New York City Energy Conservation Code Requirements for Structural Thermal Breaks

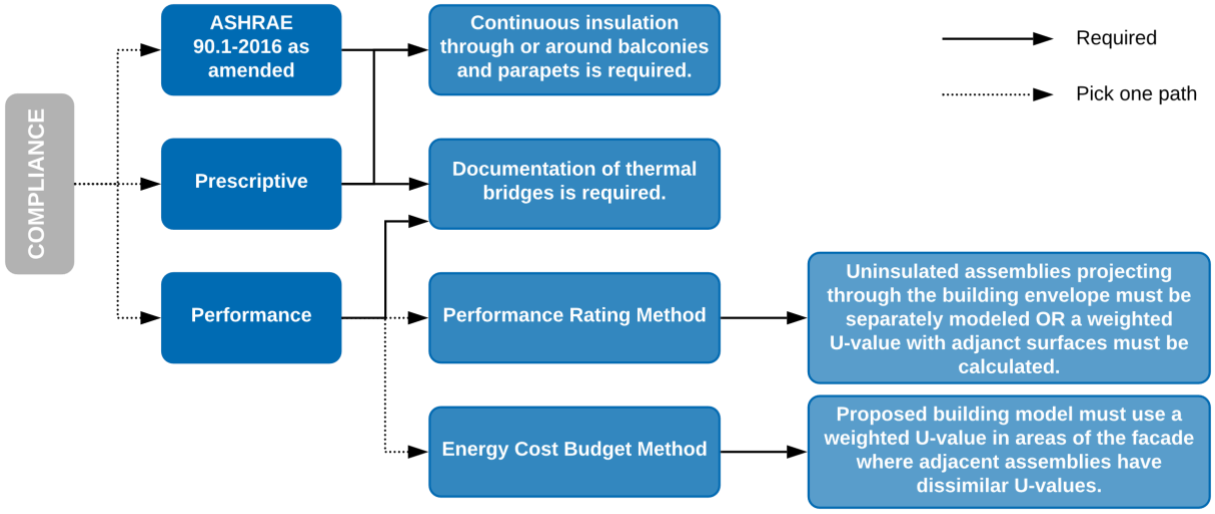
Updated: July 15, 2020

The short version: Thermal breaks or wrapped insulation is required for balconies and parapets unless you can show that your proposed building performs better than a baseline building. Documentation of thermal bridges is also required.

For the long version, keep reading.

Compliance

Commercial buildings are required to comply with one of three compliance paths.



1. **ASHRAE Compliance Path:** The requirements of ASHRAE 90.1-2016 (as amended), as set forth in Appendix CA.
2. **Prescriptive Compliance Path:** The requirements of Sections C402 through C405 and C408. In addition, commercial buildings shall comply with Section C406 and tenant spaces shall comply with Section C406.1.1.
3. **Performance Compliance Path:** The requirements of Section C407.

ASHRAE and Prescriptive Compliance Paths

The Prescriptive and ASHRAE Compliance Paths have the same requirements for thermal breaks.

Documentation of thermal bridges is mandatory. When not already included in pre-calculated assembly U-, C-, or F-factors, clear field thermal bridges must be noted in the drawings.

Point thermal bridges greater than or equal in area to 12 in^2 and not associated with HVAC or electrical systems shall be noted as thermal bridges in the drawings.

Linear thermal bridges require documentation in tabular format of

1. Linear thermal bridge type.
2. Aggregate length of each type of linear thermal bridge.
3. Cross-section details of the thermal bridge.
4. Ψ-value for each thermal bridge from Table 5.4.4 or from approved testing or modeling methods.

Table 5.4.4 Average Thermal Transmittance for Unmitigated Linear Thermal Bridges

Type of Thermal Bridge	Ψ-value[a] [Btu / hr ft °F]
Balcony	0.50
Floor Slab	0.44
Fenestration Perimeter Transition[b]	0.32
Parapet	0.42
Shelf Angle	0.41

a. Psi-values are derived from the BC Hydro Building Envelope Thermal Bridging Guide Version 1.2 –September 2018, and are based on poor performing details.

b. Fenestration Perimeter Transition is the thermal bridge between any fenestration frame and the typical wall, roof or floor assembly it abuts or is mounted within.

Insulation is required to be continuous through or around balconies. Where there are balconies or parapets that interrupt the building thermal envelope, two options are presented:

C402.2.9 Continuous insulation. In new construction, balconies and parapets that interrupt the building thermal envelope shall comply with one of the following:

1. Shall be insulated with continuous insulation having a minimum thermal resistance equivalent to the continuous insulation component required in the adjacent wall assembly as listed in Table C402.1.3. Where more than one wall assembly is interrupted by an adjacent balcony, the higher thermal resistance shall be followed.
2. Shall incorporate a minimum R-3 thermal break where the structural element penetrates the building thermal envelope.

Total Building Performance Compliance Path

Buildings following the total building performance path must comply with ASHRAE 90.1-2016 (as amended), as set forth in Appendix CA of the NYCECC, demonstrating compliance under Section 11 or Appendix G of such standard.

Section 11 outlines the Energy Cost Budget Method, which offers an alternative to the prescriptive provisions. Using an approved simulation engine, the design energy cost must not exceed the budget energy cost.

For modeling the envelope of the design building vs. the budget building, the below applies to areas of the building envelope with dissimilar U-values, which encompasses areas of thermal bridging.

5. *Building Envelope*

All components of the *building envelope* in the *proposed design* shall be modeled as shown on architectural drawings or as installed for *existing building envelopes*. *Opaque* portions of the curtain *wall* shall use the default U-factors in Table 5.5.3, unless an alternative method is approved by the department.

Exceptions: The following *building* elements are permitted to differ from architectural drawings.

1. Any *building envelope* assembly that covers less than 5% of the total area of that assembly type (e.g., *exterior walls*) need not be separately described, provided that its U-factor is similar to an assembly being modeled. If not separately described, the area of a *building envelope* assembly must be added to the area of the adjacent assembly of that same type. The *U-factors* of these assemblies shall be averaged with larger adjacent surfaces using an area-weighted average method. When the total area of penetrations from through-the-*wall* mechanical *equipment* or *equipment* listed in Table 6.8.1-4 exceeds 1% of the *opaque above-grade wall* area, the mechanical *equipment* penetration area shall be calculated as a separate *wall* assembly with a default U-factor of 0.5. Where mechanical *equipment* has been tested in accordance with testing standards approved by the *authority having jurisdiction*, the mechanical equipment penetration area may be calculated as a separate wall assembly with the *U-factor* as determined by such test.

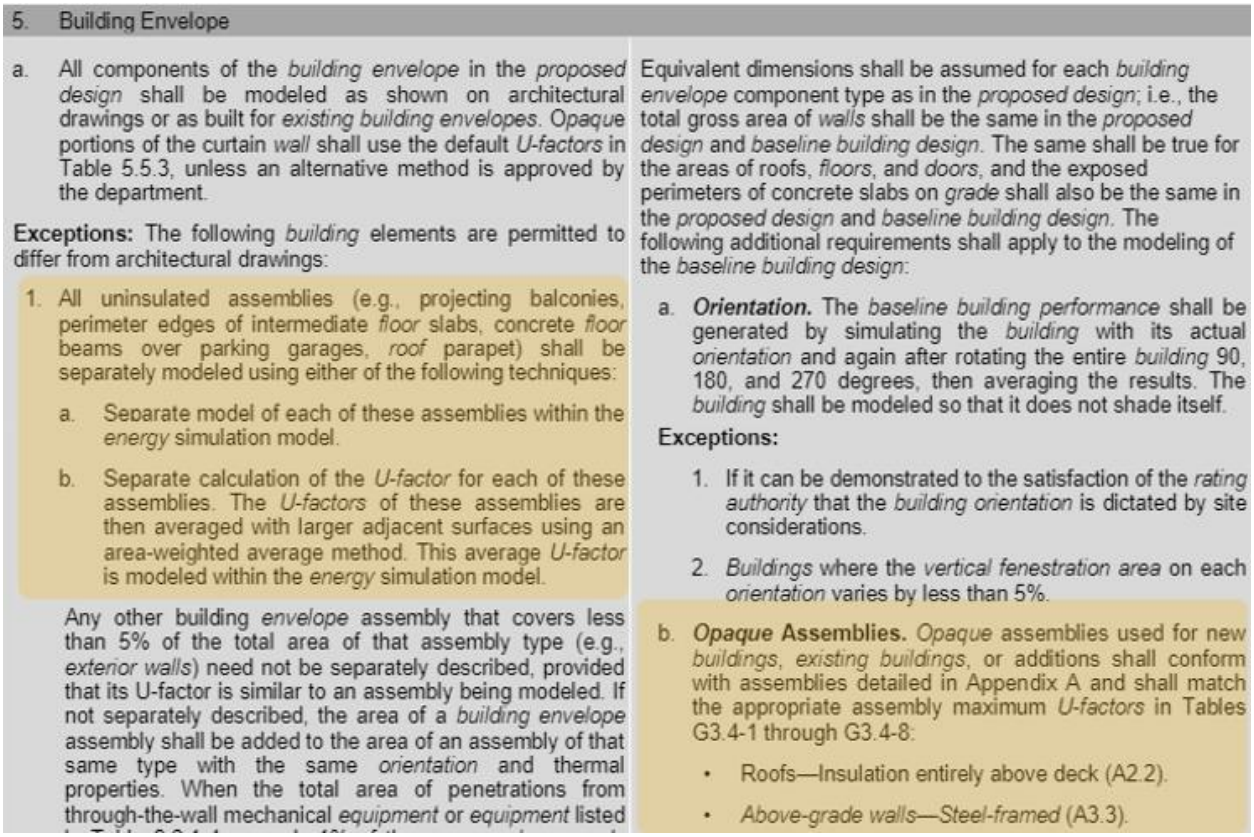
The *budget building design* shall have identical *conditioned floor area* and identical exterior dimensions and orientations as the *proposed design*, except as follows:

a. *Opaque* assemblies, such as *roof*, *floors*, *doors*, and *walls*, shall be modeled as having the same *heat capacity* as the *proposed design* but with the minimum *U-factor* required in Section 5.5 for new *buildings* or additions and Section 5.1.3 for *alterations*.

b. The exterior *roof* surfaces shall be modeled with a solar *reflectance* and thermal *emittance* as required in Section 5.5.3.1.1(a). All other *roofs*, including *roofs* exempted from the requirements in Section 5.5.3.1.1, shall be modeled the same as the *proposed design*.

Appendix G of ASHRAE 90.1-2016 (as amended), as set forth in Appendix CA of the NYCECC outlines the Performance Rating Method. Using an approved simulation engine, either the Performance Cost Index or the Performance Source Energy Index must be calculated.

Regardless of which approach is taken, the below applies for modeling the proposed vs. baseline design regarding the building envelope.



5. Building Envelope

a. All components of the *building envelope* in the *proposed design* shall be modeled as shown on architectural drawings or as built for *existing building envelopes*. Opaque portions of the curtain *wall* shall use the default *U-factors* in Table 5.5.3, unless an alternative method is approved by the department.

Exceptions: The following *building* elements are permitted to differ from architectural drawings:

1. All uninsulated assemblies (e.g., projecting balconies, perimeter edges of intermediate *floor* slabs, concrete *floor* beams over parking garages, *roof* parapet) shall be separately modeled using either of the following techniques:
   a. Separate model of each of these assemblies within the *energy* simulation model.
   b. Separate calculation of the *U-factor* for each of these assemblies. The *U-factors* of these assemblies are then averaged with larger adjacent surfaces using an area-weighted average method. This average *U-factor* is modeled within the *energy* simulation model.

Any other building *envelope* assembly that covers less than 5% of the total area of that assembly type (e.g., *exterior walls*) need not be separately described, provided that its U-factor is similar to an assembly being modeled. If not separately described, the area of a *building envelope* assembly shall be added to the area of an assembly of that same type with the same *orientation* and thermal properties. When the total area of penetrations from through-the-wall mechanical *equipment* or *equipment* listed

Equivalent dimensions shall be assumed for each *building envelope* component type as in the *proposed design*; i.e., the total gross area of *walls* shall be the same in the *proposed design* and *baseline building design*. The same shall be true for the areas of roofs, *floors*, and *doors*, and the exposed perimeters of concrete slabs on *grade* shall also be the same in the *proposed design* and *baseline building design*. The following additional requirements shall apply to the modeling of the *baseline building design*:

a. ***Orientation.*** The *baseline building performance* shall be generated by simulating the *building* with its actual *orientation* and again after rotating the entire *building* 90, 180, and 270 degrees, then averaging the results. The *building* shall be modeled so that it does not shade itself.

Exceptions:

1. If it can be demonstrated to the satisfaction of the *rating authority* that the *building orientation* is dictated by site considerations.
2. *Buildings* where the *vertical fenestration area* on each *orientation* varies by less than 5%.

b. ***Opaque* Assemblies.** *Opaque* assemblies used for new *buildings*, *existing buildings*, or additions shall conform with assemblies detailed in Appendix A and shall match the appropriate assembly maximum *U-factors* in Tables G3.4-1 through G3.4-8:

- Roofs—Insulation entirely above deck (A2.2).
- *Above-grade walls—Steel-framed* (A3.3).

Definitions

The below definitions relate to thermal bridging.

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.

THERMAL BRIDGE: Thermal bridges are elements that interrupt areas of uniform thermal resistance in the building envelope.

Clear field thermal bridge: An area-based thermal transmittance associated with elements of a building envelope assembly which repeat at regular intervals. Examples of clear field thermal bridges include metal or wood studs, brick, ties, and cladding attachments such as z-girts.

Linear thermal bridge: a length-based thermal transmittance associated with horizontal, vertical, or diagonal elements within the building envelope and with length measured along the exterior surface of the building envelope. Examples of linear thermal bridges include balconies or floor assemblies which penetrate walls in the building envelope, fenestration perimeter interfaces, parapets, and shelf angles.

Linear thermal transmittance is heat flow divided by length and by the temperature difference between the interior and exterior sides of the assembly, represented by a Ψ-value (Psi-value) in units Btu/hr•°F (W/mK).

Point thermal bridge: an element-based thermal transmittance associated with a discrete element that penetrates the building envelope. Examples of point thermal bridges include a beam penetrating a wall, a column penetrating a roof or floor, and an anchor or connection used to attach an element to the building and not otherwise addressed as a clear field thermal bridge or linear thermal bridge.

Point thermal transmittance is heat flow divided by the temperature difference between the interior or exterior sides of the assembly represented by a X-value (Chi-Value) in units Btu/hr • °F (W/K)

To discuss thermal break solutions for your next project, contact Schöck North America.

Reference

New York City Buildings: "2020 Energy Conservation Code." 12 May 2020. http://www1.nyc.gov/site/buildings/codes/2020-energy-conservation-code.page