that ~~specified in~~ permitted by Section ~~C402.4.1~~C402.5.1, the *addition* shall comply with Section ~~C402.1.5~~C402.1.4 or C407.

2. ~~*Additions* with~~ Where an *addition* has new *skylight* area that ~~result~~ results in a total building *skylight* area greater than permitted by Section ~~C402.4.1~~C402.5.1 or where *additions* ~~that exceed~~ have skylight area greater than that permitted by Section C402.4.1, the *skylight* area shall comply with Section ~~C402.4.1.2~~C402.5.1.2 for the *addition* only.

3. ~~*Additions* that result~~ Where an addition has skylight area that results in a total building *skylight* area exceeding that ~~specified in~~ permitted by Section ~~C402.4.1.2~~C402.5.1.2, the addition shall comply with Section ~~C402.1.5~~C402.1.4 or C407.

EC 07-0062

Revise as follows:

~~C502.2.3~~C502.3.3 **Building mechanical systems.** New mechanical systems and equipment that are part of the *addition* and serve the building heating, cooling and *ventilation* needs shall comply with ~~Section C403~~ Sections C403 and C408.

EC 07-0063

Revise as follows:

~~C502.2.6~~C502.3.6 **Lighting power and systems.** New lighting systems that are installed as part of the *addition* shall comply with ~~Section C405~~ Sections C405 and C408.

EC 07-0182

Add new:

[NY] C502.3.7 Additional energy efficiency credits. *Additions* shall comply with measures from Section C406.2, Section C406.3, or both to achieve no less than 50 percent of the number of required efficiency credits specified in Table C406.1.1 based on *building* occupancy group and *climate zone*. Where a project contains multiple occupancies, credits specified in Table C406.1.1 from each *building* occupancy shall be weighted by the *gross conditioned floor area* to determine the weighted average project energy credits required. Accessory occupancies shall be included with the primary occupancy group for purposes of this section. *Alterations* to the *existing building* that are not part of an *addition*, but permitted with an *addition*, shall be permitted to be used to achieve the required credits.

Exceptions:

1. *Buildings* in Utility and Miscellaneous Group U, Storage Group S, Factory Group F, High-Hazard Group H.
2. *Additions* less than 1,000 ft2 (92 m2) and less than 50 percent of existing floor area.
3. *Additions* that do not include the addition or replacement of equipment covered by Tables C403.3.2(1) through C403.3.2(16) or Section C404.2.
4. *Additions* that do not contain *conditioned space*.
5. Where the *addition* alone or the *existing building* and *addition* together comply with Section C407.

C502.3.8 Renewable energy systems. Additions shall comply with Section C405.15 for the addition alone.

EC 07-0009

Revise as follows:

[NY] C503.1 General. *Alterations* to any *building* or structure shall comply with the requirements of Section C503 and the code for new construction. *Alterations* shall be such that the existing *building* or structure is not less conforming to the

provisions of this code than the existing *building* or structure was prior to the *alteration*. *Alterations* to an existing *building*, *building system* or portion thereof shall conform to the provisions of this code as those provisions relate to new construction without requiring the unaltered portions of the existing *building* or *building system* to comply with this code. *Alterations* shall not create an unsafe or hazardous condition or overload existing *building systems*.

~~*Alterations* complying with ANSI/ASHRAE/IESNA 90.1. need not comply with Sections C402, C403, C404 and C405.~~

Exception: The following ~~alterations~~ types of work need not comply with the requirements of this chapter ~~for new construction~~, provided that the energy use of the *building* is not increased:

1. Storm windows installed over existing *fenestration*.
2. Surface-applied window film installed on existing single-pane *fenestration* assemblies reducing solar heat gain, provided that the code does not require the glazing or *fenestration* assembly to be replaced.

~~3. Existing roof, ceiling, wall or floor cavities exposed during construction, provided that these cavities are filled with insulation.~~

~~4. Construction where the existing roof, ceiling, wall or floor cavity is not exposed.~~

~~5~~3. *Roof recover*.

~~6~~4. ~~Roofs without insulation in the cavity and where the sheathing or insulation is exposed during reroofing shall be insulated either above or below the sheathing~~ Roof replacement where roof assembly insulation is integral to or located below the structural roof deck.

~~7~~5. *Air barriers* shall not be required for *roof recover* and ~~roof replacement~~ *roof replacement* where the *alterations* or renovations to the ~~building~~ *building* do not include *alterations*, renovations or *repairs* to the remainder of the ~~building envelope~~ *building thermal envelope*.

~~7. *Alterations* that replace less than fifty percent of the luminaires in a space, provided that such alterations do not increase the installed interior lighting power.~~

6. Replacement of existing doors that separate *conditioned space* from the exterior shall not require the installation of a vestibule or revolving door, provided, however, that an existing vestibule that separates such *conditioned space* from the exterior shall not be removed.

7. An *existing building* undergoing *alterations* that complies with Section C407.

EC 07-0177

Revise as follows:

[NY] ~~**C503.3.1**~~**C503.2.1 Roof ~~replacement~~, ceiling, and attic alterations.** ~~*Roof replacements* shall comply with Section C402.1.3, C402.1.4, C402.1.5 or C407 where the existing *roof assembly* is part of the *building thermal envelope* and contains insulation entirely above the roof deck.~~ Where replacement of ceiling finishes exposes cavities of the roof-ceiling construction, that is part of the *building thermal envelope*, the cavities shall be insulated to full depth with insulation that complies with Section C303.1.4 and having a minimum nominal value of R-3 per inch. Insulation complying with Section C402.1 and Section C402.2.1 shall be provided in new cavities and for the following alterations:

1. An *alteration* of roof-ceiling construction other than *reroofing* where existing insulation located below the roof deck or on an attic floor above *conditioned space* does not comply with Table C402.1.2.

2. *Roof replacement* or a roof *alteration* that includes removing and replacing the *roof covering*, where the *roof assembly* includes insulation entirely above the *roof* deck.

3. Conversion of unconditioned attic space into conditioned space.

EC 07-0064

Add new:

C503.2.2.1 Application to replacement fenestration products. Where some or all of an existing *fenestration* unit is replaced with a new *fenestration* product, including sash and glazing, the replacement *fenestration* unit shall meet the applicable requirements for *U-factor* and *SHGC* in Table C402.4.

Exception: An area-weighted average of the *U-factor* of replacement fenestration products being installed in the building for each fenestration product category listed in Table C402.4 shall be permitted to satisfy the *U-factor* requirements for each fenestration product category listed in Table C402.4. Individual fenestration products from different product categories listed in Table C402.4 shall not be combined in calculating the area-weighted average *U-factor*.

EC 07-0183

Add new:

[NY] C503.2.4 Above-grade wall alterations. Above-grade wall alterations shall comply with the following:

1. Where wall cavities are exposed, the cavities shall be insulated to full depth with insulation complying with Section C303.1.4 and having a minimum nominal value of R-3 per inch. New cavities created shall be insulated in accordance with Section C402.1.

2. Where exterior wall coverings and fenestration are added or replaced for the full extent of any exterior wall assembly on one or more elevations of the building, insulation shall be provided where required in accordance with one of the following:

   2.1 An R-value of continuous insulation not less than that designated in Table C402.1.3 for the applicable above-grade wall type and existing cavity insulation R-value, if any;

   2.2 An R-value of not less than that required to bring the above-grade wall into compliance with Table C402.1.2.

3. Where Items 1 and 2 apply, the insulation shall be provided in accordance with Section C402.1.

[NY] C503.2.5 Floor alterations. Where an alteration to a floor or floor overhang exposes cavities or surfaces to which insulation can be applied, and the floor or floor overhang is part of the *building thermal envelope*, insulation that complies with Section C303.1.4 shall be installed to fill the cavities or the exposed surfaces. New cavities created shall be insulated in accordance with Section C402.1.

[NY] C503.2.6 Below-grade wall alterations. Where unconditioned below-grade space is changed to *conditioned space*, walls enclosing such *conditioned space* shall be required to comply with Section C502. Where the below-grade space is *conditioned space* and where walls enclosing such space are altered, they shall be insulated where required in accordance with Section C402.1.

C503.2.7 Air barrier. Altered *building thermal envelope* assemblies shall be provided with an *air barrier* in accordance with Section C402.5.1. Such *air barrier* need not be continuous with unaltered portions of the *building thermal envelope*. Testing requirements of Section C402.6.1.2 shall not be required.

EC 07-0184

Add new:

C503.3.2 Mechanical system acceptance testing. Where an alteration requires compliance with Section C403 or any of its subsections, mechanical systems that serve the alteration shall comply with Sections C408.2.2, C408.2.3 and C408.2.5.

Exceptions:

1. Buildings with less than 10,000 square feet (929 m2) and a combined heating, cooling, and service water-heating capacity of less than 960,000 Btu/h (280 kW).

2. Systems included in Section C403.5 that serve individual dwelling units and sleeping units.

C503.3.3 Duct testing. Ducts and plenums designed to operate at static pressures not less than 3 inches water gauge (747 Pa) that serve an *alteration* shall be tested in accordance with this section where the *alteration* includes any of the following:

1. Where 25 percent or more of the total length of the ducts in the system are relocated.

2. Where the total length of all ducts in the system is increased by 25 percent or more.

Ducts and plenums shall be leak tested in accordance with the SMACNA HVAC Air Duct Leakage Test Manual and shown to have a rate of air leakage (CL) less than or equal to 12.0 as determined in accordance with Equation 4-10 of Section C403.13.2.3. Documentation shall be available demonstrating that representative sections totaling not less than 25 percent of the duct area have been tested and that all tested sections comply with the requirements of this section.

EC 07-0185

Add new:

C503.3.4 Controls. New heating and cooling equipment that are part of the *alteration* shall be provided with controls that comply with the control requirements in Section C403.4 and Section C403.5 other than the requirements of Section C403.4.3.3 and Section 403.4.4.

Exceptions:

1. Systems with direct digital control of individual zones reporting to a central control panel.

2. The replacement of individual components of multiple-zone VAV systems.

C503.3.5 System sizing. New heating and cooling equipment that is part of an *alteration* shall be sized in accordance with Section C403.3.1 based on the existing building features as modified by the *alteration*.

Exceptions:

1. Where is has been demonstrated to the *building official* that compliance with this section would result in heating or cooling equipment that is incompatible with the rest of the heating or cooling system.

2. Where it has been demonstrated to the *building official* that the additional capacity will be needed in the future.

[NY] C503.3.6 Replacement or added roof mounted mechanical equipment. For *roofs* with insulation entirely above the roof deck and where existing roof-mounted mechanical equipment is replaced or new equipment is added, and the existing roof does not comply with the insulation requirements for new construction in accordance with Section C402.1 and Section C402.2.1, curbs for added or replaced equipment shall be of a height necessary to accommodate the future addition of above-deck roof insulation to be installed in accordance with Section C503.2.1, Item 2. Alternatively, the curb height shall be 17.0 inches (431.8 mm). Curb height shall be the distance measured from the top of the curb to the top of the *roof* deck.

C503.4.1 Service hot water system acceptance testing. Where an alteration requires compliance with Section C404 or any of its subsections, service hot water systems that serve the alteration shall comply with Sections C408.2.3 and C408.2.5.

Exceptions:

1. Buildings with less than 10,000 square feet (929 m2) and a combined heating, cooling, and service water-heating capacity of less than 960,000 Btu/h (280 kW).

2. Systems included in Section C403.5 that serve individual dwelling units and sleeping units.

EC 07-0186

Modify as follows:

[NY] ~~C503.6~~C503.5 Lighting systems. ~~New lighting~~ Lighting systems that are part of the *alteration* shall comply with ~~Section C405~~ Sections C503.5.1 and C503.5.2.

Exception~~s~~: ~~1.~~ *Alterations* that replace less than 10 percent of the luminaires in a space, provided that such *alterations* do not increase the installed interior lighting power.

~~2. *Alterations* that replace only the bulb ballast or both within the existing luminaires in a space provided that the *alteration* does not increase the installed interior lighting power.~~

[NY] C503.5.1 Interior lighting and controls. *Alterations* to interior spaces, lighting, or controls shall comply with the following:

1. Where an *alteration* of an interior space includes the addition or relocation of full height partitions, the space shall comply with Sections C405.2, C405.3 and C408.3.
2. Where the lighting within interior spaces is altered, those spaces shall comply with Sections C405.2, C405.3 and C408.3.
3. Where the lighting controls within interior spaces are altered, those spaces shall comply with Sections C405.2 and C408.3.

   Exception: Compliance with Section C405.2.8 is not required for alterations.
4. Where the connected interior lighting power within a space is increased the existing lighting controls for that space shall undergo functional testing as follows:
   1. Verify that manual *controls* function.
   2. Verify that occupant and vacancy sensors automatically turn off the lights when spaces are unoccupied.
   3. Verify that time switch controls are functioning, set to the correct day and time, programmed with scheduled off times and applicable time changes, and capable of experiencing transient power fluctuations without manual reset.

[NY] C503.5.2 Exterior lighting and controls *Alterations* to exterior lighting and controls shall comply with the following:

1. Where the connected exterior lighting power is increased by more than 400 Watts, the total exterior connected lighting power of all exterior lighting, including lighting which is not proposed to be altered, shall not exceed the total maximum rated wattage of Section C405.5.
2. Where the combined power of added and replacement luminaires is more than 400 Watts, all lighting which is added or altered shall be controlled in accordance with Sections C405.2 and C408.3.

   Exception: Individual luminaires less than 50 Watts pass functional tests verifying automatic shut off where daylight is present.

3. Where exterior lighting controls are added or altered, those portions shall comply with Sections C405.2 and C408.3.

EC 07-0187

Add new:

[NY] C503.6 Additional credit requirements for alterations. *Alterations* that are *substantial improvements* shall comply with measures from Section C406.2, Section C406.3, or both to achieve no less than 30 percent of the number of required efficiency credits specified in Table C406.1.1 based on *building* occupancy group and *climate zone*. Where a project contains multiple occupancies, credits specified in Table C406.1.1 for each *building* occupancy shall be weighted by the *gross conditioned floor area* to determine the weighted average project energy credits required. Accessory occupancies shall be included with the primary occupancy group for the purposes of this section.

Exceptions:

1. *Alterations* that do not contain *conditioned space.*

2. Portions of *buildings* devoted to manufacturing or industrial use.

3. *Alterations* where the *alteration* alone or the *existing building* and the *alteration* together comply with Section C407.

4. *Alterations* that are permitted with an *addition* complying with Section C502.3.7.

EC 07-0188

Revise as follows:

[NY] C505.1 General. ~~Spaces~~ *Buildings* or portions of *buildings* undergoing a *change* ~~in~~ *of occupancy* ~~that would result in an increase in energy use intensity demand for either fossil fuel or electrical energy shall comply with this code. Where the use in a space changes from one use in Table C405.3.2(1) or C405.3.2(2) to another use in Table C405.3.2(1) or C405.3.2(2), the installed lighting wattage shall comply with Section C405.3. Where the space undergoing a change in occupancy or use is in a building with a fenestration area that exceeds the limitations of Section C402.4.1, the space is exempt from Section C402.4.1 provided that there is not an increase in fenestration area.~~ shall comply with this section. Where *changes in occupancy* are made to portions of an *existing building*, only those portions of the *building* shall comply with this section. *Buildings* or portions of *buildings* undergoing a change of occupancy without alterations shall comply with Section C505.2.

~~**Exceptions**~~ **Exception:**

~~1. Where the component performance alternative in Section C402.1.5 is used to comply with this section, the proposed UA shall be not greater than 110 percent of the target UA.~~

~~2. Where the total building performance option in Section C407 is used to comply with this section, the annual *energy cost* of the *proposed design* shall be not greater than 110 percent of the annual *energy cost* otherwise permitted by Section C407.3.~~ Where the total building performance option in Section C407 is used to comply with this section, the annual energy cost of the proposed design shall not be greater than 110 percent of the annual energy cost otherwise permitted by Section C407.3.

[NY] C505.1.1 Alterations and change of occupancy. *Alterations* made concurrently with any *change of occupancy* shall be in accordance with Section C503 and this section.

EC 07-0189

Add new:

[NY] C505.2 Energy use intensities. *Building thermal envelope*, space heating, cooling, *ventilation*, lighting and *service water heating* shall comply with Sections C505.2.1 through C505.2.4.

Exception: Where it is demonstrated by analysis approved by the *building official* that the change will not increase *energy use intensity*.

[NY] C505.2.1 Building thermal envelope. Where a *change of occupancy* results in *fenestration* area greater than the maximum *fenestration* area allowed by Section C402.5.1, the *building* shall comply with Section C402.1.4 with a proposed UA that shall not be greater than 110 percent of the target UA.

Exception: Where the *change of occupancy* is made to a *building* or a portion of the *building* that is less than 2,000 sq.ft., the new occupancy is exempt from Section C402.5.1 provided that there is not an increase in *fenestration* area.

[NY] C505.2.2 Building mechanical systems. Where a *change of occupancy* results in the same or an increased energy use intensity rank as specified in Table C505.2.2, the systems serving the building or space undergoing the change shall comply with Section C403.

[NY] TABLE C505.2.2
BUILDING MECHANICAL

Energy Use Intensity Rank	*Building Code of New York State* Occupancy Classification and Use
High	A-2, B-Laboratories, I-2
Medium	A-1, A-3[a], A-4, A-5, B[b], E, I-1, I-3, I-4, M, R-4
Low	A-3 Places of Religious Worship, R-1, R-2, R-3[c], S-1, S-2, F, H, U

a. Excluding places of religious worship.
b. Excluding laboratories.
c. *Buildings* three stories or less in height above grade plane shall comply with Section R505.

[NY] C505.2.3 Service water heating. Where a *change of occupancy* results in the same or an increased energy use intensity rank as specified in Table C505.2.3, the *service water heating* systems serving the *building* or space undergoing the change shall comply with Section C404.

TABLE C505.2.3
SERVICE WATER HEATING

Energy Use Intensity Rank	*Building Code of New York State* Occupancy Classification and Use
High	A-2, I-1, I-2, R-1
Low	All other occupancies and uses

[NY] C505.2.4 Lighting. Where a *change of occupancy* results in the same or an increased energy use intensity rank as specified in Table C505.2.4, the lighting systems serving the building or space undergoing the change shall comply with Section C405 except for Section C405.4.

[NY] TABLE C505.2.4
LIGHTING

Energy Use Intensity Rank	*Building Code of New York State* Occupancy Classification and Use
High	B-Laboratories, B-Outpatient Healthcare, I-2, M
Medium	A-2, A-3, Courtrooms, B[a], I-1, I-3, I-4, R-1, R-2, R-3[b], R-4, S-1, S-2
Low	A-1, A-3[c], A-4, E, F, H, U

a. Excluding laboratories and outpatient healthcare.
b. Buildings three stories or less in height above grade plane shall comply with Section R505.
c. Excluding courtrooms.