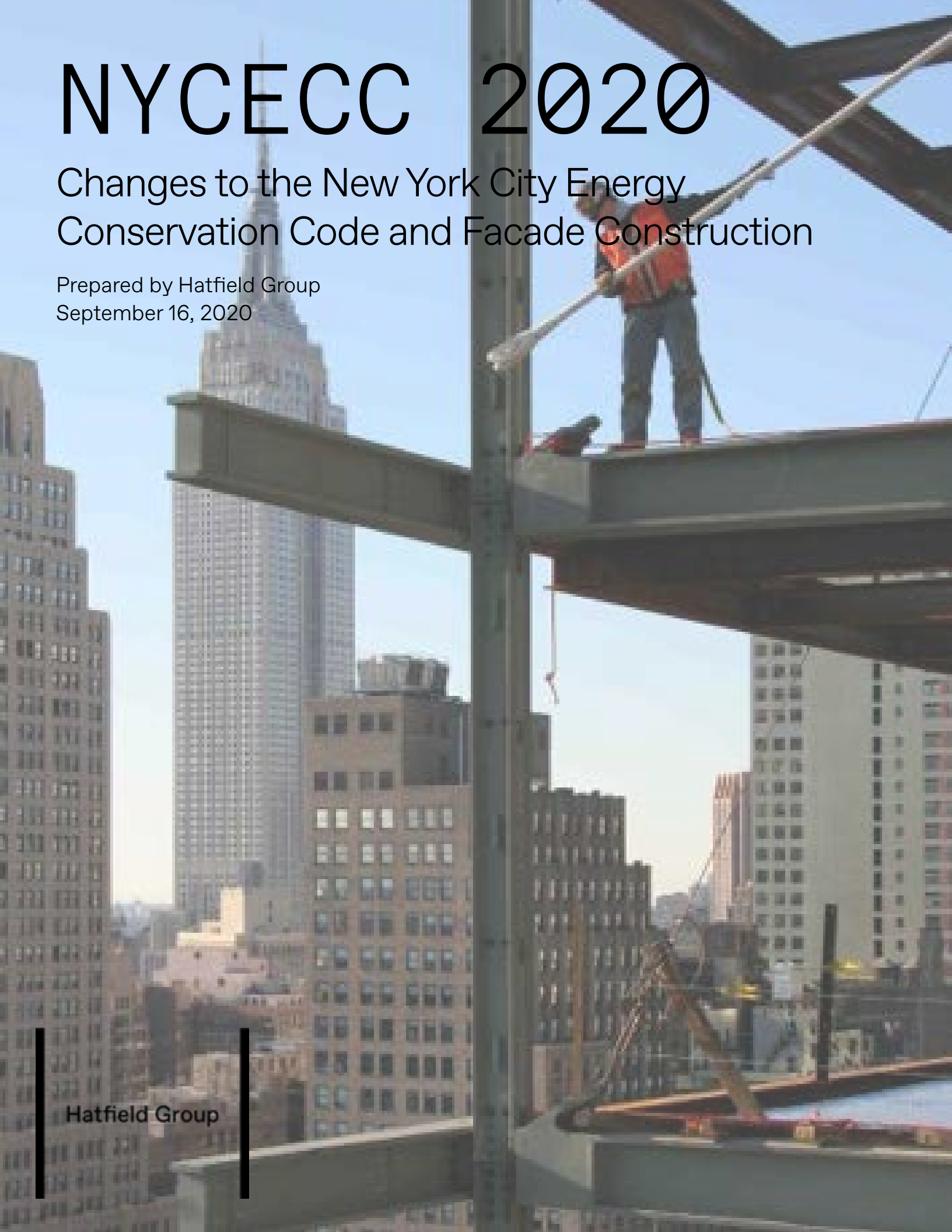
# NYCECC 2020

## Changes to the New York City Energy Conservation Code and Facade Construction

Prepared by Hatfield Group
September 16, 2020



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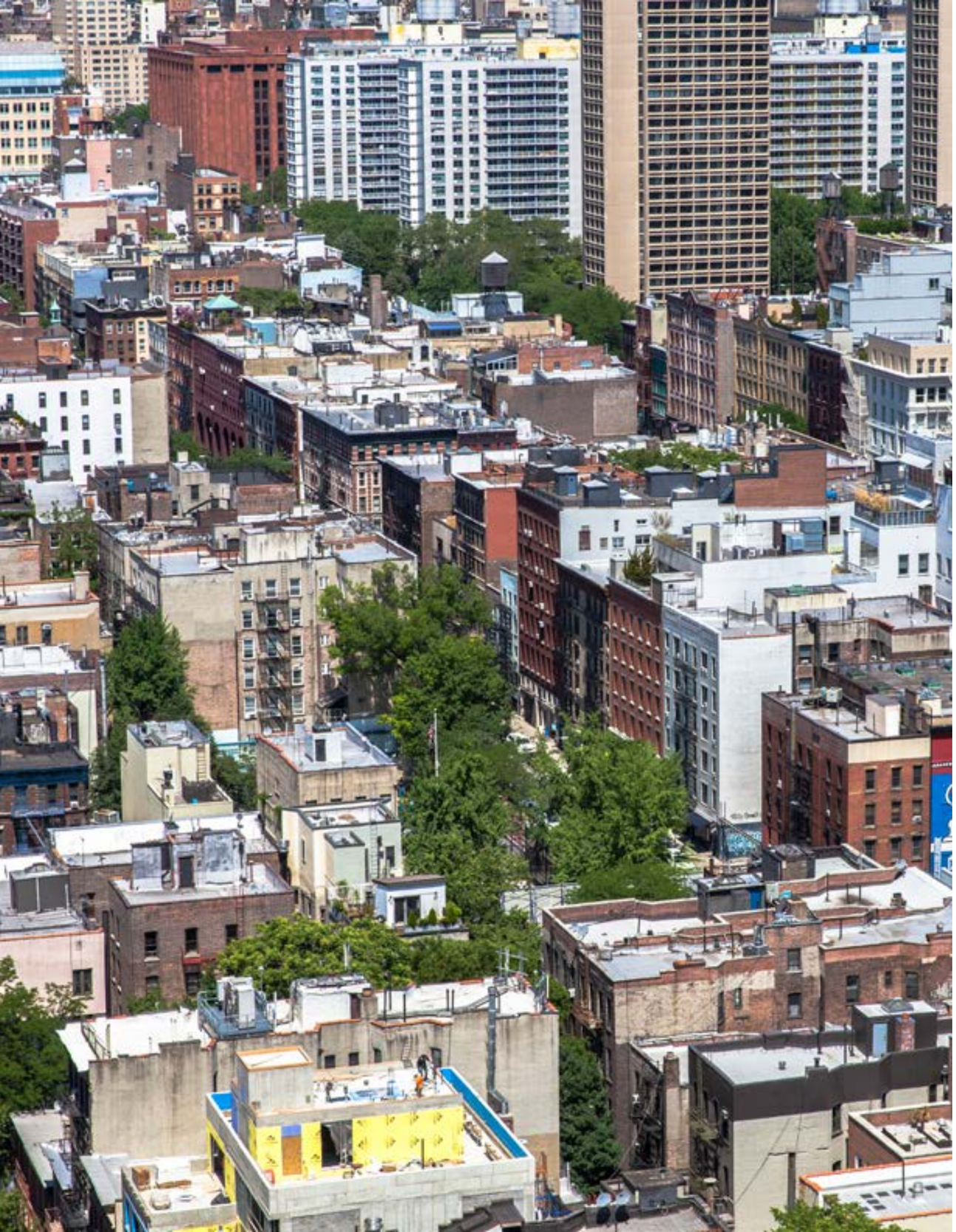

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# Introduction

NYCECC was recently updated to introduce more stringent code requirements for residential and commercial buildings. This white paper summarizes the changes to NYCECC affecting facade design and construction.

New York City Energy Conservation Code (NYCECC) governs energy consumption for New York City buildings and establishes regulations and performance standards for facade, mechanical, and electrical systems. As a City law, NYCECC must abide by all requirements set forth in New York State energy law as codified in the Energy Conservation Construction Code of New York State (ECCCNYS). NYCECC may also enact its own local codes, provided they are more stringent than those set forth by ECCCNYS.

## WHY IS NYCECC BEING UPDATED?

In 2019, New York State voted to update the commercial and residential provisions of the State Energy Code, resulting in 2020 ECCCNYS. The new State provisions must be incorporated into all local energy codes, including NYCECC.

2020 ECCCNYS supports New York State's goal to limit statewide greenhouse gas emissions—caused in part by building energy consumption—to 40% of 1990 levels by 2030 and 85% by 2050, as outlined in the Climate Leadership and Community Protection Act of 2019.

## WHAT IS BEING CHANGED?

NYCEEC 2020 sets forth more stringent energy code requirements for residential and commercial buildings. It reflects changes from three sources:

1. The new State Energy Code requirements codified in 2020 ECCCNYS.

2. NYStretch Energy Code 2020, developed by New York State Energy Research and Development Authority (NYSERDA). NYStrech is an opt-in energy code that provides energy savings roughly 11% above those provided by ECCCNYS.

3. Local New York City laws that address the unique and dense construction environment.

## WHEN DID THESE CHANGES GO INTO EFFECT?

NYCECC 2020 is currently in effect. It went into effect on May 12, 2020.

City Energy Code is required to have the same effective date as State Energy Code. The new State Energy Code went into effect 90 days after the Notice of Adoption, which appeared in the State Register on February 12, 2020.

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# Summary of Key Changes

## New Provisions Affecting Facade Design

NYCECC 2020 mandates several changes that will have wide-ranging impact on facade design and construction in New York City. Below, a summary of the most important of these changes.

### BALCONIES AND PARAPETS

Continuous insulation or thermal breaking is now required for balconies and parapets that interrupt the building's thermal envelope.

### ENERGY MODELING

Buildings that choose to comply with energy modeling are subject to additional thermal envelope performance requirements, including complying with a new performance backstop for buildings 25,000 SF and greater.

### INSULATION

Most assembly types are now subject to more stringent insulation requirements.

### FENESTRATION

Windows, skylights, and transparent doors are now subject to more stringent requirements for both the maximum allowable U-factor and solar heat gain co-efficient.

### ENERGY MONITORING

New commercial buildings 25,000 SF or greater in area and new residential buildings with 10,000 SF or more of common area must now provide measurement devices to monitor energy use for a range of utilities.

### THERMAL BRIDGING DOCUMENTATION

For all new construction, certain clear field, linear, and point thermal bridges must now be documented and quantified.

### AIR LEAKAGE TESTING

Air leakage testing is now mandatory for a wider range of new construction projects than previously.

Image: Billie Grace Ward (Creative Commons)

# Summary of Key Changes

## New Provisions Affecting Facade Design

| | AFFECTED PROJECTS / ASSEMBLIES | SUMMARY OF CHANGES FROM NYCECC 2016 | COMPLIANCE WITH NYCECC 2020 | | | ADOPTED FROM |
|---|---|---|---|---|---|---|
| BALCONIES AND PARAPETS | Balconies and parapets that interrupt the building's thermal envelope | Insulation / thermal break required | Affected assemblies required to either:<br>(1) Be insulated with continuous insulation with thermal resistance at least equal to r-value for adjacent wall assembly, or<br>(2) Provide thermal break with an R-value of at least R-3 where the structural element of the balcony / parapet penetrates the building's thermal envelope | | | NYStrech 2020 |
| ENERGY MONITORING | New commercial buildings 25,000 SF or greater in area<br>New residential buildings with 10,000 SF or greater of common area | Increased energy measurement requirements | Affected projects required to provide measurement devices to individually monitor energy use for (1) natural gas, (2) fuel oil, (3) propane, (4) steam, (5) chilled water, and (6) hot water energy heating supplied by a utility, energy provider, or off-site plant | | | NYStretch 2020 |
| INSULATION | Almost all components of a building's thermal envelope including: roofs, above-grade walls, below-grade walls in residential occupancies, mass floors, and slab-on-grade floors | More stringent R-value requirements | Roofs | R-33CI, Above Deck<br>R-53, Attic and Other | [Previously R-30CI]<br>[Previously R-38] | NYStretch 2020 |
| | | | Above-Grade Walls | R-11.2CI, Mass (All Other)<br>R-13.25CI, Mass (Group R)<br>R-13+R-.5CI, Metal Framed | [Previously R-9.5 CI]<br>[Previously R-11.4CI]<br>[Previously R-13+7.5CI] | |
| | | | Floors Above Unconditioned Space | R-14.6CI (All Other)<br>R-16.7CI (Group R) | [Previously R-10CI]<br>[Previously R-10CI] | |
| AIR BARRIER COMMISSIONING | All buildings 10,000 SF or greater in area | Expanded air barrier commissioning | Affected assemblies require air barrier commissioning<br>(Similar to air barrier continuity plan) | | | NYStretch 2020 |
| FENESTRATION | Windows, skylights, and transparent doors | More stringent U-factor and solar heat gain requirements<br>U-factor calculation now dependent on height and material | Non-Metal Framing (All) | U-2.08 (All Heights) | [Previously R-30CI] | NYC Energy Code Advisory Committee |
| | | | Metal Framing (Fixed) | U-0.30 (Below 95')<br>U-0.36 (95' and Above) | [Previously U-0.38]<br>[Previously U-0.38] | |
| | | | Metal Framing (Operable) | U-0.40 (Below 95')<br>U-0.42 (95' and Above) | [Previously U-0.45]<br>[Previously U-0.45] | |
| | | | Curtain Wall (Fixed) | U-0.36 (All Heights) | [Previously U-0.38] | |
| SPANDREL PANELS | All projects using spandrel panels within curtain wall / glazing systems | New default U-factors (see Appendix—Reference Tables, Table I.) | Default u-factors for affected assemblies determined by either:<br>(1) Using Table C402.1.4.2* to determine effective U-factor based on frame type, spandrel panel, and R-value of insulation between framing<br>Or, if assembly is not found on table (eg: assemblies with backpans, assemblies with no insulation):<br>(2) Conducting a THERM analysis | | | NYC Energy Code Advisory Committee |
| ENERGY MODELING PATH | Residential / commercial buildings 25,000 SF or greater in area | Expanded envelope backstop requirements<br>Adjusted submission requirements | Affected projects require envelope backstop (15% allowance for residential; 7% allowance for non-residential)<br>Submission requirements for energy model include ComCheck + EN1<br>Source energy or energy costs are allowable metrics for energy model compliance<br>Clarification: CO-GEN systems may only take savings from recovered energy | | | NYStretch 2020 |
| THERMAL BRIDGING DOCUMENTATION | New commercial / residential buildings<br>Additions to commercial / residential buildings<br>Any alteration to commercial / residential buildings involving the building envelope | Three types of thermal bridges must be documented on plans | Clear Field Thermal Bridge | U-factors must be taken from ASHRAE 90.1 Appendix A and documented on drawings<br>Assemblies not taking u-factors from ASHRAE 90.1 Must be noted as such in drawings (eg: brick ties, z-girts, cladding, studs) | | NYStretch 2020 |
| | | | Point Thermal Bridge | Must be noted as thermal bridges on drawings when:<br>Commercial buildings—a single point of 12 square inches or greater penetrates the insulation<br>Residential buildings—a single point of 8 square inches or greater penetrates the insulation | | |
| | | | Linear Thermal Bridge (see Appendix—Reference Tables, Tables II–III) | Thermal bridges listed in corresponding Tables R402.6* Or C402.6* Must be documented in a table containing (1) linear thermal bridge type, (2) total length of each bridge throughout entire thermal envelope, (3) identification of a relevant detail showing a cross-section through the thermal bridge (4) Ψ-value for each thermal bridge | | |
| AIR BARRIER TESTING | All buildings with areas between 10,000 SF and 50,000 SF of area | Expanded mandatory blower door testing for small buildings<br>Alternative testing options for R-2 buildings | Visual inspection required for buildings with areas less than 10,000 SF<br>Blower door test required for buildings both (1) between 10,000 SF and 50,000 SF and (2) with a height less than or equal to 75 ft<br>ABC plan or blower door test required for (1) all buildings greater than or equal 50,000 SF in area and (2) buildings between 10,000 SF and 50,000 SF in area and greater than 75 ft tall. | | | NYC Energy Code Advisory Committee |
| GROUP R-3 BUILDINGS | Group R-3 buildings less than 3 stories tall | Additional requirements | Affected projects now require (1) permanent certificate, (2) air leakage testing, and (3) balanced ventilation or energy recovery | | | NYC Energy Code Advisory Committee |

# Thermal Bridges

## Additional Information and Documentation Requirements

### WHAT IS A THERMAL BRIDGE?

A thermal bridge is an area where heat can completely bypass a building's insulation system or significantly reduce its efficacy. They occur when conducive materials interrupt a building's insulation, creating a point-of-least-resistance where heat can transfer across the otherwise insulated building envelope.

Thermal bridges can undermine the energy performance of a building envelope. Structural beams, parapets, balconies, window interfaces, slab edges, and brick ties can all act as thermal bridges.

### NEW DOCUMENTATION REQUIREMENTS

One of NYCECC 2020's most substantial new provisions is the requirement to document thermal bridges on plans for all new buildings, additions, and alterations that involve the building envelope.

This new provision applies to three types of thermal bridges: clear field thermal bridges, point thermal bridges, and linear thermal bridges. Each type has its own criteria and requirements for documentation.

### NO PERFORMANCE REQUIREMENTS

NYCECC 2020 requires documentation of thermal bridges but does not mandate specific performance criteria, though building officials might use the information to gain further insight into the compliance of the building design. Documenting thermal bridges is intended as a first step towards establishing performance regulations. NYC Energy Code Advisory Committee anticipates implementing performance regulations for thermal bridges in future revisions of NYCECC.

Example Documentation: Linear Thermal Bridges

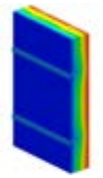
| Linear Thermal Bridge Type | Total Length | Detail Location | Ψ-value |
|---|---|---|---|
| Balcony | 260 feet | A-450 | 0.50 |
| Fenestration Perimeter | 1074 feet | A-452 | 0.32 |
| Shelf Angle | 83 feet | A-500 | 0.41 |

Courtesy of New York City Department of Buildings.

### CLEAR FIELD THERMAL BRIDGES

**DEFINITION**

"Clear field" describes thermal bridges that are uniformly distributed across a wall, floor, or roof assembly including brick ties, Z-girts, cladding, and studs. Because it is impractical to measure heat transmittance across these elements on an individual basis, their cumulative effect is measured.



Clear Field Thermal Bridge
Source: BC Hydro Building Envelope Thermal Bridging Guide V. 1.2 - Sept. 2018

**NYECC 2020 DOCUMENTATION REQUIREMENTS**

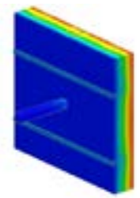
Clear field thermal bridges are taken into account in the assembly types found in ASHRAE 90.1 Appendix A.

Assemblies not taking U-factors from ASHRAE 90.1 Appendix A must be noted as such in the drawings.

### POINT THERMAL BRIDGES

**DEFINITION**

Point thermal bridges occur at only single, infrequent locations—such as a structural beam that penetrates through insulation.



Point Thermal Bridge
Source: BC Hydro Building Envelope Thermal Bridging Guide V. 1.2 - Sept. 2018

**NYECC 2020 DOCUMENTATION REQUIREMENTS**

For commercial buildings, points 12 $in^2$ or larger that penetrate the insulation must be noted in the drawings.

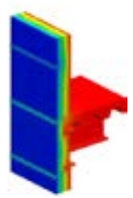
For residential buildings, points 8 $in^2$ or larger that penetrate the insulation must be noted in the drawings.

(Note: These do not include areas associated with HVAC or electrical areas within a building envelope)

### LINEAR THERMAL BRIDGES

**DEFINITION**

Linear thermal bridges extend along a plane of the building envelope and transmit heat across their length, including balconies, parapets, window interfaces, and slab edges.



Linear Thermal Bridge
Source: BC Hydro Building Envelope Thermal Bridging Guide V. 1.2 - Sept. 2018

**NYECC 2020 DOCUMENTATION REQUIREMENTS**

Linear thermal bridges listed in either Table R402.6 or Table C402.6 must be documented in a table that includes:

- Linear thermal bridge type
- Total length of each bridge throughout entire thermal envelope
- Identification of a relevant detail showing a cross-section through the thermal bridge
- Ψ-value for each thermal bridge*

* Ψ-value for each thermal bridge are listed in Table R402.6 and Table C402.6. Alternatives values derived from proper analysis (i.e. THERM analysis) may be used.

# The Future of NYCECC

## Other Legislation Affecting NYC Energy Code

NYCECC is regularly updated to comply with new State and Local Laws. Below, an overview of recent and anticipated legislation that stand to affect future versions of NYCECC.

### LOCAL LAW 32 OF 2018

Local Law 32 mandates that New York City adopt the next version of NYStretch energy code, if it exists, in 2022.

Local Law 32 also requires that the 2025 Code set absolute limits on energy consumption in buildings with 25,000 SF of area or more, based on a to-be-determined metric—such as energy use intensity (EUI) or carbon use.

### LOCAL LAW 97 OF 2019

Local Law 97 sets Greenhouse Gas emissions caps on existing buildings beginning in 2024. Caps will reduce over time to require deep-energy retrofits of all buildings with 25,000 SF of area or more based on their occupancy.

### FUTURE LEGISLATION: NET ZERO BY 2030

According to the NYC Department of Buildings, future legislation is expected to target net-zero performance for all new buildings by 2030.

Image: Billie Grace Ward (Creative Commons)

## APPENDIX—REFERENCE TABLES

I. Table C402.1.4.2

II. Table R402.6

III. Table C402.6

Image: Billie Grace Ward (Creative Commons)

I. TABLE C402.1.4.2
EFFECTIVE U-FACTORS FOR SPANDREL PANELS

| FRAME TYPE | SPANDREL PANEL | RATED R-VALUE OF INSULATION BETWEEN FRAMING MEMBERS | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | R-4 | R-7 | R-10 | R-15 | R-20 | R-25 | R-30 |
| ALUMINUM WITHOUT THERMAL BREAK | Single glass pane, stone, or metal panel | 0.242 | 0.222 | 0.212 | 0.203 | 0.198 | 0.195 | 0.193 |
| | Double glass with no low-e coatings | 0.233 | 0.218 | 0.209 | 0.202 | 0.197 | 0.194 | 0.192 |
| | Triple or low-e glass | 0.226 | 0.214 | 0.207 | 0.200 | 0.196 | 0.194 | 0.192 |
| ALUMINUM WITH THERMAL BREAK | Single glass pane, stone, or metal panel | 0.211 | 0.186 | 0.173 | 0.162 | 0.155 | 0.151 | 0.149 |
| | Double glass with no low-e coatings | 0.200 | 0.180 | 0.170 | 0.160 | 0.154 | 0.151 | 0.148 |
| | Triple or low-e glass | 0.191 | 0.176 | 0.167 | 0.159 | 0.153 | 0.150 | 0.148 |
| STRUCTURAL GLAZING | Single glass pane, stone, or metal panel | 0.195 | 0.163 | 0.147 | 0.132 | 0.123 | 0.118 | 0.114 |
| | Double glass with no low-e coatings | 0.180 | 0.156 | 0.142 | 0.129 | 0.122 | 0.117 | 0.114 |
| | Triple or low-e glass | 0.169 | 0.150 | 0.138 | 0.127 | 0.121 | 0.116 | 0.113 |
| NO FRAMING OR INSULATION IS CONTINUOUS | Single glass pane, stone, or metal panel | 0.148 | 0.102 | 0.078 | 0.056 | 0.044 | 0.036 | 0.031 |
| | Double glass with no low-e coatings | 0.136 | 0.097 | 0.075 | 0.054 | 0.043 | 0.035 | 0.030 |
| | Triple or low-e glass | 0.129 | 0.093 | 0.073 | 0.053 | 0.042 | 0.035 | 0.030 |

From NYCEEC 2020. Courtesy of New York City Department of Buildings.

Appendix—Reference Tables

II. TABLE R402.6 (RESIDENTIAL BUILDINGS)
AVERAGE THERMAL TRANSMITTANCE FOR UNMITIGATED LINEAR THERMAL BRIDGES

| TYPE OF THERMAL BRIDGE | Ψ-VALUE [a] [Btu/hr x ft x ℉] | Ψ-VALUE[a] [W/mK] |
|---|---|---|
| **Steel Frame, Steel Stud, Poured-in-Place Concrete, Concrete Block, Curtain-Wall** | | |
| Balcony | 0.050 | 0.871 |
| Floor [b] | 0.44 | 0.755 |
| Slab to Ground | n/a | n/a |
| Fenestration Perimeter Transition [c] | 0.32 | 0.550 |
| Parapet | 0.42 | 0.735 |
| Eaves | n/a | n/a |
| Shelf Angle | 0.41 | 0.713 |
| **Wood Frame Construction** | | |
| Balcony | n/a | n/a |
| Floor [b] | 0.336 | 0.582 |
| Slab to Ground | n/a | n/a |
| Fenestration Perimeter Transition [c] | 0.15 | 0.26 |
| Parapet | 0.032 | 0.056 |
| Eaves | n/a | n/a |
| Shelf Angle | 0.186 | 0.322 |

a. Psi-values are derived from the ASHRAE Research Project 1365 and *BC Hydro Building Envelope Thermal Bridging Guide Version 1.2 - September 2018*, and are based on poor performing details.
b. This value is for an intermediate floor. Ground to Slab thermal bridging is applicable for all buildings.
c. 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. For each unique window or door installation type, provide a minimum of one typical-installation detail showing either the head, jamb or sill detail of the window or door frame and the abutting wall, roof or floor construction, including all structural and insulation layers, blocking, flashing, and cladding.

From NYCEEC 2020. Courtesy of New York City Department of Buildings.

# Appendix—Reference Tables

## III. TABLE C402.6 (COMMERCIAL BUILDINGS)
## AVERAGE THERMAL TRANSMITTANCE FOR UNMITIGATED LINEAR THERMAL BRIDGES

| TYPE OF THERMAL BRIDGE | Ψ-VALUE [a] [Btu/hr x ft x °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 ASHRAE Research Project 1365 and *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.

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# About Hatfield Group

Inventive engineering rooted in architectural thinking

Hatfield Group is a New York-based, globally-minded team of designers, engineers, and thinkers dedicated to bringing architectural thinking to the field of engineering. Founded by engineer Erleen Hatfield and architect Martin Finio, we think and work like architects to better engineer distinctive and enduring buildings.

Where other engineers see risks, we see opportunities to innovate. We partner with our clients from concept through delivery, treating inventive engineering as an integral part of design. We make the architect's priorities and working methods our own, approaching engineering as an iterative, creative process to realize complex buildings with a meticulous attention to aesthetic intent.

250 West Broadway, 2nd Floor
New York, NY 10013
+1-212-260-1513
info@HatfieldGrp.com
HatfieldGrp.com

Hatfield Group