2016 NEW YORK CITY ENERGY CONSERVATION CODE REPLACEMENT PAGES

The 2016 *Energy Conservation Code* replacement pages reflect changes made by Local Law 125 of 2016 to align the 2016 *New York City Energy Conservation Code* with the revised (August 2016) Supplement to the *New York State Energy Conservation Construction Code*.

These pages also contain ministerial administrative corrections; noted with an asterisk.

By starting with a loose-leaf copy of the 2016 New York City Energy Conservation Code, and substituting the New York City Energy Conservation Code replacement pages, the user will have a complete 2016 New York City Energy Conservation Code, in correct numerical sequence.

Remove 2016 New York City Energy Conservation Code Pages

Pages R-3 through R-6 Pages R-19 through R-20 Pages C-3 through C-4 Pages C-13 through C-16 Pages C-43 through C-44 Ashrae 90.1 Pages 85 through 86

Insert Replacement Pages

Replacement Pages R-3 through R-6 Replacement Pages R-19 through R-20 Replacement Pages C-3 through C-4 Pages C-13 through C-16 Replacement Pages C-43 through C-44 Replacement Pages Ashrae 90.1 Pages 85 through 86

CHAPTER R2 DEFINITIONS

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SECTION ECC R201 GENERAL

R201.1 Scope. Unless stated otherwise, the following words and terms in this code shall have the meanings indicated in this chapter.

R201.2 Interchangeability. Words used in the present tense include the future; words in the masculine gender include the feminine and neuter; the singular number includes the plural and the plural includes the singular.

R201.3 Terms defined in other codes. Terms that are not NYC defined in this code but are defined in the New York City Con-NYC struction Codes, New York City Fire Code, or the New York City Electrical Code shall have the meanings ascribed to them NYC in those codes.

R201.4 Terms not defined. Terms not defined by this chapter shall have ordinarily accepted meanings such as the context implies.

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SECTION ECC R202 GENERAL DEFINITIONS

NYC 2016 ENERGY CODE SUPPLEMENT. The publication NYC entitled "2016 Supplement to the New York State Energy NYC Conservation Construction Code (Revised August 2016)" NYC NYC (Publication Date: August, 2016) published by the New York NYC State Department of State. NYC NYC

NYC *2016 UNIFORM CODE SUPPLEMENT. The publication NYC entitled "2016 Uniform Code Supplement" (Publication Date: NYC NYC March, 2016) published by the New York State Department NYC of State. NYC

NYC *2015 INTERNATIONAL BUILDING CODE (AS NYC NYC AMENDED). The publication entitled "2015 International NYC Building Code" (Third Printing: October 2015) published by NYC International Code Council, Inc., as said publication is NYC NYC deemed to be amended by the 2016 Uniform Code Supple-NYC NYC ment.

ABOVE-GRADE WALL. A wall more than 50 percent above grade and enclosing conditioned space. This includes between-floor spandrels, peripheral edges of floors, roof and basement knee walls, dormer walls, gable end walls, walls enclosing a mansard roof and skylight shafts.

ACCESSIBLE. Admitting close approach as a result of not being guarded by locked doors, elevation or other effective means (see "Readily accessible").

ADDITION. An extension or increase in the conditioned space floor area or height of a building or structure.

AIR BARRIER. Material(s) assembled and joined together to provide a barrier to air leakage through the building envelope. An air barrier may be a single material or a combination of materials.

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

ALTERATION. Any construction, retrofit or renovation to an existing structure other than repair or addition that requires a permit. Also, a change in a building, electrical, gas, mechanical or plumbing system that involves an extension, addition or change to the arrangement, type or purpose of the original installation that requires a permit.

APPROVED. See Section 28-101.5 of the Administrative Code.

APPROVED AGENCY. See Section 28-101.5 of the Administrative Code.

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*-value for floor, wall, or ceiling insulation, or more than one U-factor for fenestration in a building. As an example, the area weighted average for window fenestration U-factors equals (Area $1 \times U$ -factor 1) + (Area $2 \times U$ -factor 2) + .../ Total Area = maximum allowable fenestration *U*-factor.

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AUTHORITY HAVING JURISDICTION. The commissioner or the commissioner's designee.

AUTOMATIC. Self-acting, operating by its own mechanism when actuated by some impersonal influence, as, for example, a change in current strength, pressure, temperature or mechanical configuration (see "Manual").

BASEMENT WALL. A wall 50 percent or more below grade and enclosing conditioned space.

BUILDING. Any structure used or intended for supporting or sheltering any use or occupancy or for affording shelter to persons, animals or property, together with (A) any equipment, mechanical systems, service water heating systems, and electric power and lighting systems located in such structure, and (B) any mechanical systems, service water heating systems, and electric power and lighting systems located on the site where such structure is located and supporting such structure. The term "building" shall include, but shall not be limited to, factory manufactured homes (as defined in section 372(8) of the *Executive Law*) and mobile homes (as defined in section 372(13) of the *Executive Law*).

BUILDING SITE. A contiguous[‡] area of land that is under NYC the ownership or control of one entity.

BUILDING SYSTEM. The term "building system" means a combination of central or terminal equipment or components or controls, accessories, interconnecting means, and terminal devices by which energy is transformed so as to perform a specific function, such as heating, ventilation and air conditioning, service water heating or illumination.

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BUILDING THERMAL ENVELOPE. The exterior walls (above and below grade), floor, roof, and any other building elements that enclose conditioned space or provide a boundary between conditioned space and exempt or unconditioned space.

C-FACTOR (THERMAL CONDUCTANCE). The coefficient of heat transmission (surface to surface) through a building component or assembly, equal to the time rate of heat flow per unit area and the unit temperature difference between the warm side and cold side surfaces (Btu/h \cdot ft² \cdot °F) [W/(m² \cdot K)].

CIRCULATING HOT WATER SYSTEM. A specifically designed water distribution system where one or more pumps are operated in the service hot water piping to circulate heated water from the water-heating equipment to fixtures and back to the water-heating equipment.

CLIMATE ZONE. A geographical region based on climatic criteria as specified in this code.

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CODE OFFICIAL. The commissioner or the commissioner's NYC NYC designee.

COMMERCIAL BUILDING. For this code, all buildings that are not included in the definition of "Residential building."

CONDITIONED FLOOR AREA. The horizontal projection of the floors associated with the conditioned space.

CONDITIONED SPACE. An area or room within a building which is within the thermal envelope of a building which is directly or indirectly heated or cooled using fossil fuel or electricity as the energy source. Spaces that are indirectly heated or cooled where they communicate through openings with conditioned spaces, where they are separated from conditioned spaces by uninsulated walls, floors or ceilings, or where they contain uninsulated ducts, piping or other sources of heating or cooling using fossil fuel or electricity.

CONTINUOUS AIR BARRIER. A combination of materials and assemblies that restrict or prevent the passage of air through the building thermal envelope.

CONTINUOUS INSULATION (ci). Insulating material that is continuous across all structural members without thermal bridges other than fasteners and service openings. It is installed on the interior or exterior, or is integral to any opaque surface, of the building envelope.

CRAWL SPACE WALL. The opaque portion of a wall that encloses a crawl space and is partially or totally below grade.

CURTAIN WALL. Fenestration products used to create an external nonload-bearing wall that is designed to separate the exterior and interior environments.

DEMAND RECIRCULATION WATER SYSTEM. A water distribution system where pump(s) prime the service hot water piping with heated water upon demand for hot water.

DUCT. A tube or conduit utilized for conveying air. The air passages of self-contained systems are not to be construed as air ducts.

DUCT SYSTEM. A continuous passageway for the transmission of air that, in addition to ducts, includes duct fittings,

dampers, plenums, fans and accessory air-handling equipment and appliances.

DWELLING UNIT. A single unit providing complete independent living facilities for one or more persons, including permanent provisions for living, sleeping, eating, cooking and sanitation.

ENERGY ANALYSIS. A method for estimating the annual energy use of the proposed design and standard reference design based on estimates of energy use.

ENERGY COST. The total estimated annual cost for purchased energy for the building functions regulated by this code, including applicable demand charges.

ENERGY SIMULATION TOOL. An approved software program or calculation-based methodology that projects the annual energy use of a building.

ERI REFERENCE DESIGN. A version of the rated design that meets the minimum requirements of the 2006 International Energy Conservation Code, and which establishes the NYC index value of 100 on the Energy Rating Index scale.

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EXTERIOR WALL. Walls including both above-grade walls and basement walls.

FENESTRATION. Products classified as either vertical fenestration or skylights.

FENESTRATION PRODUCT, SITE-BUILT. A fenestration designed to be made up of field-glazed or field-assembled units using specific factory cut or otherwise factoryformed framing and glazing units. Examples of site-built fenestration include storefront systems, curtain walls and atrium roof systems.

F-FACTOR. The perimeter heat loss factor for slab-on-grade floors $(Btu/h \cdot ft \cdot {}^{\circ}F) [W/(m \cdot K)].$

GRADE PLANE. A reference plane representing the aver-NYC NYC age of finished ground level adjoining the building at exterior NYC walls. Where the finished ground level slopes away from the NYC NYC exterior walls, the reference plane shall be established by the NYC lowest points within the area between the building and the lot NYC NYC line or, where the lot line is more than 6 feet (1829 mm) from NYC the building, between the building and a point 6 feet (1829 NYC NYC mm) from the building. NYC

HEATED SLAB. Slab-on-grade construction in which the

heating elements, hydronic tubing, or hot air distribution system is in contact with, or placed within or under, the slab.

HIGH-EFFICACY LAMPS. Compact fluorescent lamps, T-8 or smaller diameter linear fluorescent lamps, or lamps with a minimum efficacy of:

- 1. 60 lumens per watt for lamps over 40 watts;
- 2. 50 lumens per watt for lamps over 15 watts to 40 watts; and
- 3. 40 lumens per watt for lamps 15 watts or less.

HISTORIC BUILDING. Any building that is (a) listed on NYC the national register of historic places or on the state register NYC of historic places, (b) determined by the commissioner of NYC NYC parks, recreation and historic preservation to be eligible for NYC listing on the state register of historic places, (c) determined NYC by the commissioner of parks, recreation and historic preser-NYC NYC vation to be a contributing building to an historic district that

NYC is listed or eligible for listing on the state or national registers

NYC of historic places, or (d) otherwise defined as an historic building in regulations adopted by the state fire prevention

NYC and building code council.

INFILTRATION. The uncontrolled inward air leakage into a building caused by the pressure effects of wind or the effect of differences in the indoor and outdoor air density or both.

INSULATED SIDING. A type of continuous insulation with manufacturer-installed insulating material as an integral part of the cladding product having a minimum *R*-value of R-2.

INSULATING SHEATHING. An insulating board with a core material having a minimum *R*-value of R-2.

LABELED. Equipment, materials or products to which have been affixed a label, seal, symbol or other identifying mark of a nationally recognized testing laboratory, inspection agency or other organization concerned with product evaluation that maintains periodic inspection of the production of the above-labeled items and where labeling indicates either that the equipment, material or product meets identified standards or has been tested and found suitable for a specified purpose.

NYC LEAD ENERGY PROFESSIONAL. The registered design

NYC professional who signs and seals the energy analysis for an

NYC entire project. Such individual may be the same registered design professional who signs and seals the design drawings

NYC design professional who sights and

NYC for the same project.

LISTED. Equipment, materials, products or services included in a list published by an organization acceptable to the code official and concerned with evaluation of products or services that maintains periodic inspection of production of listed equipment or materials or periodic evaluation of services and where the listing states either that the equipment, material, product or service meets identified standards or has been tested and found suitable for a specified purpose.

LOW-VOLTAGE LIGHTING. Lighting equipment powered through a transformer such as a cable conductor, a rail conductor and track lighting.

MANUAL. Capable of being operated by personal intervention (see "Automatic").

NYC PROFESSIONAL CERTIFICATION. See Section 28-101.5 of the Administrative Code.

NYC PROJECT. A design and construction undertaking com-NYC NYC prised of work related to one or more buildings and the site NYC improvements. A project is represented by one or more plan/ NYC work applications, including construction documents com-NYC NYC piled in accordance with Section 107 of the New York City NYC Building Code, that relate either to the construction of a new NYC NYC building or buildings or to the demolition or alteration of an NYC existing building or buildings. Applications for a project may NYC have different registered design professionals and different NYC NYC job numbers, and may result in the issuance of one or more NYC NYC permits.

PROPOSED DESIGN. A description of the proposed building used to estimate annual energy use for determining compliance based on total building performance. **RATED DESIGN.** A description of the proposed building used to determine the energy rating index.

READILY ACCESSIBLE. Capable of being reached quickly for operation, renewal or inspection without requiring those to whom ready access is requisite to climb over or remove obstacles or to resort to portable ladders or access equipment (see "Accessible").

REGISTERED DESIGN PROFESSIONAL. An individual Who is a licensed and registered architect (RA) in accordance with Article 147 of the *New York State Education Law* or a licensed and registered professional engineer (PE) in accordance with Article 145 of the *New York State Education Law*. NYC

REPAIR. The reconstruction or renewal of any part of an existing building for the purpose of its maintenance or to correct damage.

REROOFING. The process of recovering or replacing an existing roof covering. See "Roof recover" and "Roof replacement."

RESIDENTIAL BUILDING. The term "residential building" includes:

- 1. detached one-family dwellings 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;
- buildings that (i) are classified in accordance with Chapter 3 of the 2015 *International Building Code (as amended)* in Group R-2, R-3 or R-4 and (ii) have not more than three stories above grade plane;
- 5. factory manufactured homes (as defined in section 372(8) of the *Executive Law*); and,
- 6. mobile homes (as defined in section 372(13) of the *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 (i) extends from the foundation to roof and (ii) has open space on at least two sides.

ROOF ASSEMBLY. A system designed to provide weather protection and resistance to design loads. The system consists of a roof covering and roof deck or a single component serving as both the roof covering and the roof deck. A roof assembly includes the roof covering, underlayment, roof deck, insulation, vapor retarder and interior finish.

ROOF RECOVER. The process of installing an additional roof covering over a prepared existing roof covering without removing the existing roof covering.

ROOF REPAIR. Reconstruction or renewal of any part of an existing roof for the purposes of its maintenance.

ROOF REPLACEMENT. The process of removing the existing roof covering, repairing any damaged substrate and installing a new roof covering.

*R***-VALUE (THERMAL RESISTANCE).** The inverse of the time rate of heat flow through a body from one of its bounding surfaces to the other surface for a unit temperature difference between the two surfaces, under steady state conditions, per unit area ($h \cdot ft^2 \cdot {}^\circ F/Btu$) [($m^2 \cdot K$)/W].

SERVICE WATER HEATING. Supply of hot water for purposes other than comfort heating.

SKYLIGHT. Glass or other transparent or translucent glazing material installed at a slope of less than 60 degrees (1.05 rad) from horizontal.

SOLAR HEAT GAIN COEFFICIENT (SHGC). The ratio of the solar heat gain entering the space through the fenestration assembly to the incident solar radiation. Solar heat gain includes directly transmitted solar heat and absorbed solar radiation that is then reradiated, conducted or convected into the space.

STANDARD REFERENCE DESIGN. A version of the proposed design that meets the minimum requirements of this code and is used to determine the maximum annual energy use requirement for compliance based on total building performance.

SUNROOM. A one-story structure attached to a dwelling with a glazing area in excess of 40 percent of the gross area of the structure's exterior walls and roof.

THERMAL ISOLATION. Physical and space conditioning separation from conditioned space(s). The conditioned space(s) shall be controlled as separate zones for heating and cooling or conditioned by separate equipment.

THERMOSTAT. An automatic control device used to maintain temperature at a fixed or adjustable set point.

U-FACTOR (THERMAL TRANSMITTANCE). The coefficient of heat transmission (air to air) through a building component or assembly, equal to the time rate of heat flow per unit area and unit temperature difference between the warm side and cold side air films (Btu/h \cdot ft² \cdot °F) [W/(m² \cdot K)].

VENTILATION. The natural or mechanical process of supplying conditioned or unconditioned air to, or removing such air from, any space.

VENTILATION AIR. That portion of supply air that comes from outside (outdoors) plus any recirculated air that has been treated to maintain the desired quality of air within a designated space.

VERTICAL FENESTRATION. Windows (fixed or moveable), opaque doors, glazed doors, glazed block and combination opaque/glazed doors composed of glass or other transparent or translucent glazing materials and installed at a slope of a least 60 degrees (1.05 rad) from horizontal.

VISIBLE TRANSMITTANCE [VT]. The ratio of visible light entering the space through the fenestration product assembly to the incident visible light, Visible Transmittance, includes the effects of glazing material and frame and is expressed as a number between 0 and 1.

WHOLE HOUSE MECHANICAL VENTILATION SYSTEM. An exhaust system, supply system, or combination thereof that is designed to mechanically exchange indoor air with outdoor air when operating continuously or through a programmed intermittent schedule to satisfy the whole house ventilation rates.

ZONE. A space or group of spaces within a building with heating or cooling requirements that are sufficiently similar so that desired conditions can be maintained throughout using a single controlling device.

R405.5 Calculation procedure. Calculations of the performance design shall be in accordance with Sections R405.5.1 and R405.5.2.

R405.5.1 General. Except as specified by this section, the standard reference design and proposed design shall be configured and analyzed using identical methods and techniques.

R405.5.2 Residence specifications. The standard reference design and proposed design shall be configured and analyzed as specified by Table R405.5.2(1). Table R405.5.2(1) shall include, by reference, all notes contained in Table R402.1.2.

R405.6 Calculation software tools. Calculation software, where used, shall be in accordance with Sections R405.6.1 through R405.6.3.

R405.6.1 Minimum capabilities. Calculation procedures used to comply with this section shall be 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:

- 1. Computer generation of the standard reference design using only the input for the proposed design. The calculation procedure shall not allow the user to directly modify the building component characteristics of the standard reference design.
- 2. Calculation of whole-building (as a single zone) sizing for the heating and cooling equipment in the standard reference design residence in accordance with Section R403.6.
- 3. Calculations that account for the effects of indoor and outdoor temperatures and part-load ratios on the performance of heating, ventilating and air-conditioning equipment based on climate and equipment sizing.
- 4. Printed code official inspection checklist listing each of the proposed design component characteristics from Table R405.5.2(1) determined by the analysis to provide compliance, along with their respective performance ratings (*R*-value, *U*-factor, SHGC, HSPF, AFUE, SEER, EF are some examples).

R405.6.2 Specific approval. Performance analysis tools meeting the applicable provisions of Section R405 shall be permitted to be approved. Tools are permitted to be approved based on meeting a specified threshold for a jurisdiction. The code official shall be permitted to approve tools for a specified application or limited scope.

R405.6.3 Input values. When calculations require input values not specified by Sections R402, R403, R404 and R405, those input values shall be taken from an approved source.

SECTION ECC R406 ENERGY RATING INDEX COMPLIANCE ALTERNATIVE

R406.1 Scope. This section establishes criteria for compliance using an Energy Rating Index (ERI) analysis.

R406.2 Mandatory requirements. Compliance with this section requires that (1) the provisions in Sections R401 NYC through R404 labeled as "mandatory" and (2) the provisions of Section R403.5.3 be met. The building thermal envelope NYC shall be greater than or equal to levels of efficiency and Solar Heat Gain Coefficient in Table 402.1.1 or 402.1.3 of the 2011 New York City Energy Conservation Code.

Exception: Supply and return ducts not completely inside the building thermal envelope shall be insulated to a minimum of R-6.

R406.3 Energy Rating Index. The Energy Rating Index (ERI) shall be a numerical integer value that is based on a linear scale constructed such that the ERI reference design has an Index value of 100 and a residential building that uses no net purchased energy has an Index value of 0. Each integer value on the scale shall represent a 1-percent change in the total energy use of the rated design relative to the total energy use of the ERI reference design. The ERI shall consider all energy used in the residential building.

R406.3.1 ERI reference design. The ERI reference design shall be configured such that it meets the minimum requirements of the 2006 *International Energy Conservation Code* prescriptive requirements.

The proposed residential building shall be shown to have an annual total normalized modified load less than or equal to the annual total loads of the ERI reference design.

R406.4 ERI-based compliance. Compliance based on an ERI analysis requires that the rated design be shown to have an ERI less than or equal to the appropriate value listed in Table R406.4 when compared to the ERI reference design.

	E R406.4 IGY RATING INDEX
CLIMATE ZONE	ENERGY RATING INDEX
1	52
2	52
3	51
4	54
5	55
6	54
7	53
8	53

R406.5 Verification by approved agency. Verification of compliance with Section R406 shall be completed by an approved third party.

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S	PECIFICATIONS FOR THE STANDARD REFERENCE AND PROPOSED DES	IGNS
BUILDING COMPONENT	STANDARD REFERENCE DESIGN	PROPOSED DESIGN
	Type: mass wall if proposed wall is mass; otherwise wood frame.	As proposed
	Gross area: same as proposed	As proposed
Above-grade walls	U-factor: as specified in Table R402.1.4	As proposed
	Solar absorptance = 0.75	As proposed
	Emittance = 0.90	As proposed
Pasamant and arow! space	Type: same as proposed	As proposed
Basement and crawl space walls	Gross area: same as proposed	As proposed
	U-factor: from Table R402.1.4, with insulation layer on interior side of walls	As proposed
	Type: wood frame	As proposed
Above-grade floors	Gross area: same as proposed	As proposed
	U-factor: as specified in Table R402.1.4	As proposed
	Type: wood frame	As proposed
Ceilings	Gross area: same as proposed	As proposed
	U-factor: as specified in Table R402.1.4	As proposed
	Type: composition shingle on wood sheathing	As proposed
Deefe	Gross area: same as proposed	As proposed
Roofs	Solar absorptance = 0.75	As proposed
	Emittance = 0.90	As proposed
Attics	Type: vented with aperture = $1 \text{ ft}^2 \text{ per } 300 \text{ ft}^2 \text{ ceiling area}$	As proposed
	Type: same as proposed	As proposed
Foundations	Foundation wall area above and below grade and soil characteristics: same as proposed	As proposed
	Area: 40 ft ²	As proposed
Opaque doors	Orientation: North	As proposed
	U-factor: same as fenestration from Table R402.1.4	As proposed
	Total area ^b =	
	(a) The proposed glazing area, where the proposed glazing area is less than 15 percent of the conditioned floor area(b) 15 percent of the conditioned floor area, where the proposed glazing area is 15 percent or more of the conditioned floor area	As proposed
Vertical fenestration other than opaque doors	Orientation: equally distributed to four cardinal compass orientations (N, E, S & W).	As proposed
inun opuque doors	U-factor: as specified in Table R402.1.4	As proposed
	SHGC: as specified in Table R402.1.2 except that for climates with no requirement (NR) SHGC = 0.40 shall be used.	As proposed
	Interior shade fraction: 0.92 -($0.21 \times$ SHGC for the standard reference design)	0.92-(0.21 × SHGC as proposed
	External shading: none	As proposed
Skylights	None	As proposed
Thermally isolated sunrooms	None	As proposed
Air exchange rate	Air leakage rate of 5 air changes per hour in climate zones 1 and 2, and 3 air changes per hour in climate zones 3 through 8 at a pressure of 0.2 inches w.g (50 Pa). The mechanical ventilation rate shall be in addition to the air leakage rate and the same as in the proposed design, but no greater than $0.01 \times CFA + 7.5 \times (N_{br} + 1)$	For residences that are not tested, the same air leakage rate as the standard reference design. For tested residences, the mea- sured air exchange rate ^a .
	where: CFA = conditioned floor area N_{br} = number of bedrooms Energy recovery shall not be assumed for mechanical ventilation.	The mechanical ventilation rate ^b shall be in addition to the air leak age rate and shall be as proposed

TABLE R405.5.2(1) SPECIFICATIONS FOR THE STANDARD REFERENCE AND PROPOSED DESIGNS

(continued)

CHAPTER C2

NYC

SECTION ECC C201 GENERAL

C201.1 Scope. Unless stated otherwise, the following words and terms in this code shall have the meanings indicated in this chapter.

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

C201.3 Terms defined in other codes. Terms that are not defined in this code but are defined in the *New York City Construction Codes, New York City Fire Code*, or *New York*

NYC *City Electrical Code* shall have the meanings ascribed to them in those codes.

C201.4 Terms not defined. Terms not defined by this chapter shall have ordinarily accepted meanings such as the context implies.

NYC

SECTION ECC C202 GENERAL DEFINITIONS

NYC 2016 ENERGY CODE SUPPLEMENT. The publication entitled "2016 Supplement to the New York State Energy NYC Conservation Construction Code (Revised August 2016)" NYC (Publication Date: August, 2016) published by the New York

NYC State Department of State.

NYC 2015 INTERNATIONAL BUILDING[‡] CODE (AS

AMENDED). The publication entitled "2015 International

NYC Building Code" (Third printing: October 2015) published by

NYC International Code Council, Inc., as said publication is deemed

NYC to be amended by the 2016 Uniform Code Supplement.

ABOVE-GRADE WALL. See "Wall, above-grade."

ACCESSIBLE. Admitting close approach as a result of not being guarded by locked doors, elevation or other effective means (see "Readily accessible").

ADDITION. An extension or increase in the conditioned space floor area or height of a building or structure.

AIR BARRIER. Materials assembled and joined together to provide a barrier to air leakage through the building envelope. An air barrier may be a single material or a combination of materials.

AIR CURTAIN. 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.

AIR-IMPERMEABLE INSULATION. An insulation having an air permeance equal to, or less than 0.02 L/s-m² at 75 Pa pressure differential tested according to ASTM E 2178 or E 283.

ALTERATION. Any construction, retrofit or renovation to an existing structure other than repair or addition that requires a permit. Also, a change in a building, electrical, gas, mechanical or plumbing system that involves an extension, addition or change to the arrangement, type or purpose of the original installation that requires a permit.

APPROVED. See Section 28-101.5 of the Administrative NY Code.

APPROVED AGENCY. See Section 28-101.5 of the *Administrative Code*.

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*-value for floor, wall, or ceiling insulation, or more than one *U*-factor for fenestration in a building. As an example, the area weighted average for window fenestration *U*-factors equals (Area 1 × *U*-factor 1) + (Area 2 × *U*-factor 2) + .../ Total Area = maximum allowable fenestration *U*-factor.

ASHRAE 90.1-2013 (AS AMENDED). ASHRAE 90.1-2013, as amended by Part 2 of the 2016 Energy Code Supplement with revisions as set forth in Appendix CA of this code.

AUTHORITY HAVING JURISDICTION. The commissioner or the commissioner's designee.

AUTOMATIC. Self-acting, operating by its own mechanism when actuated by some impersonal influence, as, for example, a change in current strength, pressure, temperature or mechanical configuration (see "Manual").

BELOW-GRADE WALL. See "Wall, below-grade."

BOILER, MODULATING. A boiler that is capable of more than a single firing rate in response to a varying temperature or heating load.

BOILER SYSTEM. One or more boilers, their piping and controls that work together to supply steam or hot water to heat output devices remote from the boiler.

BUBBLE POINT. The refrigerant liquid saturation temperature at a specified pressure.

BUILDING. Any structure used or intended for supporting or sheltering any use or occupancy or for affording shelter to persons, animals or property, together with (A) any equipment, mechanical systems, service water heating systems, and electric power and lighting systems located in such structure, and (B) any mechanical systems, service water heating systems, and electric power and lighting systems located on the site where such structure is located and supporting such NYC

NYC structure. The term "building" shall include, but shall not be NYC limited to, factory manufactured homes (as defined in section

NYC NYC 372(8) of the Executive Law) and mobile homes (as defined

NYC NYC in section 372(13) of the *Executive Law*).

> BUILDING COMMISSIONING. A process that verifies and documents that the selected building systems have been designed, installed, and function according to the owner's project requirements and construction documents, and to minimum code requirements.

> **BUILDING ENTRANCE.** Any door, set of doors, doorway, or other form of portal that is used to gain access to the building from the outside by the public.

NYC BUILDING SITE. A contiguous area of land that is under the ownership or control of one entity.

NYC BUILDING SYSTEM. The term "building system" means a NYC combination of central or terminal equipment or components NYC or controls, accessories, interconnecting means, and terminal NYC devices by which energy is transformed so as to perform a NYC specific function, such as heating, ventilation and air condi-NYC NYC tioning, service water heating or illumination.

BUILDING THERMAL ENVELOPE. The exterior walls NYC (above and below grade), floor, roof, and any other building ele-NYC ments that enclose conditioned space or provides a boundary between conditioned space and exempt or unconditioned space.

C-FACTOR (THERMAL CONDUCTANCE). The coefficient of heat transmission (surface to surface) through a building component or assembly, equal to the time rate of heat flow per unit area and the unit temperature difference between the warm side and cold side surfaces (Btu/h \cdot ft² \cdot °F) $[W/(m^2 \cdot K)].$

CIRCULATING HOT WATER SYSTEM. A specifically designed water distribution system where one or more pumps are operated in the service hot water piping to circulate heated water from the water-heating equipment to the fixture supply and back to the water-heating equipment.

CLIMATE ZONE. A geographical region based on climatic criteria as specified in this code.

NYC CODE OFFICIAL. The commissioner or the commis-NYC sioner's designee.

COEFFICENT OF PERFORMANCE (COP) - COOL-**ING.** The ratio of the rate of heat input, in consistent units, for a complete refrigerating system or some specific portion of that system under designated operating conditions.

COEFFICIENT OF PERFORMANCE (COP) – HEAT-ING. The ratio of the rate of heat delivered to the rate of energy input, in consistent units, for a complete heat pump system, including the compressor and, if applicable, auxiliary heat, under designated operating conditions.

COMMERCIAL BUILDING. The term "commercial building" includes all buildings that are not included in the definition of "residential building."

COMPUTER ROOM. A room whose primary function is to house equipment for the processing and storage of electronic data and that has a design electronic data equipment power density exceeding 20 watts per square foot of conditioned floor area.

CONDENSING UNIT. A factory-made assembly of refrigeration components designed to compress and liquefy a specific refrigerant. The unit consists of one or more refrigerant compressors, refrigerant condensers (air-cooled, evaporatively cooled, or water-cooled), condenser fans and motors (where used) and factory-supplied accessories.

CONDITIONED FLOOR AREA. The horizontal projection of the floors associated with the conditioned space.

CONDITIONED SPACE. An area or room within a build-NYC NYC ing which is within the thermal envelope of a building which is directly or indirectly heated or cooled using fossil fuel or electricity as the energy source. Spaces that are indirectly heated or cooled where they communicate through openings with conditioned spaces, where they are separated from conditioned spaces by uninsulated walls, floors or ceilings, or where they contain uninsulated ducts, piping or other sources of heating or cooling using fossil fuel or electricity.

CONTINUOUS AIR BARRIER. A combination of materials and assemblies that restrict or prevent the passage of air through the building thermal envelope.

CONTINUOUS INSULATION (ci). Insulating material that is continuous across all structural members without thermal bridges other than fasteners and service openings. It is installed on the interior or exterior or is integral to any opaque surface of the building envelope.

CRAWL SPACE WALL. The opaque portion of a wall that encloses a crawl space and is partially or totally below grade.

CURTAIN WALL. Fenestration products used to create an external nonload-bearing wall that is designed to separate the exterior and interior environments.

DAYLIGHT RESPONSIVE CONTROL. A device or system that provides automatic control of electric light levels based on the amount of daylight in a space.

DAYLIGHT ZONE. That portion of a building's interior floor area that is illuminated by natural light.

DEMAND CONTROL VENTILATION (DCV). A ventilation system capability that provides for the automatic reduction of outdoor air intake below design rates when the actual occupancy of spaces served by the system is less than design occupancy.

DEMAND RECIRCULATION WATER SYSTEM. A water distribution system where pumps prime the service hot water piping with heated water upon demand for hot water.

DUCT. A tube or conduit utilized for conveying air. The air passages of self-contained systems are not to be construed as air ducts.

DUCT SYSTEM. A continuous passageway for the transmission of air that, in addition to ducts, includes duct fittings, dampers, plenums, fans and accessory air-handling equipment and appliances.

DWELLING UNIT. A single unit providing complete independent living facilities for one or more persons, including permanent provisions for living, sleeping, eating, cooking and sanitation.

$\mathrm{U}_{\mathrm{Wall}}$	= 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.

= 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:

- $E = (EA \cdot US) (EA \cdot U_{Roof})$, 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.

C402.2 Specific building thermal envelope insulation requirements (Prescriptive). Insulation in building thermal envelope opaque assemblies shall comply with Sections C402.2.1 through C402.2.6 and Table C402.1.3.

C402.2.1 Multiple layers of continuous insulation board. Where two or more layers of continuous insulation board are used in a construction assembly, the continuous insulation boards shall be installed in accordance with Section C303.2. Where the continuous insulation board manufacturer's instructions do not address installation of two or more layers, the edge joints between each layer of continuous insulation boards shall be staggered.

C402.2.2 Roof assembly. The minimum thermal resistance (R-value) of the insulating material installed either between the roof framing or continuously on the roof assembly shall be as specified in Table C402.1.3, based on construction materials used in the roof assembly. Skylight curbs shall be insulated to the level of roofs with insulation entirely above deck or R-5, whichever is less.

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. 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.

Insulation installed on a suspended ceiling with removable ceiling tiles shall not be considered part of the minimum thermal resistance of the roof insulation.

C402.2.3 Thermal resistance of 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.

"Mass walls" shall include walls:

- 1. Weighing not less than 35 psf (170 kg/m^2) of wall surface area.
- 2. Weighing not less than 25 psf (120 kg/m²) of wall surface area where the material weight is not more than 120 pcf (1900 kg/m³).
- 3. Having a heat capacity exceeding 7 Btu/ft² \cdot °F (144 $kJ/m^2 \cdot K$).
- 4. Having a heat capacity exceeding 5 Btu/ft² \cdot °F (103 kJ/m² · K), where the material weight is not more than 120 pcf (1900 kg/m³).

C402.2.4 Floors. 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 framing cavity insulation or structural slab insulation shall be installed to maintain permanent contact with the underside of the subfloor decking or structural slabs.

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 combined with insulation that meets or exceeds the minimum R-value in Table NYC C402.1.3 for "Metal framed" or "Wood framed NYC and other" values for "Walls, Above Grade" and extends from the bottom to the top of all perimeter floor framing or floor assembly members.
- 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.

AQUE THERMAL ENVELOPE INSULATION COMPONENT MINIMUM REQUIREMENTS, A-VALUE METHOD [≗]
OPAQUE THERMAL ENVEL

		OPA						OPE INSULATION COMPONENT MINIMUM REQUIREMENTS, R-VALUE METHOD ^a			NTS, R-V,					
CLIMATE ZONE		_				ر ۲	4 EXCEPT	MAHINE	5 AND MARINE	AHINE 4		0			8	
	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R
							9 P	Hoots								
Insulation entirely above roof deck	R-20ci	R-25ci	R-25ci	R-25ci	R-25ci	R-25ci	R-30ci	R-30ci	R-30ci	R-30ci	R-30ci	R-30ci	R-35ci	R-35ci	R-35ci	R-35ci
Metal buildings ^b	R-19 + R-11 LS	R-19 + R-11 LS	R-19 + R11 LS	R-19 + R-11 LS	R-19 + R-11 LS	R-19 + R-11 LS	R-19 + R-11 LS	R19 + R-11 LS	R19 + R-11 LS	R-19 + R-11 LS	R-25 + R-11 LS	R-25 + R-11 LS	R-30 + R-11 LS	R-30 + R-11 LS	R-30 + R-11 LS	R-30 + R-11 LS
Attic and other	R-38	R-38	R-38	R-38	R-38	R-38	R-38	R-38	R-38	R-49	R-49	R-49	R-49	R-49	R-49	R-49
							Walls, ab	Walls, above grade								
Mass	R-5.7ci ^c	R-5.7ci ^c	R-5.7ci ^c	R-7.6ci	R-7.6ci	R-9.5ci	R-9.5ci	R-11.4ci	R-11.4ci	R-13.3ci	R-13.3ci	R-15.2ci	R-15.2ci	R-15.2ci	R-25ci	R-25ci
Metal building	R-13+ R-6.5ci	R-13 + R-6.5ci	R-13 + R-6.5ci	R-13 + R-13ci	R-13 + R-6.5ci	R-13 + R-13ci	R-13 + R-13ci	R-13 + R-13ci	R-13 + R-13ci	R-13 + R-13ci	R-13 + R-13ci	R-13 + R-13ci	R-13 + R-13ci	R-13+ R-19.5ci	R-13 + R-13ci	R-13 + R-19.5ci
Metal framed	R-13 + R-5ci	R-13 + R-5ci	R-13 + R-5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-15.6ci	R-13 + R-7.5ci	R-13 + R-17.5ci
Wood framed and	R-13 +			R-13 +	R-13 +	R-13 +	R-13 +	R-13 +	R-13 +	R-13 + R-7 5ci	R-13 + R-7 5ci	R-13 + R_7 5ci	R-13 + R-7 5ci	R-13 + B-7 5ci	R13 + B_15 6ci	R13 + B_15 6ci
other	R-3.8ci or R-20	R-3.8ci or R-20	R-3.8ci or R-20	R-3.8ci or R-20	R-3.8ci or R-20	R-3.8ci or R-20	R-3.8ci or R-20	R-3.8ci or R-20	R-3.8ci or R-20	or R-20 + R-3.8ci	or R-20 + R-3.8ci	or R-20 + R-3.8ci	or R-20 + R-3.8ci	or R-20 + R-3.8ci	or R-20 + R-10ci	or R-20 + R-10ci
							Walls, be	Walls, below grade								
Below-grade wall ^d	NR	NR	NR	NR	NR	NR	R-7.5ci	R-7.5ci	R-7.5ci	R-7.5ci	R-7.5ci	R-7.5ci	R-10ci	R-10ci	R-10ci	R-12.5ci
							FIC	Floors								
Mass ^e	NR	NR	R-6.3ci	R-8.3ci	R-10ci	R-10ci	R-10ci	R-10.4ci	R-10ci	R-12.5ci	R-12.5ci	R-12.5ci	R-15ci	R-16.7ci	R-15ci	R-16.7ci
Joist/framing	NR	NR	R-30	R-30	R-30	R-30	R-30	R-30	R-30	R-30	R-30	\mathbf{R} -30 ^f	$R-30^{f}$	$R-30^{f}$	$R-30^{f}$	$R-30^{f}$
							Slab-on-g	Slab-on-grade floors								
Unheated slabs	NR	NR	NR	NR	NR	NR	R-10 for 24" below	R-10 for 24" below	R-10 for 24" below	R-10 for 24" below	R-10 for 24" below	R-15 for 24" below	R-15 for 24" below	R-15 for 24" below	R-15 for 24" below	R-20 for 24" below
Heated slabs	R-7.5 for 12" below	R-7.5 for 12" below	R-7.5 for 12" below	R-7.5 for R-1 12" below 24"	R-10 for 24" below	R-10 for 24" below	R-15 for 24" below	R-15 for 24" below	R-15 for 36" below	R-15 for 36" below	R-15 for 36" below	R-20 for 48" below	R-20 for 24" below	R-20 for 48" below	R-20 for 48" below	R-20 for 48" below
							Opaqu	Opaque doors								
Nonswinging	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	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 Appendix A. b. Where using <i>R</i>-value compliance method, a thermal spacer block shall be provided, otherwise use the U-factor compliance method in Table C402.1.4. c. B-5.7ci is allowed to be substituted with concrete block walls combrise with ASTM C90. uncrouted or natially erouted at 3.2 inches or less on center borches or less on center block and concrete block walls combrine with ASTM C90. uncrouted or natially erouted at 3.2 inches or less on center brock and concrete block and k and k inches or less on center brock and concrete block and k concrete block concrete block and k concrete block and k concrete	mm, 1 pour ation, NR = ions can be ue compliat to be substi	nd per squar No require found in AN nce method, tuted with co	e foot = 4.8(nent, LS = 1 (SI/ASHRA a thermal si	8 kg/m ² , 1 p Liner systen E/IESNA A pacer block k walls com	ound per cu n. vppendix A. shall be pro	lbic foot = 1 vided, other	6 kg/m ³ . wise use the	≥ U-factor c I or partially	ompliance n	nethod in Ta 32 inches to	able C402.] r less on cei	L.4. nter vertical	lv and 48 in	ches or less	on center h	orizontally.
When the period cores filled with materials having a maximum thermal When the period cores filled with materials having a maximum thermal d When hencould slabs are below orded. Pelow-orade walls shall commity	res filled wi	th materials orade_below	having a ma a-orade wali	aximum the	rmal conduc	ctivity of 0.4	conductivity of 0.44 Btu-in/h-f ² °F.	contractivity of 0.44 Bu-inh-f ² °F.	vr heated sla							

d. Where headed slabs are below grade, below-grade walls shall comply with the exterior insulation requirements for heated slabs.
e. "Mass floors" shall include floors weighing not less than:

35 pounds per square foot of floor surface area; or
2. 25 pounds per square foot of floor surface area where the material weight is not more than 120 pounds per cubic foot.
f. Steel floor joist systems shall be insulated to R-38.

	9
	RMAL ENVELOPE ASSEMBLY MAXIMUM REQUIREMENTS, UFACTOR METHOD ^{a, b}
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TABLE C402.1.4	LY MA
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CLIMATE ZONE		-				3 1 200	EXCEPT	4 EXCEPT MARINE		AND MARINE 4		9	2		8	
	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R
							Rc	Roofs								
Insulation entirely above roof deck	U-0.048	U-0.039	U-0.039	U-0.039	U-0.039	U-0.039	U-0.032	U-0.032	U-0.032	U-0.032	U-0.032	U-0.032	U-0.028	U-0.028	U-0.028	U-0.028
Metal buildings	U-0.044	U-0.035	U-0.035	U-0.035	U-0.035	U-0.035	U-0.035	U-0.035	U-0.035	U-0.035	U-0.031	U-0.031	U-0.029	U-0.029	U-0.029	U-0.029
Attic and other	U-0.027	U-0.027	U-0.027	U-0.027	U-0.027	U-0.027	U-0.027	U-0.027	U-0.027	U-0.021	U-0.021	U-0.021	U-0.021	U-0.021	U-0.021	U-0.021
							Walls, ab	Walls, above grade								
Mass	U-0.151	U-0.151	U-0.151	U-0.123	U-0.123	U-0.104	U-0.104	060.0-U	U-0.090	U-0.080	U-0.080	U-0.071	U-0.071	U-0.061	U-0.061	U-0.061
Metal building	U-0.079	U-0.079	U-0.079	U-0.079	U-0.079	U-0.052	U-0.052	U-0.052	U-0.052	U-0.052	U-0.052	U-0.052	U-0.052	U-0.039	U-0.052	U-0.039
Metal framed	U-0.077	U-0.077	U-0.077	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.057	U-0.064	U-0.052	U-0.045	U-0.045
Wood framed and other ^c	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.051	U-0.051	U-0.051	U-0.051	U-0.036	U-0.036
							Walls, be	Walls, below grade								
Below-grade wall ^c	C-1.140 ^e	C-1.140 ^e	C-1.140°	C-1.140°	C-1.140°	C-1.140°	C-0.119	C-0.119	C-0.119	C-0.119	C-0.119	C-0.119	C-0.092	C-0.092	C-0.092	C-0.092
							FIG	Floors								
Mass ^d	U-0.322°	U-0.322 ^e	U-0.107	U-0.087	U-0.076	U-0.076	U-0.076	U-0.074	U-0.074	U-0.064	U-0.064	U-0.057	U-0.055	U-0.051	U-0.055	U-0.051
Joist/framing	U-0.066°	U-0.066°	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033
							Slab-on-g	Slab-on-grade floors								
Unheated slabs	F-0.73°	F-0.73°	F-0.73°	F-0.73°	F-0.73°	F-0.73°	F-0.54	F-0.54	F-0.54	F-0.54	F-0.54	F-0.52	F-0.40	F-0.40	F-0.40	F-0.40
Heated slabs ^f	F-0.70	F-0.70	F-0.70	F-0.70	F-0.70	F-0.70	F-0.65	F-0.65	F-0.65	F-0.65	F-0.58	F-0.58	F-0.55	F-0.55	F-0.55	F-0.55
							Opaqu	Opaque doors								
Swinging	U-0.61	U-0.61	U-0.61	U-0.61	U-0.61	U-0.61	U-0.61	U-0.61	U-0.37	U-0.37	U-0.37	U-0.37	U-0.37	U-0.37	U-0.37	U-0.37
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. Use of Opaque assembly <i>U</i> -factors, and <i>F</i> -factors from ANSI/ASIRAE/IESN	quare foot = ation, NR = embly U -fac	4.88 kg/m ² No required stors, <i>C</i> -fact	, 1 pound per ment, LS = 1 cors, and F -f	Example foot Liner system actors from		: IRAE/IESN	A 90.1 App	16 kg/m ³ . NSI/ASHRAE/IESNA 90.1 Appendix A shall be permitted, provided the construction, excluding the cladding system on walls, complies	ll be permit	ted, provide	d the constr	ruction, exc	luding the c	ladding syst	tem on wall	s, complies

with the appropriate construction details from ANSI/ASHRAE/ISNEA 90.1 Appendix A. b. Opaque assembly *U*-factors based on designs tested in accordance with ASTM C1363 shall be permitted. The *R*-value of continuous insulation shall be permitted to be added to or subtracted from the

original tested design.

Where heated slabs are below grade, below-grade walls shall comply with the *F*-factor requirements for heated slabs.
 Mass floors" shall include floors weighing not less than:

1. 35 pounds per square foot of floor surface area; or

2. 25 pounds per square foot of floor surface area where the material weight is not more than 120 pounds per cubic foot.

e. These *C*, *F*- and *U*-factors are based on assemblies that are not required to contain insulation. f. Evidence of compliance with the *F*-factors indicated in the table for heated slabs shall be demonstrated by the application of the unheated slab *F*-factors and *R*-values derived from ASHRAE 90.1 Appendix A.

C402.2.5 Slabs-on-grade perimeter insulation. Where 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 insulation shall be placed on the outside of the foundation or on the inside of the foundation wall. The insulation shall extend downward from the top of the slab for a minimum distance as shown in the table or to the top of the footing, whichever is less, or downward to at least 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.

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

C402.2.6 Insulation of radiant heating systems. Radiant heating system panels, and their associated components that are installed in interior or exterior assemblies shall be insulated with a minimum of R-3.5 ($0.62 \text{ m}^2/\text{K} \cdot \text{W}$) 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.

Exception: Heated slabs on grade insulated in accordance with Section C402.2.5.

C402.2.7 Fireplaces. New wood-burning fireplaces that are designed to allow an open burn and new wood-burning fireplace units that are designed to allow an open burn shall have tight-fitting flue dampers or tight-fitting doors. Tight-fitting doors used on a factory-built fireplace listed and labeled in accordance with UL 127 or on a factorybuilt fireplace unit listed and labeled in accordance with UL 127 shall be tested and listed for such fireplace or fireplace unit. Tight-fitting doors used on a masonry fireplace shall be listed and labeled in accordance with UL 907.

New wood-burning fireplaces that are designed to allow an open burn and new wood-burning fireplace units that are designed to allow an open burn shall be provided with a source of outdoor combustion air as required by the fireplace construction provisions of the *New York City Construction Codes*, as applicable.

C402.3 Roof solar reflectance and thermal emittance. Low-sloped roofs directly above cooled conditioned spaces in Climate Zones 1, 2 and 3 shall comply with one or more of the options in Table C402.3.

Exceptions: The following roofs and portions of roofs are exempt from the requirements of Table C402.3:

- 1. Portions of the roof that include or are covered by the following:
 - 1.1. Photovoltaic systems or components.

- 1.2. Solar air or water-heating systems or components.
- 1.3. Roof gardens or landscaped roofs.
- 1.4. Above-roof decks or walkways.
- 1.5. Skylights.
- 1.6. HVAC systems and components, and other opaque objects mounted above the roof.
- 2. Portions of the roof shaded during the peak sun angle on the summer solstice by permanent features of the building or by permanent features of adjacent buildings.
- 3. Portions of roofs that are ballasted with a minimum stone ballast of 17 pounds per square foot [74 kg/m²] or 23 psf [117 kg/m²] pavers.
- 4. Roofs where not less than 75 percent of the roof area complies with one or more of the exceptions to this section.

TABLE C402.3
MINIMUM ROOF REFLECTANCE AND EMITTANCE OPTIONS ^a

Three-year aged solar reflectance^b of 0.55 and 3-year aged thermal emittance^c of 0.75

Three-year-aged solar reflectance index^d of 64

- a. The use of area-weighted averages to comply with these requirements shall be permitted. Materials lacking 3-year-aged tested values for either solar reflectance or thermal emittance shall be assigned both a 3-year-aged solar reflectance in accordance with Section C402.3.1 and a 3-year-aged thermal emittance of 0.90.
- b. Aged solar reflectance tested in accordance with ASTM C 1549, ASTM E 903 or ASTM E 1918 or CRRC-1 Standard.
- c. Aged thermal emittance tested in accordance with ASTM C 1371 or ASTM E 408 or CRRC-1 Standard.
- d. Solar reflectance index (SRI) shall be determined in accordance with ASTM E 1980 using a convection coefficient of 2.1 Btu/h \cdot ft² \cdot °F (12W/m² \cdot K). Calculation of aged SRI shall be based on aged tested values of solar reflectance and thermal emittance.

C402.3.1 Aged roof solar reflectance. Where an aged solar reflectance required by Section C402.3 is not available, it shall be determined in accordance with Equation 4-3.

$$R_{aged} = [0.2+0.7(R_{initial}-0.2)]$$
 (Equation 4-3) where:

- R_{aged} = The aged solar reflectance.
- $R_{initial}$ = The initial solar reflectance determined in accordance with CRRC-1 Standard.

C402.4 Fenestration (Prescriptive). Fenestration shall comply with Sections C402.4 through C402.4.4 and Table C402.4. Daylight responsive controls shall comply with this section and Section C405.2.3.1.

C402.4.1 Maximum area. The vertical fenestration area (not including opaque doors and opaque spandrel panels) shall not be greater than 30 percent of the gross above-grade wall area. The skylight area shall not be greater than 3 percent of the gross roof area.

C402.4.1.1 Increased vertical fenestration area with daylight responsive controls. In Climate Zones 1 through 6, not more than 40 percent of the gross above11. 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.

C403.2.17 Refrigerated display cases. 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 at least 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.

C403.2.18 Automatic control of HVAC in hotel/motel guest rooms. In hotels and motels with greater than 50 guest rooms, automatic controls for the HVAC equipment serving each guest room shall be configured according to the requirements in the following subsection. Controls must comply with either Section C403.2.18.1 or C403.2.18.2.

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C403.2.18.1 Guest room HVAC setpoint control. Within 30 minutes of all occupants leaving the guest room, HVAC setpoints shall be automatically raised by at least 4°F (2°C) from the occupant setpoint in the cooling mode and automatically lowered by at least $4^{\circ}F(2^{\circ}C)$ from the occupant setpoint in the heating mode. When the guest room is unrented and unoccupied, HVAC setpoints shall be automatically reset to 80°F (27°C) or higher in the cooling mode and to 60°F (16°C) or lower in the heating mode. Unrented and unoccupied guest rooms shall be determined by either of the following:

- 1. The guest room has been continuously unoccu-NYC pied for up to 16 hours.
- 2. A networked guest room control system indicates the guest room is unrented and the guest room is unoccupied for more than 30 minutes.

Exceptions:

- 1. A networked guest room control system shall be permitted to return the thermostat setpoints to their default occupied setpoints 60 minutes prior to the time the room is scheduled to be occupied.
- 2. Cooling for humidity control shall be permitted during unoccupied periods.

NYC NYC NYC NYC NYC NYC C403.2.18.2 Automatic Control. Captive key card systems shall be permitted to be used to comply with Section C403.2.18.

C403.3 Economizers (Prescriptive). Each cooling system shall include either an air or water economizer complying with Sections C403.3.1 through C403.3.4.

Exceptions: Economizers are not required for the systems listed below.

- 1. In cooling systems for buildings located in Climate Zones 1A and 1B.
- 2. In climate zones other than 1A and 1B, where individual fan cooling units have a capacity of less than 54,000 Btu/h (15.8 kW) and meet one of the following:
 - 2.1. Have direct expansion cooling coils.
 - 2.2. The total chilled water system capacity less the capacity of fan units with air economizers is less than the minimum specified in Table C403.3(1).

*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. 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) dewpoint temperature to satisfy process needs.
- 4. Systems that serve residential spaces where the system capacity is less than five times the requirement listed in Table C403.3(1).

TABLE C403.3(1)
MINIMUM CHILLED-WATER SYSTEM COOLING CAPACITY FOR DETERMINING ECONOMIZER COOLING REQUIREMENTS

CLIMATE ZONES	TOTAL CHILLED-WATER SYSTEM CAPAC	ITY LESS CAPACITY OF COOLING UNITS WITH AIR ECONOMIZERS
(COOLING)	Local Water-cooled Chilled-water Systems	Air-cooled Chilled-water Systems or District Chilled-Water Systems
1a	No economizer requirement	No economizer requirement
1b, 2a, 2b	960,000 Btu/h	1,250,000 Btu/h
3a, 3b, 3c, 4a, 4b, 4c	720,000 Btu/h	940,000 Btu/h
5a, 5b, 5c, 6a, 6b, 7, 8	1,320,000 Btu/h	1,720,000 Btu/h

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

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- 5. Systems expected to operate less than 20 hours per week.
- 6. Where the use of outdoor air for cooling will affect supermarket open refrigerated casework systems.
- 7. Where the cooling efficiency meets or exceeds the efficiency requirements in Table C403.3(2).
- 8. Chilled-water cooling systems that are passive (without a fan) or use induction where the total chilled water system capacity less the capacity of fan units with air economizers is less than the minimum specified in Table C403.3(1).
- 9. Systems that include a heat recovery system in accordance with Section C403.4.5.

EC	TABLE C403.3(2) QUIPMENT EFFICIENCY PERFORMANCE EXCEPTION FOR ECONOMIZERS
CLIMATE ZONES	COOLING EQUIPMENT PERFORMANCE IMPROVEMENT (EER OR IPLV)
2B	10% efficiency improvement
3B	15% efficiency improvement
4B	20% efficiency improvement

C403.3.1 Integrated economizer control. Economizer systems shall be integrated with the mechanical cooling system and be capable of providing partial cooling even where additional mechanical cooling is required to provide the remainder of the cooling load. Controls shall not be capable of creating a false load in the mechanical cooling systems by limiting or disabling the economizer or any other means, such as hot gas bypass, except at the lowest stage of mechanical cooling.

Units that include an air economizer shall comply with the following:

- 1. Unit controls shall have the mechanical cooling capacity control interlocked with the air economizer controls such that the outdoor air damper is at the 100-percent open position when mechanical cooling is on and the outdoor air damper does not begin to close to prevent coil freezing due to minimum compressor run time until the leaving air temperature is less than 45° F (7°C).
- 2. Direct expansion (DX) units that control 75,000 Btu/h (22 kW) or greater of rated capacity of the capacity of the mechanical cooling directly based on occupied

space temperature shall have not fewer than two stages of mechanical cooling capacity.

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3. Other DX units, including those that control space temperature by modulating the airflow to the space, shall be in accordance with Table C403.3.1.

C403.3.2 Economizer heating system impact. HVAC system design and economizer controls shall be such that economizer operation does not increase building heating energy use during normal operation.

Exception: Economizers on variable air volume (VAV) systems that cause zone level heating to increase due to a reduction in supply air temperature.

C403.3.3 Air economizers. Air economizers shall comply with Sections C403.3.3.1 through C403.3.3.5.

C403.3.3.1 Design capacity. Air economizer systems shall be capable of modulating outdoor air and return air dampers to provide up to 100 percent of the design supply air quantity as outdoor air for cooling.

C403.3.3.2 Control signal. Economizer dampers shall be capable of being sequenced with the mechanical cooling equipment and shall not be controlled by only mixed-air temperature.

Exception: The use of mixed-air temperature limit control shall be permitted for systems controlled from space temperature (such as single-zone systems).

C403.3.3.3 High-limit shutoff. Air economizers shall be capable of automatically reducing outdoor air intake to the design minimum outdoor air quantity when outdoor air intake will no longer reduce cooling energy usage. High-limit shutoff control types for specific climates shall be chosen from Table C403.3.3.3. High-limit shutoff control settings for these control types shall be those specified in Table C403.3.3.

C403.3.3.4 Relief of excess outdoor air. Systems shall be capable of relieving excess outdoor air during air economizer operation to prevent overpressurizing the building. The relief air outlet shall be located to avoid recirculation into the building.

C403.3.3.5 Economizer dampers. Return, exhaust/ relief and outdoor air dampers used in economizers shall comply with Section C403.2.4.3.

C403.3.4 Water-side economizers. Water-side economizers shall comply with Sections C403.3.4.1 and C403.3.4.2.

RATING CAPACITY	MINIMUM NUMBER OF MECHANICAL COOLING STAGES	MINIMUM COMPRESSOR DISPLACEMENT [®]
≥ 65,000 Btu/h and < 240,000 Btu/h	3 stages	\leq 35% of full load
≥ 240,000 Btu/h	4 stages	$\leq 25\%$ full load

TABLE C403.3.1 DX COOLING STAGE REQUIREMENTS FOR MODULATING AIRFLOW UNITS

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

a. For mechanical cooling stage control that does not use variable compressor displacement, the percent displacement shall be equivalent to the mechanical cooling capacity reduction evaluated at the full load rating conditions for the compressor.

Equipment Type	Size Category (Input)	Subcategory or Rating Condition	Performance Required ^a	Test Procedure ^{b,c}
Electric table-top water heaters	\leq 12 kW	Resistance ≥ 20 gal	0.93–0.00035V EF	DOE 10 CFR Part 430
Electric water heaters	$\leq 12 \text{ kW}^{\text{e}}$	Resistance ≥ 20 gal	0.97–0.00035V EF	DOE 10 CFR Part 430
	> 12 kW	Resistance ≥ 20 gal	0.3 + 27/Vm %/h	Section G.2 of ANSI Z21.10.3
	\leq 24 Amps and \leq 250 Volts	Heat Pump	0.93–0.00035V EF	DOE 10 CFR Part 430
Gas storage water heaters	≤ 75,000 Btu/h	≥ 20 gal	0.67–0.0005V EF	DOE 10 CFR Part 430
	> 75,000 Btu/h	< 4,000 (Btu/h)/gal	$\frac{Q}{799} + 16.6\sqrt{V}$ SL, Btu/h	Sections G.1 and G.2 of ANSI Z21.10.3
Gas instantaneous water heaters	> 50,000 Btu/h < 200,000 Btu/h	\geq 4,000 (Btu/h)/gal and < 2 gal	0.67–0.0005V EF	DOE 10 CFR Part 430
	\geq 200,000 Btu/h ^d	≥ 4,000 (Btu/h)/gal and < 10 gal	80% E _t	Sections G.1 and G.2 of ANSI Z21.10.3
	≥ 200,000 Btu/h	\geq 4,000 (Btu/h)/gal and \geq 10 gal	80% $E_t (Q/799 + 16.6\sqrt{V})$ SL, Btu/h	
Oil storage water heaters	\leq 105,000 Btu/h	≥ 20 gal	0.59–0.0005V EF	DOE 10 CFR Part 430
	> 105,000 Btu/h	< 4,000 (Btu/h)/gal	80% $E_t (Q/799 + 16.6\sqrt{V})$ SL, Btu/h	Sections G.1 and G.2 of ANSI Z21.10.3
Oil instantaneous water heaters	\leq 210,000 Btu/h	≥ 4,000 (Btu/h)/gal and < 2 gal	0.59–0.0005V EF	DOE 10 CFR Part 430
	> 210,000 Btu/h	≥ 4,000 (Btu/h)/gal and < 10 gal	80% E _t	Sections G.1 and - G.2 of ANSI Z21.10.3
	> 210,000 Btu/h	\geq 4,000 (Btu/h)/gal and \geq 10 gal	78% $E_t (Q/799 + 16.6\sqrt{V})$ SL, Btu/h	
Hot-water supply boilers, gas and oil	≥ 300,000 Btu/h and < 12,500,000 Btu/h	\geq 4,000 (Btu/h)/gal and < 10 gal	80% E _t	 Sections G.1 and G.2 of ANSI Z21.10.3
Hot-water supply boilers, gas		\geq 4,000 (Btu/h)/gal and \geq 10 gal	80% $E_t (Q/799 + 16.6\sqrt{V})$ SL, Btu/h	
Hot-water supply boilers, oil		\geq 4,000 (Btu/h)/gal and \geq 10 gal	78% $E_t (Q/800 + 110\sqrt{V})$ SL, Btu/h	
Pool heaters, oil and gas	All	z	78% E _t	ASHRAE 146
Heat-pump pool heaters	All		4.0 COP	ASHRAE 146
Unfired storage tanks	Al		R-12.5	(none)

a. Energy factor (EF) and thermal efficiency (E_i) are minimum requirements, while standby loss (SL) is maximum Btu/h based on a 70°F temperature difference between stored water and ambient requirements. In the EF equation, V is the rated volume in gallons. In the SL equation, V is the rated volume in gallons and Q is the nameplate input rate in Btu/h. V_m is the measured volume in the tank

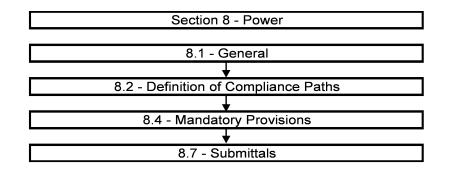
b. Section 12 contains a complete specification, including the year version, of the referenced test procedure.

c. Section G.1 is titled "Test Method for Measuring Thermal Efficiency" and Section G.2 is titled "Test Method for Measuring Standby Loss."

d. Instantaneous water heaters with input rates below 200,000 Btu/h must comply with these requirements if the water heater is designed to heat water to temperatures of 180°F or higher.

e. Electric water heaters with input rates below 12 kW must comply with these requirements if the water heater is designed to heat water to temperatures of 180°F or higher.

f. Refer to Section 7.5.3 for additional requirements for gas storage and instantaneous water heaters and gas hot-water supply boilers.



8. POWER

8.1 General

8.1.1 Scope. This section applies to all building power distribution systems and only to equipment described below.

8.1.2 New Buildings. Equipment installed in new buildings shall comply with the requirements of this section.

8.1.3 Addition to Existing Buildings. Equipment installed in addition to existing buildings shall comply with the requirements of this section.

8.1.4 Alterations to Existing Buildings

Exception: Compliance shall not be required for the relocation or reuse of existing equipment at the same site.

8.1.4.1 Alterations to building service equipment or systems shall comply with the requirements of this section applicable to those specific portions of the building and its systems that are being altered.

8.1.4.2 Any new equipment subject to the requirements of this section that is installed in conjunction with the alterations as a direct replacement of existing equipment shall comply with the specific requirements applicable to that equipment.

8.2 Compliance Paths

8.2.1 Compliance. Power distribution systems in all projects shall comply with the requirements of Section 8.1, "General"; Section 8.4, "Mandatory Provisions"; and Section 8.7, "Submittals."

8.3 Simplified/Small Building Option (Not Used)

8.4 Mandatory Provisions

8.4.1 Voltage Drop. The conductors for feeders and branch circuits combined shall be sized for a maximum of 5% voltage drop total.

Exception: Feeder conductors and branch circuits that are dedicated to emergency services.

8.4.2 Automatic Receptacle Control. The following shall be automatically controlled:

- a. At least 50% of all 125-volt 15- and 20-amp receptacles in all private offices, conference rooms, rooms used primarily for printing and/or copying functions, break rooms, classrooms, and individual workstations
- b. At least 25% of branch circuit feeders installed for modular furniture not shown on the construction documents

This control shall function on

- a. a scheduled basis using a time-of-day operated control device that turns receptacles off at specific programmed times—an independent program schedule shall be provided for controlled areas of no more than 5000 ft^2 and not more than one floor (the occupant shall be able to manually override the control device for up to two hours),
- b. an occupant sensor that shall turn receptacles off within 20 minutes of all occupants leaving a space, or
- c. an automated signal from another control or alarm system that shall turn receptacles off within 20 minutes after determining that the area is unoccupied.

All controlled receptacles shall be permanently marked to visually differentiate them from uncontrolled receptacles and are to be uniformly distributed throughout the space.

Plug-in devices shall not be used to comply with Section 8.4.2.

Exceptions: Receptacles for the following shall not require an automatic control device:

- 1. Receptacles specifically designated for equipment requiring continuous operation (24 hours/day, 365 days/year)
- 2. Spaces where an automatic control would endanger the safety or security of the room or building occupant(s).

8.4.3 Electrical Energy Monitoring

8.4.3.1 Monitoring. Measurement devices shall be installed in new buildings to monitor the electrical energy use for each of the following separately:

- a. Total electrical energy
- b. HVAC systems
- c. Interior lighting
- d. Exterior lighting
- e. Receptacle circuits

For buildings with tenants, these systems shall be separately monitored for the total building and (excluding shared systems) for each individual tenant.

Exception: Up to 10% of the load for each of the categories (b) through (e) shall be allowed to be from other electrical loads.

8.4.3.2 Recording and Reporting. The electrical energy usage for all loads specified in Section 8.4.3.1 shall be recorded a minimum of every 15 minutes and reported at least hourly, daily, monthly, and annually. The data for each tenant