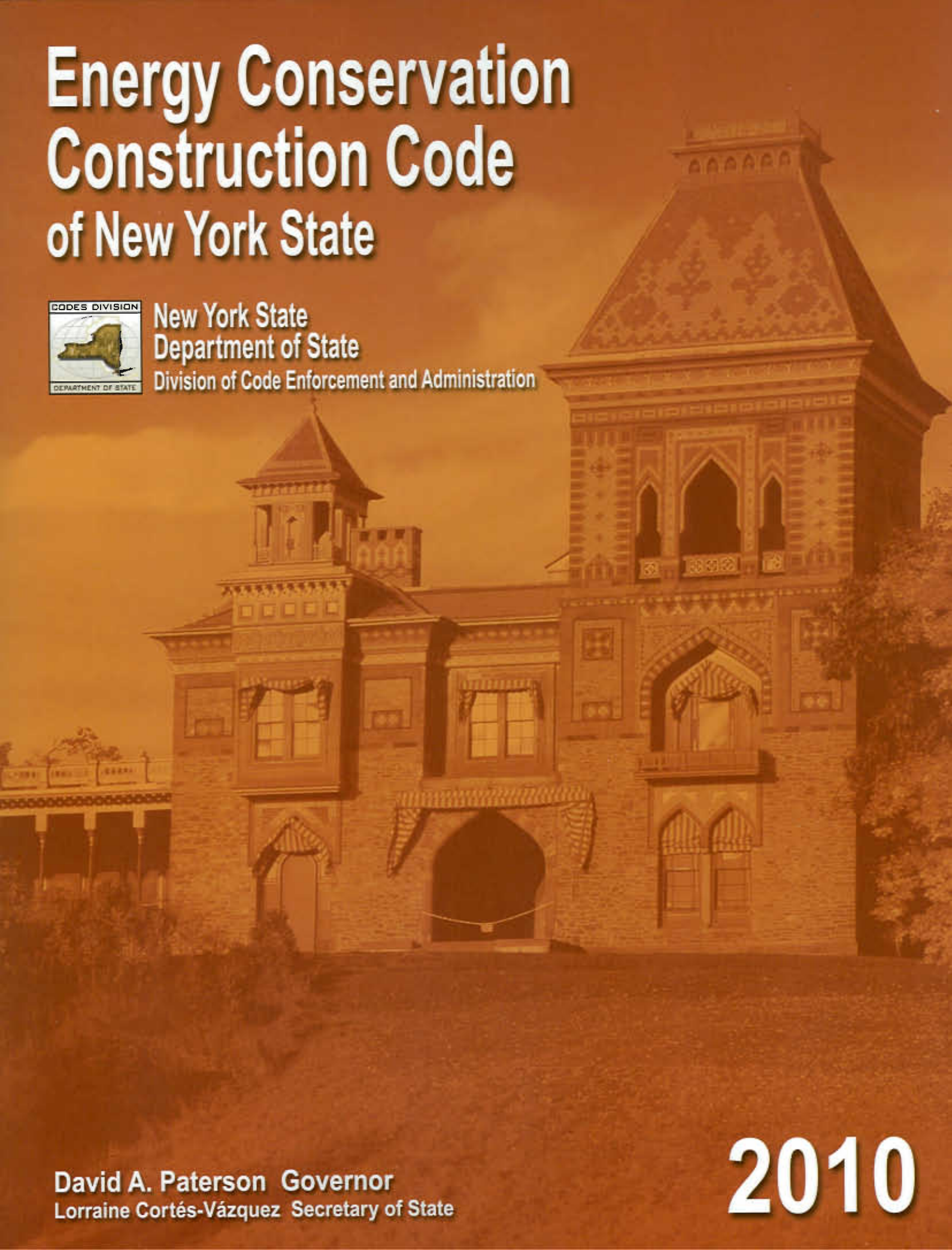
Energy Conservation Construction Code of New York State



New York State
Department of State
Division of Code Enforcement and Administration

David A. Paterson Governor
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CHAPTER 1
GENERAL REQUIREMENTS

This chapter has been revised in its entirety; there will be no marginal markings.

SECTION 101
SCOPE AND GENERAL REQUIREMENTS

101.1 Title. This code shall be known as the *Energy Conservation Construction Code of New York State*, and shall be cited as such. It is referred to herein as "this code."

101.1.1 General. Administration and enforcement of the *Energy Conservation Construction Code of New York State* shall be in accordance with local law, subject to the minimum requirements set forth in Part 1203 of Title 19 NYCRR.

101.1.2 City of New York. When within the jurisdiction of the City of New York, administration and enforcement shall be in conformance with the *New York City Construction Codes*.

101.2 Scope. This code applies to *residential* buildings and *commercial buildings*.

101.2.1 City of New York. When within the jurisdiction of the City of New York, the Counties of New York, Kings, Queens, Bronx and Richmond, the following shall apply:

1. For determination of occupancy classification and use within this code, a comparable occupancy classification may be made to the *New York City Construction Codes*.
2. Where reference is made within this code to codes referenced in the *Uniform Fire Prevention and Building Code*, the reference shall be deemed to be to the *New York City Construction Codes*.

101.3 Intent. This code shall regulate the design and construction of buildings for the effective use of energy. This code is intended to provide flexibility to permit the use of innovative approaches and techniques to achieve the effective use of energy. This code is not intended to abridge safety, health or environmental requirements contained in other applicable codes or ordinances. To the fullest extent feasible, use of modern technical methods, devices and improvements which tend to minimize consumption of energy and utilize to the greatest extent practical solar and other renewable sources of energy without affecting reasonable requirements for the health, safety and security of the occupants or users of buildings shall be permitted. As far as may be practicable, the improvement of energy conservation construction practices, methods, equipment, materials and techniques shall be encouraged.

101.3.1 ARRA. This code is intended to comply with the requirements of the *American Recovery and Renewal Act of 2009* (the "ARRA"), i.e., to be a building energy code for residential buildings and for commercial buildings that meets or exceeds the model codes mentioned in the ARRA, or achieves equivalent or greater energy savings. The New York State Department of State has determined (1) that a building energy code which is applicable to both residential buildings and commercial buildings and which meets or exceeds the 2009 edition of the *International Energy Conservation Code*, published by the International Code Council, Inc. (hereinafter referred to as the "2009 IECC"), or achieves equivalent or greater energy savings, meets or exceeds the requirements of the ARRA; (2) that this code, which is applicable to both residential buildings and commercial buildings, meets or exceeds the 2009 IECC, or achieves equivalent or greater energy savings; and (3) accordingly, that this code meets or exceeds the requirements of the ARRA.

101.4 Applicability. The provisions of this code shall apply to the construction of buildings. This code shall apply as provided in this Section 101.4. 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.

101.4.1 Existing buildings. Except as specified in this chapter, this code shall not be used to require the removal, *alteration* or abandonment of, nor prevent the continued use and maintenance of, an existing building or building system lawfully in existence at the time of adoption of this code.

101.4.2 Historic buildings. An alteration or renovation to an existing building or structure that (1) is listed 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, 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 as a contributing building to a historic district, by the U.S. Secretary of the Interior, need not comply with this code.

101.4.3 Additions, alterations or renovations. It is intended that this code apply to additions, alterations, and renovations to existing residential building in all cases where the 2009 IECC would apply, and that this code shall apply to additions, alterations and renovations to existing commercial buildings in all cases where ASHRAE 90.1-2007 would apply. Additions, alterations or renovations to an existing building, building system or portion thereof shall conform to the provisions of this code as they relate to new construction without requiring the unaltered portion(s) of the existing building or building system to comply with this code. Additions, alterations or renovations shall not create an unsafe or hazardous condition or overload existing building systems. An addition shall be deemed to comply with this code if (1) the addition alone complies with this code, or (2) the existing building and addition considered as a single building comply with this code.

Exceptions: The following need not comply with the provisions of this code, provided 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, provided the *U*-factor and the solar heat gain coefficient (SHGC) will be equal to or lower than before the glass replacement.
3. Alterations, renovations or repairs to roof/ceiling, wall or floor cavities which are insulated to full depth with insulation having a minimal nominal value of R-3.0/inch.
4. Alterations, renovations or repairs to walls and floors, where the existing structure is without framing cavities and no new framing cavities are created.
5. Reroofing 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 a *conditioned space* from the exterior shall not be removed.
7. An alteration that replaces less than 50 percent of the luminaires in a space, provided that such alteration does not increase the installed interior lighting power.
8. An alteration that replaces only the bulb and ballast within the existing luminaires in a space, provided that such *alteration* does not increase the installed interior lighting power.

101.4.4 Change in occupancy or use. Spaces undergoing a change in occupancy that would result in an increase in 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 505.5.2 to another use in Table 505.5.2, the installed lighting wattage shall comply with Section 505.5.

101.4.5 Change in space conditioning. Any nonconditioned space that is altered to become conditioned space shall be required to be brought into full compliance with this code.

101.4.6 Statutory exemptions and limitations. The provisions of sections 101.4.1, 101.4.2, 101.4.4, 101.4.5 and 101.4.6, of this code are subject to any provisions of Article 11 of the New York State Energy Law, as in effect at the time of adoption of this code and as thereafter amended from time to time, which may (1) require certain buildings to be exempt from this code or (2) limit the applicability of this code in the case of renovations of existing buildings. If the provisions of Article 11 of the New York State Energy Law, as in effect at the time of any alteration, renovation or repair to an existing building, require that such building be exempt from this code, then such alteration, renovation or repair to such building need not comply with this code. If the provisions of Article 11 of the New York State Energy Law, as in effect at the time of any alteration, renovation or repair to an existing building, limit the applicability of this code to such alteration, renovation or repair, then the applicability of this code to such alteration, renovation or repair shall be limited to the extent required by the provisions of Article 11 of the New York State Energy Law, as then in effect.

Example: New York State Energy Law section 11-103(b), as in effect at the time of adoption of this code, provides that in the case of the renovation of an existing building, this code (1) shall apply only if the renovation is a "substantial renovation" (i.e., only if more than fifty percent of any "building subsystem" is replaced), and (2) shall apply only to that portion of the "building subsystem" which is being replaced. If New York State Energy Law section 11-103(b) remains in effect at the time of any alteration, renovation or repair to an existing building, the applicability of this code to such alteration, renovation or repair shall be limited to the extent required by said section 11-103(b).

101.5 Compliance. *Residential* buildings shall meet the provisions of Chapter 4. *Commercial* buildings shall meet the provisions of Chapter 5. Where a building includes both residential and commercial occupancies, each occupancy shall be separately considered and meet the applicable provisions of Chapter 4 for residential and Chapter 5 for commercial.

101.5.1 Compliance software. Compliance can be determined through the use of computer software developed by the United States Department of Energy (DOE), including REScheck, COMcheck, or REM/Rate home energy rating and REM/Design Home energy analysis software specifically developed for this code, or of other building energy modeling or home energy rating (HERS) software approved by the Secretary of State. In the case of energy modeling, the code official shall be permitted to accept an energy cost budget worksheet based on ASHRAE 90.1

or Section 506 and any information and reports showing acceptable results of the energy modeling. Software programs used to show compliance, must indicate compliance with the *Energy Conservation Construction Code of New York State*-2010 (ECCCNYS 2010) to reflect the actual requirements of the code. REScheck or COMCheck printout forms must show "ECCCNYS 2010" in the title of the print out. Other software programs (for example. REM Rate/REM Design) must clearly indicate that ECCCNYS 2010 parameters have been complied with. When using the software approach to show compliance, the mandatory code provisions of Chapters 4 and 5 must be complied with.

101.5.2 Low energy buildings. The following buildings, or portions thereof, separated from the remainder of the building by *building thermal envelope* assemblies complying with this code shall be exempt from the *building thermal envelope* provisions of this code.

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

SECTION 102
ALTERNATE MATERIALS—METHOD OF CONSTRUCTION, DESIGN OR INSULATING SYSTEMS

102.1 General. This code is not intended to prevent the use of any material, method of construction, design or insulating system not specifically prescribed herein, provided that such method of construction, design or insulating system has been approved by the code enforcement official as (1) meeting the intent 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. Nothing in this section 102 shall be construed as permitting any code enforcement official, or any town, village, city, county, or state agency charged with the administration and enforcement of this code, to waive, vary, modify or otherwise alter any standard or requirement of this code. Standards or requirements of this code may be varied or modified only pursuant to Section 11-106 of the New York State Energy Law.

102.1.1 Above code programs. The authority having jurisdiction shall be permitted to determine a national, state or local energy efficiency program to exceed the energy efficiency required by this code. Buildings approved in writing by such an energy efficiency program shall be considered in compliance with this code. The requirements identified as "mandatory" in Chapters 4 and 5 of this code, as applicable, shall be met.

SECTION 103
CONSTRUCTION DOCUMENTS

103.1 General. Construction documents and other supporting data shall be submitted in one or more sets with each application for a permit. The construction documents shall be prepared by a design professional as required by the New York State Education Law Articles 145 and 147.

103.2 Information on construction documents. Construction documents shall be drawn to scale upon suitable material. Electronic media documents are permitted to be submitted when *approved* by the *code enforcement official*. 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, systems and equipment as herein governed. Details shall include, but are not limited to, as applicable, insulation materials and their *R*-values; fenestration *U*-factors and SHGCs; area-weighted *U*-factor and SHGC calculations; mechanical system design criteria; mechanical and service water heating system and equipment, types, sizes and efficiencies; economizer description; equipment and systems controls; fan motor horsepower (hp) and controls; duct sealing, duct and pipe insulation and location; lighting fixture schedule with wattages and control narrative; and air sealing details. The specific path of code compliance for each element of the building regulated by this code shall be clearly identified within the construction documentation. When compliance is achieved through computer software programs the documentation shall include all of the worksheets associated with specific building elements.

103.2.1 Written statement. When plans or specifications bear the seal and signature of a licensed professional, such licensed professional shall also include a written statement that to the best of his/her knowledge, belief and professional judgment, such plans or specifications are in compliance with this code.

103.2.2 System certification. A registered design professional shall provide to the code enforcement official a written certification that the required HVAC tests, system balancing, etc., have been performed and that, in the professional opinion of the registered design professional, the system is operating as designed. The registered design professional shall retain copies of the test reports to be provided to the code enforcement official, if requested. In New York City, such inspections shall be special or progress inspections and shall be performed by approved agencies.

Exception: One- and two-family dwelling units.

103.2.3 City of New York. When within the jurisdiction of the City of New York, refer to the *New York City Construction Codes* for additional requirements.

103.3 Examination of documents. The *code enforcement official* shall examine or cause to be examined the accompa-

nying construction documents and shall ascertain by such examinations whether the construction indicated and described is in accordance with the requirements of this code and other pertinent laws or ordinances.

103.3.1 Previous approvals. This code shall not require changes in the construction documents, construction or designated occupancy of a structure for which a lawful permit has been heretofore issued or otherwise lawfully authorized, and the construction of which has been pursued in good faith within 180 days after the effective date of this code and has not been abandoned.

103.4 Changes during construction. Changes made during construction that are not in compliance with the *approved* construction documents shall be resubmitted for approval as an amended set of construction documents.

SECTION 104
INSPECTIONS

104.1 General. Construction or work for which a permit is required shall be subject to inspection by the *code enforcement official*. Administration and enforcement of this code shall be in accordance with local law subject to the minimum requirements of Part 1203 of Title 19 (NYS Department of State Rules and Regulations).

104.2 Required approvals. Work shall not be done beyond the point indicated in each successive inspection without first obtaining the approval of the *code enforcement official*. The *code enforcement official*, upon notification, shall make the requested inspections and shall either indicate the portion of the construction that is satisfactory as completed, or notify the permit holder or his or her agent wherein the same fails to comply with this code. Any portions that do not comply shall be corrected and such portion shall not be covered or concealed until authorized by the *code enforcement official*. In New York City, such required approvals shall be conducted in accordance with (Sections 109.3.5 and 190.9 of the *New York City Building Code*) the *New York City Construction Codes*.

104.3 Final inspection. The building shall have a final inspection and not be occupied until *approved*.

104.4 Reinspection. A building shall be reinspected when determined necessary by the *code enforcement official*.

104.5 Approved inspection agencies. The *code enforcement official* is authorized to accept reports of *approved* inspection agencies, provided such agencies satisfy the requirements as to qualifications and reliability.

104.6 Inspection requests. It shall be the duty of the holder of the permit or their duly authorized agent to notify the *code enforcement official* when work is ready for inspection. It shall be the duty of the permit holder to provide access to and means for inspections of such work that are required by this code.

104.7 Reinspection and testing. Where any work or installation does not pass an initial test or inspection, the necessary corrections shall be made so as to achieve compliance with this code. The work or installation shall then be resubmitted to the *code enforcement official* for inspection and testing.

104.8 Approval. After the prescribed tests and inspections indicate that the work complies in all respects with this code, a notice of approval shall be issued by the *code enforcement official*.

104.8.1 Suspension and/or revocation. The *code enforcement official* is authorized to suspend and/or revoke a notice of approval in writing which was issued under the provisions of this code or the *New York City Construction Codes* wherever the 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 ordinance or regulation or any of the provisions of this code.

SECTION 105
INTERPRETATION OF CODE REQUIREMENTS

105.1 General. Upon written request by a building permit applicant and/or a *code enforcement official*, the Secretary of State may issue an interpretation of the application of any specific requirement of this code to the proposed construction for which an application for a building permit and required plans and specifications have been filed, and concerning a disagreement between the building permit applicant and the *code enforcement official* as to the application of such specific requirement to the proposed construction.

105.2 Procedure. A request for an interpretation shall be signed by the building permit applicant and the *code enforcement 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 building permit applicant and the *code enforcement official*;
2. A detailed description of the proposed construction, including a copy of the building permit application and plans and specifications that have been filed by the building permit applicant with the *code enforcement 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 this code for which an interpretation is requested;
4. A concise summary of the disagreement 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 *code enforcement official*.

105.3 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.

105.4 Notification. Upon receipt of a complete request for an interpretation signed by only the building permit applicant or the *code enforcement 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 Commissioner may waive this deadline when warranted by extenuating circumstances.

105.5 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 *code enforcement 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 *code enforcement 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.

105.6 Enforcement. Subsequent enforcement of this code with respect to the construction project for which an interpretation has been requested shall be consistent with the interpretation issued by the Secretary of State.

105.7 Interpretation of local code provisions. In jurisdictions that have adopted local energy codes in accordance with the provisions of Article 11 of the Energy Law, local code officials are permitted to interpret provisions added by the local jurisdiction or provisions amended by the local jurisdiction to be more stringent than this code; such interpretations by local jurisdictions, however, shall not result in interpretations of this code by the Secretary of State.

SECTION 106
VALIDITY

106.1 General. If a portion of this code is held to be illegal or void, such a decision shall not affect the validity of the remainder of this code.

SECTION 107
REFERENCED STANDARDS

107.1 General. The codes and standards referenced in this code shall be those listed in Chapter 6, and such codes and standards shall be considered as part of the requirements of this code to the prescribed extent of each such reference.

107.2 Conflicting requirements. Where the provisions of this code and the referenced standards conflict, the provisions of this code shall take precedence.

107.3 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 this code.

107.4 Other laws and regulations.

107.4.1 General. This code (as amended and/or supplemented from time to time by the provisions of Part 1240 of Title 19 of the New York Codes, Rules and Regulations) constitutes the *New York State Energy Conservation Construction Code* (the Energy Code), promulgated pursuant to Article 11 of the New York State Energy Law. The provisions of the Energy Code shall not be deemed to nullify any federal, state or local law, ordinance, administrative code, rule or regulation relating to any matter as to which the Energy Code does not provide.

107.4.2 Other agencies' regulations. Pursuant to Section 11-103(3) of the New York State Energy Law, any other code, rule or regulation heretofore promulgated or enacted 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, shall be superseded by the Energy Code.

107.4.3 More stringent 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 stringent than the Energy Code.

CHAPTER 3

CLIMATE ZONES, DESIGN CONDITIONS, MATERIALS, EQUIPMENT AND SYSTEMS

SECTION 301
CLIMATE ZONES

301.1 General. Climate *zones* from Table 301.1 shall be used in determining the applicable requirements from Chapters 4 and 5.

SECTION 302
DESIGN CONDITIONS

302.1 Interior design conditions. The interior design temperatures used for heating and cooling load calculations shall be a maximum of 72°F (22°C) for heating and minimum of 75°F (24°C) for cooling.

SECTION 303
MATERIALS, SYSTEMS AND EQUIPMENT

303.1 Identification. Materials, systems and equipment shall be identified in a manner that will allow a determination of compliance with the applicable provisions of this code.

303.1.1 Building thermal envelope insulation. An *R*-value identification mark shall be applied by the manufacturer to each piece of *building thermal envelope* insulation 12 inches (305 mm) or greater in width. Alternately, the insulation installers shall provide a certification listing the type, manufacturer and *R*-value of insulation installed in each element of the *building thermal envelope*. For blown or sprayed insulation (fiberglass and cellulose), the initial installed thickness, settled thickness, settled *R*-value, installed density, coverage area and number of bags installed shall be *listed* on the certification. For sprayed polyurethane foam (SPF) insulation, the installed thickness of the areas covered and *R*-value of installed thickness shall be *listed* on the certification. The insulation installer shall sign, date and post the certification in a conspicuous location on the job site.

303.1.1.1 Blown or sprayed roof/ceiling insulation. The thickness of blown-in or sprayed roof/ceiling insulation (fiberglass or cellulose) shall be written in inches (mm) on markers that are installed at least one for every 300 square feet (28 m^2) throughout the attic space. The markers shall be affixed to the trusses or joists and marked with the minimum initial installed thickness with numbers a minimum of 1 inch (25 mm) in height. Each marker shall face the attic access opening. Spray polyurethane foam thickness and installed *R*-value shall be *listed* on certification provided by the insulation installer.

303.1.2 Insulation mark installation. Insulating materials shall be installed such that the manufacturer's *R*-value mark is readily observable upon inspection.

303.1.3 Fenestration product rating. *U*-factors of fenestration products (windows, doors and skylights) shall be determined in accordance with NFRC 100 by an accredited, independent laboratory, and labeled and certified by the manufacturer. Products lacking such a labeled *U*-factor shall be assigned a default *U*-factor from Table 303.1.3(1) or 303.1.3(2). The solar heat gain coefficient (SHGC) 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 shall be assigned a default SHGC from Table 303.1.3(3).

TABLE 301.1
CLIMATE ZONES BY COUNTY, ALL ZONES ARE CATEGORY "A" OR, MOIST DESIGNATIONS

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

TABLE 303.1.3(1)
DEFAULT GLAZED FENESTRATION *U*-FACTORS

FRAME TYPE	SINGLE PANE	DOUBLE PANE	SKYLIGHT	
			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 block	0.60			

TABLE 303.1.3(2)
DEFAULT DOOR *U*-FACTORS

DOOR TYPE	*U*-FACTOR
Uninsulated metal	1.20
Insulated metal	0.60
Wood	0.50
Insulated, nonmetal edge, max 45% glazing, any glazing double pane	0.35

TABLE 303.1.3(3)
DEFAULT GLAZED FENESTRATION SHGC

SINGLE GLAZED		DOUBLE GLAZED		GLAZED BLOCK
Clear	Tinted	Clear	Tinted	
0.8	0.7	0.7	0.6	0.6

303.1.4 Insulation product rating. The thermal resistance (*R*-value) of insulation shall be determined in accordance with the U.S. Federal Trade Commission *R*-value rule (CFR Title 16, Part 460, May 31, 2005) in units of h x ft^2 x °F/Btu at a mean temperature of 75°F (24°C).

303.1.5 Fireplaces. Tight-fitting noncombustible fireplace doors to control infiltration losses shall be installed on fireplace openings as provided herein:

1. Masonry fireplaces or fireplace units designed to allow an open burn.
2. Decorative appliances (ANSI Standard Z21.60 gas-log style unit) installed in vented solid fuel fireplaces.
3. Vented decorative gas fireplace appliances (ANSI Standard Z21.50 unit).

Fireplaces shall be provided with a source of combustion air as required by the fireplace construction provisions of the *Building Code of New York State*, the *Residential Code of New York State* or the *New York City Construction Codes*, as applicable.

303.2 Installation. All materials, systems and equipment shall be installed in accordance with the manufacturer's installation instructions and the *Uniform Fire Prevention and Building Code*, and in the City of New York, the *New York City Construction Codes*.

303.2.1 Protection of exposed foundation insulation. Insulation applied to the exterior of basement walls, crawl space walls and the perimeter of slab-on-grade floors shall have a rigid, opaque and weather-resistant protective covering to prevent the degradation of the insulation's thermal performance. The protective covering shall cover the exposed exterior insulation and extend a minimum of 6 inches (153 mm) below grade.

303.3 Maintenance information. Maintenance instructions shall be furnished for equipment and systems that require preventive maintenance. Required regular maintenance actions shall be clearly stated and incorporated on a readily accessible label. The label shall include the title or publication number for the operation and maintenance manual for that particular model and type of product.

CHAPTER 4
RESIDENTIAL ENERGY EFFICIENCY

SECTION 401
GENERAL

401.1 Scope. This chapter applies to residential buildings.

401.2 Compliance. Projects shall comply with Sections 401, 402.2.12, 402.4, 402.5, 402.6, 403 and 404.1 (referred to as the mandatory provisions) and either:

1. Sections 402.1 through 402.3 (prescriptive); or
2. Section 405 (performance).
3. When compliance is demonstrated by computer software, as provided in Section 101.5.1.
4. When a sunroom complies with Section 402.2.11.

401.3 Certificate. A permanent certificate shall be posted on or in the electrical distribution panel. The certificate shall not cover or obstruct visibility of the circuit directory label, service disconnect label or other required labels. The certificate shall be completed by the builder or registered design professional. The certificate shall list the predominant *R*-values of insulation installed in or on ceiling/roof, walls, foundation (slab, *basement wall*, crawl space wall and/or floor) and ducts outside conditioned spaces; *U*-factors for fenestration. Where there is more than one value for each component, the certificate shall list the value covering the largest area. The certificate shall list the types and efficiencies of heating, cooling and service water heating equipment. Where a gas-fired unvented room heater, electric furnace, and/or baseboard electric heater is installed in the residence, the certificate shall list "gas-fired unvented room heater," "electric furnace," or "baseboard electric heater" as appropriate. An efficiency shall not be *listed* for gas-fired unvented room heaters, electric furnaces, or electric baseboard heaters.

SECTION 402
BUILDING THERMAL ENVELOPE

402.1 General (Prescriptive).

402.1.1 Insulation and fenestration criteria. The *building thermal envelope* shall meet the requirements of Table 402.1.1 based on the climate zone specified in Chapter 3.

402.1.2 *R*-value computation. Insulation material used in layers, such as framing cavity insulation and insulating sheathing, shall be summed to compute the component *R*-value. The manufacturer's settled *R*-value shall be used for blown insulation. Computed *R*-values shall not include an *R*-value for other building materials or air films.

402.1.3 *U*-factor alternative. An assembly with a *U*-factor equal to or less than that specified in Table 402.1.3 shall be permitted as an alternative to the *R*-value in Table 402.1.1.

402.1.4 Total UA alternative. If the total *building thermal envelope* UA (sum of *U*-factor times assembly area) is less than or equal to the total UA resulting from using the *U*-factors in Table 402.1.3 (multiplied by the same assembly area as in the proposed building), the building shall be considered in compliance with Table 402.1.1. The UA calculation shall be done using a method consistent with the ASHRAE *Handbook of Fundamentals* and shall include the thermal bridging effects of framing materials.

TABLE 402.1.1
INSULATION AND FENESTRATION REQUIREMENTS BY COMPONENT[a]

CLIMATE ZONE	FENESTRATION *U*-FACTOR[b]	SKYLIGHT[b] *U*-FACTOR	CEILING *R*-VALUE	WOOD FRAME WALL *R*-VALUE[f]	MASS WALL *R*-VALUE[g]	FLOOR *R*-VALUE	BASEMENT[c] WALL *R*-VALUE	SLAB[d] *R*-VALUE & DEPTH	CRAWL SPACE[c] WALL *R*-VALUE
4	0.35	0.60	38	13	5/10[g]	19	10 / 13[c]	10, 2 ft[d]	10 / 13[c]
5	0.35	0.60	38	20 or 13+5[f]	13/17[g]	30[e]	10 / 13[c]	10, 2 ft[d]	10 / 13[c]
6	0.35	0.60	49	20 or 13+5[f]	15/19[g]	30[e]	15 / 19[c]	10, 4 ft[d]	10 / 13[c]

For SI: 1 foot = 304.8 mm.

a. *R*-values are minimums. *U*-factors and SHGC are maximums. R-19 batts compressed into a nominal 2 × 6 framing cavity such that the *R*-value is reduced by R-1 or more shall be marked with the compressed batt *R*-value in addition to the full thickness *R*-value.

b. The fenestration *U*-factor column excludes skylights.

c. The first value shown represents minimum "R" value of continuous insulated sheathing on the interior or the exterior of the wall, the second value shown represents minimum "R" value of cavity insulation at the interior of the basement wall. "10/13" means R-10 continuous insulated sheathing on the interior or exterior of the home or R-13 cavity insulation at the interior of the basement wall.

d. R-5 shall be added to the required slab edge *R*-values for heated slabs.

e. Or insulation sufficient to fill the framing cavity, R-19 minimum.

f. "13 + 5" means R-13 cavity insulation plus R-5 insulated sheathing. When structural sheathing is utilized per requirements of the *Residential Code of New York State*, Section R602.10 Wall Bracing (or per requirements of the *Building Code of New York State*, Section 2309.8.3 Bracing), insulating sheathing with a minimum value R-2 shall be added over the required structural sheathing. All other areas must be sheathed with insulating sheathing of R-5 as indicated by the table. If 100 percent continuous structural panel sheathing is used on a 2 × 4 wall, then R-5 continuous insulated sheathing must also be applied over the structural sheathing.

g. The second *R*-value applies when more than half the insulation is on the interior of the mass wall.

TABLE 402.1.3
EQUIVALENT *U*-FACTORS[a]

CLIMATE ZONE	FENESTRATION *U*-FACTOR	SKYLIGHT *U*-FACTOR	CEILING *U*-FACTOR	FRAME WALL *U*-FACTOR	MASS WALL *U*-FACTOR[b]	FLOOR *U*-FACTOR	BASEMENT WALL *U*-FACTOR	CRAWL SPACE WALL *U*-FACTOR
4	0.35	0.60	0.030	0.082	0.141	0.047	0.059	0.065
5	0.35	0.60	0.030	0.057	0.082	0.033	0.059	0.065
6	0.35	0.60	0.026	0.057	0.060	0.033	0.050	0.065

a. Nonfenestration *U*-factors shall be obtained from measurement, calculation or an approved source.

b. When more than half the insulation is on the interior, the mass wall *U*-factors shall be a maximum of 0.10 in Zone 4, and the same as the frame wall *U*-factor in Zones 5 through 6.

TABLE 402.1.5.1
SIDING MINIMUM FASTENING REQUIREMENTS FOR DIRECT SIDING ATTACHMENT OVER FOAM PLASTIC SHEATHING TO SUPPORT SIDING WEIGHT[1]

SIDING FASTENER THROUGH FOAM SHEATHING INTO:	SIDING FASTENER TYPE AND MINIMUM SIZE[2]	SIDING FASTENER VERTICAL SPACING (INCHES)	MAXIMUM FOAM SHEATHING THICKNESS (INCHES)					
			16"oc Fastener Horizontal Spacing			24"oc Fastener Horizontal Spacing		
			Siding Weight:			Siding Weight:		
			3 psf	11 psf	25 psf	3 psf	11 psf	25 psf
Wood Framing (minimum 1-1/4 inch penetration)	0.113" diameter nail	6	4	3	1	4	2	0.75
		8	4	2	0.75	4	1.5	DR
		12	4	1.5	DR	3	0.75	DR
	0.120" diameter nail	6	4	3	1.5	4	2	0.75
		8	4	2	1	4	1.5	0.5
		12	4	1.5	0.5	3	1	DR
	0.131" diameter nail	6	4	4	1.5	4	3	1
		8	4	3	1	4	2	0.75
		12	4	2	0.75	4	1	DR
Steel Framing (minimum penetration of steel thickness + 3 threads)	#8 screw into 33 mil steel or thicker	6	3	3	1.5	3	2	DR
		8	3	2	0.5	3	1.5	DR
		12	3	1.5	DR	3	0.75	DR
	#10 screw into 33 mil steel	6	4	3	2	4	3	0.5
		8	4	3	1	4	2	DR
		12	4	2	DR	3	1	DR
	#10 screw into 43 mil steel or thicker	6	4	4	3	4	4	2
		8	4	4	2	4	3	1.5
		12	4	3	1.5	4	3	DR

For SI: 1 inch = 25.4 mm; 1 pound per square foot (psf) = 0.0479 kPa.

DR = design required

1. Tabulated requirements are based on wood framing of Spruce-Pine-Fir or any wood species with a specific gravity of 0.42 or greater in accordance with AFPA/NDS and minimum 33 ksi steel for 33 mil and 43 mil steel and 50 ksi steel for 54 mil steel or thicker.
2. Nail fasteners shall comply with ASTM F1667, except nail length shall be permitted to exceed ASTM F1667 standard lengths. Self-drilling tapping screw fasteners for connection of siding to steel framing shall comply with the requirements of AISI S230. Specified fasteners in accordance with *Residential Code of New York State*, Section R703.4, or the siding manufacturer's approved installation instructions shall meet all other requirements in ASTM F1667, AISI S230 or be otherwise approved for the intended application.

402.1.5 Siding attachment over foam sheathing. In areas where the basic wind speed is less than 100 mph (45 m/s), siding shall be attached over foam sheathing in accordance with Section 402.1.5.1, Section 402.1.5.2, or an approved design. In all other areas, siding attachments shall be in accordance with approved design. In no case shall the siding material be used in a manner that exceeds its application limits.

Exception: Where the siding manufacturer has provided installation instructions for application over foam sheathing, those requirements shall apply.

402.1.5.1 Direct siding attachment. Siding installed directly over foam sheathing without separation by an air space shall comply with Table 402.1.5.1 in regard to minimum fastening requirements and maximum foam sheathing thickness limitations to support siding dead load. The siding fastener and siding installation shall

402.2.3 Access hatches and doors (Mandatory). Access doors from conditioned spaces to unconditioned spaces (e.g., attics and crawl spaces) shall be weatherstripped and insulated to a level equivalent to the insulation on the surrounding surfaces. Access shall be provided to all equipment which prevents damaging or compressing the insulation. A wood framed or equivalent baffle or retainer is required to be provided when loose fill insulation is installed, the purpose of which is to prevent the loose fill insulation from spilling into the living space when the attic access is opened, and to provide a permanent means of maintaining the installed *R*-value of the loose fill insulation.

402.2.4 Mass walls. Mass walls for the purposes of this Chapter shall be considered above-grade walls of concrete block, concrete, insulated concrete form (ICF), masonry cavity, brick (other than brick veneer), earth (adobe, compressed earth block, rammed earth) and solid timber/logs.

402.2.5 Steel-frame ceilings, walls and floors. Steel-frame ceilings, walls and floors shall meet the insulation requirements of Table 402.2.5, or shall meet the *U*-factor requirements of Table 402.1.3. The calculation of the *U*-factor for a steel-frame envelope assembly shall use a series-parallel path calculation method.

TABLE 402.2.5
STEEL-FRAME CEILING, WALL AND FLOOR INSULATION (*R*-VALUE)

WOOD FRAME *R*-VALUE REQUIREMENT	COLD-FORMED STEEL EQUIVALENT *R*-VALUE[a]
Steel Truss Ceilings[b]	
R-30	R-38 or R-30 + 3 or R-26 + 5
R-38	R-49 or R-38 + 3
R-49	R-38 + 5
Steel Joist Ceilings[b]	
R-30	R-38 in 2 × 4 or 2 × 6 or 2 × 8 R-49 in any framing
R-38	R-49 in 2 × 4 or 2 × 6 or 2 × 8 or 2 × 10
Steel Framed Wall	
R-13	R-13 + 5 or R-15 + 4 or R-21 + 3 or R-0 + 10
R-20	R-13 + 10 or R-19 + 9 or R-25 + 8
Steel Joist Floor	
R-30	R-38 or R-30 + 3 or R-26 + 5
R-19	R-19 + 6 in 2 × 6 R-19 + 12 in 2 × 8 or 2 × 10

For SI: 1 inch = 25.4 mm.

a. Cavity insulation *R*-value is listed first, followed by continuous insulation *R*-value.

b. Insulation exceeding the height of the framing shall cover the framing.

402.2.6 Floors. Floor insulation shall be installed to maintain permanent contact with the underside of the subfloor decking.

402.2.7 Basement walls. Walls associated with conditioned basements shall be insulated from the top of the *basement wall* down to 10 feet (3048 mm) below grade or to the basement floor, whichever is less. Walls associated with unconditioned basements shall meet this requirement unless the floor overhead is insulated in accordance with Sections 402.1.1 and 402.2.6.

402.2.8 Slab-on-grade floors. Slab-on-grade floors with a floor surface less than 12 inches (305 mm) below grade shall be insulated in accordance with Table 402.1.1. The insulation shall extend downward from the top of the slab on the outside or inside of the foundation wall. Insulation located below grade shall be extended the distance provided in Table 402.1.1 by any combination of vertical insulation, insulation extending under the slab or insulation extending out from the building. Insulation extending away from the building shall be protected by pavement or by a minimum of 10 inches (254 mm) of soil. The top edge of the insulation installed between the *exterior wall* and the edge of the interior slab shall be permitted to be cut at a 45-degree (0.79 rad) angle away from the *exterior wall*. Slab-edge insulation is not required in jurisdictions designated by the *code enforcement official* as having a very heavy termite infestation.

402.2.9 Crawl space walls. As an alternative to insulating floors over crawl spaces, crawl space walls shall be permitted to be insulated when the crawl space is not vented to the outside. Crawl space wall insulation shall be permanently fastened to the wall and extend downward from the floor to the finished grade level and then vertically and/or horizontally for at least an additional 24 inches (610 mm). Exposed earth in unvented crawl space foundations shall be covered with a continuous Class I vapor retarder. All joints of the vapor retarder shall overlap by 6 inches (153 mm) and be sealed or taped. The edges of the vapor retarder shall extend at least 6 inches (153 mm) up the stem wall and shall be attached to the stem wall.

402.2.10 Masonry veneer. Insulation shall not be required on the horizontal portion of the foundation that supports a masonry veneer.

402.2.11 Thermally isolated sunroom insulation (Prescriptive). For sunroom additions not exceeding 500 square feet (46 m^2) in area, the minimum ceiling insulation *R*-values shall be R-19 in Zone 4 and R-24 in Zones 5 and 6. The minimum wall *R*-value shall be R-13 in all zones. New wall(s), windows and doors separating such sunroom addition from *conditioned* space shall meet the *building thermal envelope* requirements of Table 402.1.1.

402.2.12 Tenant separation walls. (Mandatory). Fire separations between dwelling units in two-family dwellings and multiple single-family dwellings (townhouses) shall be insulated to no less than R-10 and the walls shall be air sealed in accordance with Section 402.4.1 of this chapter.

402.3 Fenestration (Prescriptive).

402.3.1 *U*-factor. An area-weighted average of fenestration products shall be permitted to satisfy the *U*-factor requirements.

402.3.2 Glazed fenestration exemption. Up to 15 square feet (1.4 m^2) of glazed fenestration per dwelling unit shall be permitted to be exempt from *U*-factor requirements in Section 402.1.1. This exemption shall not apply to the *U*-factor alternative approach in Section 402.1.3 and the Total UA alternative in Section 402.1.4.

402.3.3 Opaque door exemption. One side-hinged opaque door assembly up to 24 square feet (2.22 m^2) in area is exempted from the *U*-factor requirement in Section 402.1.1. This exemption shall not apply to the *U*-factor alternative approach in Section 402.1.3 and the total UA alternative in Section 402.1.4.

402.3.4 Thermally isolated sunroom *U*-factor (Prescriptive). For Zones 4 through 6, the maximum fenestration *U*-factor shall be 0.50 and the maximum skylight *U*-factor shall be 0.75. New windows and doors separating the sunroom from *conditioned space* shall meet the *building thermal envelope* requirements.

402.3.5 Replacement fenestration. 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 in Table 402.1.1, where required by Section 101.4.3.

402.4 Air leakage (Mandatory).

402.4.1 Building thermal envelope. The *building thermal envelope* shall be durably sealed to limit infiltration. The sealing methods between dissimilar materials shall allow for differential expansion and contraction. The following shall be caulked, gasketed, weatherstripped or otherwise sealed with an air barrier material, suitable film or solid material:

1. All joints, seams and penetrations.
2. Site-built windows, doors and skylights.
3. Openings between window and door assemblies and their respective jambs and framing.
4. Utility penetrations.
5. Dropped ceilings or chases adjacent to the thermal envelope.
6. Knee walls.
7. Walls and ceilings separating a garage from conditioned spaces.
8. Behind tubs and showers on exterior walls.
9. Common walls between dwelling units.
10. Attic access openings.
11. Rim joist junctions.
12. Sill plates and headers. Foam plastic (spray foam insulation) shall be permitted to be spray applied to a sill plate, header, and rim joists without the thermal barrier as specified in the *Residential Code of New York State*, Section 314.4 subject to all of the following:
    a. The maximum thickness of the foam plastic shall be $3^1/_4$ inches (83 mm).
    b. The density of the foam plastic shall be in the range of 0.5 to 2.0 pounds per cubic foot (8 to 32 kg/m^3).
    c. The foam plastic shall have a flame spread index of 25 or less and an accompanying smoke developed index of 450 or less when tested in accordance with ASTM E 84.
13. Other sources of infiltration

402.4.2 Air sealing and insulation (Mandatory). Building envelope air tightness and insulation installation shall be demonstrated to comply with one of the following options given by Section 402.4.2.1 or 402.4.2.2:

402.4.2.1 Testing option. Building envelope tightness and insulation installation shall be considered acceptable when tested air leakage is less than seven air changes per hour (ACH) when tested with a blower door at a pressure of 1.0 psf (50 Pa) as verified using instruments and procedures specified in ASHRAE/ASTM E779. The test shall be conducted by a qualified person, who shall demonstrate competence to the satisfaction of the code enforcement official for the conduct of such tests. For the purpose of this section, ACH50 shall mean air changes per hour of infiltration into a house as measured with a blower door at 50 pascals of pressure, in accordance with ASHRAE/ASTM E779. Testing shall occur after rough in and after installation of penetrations of the building envelope, including penetrations for utilities, plumbing, electrical, ventilation and combustion appliances.

During testing:

1. Exterior windows and doors, fireplace and stove doors shall be closed, but not sealed;
2. Dampers shall be closed, but not sealed, including exhaust, intake, makeup air, backdraft and flue dampers;
3. Interior doors shall be open;
4. Exterior openings for continuous ventilation systems and heat recovery ventilators shall be closed and sealed;
5. Heating and cooling system(s) shall be turned off;
6. HVAC ducts shall not be sealed; and
7. Supply and return registers shall not be sealed.

Test results shall be provided to the code enforcement official and shall include:

a. Name and place of business of the tester;
b. Address of the building which was tested;
c. Conditioned floor area of dwelling, calculated in accordance with ANSI Z65-1996, except that conditioned floor area shall include areas where the ceiling height is less than 5 feet (1524 mm);
d. Measurement of ACH50; and
e. Certification of accuracy of test results and signature of tester.

402.4.2.2 Visual inspection option. Building envelope tightness and insulation installation shall be considered acceptable when the items listed in Table 402.4.2, applicable to the method of construction, are field verified. Where required by the *code enforcement official*, an *approved* party independent from the installer of the insulation shall inspect the air barrier and insulation.

402.4.3 Recessed lighting. Recessed luminaires installed in the *building thermal envelope* shall be sealed to limit air leakage between conditioned and unconditioned spaces. All recessed luminaires shall be IC-rated and labeled as meeting ASTM E 283 when tested at 1.57 psf (75 Pa) pressure differential with no more than 2.0 cfm (0.944 L/s) of air movement from the *conditioned space* to the ceiling cavity. All recessed luminaires shall be sealed with a gasket or caulk between the housing and the interior wall or ceiling covering.

402.4.4 Fenestration air leakage. Windows, skylights and sliding glass doors shall have an air infiltration rate of no more than 0.3 cfm per square foot (1.5 L/s/m^2), and swinging doors no more than 0.5 cfm per square foot (2.6 L/s/m^2), when tested according to NFRC 400 or AAMA/WDMA/CSA 101/I.S.2/A440 by an accredited, independent laboratory and *listed* and *labeled* by the manufacturer.

Exception: Site-built windows, skylights and doors.

402.5 Vapor retarders (Mandatory). Class I or II vapor retarders are required on the interior side of frame walls in Zones 5 and 6 for all above grade framed walls, and floors

TABLE 402.4.2
AIR BARRIER AND INSULATION INSPECTION COMPONENT CRITERIA

COMPONENT	CRITERIA
Air barrier and thermal barrier	Exterior thermal envelope insulation for framed walls is installed in substantial contact and continuous alignment with building envelope air barrier.
	Breaks or joints in the air barrier are filled or repaired.
	Air-permeable insulation is not used as a sealing material.
	Air-permeable insulation is inside of an air barrier.
Ceiling/attic	Air barrier in any dropped ceiling/soffit is substantially aligned with insulation and any gaps are sealed.
	Attic access (except unvented attic), knee wall door, or drop down stair is sealed.
Walls	Corners and headers are insulated.
	Junction of foundation and sill plate is sealed.
Windows and doors	Space between window/door jambs and framing is sealed.
Rim joists	Rim joists are insulated and include an air barrier.
Floors (including above-garage and cantilevered floors)	Insulation is installed to maintain permanent contact with underside of subfloor decking.
	Air barrier is installed at any exposed edge of insulation.
Crawl space walls	Insulation is permanently attached to walls.
	Exposed earth in unvented crawl spaces is covered with Class I vapor retarder with overlapping joints taped.
Shafts, penetrations	Duct shafts, utility penetrations, knee walls and flue shafts opening to exterior or unconditioned space are sealed.
Narrow cavities	Batts in narrow cavities are cut to fit, or narrow cavities are filled by sprayed/blown insulation.
Garage separation	Air sealing is provided between the garage and conditioned spaces.
Recessed lighting	Recessed light fixtures are air tight, IC rated, and sealed to drywall. Exception—fixtures in conditioned space.
Plumbing and wiring	Insulation is placed between outside and pipes.
	Batt insulation is cut to fit around wiring and plumbing, or sprayed/blown insulation extends behind piping and wiring.
Shower/tub on exterior wall	Showers and tubs on exterior walls have insulation and an air barrier separating them from the exterior wall.
Electrical/phone box on exterior walls	Air barrier extends behind boxes or air sealed-type boxes are installed.
Common wall	Air barrier is installed in common wall between dwelling units.
HVAC register boots	HVAC register boots that penetrate building envelope are sealed to subfloor or drywall.
Fireplace	Fireplace walls include an air barrier.

CHAPTER 5
COMMERCIAL ENERGY EFFICIENCY

This chapter has been reformatted; some deletions are not marked, relocated sections are not marked.

SECTION 501
GENERAL

501.1 Scope. The requirements contained in this chapter are applicable to commercial buildings, or portions of commercial buildings. These commercial buildings shall meet either the requirements of ASHRAE/IESNA Standard 90.1, *Energy Standard for Buildings Except for Low-Rise Residential Buildings*, or the requirements contained in this chapter.

501.2 Application. The *commercial building* project shall comply with the requirements in Sections 502 (Building envelope requirements), 503 (Building mechanical systems), 504 (Service water heating) and 505 (Electrical power and lighting systems) in its entirety. As an alternative the *commercial building* project shall comply with the requirements of ASHRAE/IESNA 90.1 in its entirety.

Exception: Buildings conforming to Section 506, provided Sections 502.4, 502.5, 503.2, 504, 505.2, 505.3, 505.4, 505.6 and 505.7 are each satisfied.

SECTION 502
BUILDING ENVELOPE REQUIREMENTS

502.1 General (Prescriptive).

502.1.1 Insulation and fenestration criteria. The *building thermal envelope* shall meet the requirements of Tables 502.2(1) and 502.3 based on the climate *zone* specified in Chapter 3. Commercial buildings or portions of commercial buildings enclosing Group R occupancies shall use the *R*-values from the "Group R" column of Table 502.2(1). Commercial buildings or portions of commercial buildings enclosing occupancies other than Group R shall use the *R*-values from the "All other" column of Table 502.2(1). Buildings with a vertical fenestration area or skylight area that exceeds that allowed in Table 502.3 shall comply with the building envelope provisions of ASHRAE/IESNA 90.1.

502.1.2 *U*-factor alternative. An assembly with a *U*-factor, *C*-factor, or *F*-factor equal to or less than that specified in Table 502.1.2 shall be permitted as an alternative to the *R*-value in Table 502.2(1). Commercial buildings or portions of commercial buildings enclosing Group R occupancies shall use the *U*-factor, *C*-factor, or *F*-factor from the "Group R" column of Table 502.1.2. Commercial

TABLE 502.1.2
BUILDING ENVELOPE REQUIREMENTS - OPAQUE ELEMENT, MAXIMUM *U*-FACTORS

CLIMATE ZONE	4		5		6	
	ALL OTHER	GROUP R	ALL OTHER	GROUP R	ALL OTHER	GROUP R
Roofs						
Insulation entirely above deck	U-0.048	U-0.048	U-0.048	U-0.048	U-0.048	U-0.048
Metal buildings	U-0.055	U-0.055	U-0.055	U-0.055	U-0.049	U-0.049
Attic and other	U-0.027	U-0.027	U-0.027	U-0.027	U-0.027	U-0.027
Walls, Above Grade						
Mass	U-0.104	U-0.090	U-0.090	U-0.080	U-0.080	U-0.071
Metal building	U-0.084	U-0.084	U-0.069	U-0.069	U-0.069	U-0.069
Metal framed	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064
Wood framed and other	U-0.089	U-0.064	U-0.064	U-0.051	U-0.051	U-0.051
Below-Grade Walls[a]						
Below-grade walls[a]	C-1.140	C-0.119	C-0.119	C-0.119	C-0.119	C-0.119
Floors						
Mass	U-0.087	U-0.074	U-0.074	U-0.064	U-0.064	U-0.057
Joist/Framing	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033
Slab-on-Grade Floors						
Unheated slabs	F-0.730	F-0.540	F-0.730	F-0.540	F-0.540	F-0.520
Heated slabs	F-0.860	F-0.860	F-0.860	F-0.860	F-0.860	F-0.688

a. When heated slabs are placed below grade, below-grade walls must meet the *F*-factor requirements for perimeter insulation according to the heated slab-on-grade construction.

TABLE 502.2.8.2
FURRING MINIMUM FASTENING REQUIREMENTS FOR APPLICATION OVER FOAM PLASTIC SHEATHING TO SUPPORT SIDING DEAD LOAD[1,2]

FURRING MATERIAL	FRAMING MEMBER	FASTENER TYPE AND MINIMUM SIZE	MINIMUM PENETRATION INTO WALL FRAMING (inches)	FASTENER SPACING IN FURRING (inches)	MAXIMUM THICKNESS OF FOAM SHEATHING (inches)					
					16"oc Furring[4]			24"oc Furring[4]		
					Siding Weight:			Siding Weight:		
					3 psf	11 psf	25 psf	3 psf	11 psf	25 psf
Minimum 1 × Wood Furring[3]	Minimum 2 × Wood Stud	0.120" diameter nail	1 1/4	8	4	4	1.5	4	2	1
				12	4	2	1	4	1.5	0.5
				16	4	2	0.5	4	1	DR
		0.131" diameter nail	1 1/4	8	4	4	2	4	3	1
				12	4	3	1	4	2	0.75
				16	4	2	0.75	4	1.5	DR
		#8 wood screw[5]	1	12	4	4	1.5	4	3	1
				16	4	3	1	4	2	0.5
				24	4	2	0.5	4	1	DR
		1/4" lag screw[5]	1 1/2	12	4	4	3	4	4	1.5
				16	4	4	2	4	3	1
				24	4	3	1	4	2	0.5
Minimum 33 mil Steel Hat Channel or Minimum 1 × Wood Furring[3]	33 mil Steel Stud	#8 screw	Steel thickness + 3 threads	12	3	1.5	DR	3	0.5	DR
				16	3	1	DR	2	DR	DR
				24	2	DR	DR	2	DR	DR
		#10 screw	Steel thickness + 3 threads	12	4	2	R	4	1	DR
				16	4	1.5	DR	3	DR	DR
				24	3	DR	DR	2	DR	DR
	43 mil or thicker Steel Stud	#8 Screw	Steel thickness + 3 threads	12	3	1.5	DR	3	0.5	DR
				16	3	1	DR	2	DR	DR
				24	2	DR	DR	2	DR	DR
		#10 screw	Steel thickness + 3 threads	12	4	3	1.5	4	3	DR
				16	4	3	0.5	4	2	DR
				24	4	2	DR	4	0.5	DR

For SI: 1 inch = 25.4 mm; 1 pound per square foot (psf) = 0.0479 kPa. DR = design required.

1. Table values are based on: (1) minimum 3/4-inch (19.1 mm) thick wood furring and wood studs of Spruce-Pine-Fir or any softwood species with a specific gravity of 0.42 or greater per AFPA/NDS, (2) minimum 33 mil steel hat channel furring of 33 ksi steel, and (3) steel framing of indicated nominal steel thickness and minimum 33 ksi steel for 33 mil and 43 mil steel and 50 ksi steel for 54 mil steel or thicker.
2. Nail fasteners shall comply with ASTM F1667, except nail length shall be permitted to exceed ASTM F1667 standard lengths. Self-drilling tapping screw fasteners for connection of siding to steel framing shall comply with the requirements of AISI S230. Specified fasteners in accordance with the *Building Code of New York State*, Chapter 1405 or the siding manufacturer's approved installation instructions shall meet all other requirements in ASTM F1667 or AISI S230 or be otherwise approved for the intended application.
3. Where the required siding fastener penetration into wood material exceeds 3/4 inch (19.1 mm) and is not more than 1 1/2 inches (38.1 mm), a minimum 2 × wood furring shall be used unless approved deformed shank siding nails or siding screws are used to provide equivalent withdrawal strength allowing connection to 1× wood furring.
4. Furring shall be spaced a maximum of 24 inches o.c. in a vertical or horizontal orientation. In a vertical orientation, furring shall be located over wall studs and attached with the required fastener spacing. In a horizontal orientation, furring strips shall be fastened at each stud intersection with a number of fasteners equivalent to the required fastener spacing. In no case shall fasteners be spaced more than 24 inches (0.6 m) apart.
5. Lag screws shall be installed with a standard cut washer. Lag screws and wood screws shall be predrilled in accordance with AFPA/NDS. Approved self-drilling screws of equal or greater shear and withdrawal strength shall be permitted without predrilling.

servative-treated wood in accordance with the *Building Code of New York State*, Section 2303.1.8 or naturally durable wood and fasteners shall be corrosion resistant in accordance with the *Building Code of New York State*, Section 2304.9.5. Steel hat channel furring shall have a minimum G60 galvanized coating.

Exception: Furring shall not be required over foam plastic sheathing behind anchored stone and masonry veneer installed in accordance with the *Building Code of New York State*, Section 1405.6. Veneer ties shall be installed on the surface of the foam plastic sheathing with fasteners of sufficient length to pass through the thickness of foam plastic sheathing and penetrate framing to provide required pull-out resistance determined in accordance with the *Building Code of New York State*, Chapter 16.

502.3 Fenestration (Prescriptive). Fenestration shall comply with Table 502.3.

502.3.1 Maximum area. The vertical fenestration area (not including opaque doors) shall not exceed the percentage of the gross wall area specified in Table 502.3. The skylight area shall not exceed the percentage of the gross roof area specified in Table 502.3.

TABLE 502.3
BUILDING ENVELOPE REQUIREMENTS: FENESTRATION

CLIMATE ZONE	4	5	6
Vertical Fenestration (40% maximum of above-grade wall)			
U-Factor			
Framing materials other than metal with or without metal reinforcement or cladding			
U-Factor	0.40	0.35	0.35
Metal framing with or without thermal break			
Curtain Wall/Storefront *U*-Factor	0.50	0.45	0.45
Entrance Door *U*-Factor	0.85	0.80	0.80
All Other *U*-Factor[a]	0.55	0.55	0.55
SHGC-All Frame Types			
SHGC: PF < 0.25	0.40	0.40	0.40
SHGC: 0.25 PF < 0.5	NR	NR	NR
SHGC: PF 0.5	NR	NR	NR
Skylights (3% maximum)			
U-Factor	0.60	0.60	0.60
SHGC	0.40	0.40	0.40

NR = No requirement.
PF = Projection factor (See Section 502.3.2).
a. All others includes operable windows, fixed windows and nonentrance

502.3.2 Maximum *U*-factor and SHGC. For vertical fenestration, the maximum *U*-factor and solar heat gain coefficient (SHGC) shall be as specified in Table 502.3, based on the window projection factor. For skylights, the maximum *U*-factor and solar heat gain coefficient (SHGC) shall be as specified in Table 502.3.

The window projection factor shall be determined in accordance with Equation 5-1.

$$PF = A/B \qquad \textbf{(Equation 5-1)}$$

where:

PF = Projection factor (decimal).

A = Distance measured horizontally from the furthest continuous extremity of any overhang, eave, or permanently attached shading device to the vertical surface of the glazing.

B = Distance measured vertically from the bottom of the glazing to the underside of the overhang, eave, or permanently attached shading device.

Where different windows or glass doors have different PF-values, they shall each be evaluated separately, or an area-weighted PF-value shall be calculated and used for all windows and glass doors.

502.4 Air leakage (Mandatory).

502.4.1 Window and door assemblies. The air leakage of window and sliding or swinging door assemblies that are part of the building envelope shall be determined in accordance with AAMA/WDMA/CSA 101/I.S.2/A440, or NFRC 400 by an accredited, independent laboratory, and *labeled* and certified by the manufacturer and shall not exceed 0.3 cfm per square foot (1.5 L/s/m^2), and swinging doors no more than 0.5 cfm per square foot (2.6 L/s/m^2).

Exception: Site-constructed windows and doors that are weatherstripped or sealed in accordance with Section 502.4.3.

502.4.2 Curtain wall, storefront glazing and commercial entrance doors. Curtain wall, *storefront* glazing and commercial-glazed swinging entrance doors and revolving doors shall be tested for air leakage at 1.57 pounds per square foot (psf) (75 Pa) in accordance with ASTM E 283. For curtain walls and *storefront* glazing, the maximum air leakage rate shall be 0.3 cubic foot per minute per square foot (cfm/ft^2) (5.5 m^3/h × m^2) of fenestration area. For commercial glazed swinging entrance doors and revolving doors, the maximum air leakage rate shall be 1.00 cfm/ft^2 (18.3 m^3/h × m^2) of door area when tested in accordance with ASTM E 283.

502.4.3 Continuous air barrier. Except in unheated structures and as permitted by this section, a continuous air barrier shall be installed; sealing all seams, openings, and penetrations of the building and shall be sealed with caulking materials or closed with gasketing systems compatible with the construction materials and location. Joints and seams shall be sealed in the same manner or taped or covered with a moisture vapor-permeable wrapping material. Sealing materials spanning joints between construction materials shall allow for expansion and contraction of the construction materials. Such air barrier shall have all the following characteristics:

1. Continuous throughout the envelope with all joints and seams sealed and with sealed connections between all transitions in planes and changes in materials and at all penetrations.
2. Joined and sealed in a flexible manner to the air barrier component of adjacent assemblies, allowing for the relative movement of these assemblies and components.
3. Installed in accordance with the manufacturer's instructions and in such a manner as to achieve the performance requirements.
4. Penetrations of the continuous air barrier shall be made in a way such that the integrity of the continuous air barrier is maintained.

502.4.3.1 Compliance. Compliance for continuous air barriers may be demonstrated using any one of the following three methods:

1. Materials. Using individual materials that have an air permeability not to exceed 0.02 L/s · m^2 under a pressure differential of 75 Pa [0.004 cfm/ft^2 under a pressure differential of 0.3 in.

water (1.57 lb/ft^2)] when tested in accordance with ASTM E 2178.

2. Assemblies. Assemblies of materials and components shall have an average air leakage not to exceed 0.2 L/s·m^2 under a pressure differential of 75 Pa [0.04 cfm/ft^2 under a pressure differential of 0.3 in. water (1.57 lb/ft^2)] when tested in accordance with ASTM E 2357 or ASTM E 1677. In addition these assemblies must meet the requirement for joints per Section 502.4.3.

3. Building. Testing the completed building and demonstrating that the air leakage rate of the building envelope does not exceed 2.0 L/s·m^2 under a pressure differential of 75 Pa [0.4 cfm/ft^2 at a pressure differential of 0.3 in. water (1.57 psf)] in accordance with ASTM E 779 or an equivalent approved method.

502.4.4 Outdoor air intakes and exhaust openings. Stair and elevator shaft vents and other outdoor air intakes and exhaust openings integral to the building envelope shall be equipped with not less than a Class I motorized, leakage-rated damper with a maximum leakage rate of 4 cfm per square foot (6.8 L/s · m^2) at 1.0 inch water gauge (w.g.) (1250 Pa) when tested in accordance with AMCA 500D.

Exception: Gravity (nonmotorized) dampers are permitted to be used in buildings less than three stories in height above grade.

502.4.5 Loading dock weatherseals. Cargo doors and loading dock doors shall be equipped with weatherseals to restrict infiltration when vehicles are parked in the doorway.

502.4.6 Vestibules. A door that separates *conditioned space* from the exterior shall be protected with an enclosed vestibule, with all 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.

Exceptions:

1. Doors not intended to be used as a building *entrance door*, such as doors to mechanical or electrical equipment rooms.
2. Doors opening directly from a *sleeping unit* or dwelling unit.
3. Doors that open directly from a space less than 3,000 square feet (279 m^2) in area.
4. Revolving doors.
5. Doors used primarily to facilitate vehicular movement or material handling and adjacent personnel doors.

502.4.7 Recessed lighting. Recessed luminaires installed in the *building thermal envelope* shall be sealed to limit air leakage between conditioned and unconditioned spaces. All recessed luminaires shall be IC-rated and labeled as meeting ASTM E 283 when tested at 1.57 psf (75 Pa) pressure differential with no more than 2.0 cfm (0.944 L/s) of air movement from the *conditioned space* to the ceiling cavity. All recessed luminaires shall be sealed with a gasket or caulk between the housing and interior wall or ceiling covering.

502.5 Vapor retarders (Mandatory). Class I or II vapor retarders are required on the interior side of walls in Zones 5 and 6 for all framed walls, floors and ceilings where the framed cavity is not ventilated to allow moisture to escape.

Exceptions:

1. *Basement walls.*
2. Below-grade portion of any wall.
3. Construction where moisture or its freezing will not damage the materials.

502.5.1 Class III vapor retarders. Class III vapor retarders shall be permitted where the conditions in Table 502.5.1 are met.

TABLE 502.5.1
CLASS III VAPOR RETARDERS

ZONE	CLASS III VAPOR RETARDERS PERMITTED FOR
5	Vented cladding over OSB Vented cladding over Plywood Vented cladding over Fiberboard Vented cladding over Gypsum Insulated sheathing with R-value ≥ 5 over 2 × 4 wall Insulated sheathing with R-value ≥ 7.5 over 2 × 6 wall
6	Vented cladding over Fiberboard Vented cladding over Gypsum Insulated sheathing with R-value ≥ 7.5 over 2 × 4 wall Insulated sheathing with R-value ≥ 11.25 over 2 × 6 wall

502.5.2 Material vapor retarder class. The vapor retarder class shall be based on the manufacturer's certified testing or a tested assembly. The following shall be deemed to meet the class specified:

Class I: Sheet polyethylene, nonperforated aluminum foil

Class II: Kraft faced fiberglass batts

Class III: Latex or enamel paint

502.5.3 Minimum clear air spaces and vented openings for vented cladding. For the purposes of this section, vented cladding shall include the following minimum clear air spaces or vented siding:

1. Stucco with a $^3/_8$-inch (9.52 mm) clear airspace with $^3/_8$-inch (9.52 mm) continuous slot vent openings at the top and bottom of each wall.
2. Brick with a 2-inch (51 mm) clear airspace behind the brick with vents at both the top and bottom of the brick. The vents shall be $^3/_8$ inch × 2.5-inch (9.52 mm × 63 mm) openings every third brick at both the bottom and top.
3. Stone or masonry veneer with a 2-inch (51 mm) clear airspace behind the stone with vents at the top and bottom. The vents shall have at least 1 square