

### **MODEL COMMERCIAL STRETCH CODE**

NEEP's Model Commercial Stretch Code is a collection of code language developed at the local, state, and national levels to help states in the Northeast and Mid-Atlantic region reach **beyond the 2015 IECC performance level**. Individual provisions can be selected from those presented below to be incorporated into a jurisdiction's building code or formalized into a statewide stretch energy code. Informative boxes like this one will provide a brief summary of each provision.

Be sure to visit NEEP's <u>Building Energy Codes</u> page for the latest version.

See also NEEP's Model Residential Stretch Code.

### I. Air Barrier Compliance

(source: proposed VT Stretch Code, ICC G4-2012 Guideline for Commissioning)

Buildings must comply with either:

- > Materials or Assemblies plus air barrier commissioning or
- > Air leakage testing to 0.40 CFM/SF of shell area

**C701 Air leakage—thermal envelope (Mandatory).** The *thermal envelope* of buildings shall comply with Sections C402.5.1 through C402.5.8 of the base code, in addition to stretch code section C701.1, or the building *thermal envelope* shall be tested and deemed to comply with the provisions of these sections when the tested air leakage rate of the building thermal envelope is not greater than 0.40 cfm/per square foot of shell area (excluding area of slab and below grade walls) at 50 Pa in accordance with ASTM E 779 or an equivalent method approved by the code official or authority having jurisdiction. Where compliance is based on such testing, the building shall also comply with Sections C402.5.5, C402.5.6 and C402.5.7.

**C701.1 Continuous Air Barrier Commissioning.** Prior to the final inspection, the registered design professional shall provide evidence of commissioning of the continuous air barrier by an approved agency. As part of the continuous air barrier commissioning, a building air leakage test shall be performed and the resulting air leakage rate of the building thermal envelope shall be reported in units of cfm/per square foot of shell area (excluding area of slab and below grade walls) at 50 Pa in accordance with ASTM E 779 or an equivalent method approved by the code official or authority having jurisdiction. There is no maximum air leakage rate specified for compliance. A final commissioning report shall be delivered to the building owner, and shall include at a minimum:

1. A field inspection checklist showing the requirements necessary for proper installation of the continuous air barrier.

2. The results of the required building air leakage testing (no maximum air leakage rate specified for compliance).

3. Reports from field inspections during project construction showing compliance with continuous air barrier requirements including but not limited to proper material handling and storage, use of approved materials and approved substitutes, proper material and surface preparation, air barrier continuity at building thermal envelope penetrations

**C701.2 Building Envelope Commissioning Guideline.** In addition to complying with C701.1, projects shall follow all applicable items in Table C701.2.

### TABLE C701.2 BUILDING ENVELOPE Commissioning Checklist

RELATED SYSTEMS, EQUIPMENT, ASSEMBLIES AND COMPONENTS	TASKS/COMMENTS			
• Foundations subsoil drainage system	Verify compliance with approved plans, specifications and construction documents.			
• Foundation damp-proofing and				
waterproofing				
<ul> <li>Flashing at: exterior doors, skylights, wall flashing and</li> </ul>				
drainage systems				
Exterior wall coverings				
Moisture envelopes	Meet Owner's Project Requirements (OPR), Basis of Design			
Moistare envelopes	(BOD), Cx specifications.			
• Exterior below-grade walls	Check for proper drainage system at exterior wall perimeter to			
	keep water from entering the building.			
• External floor and soffits, slab-	Check for thermal resistance or insulation when required.			
on-grade	Slabs: Check drainage for moisture penetration.			
Exterior walls	Check drawings for wall assembly requirements and any sound			
	transmission class (STC) requirements in accordance with ASTM E			
	90 and ASTM E 413.			
<ul> <li>Exterior glazed window</li> </ul>	Drawing reviews and contractor submittal reviews:			
fenestration: windows, glazed	<ul> <li>Check that fenestration products are labeled with a U-factor</li> </ul>			
doors and skylights	(see NFRC 100) and a solar heat gain coefficient (SHGC) (see NFRC			
	200), and certification for the air infiltration requirement of 0.3			
	cfm/ft2 of the 2010 California Energy Code (CEC) or other			
	approved standards.			
	Check for proper flashing and caulking at walls and roof			
	assemblies.			
	Glazed doors:			
	• Check for proper flashing, and seals and gaskets; and proper			
	pull force, if provided with a closer.			
	Check for proper door swing.			
	• Check for STC requirements, if applicable.			
Site-built fenestration: curtain	Check for a label certificate issued by the National Fenestration			
walls and store-front systems,	Rating Council (NFRC) or a label certificate issued by the glazing			
and atrium roof	fabricator that meets the default U-factor of the 2008 CEC and			
	SHGC; or an NFRC component modeling approach (CMA) label			
	certificate or another approved standard.			
	<ul> <li>Check for proper door swing.</li> </ul>			
	<ul> <li>Check for STC requirements, if applicable.</li> </ul>			

• Field-fabricated fenestrations:	• Check for compliance with the default U-factor and the default
fenestration made at the site, not	SHGC in accordance with the tables of the 2008 CEC or another
preformed or cut	approved standard.
Exterior doors	• Check for proper flashing installation at header, walls and floor.
	Check for U-factor requirements for swinging and nonswinging
	doors.
	<ul> <li>Check for appropriate manufacturer's referenced standard</li> </ul>
	[American Architectural Manufacturer's Association (AAMA);
	Canadian Standards Association (CSA); and Window and Door
	Manufacturer's Association (WDMA) or other approved standard]
	product data sheets.
Sealants, control joints and	Check for proper installation in accordance with the
flashing (stationary and	manufacturer's written instructions.
moveable)	
Shading devices (stationary and	<ul> <li>Check for proper anchoring to building with proper flashing at</li> </ul>
moveable)	wall connections.
Structural systems	Check for proper anchoring in accordance with construction
	documents, including metal connectors and beam supports.
Materials and finishes	Check for compliance with allowed volatile organic compound
	limits and proper manufacturer's installation application.

For SI: 1 cubic foot per minute per square foot =  $0.00508 \text{ m}^3/(\text{s} \cdot \text{m}^2)$ .

## **II. Opaque Envelope Requirements**

(source: proposed VT Stretch Code, 2015 IECC)

Buildings must meet more efficient Prescriptive thermal resistance values.

The values provided here were designed for use in Climate Zone 6 (they are simply the 2015 IECC Climate Zone 7/8 values). For other Climate Zones, reference Table C402.1.3 & C402.1.4.

#### TABLE C402.1 BUILDING ENVELOPE REQUIREMENTS-OPAQUE ASSEMBLIES AND ELEMENTS

Component	Maximum Ov	erall U-Factor	Minimum R-Values		
	All other	Group R	All other	Group R	
Roofs		•			
Insulation entirely	U-0	.028	R-3	35ci	
above deck					
Metal buildings	U-0	.029	R-30 + R-11LS		
Attic and Other	U-0	.021	R-	R-49	
Walls, Above Grade					
Mass	U-0	.061	R-2	25ci	
Metal building	U-0	.039	R-13 +	R-19.5ci	
Metal-framed	U-0	.052	R-13 +	R-15.6ci	
Wood-framed and other	U-0	.036	R-13+R-15.6ci or R-20+R-10ci		
Walls, Below Grade					
Below-grade wall	C-0	.092	R-10ci		
Floors					
Mass	U-0.055	U-0.051	R-15ci	R-16.7ci	
Joist/Framing-metal	U-0.032		R-38		
Joist/Framing – Wood &	U-0.033		R-30		
Other					
Slab-on-grade Floors					
Unheated slabs	F-0.48	F-0.45	R-10 for 48 in.	R-15 for 48 in.	
			below	below	
Heated slabs	F-0.55		R-10 for entire slab		
Opaque Doors			•		
Swinging	U-0.37		N/A		
Non-Swinging	N/A		R-4.75		
Upward-acting,	N/A		R-10		
Sectional					

### **III. Fenestration Requirements**

(source: proposed VT Stretch Code, 2015 IECC)

Buildings must meet more efficient Prescriptive values.

The values provided here were designed for use in Climate Zone 4-6 (they are simply the 2015 IECC Climate Zone 7 values).

#### TABLE C402.4 BUILDING ENVELOPE FENESTRATION MAXIMUM U-FACTOR AND SHGC REQUIREMENTS

Vertical Fenestration							
U-factor							
Fixed fenestration	0.	29					
Operable fenestration	0.	37					
Entrance doors	Entrance doors 0.77						
SH	SHGC						
Orientation <sup>a</sup>	Orientation <sup>a</sup> S/E/W N						
PF < 0.2 0.40 0.5							
$0.2 \le PF < 0.5$	$0.2 \le PF < 0.5$ 0.48 0.58						
$PF \ge 0.5$ 0.64 0.64		0.64					
Skylights							
U-factor 0.50							
SHGC 0.40							

<sup>a</sup>PF = Projection factor.

"N" indicates vertical fenestration oriented within 45 degrees of true north. "SEW" indicates orientations other than "N."

## **IV. Exterior Duct Limitation**

(source: proposed VT Stretch Code, Advanced Buildings New Construction Guide)

Five percent limit on ductwork located outside the thermal envelope, with exceptions.

The duct insulation values provided here were designed for use in Climate Zone 5-8 (see comments for Climate Zone 1-4 values).

**C403.2.9 Roof-top unit, duct and plenum insulation and sealing.** Supply and return air ducts and plenums shall be insulated with a minimum of R-8 (R-6 for Climate Zone 4) insulation where located in unconditioned spaces and where located outside the building with a minimum of R-12 (R-8 for CZ 4) insulation. No more than 5% of the ductwork may be located outside the building thermal envelope. Where located within a building envelope assembly, the duct or plenum shall be separated from the building exterior or unconditioned or exempt spaces by a minimum of R-12 (R-8 for CZ 4) insulation.

Exceptions:

1. Where located within equipment.

2. Where the design temperature difference between the interior and exterior of the duct or plenum is not greater than  $15^{\circ}$ F (8°C).

Ducts, air handlers and filter boxes shall be sealed. Joints and seams shall comply with Section 603.9 of the *International Mechanical Code*.

### V. HVAC Energy Recovery

### (source: proposed VT Stretch Code, 2015 IECC)

Requires energy recovery for systems for nearly all ventilation systems.

The values provided here were designed for use in Climate Zone 4-6 (they are simply the 2015 IECC Climate Zone 7/8 values).

**C403.2.7 Energy recovery ventilation systems.** Where the supply airflow rate of a fan system meets or exceeds the values specified in Tables C403.2.7(1) <u>or for ventilation systems operating not less than</u> <u>8,000 hours per year</u>, the system shall include an energy recovery system. [...]

PERCENT (%)	$\geq$ 10% and <	≥ 20% and <	≥ 30% and	≥ 40% and <	≥ 50%	
OUTDOOR AIR AT FULL	20%	30%	< 40%	50%		
DESIGN AIRFLOW RATE						
DESIGN SUPPLY FAN	≥ 4,500	≥ 4,000	≥ 2,500	≥ 1,000	> 0	
AIRFLOW RATE (cfm)						

#### TABLE C403.2.7(1) ENERGY RECOVERY REQUIREMENT

For SI: 1 cfm = 0.4719 L/s.

# **VI. Additional Efficiency Packages**

(source: proposed VT Stretch Code, 2015 IECC)

Requires two of the C406 Additional Efficiency Packages to be chosen instead of one. If package #4 is not chosen, then section C405.XX requirements for renewable-ready energy systems must also be met.

**C406.1** <u>Requirements for renewable-ready energy systems.</u> Building projects with footprint greater than 20,000 square feet, shall install *on-site renewable energy* systems with a minimum rating of 3.7 W/ft<sup>2</sup> or 13 Btu/h·ft<sup>2</sup> (40 W/m<sup>2</sup>) multiplied by the horizontally-projected gross roof area less the area covered by rooftop equipment, skylights, occupied roof decks and planted areas.

**Exception:** Additions, alterations and repairs to existing buildings.

**<u>C406.2</u>** Requirements. Buildings shall comply with at least <u>two</u> of the following package options:

- 1. More efficient HVAC performance in accordance with Section C406.2.
- 2. Reduced lighting power density system in accordance with Section C406.3.
- 3. Enhanced lighting controls in accordance with Section C406.4.
- 4. On-site supply of renewable energy in accordance with Section C406.5.
- 5. Provision of a dedicated outdoor air system for certain HVAC equipment in accordance with Section C406.6.
- 6. High-efficiency service water heating in accordance with Section C406.7.

### **VII. Data Center Requirements**

(source: proposed VT Stretch Code, NBI Core Performance Guide - Tier 2)

#### Requires two of the C406 Additional Efficiency Packages to be chosen instead of one.

**C703.1 Economizers.** Each individual cooling fan system primarily serving computer room(s) shall include either:

1. An integrated air economizer capable of providing 100 percent of the expected system cooling load as calculated in using, an outside air temperatures of 55°F dry-bulb/50°F wet-bulb and below; or

2. An integrated water economizer capable of providing 100 percent of the expected system cooling load as calculated using, an outside air temperatures of 40°F dry-bulb/35°F wet-bulb and below.

#### **Exceptions:**

1. Individual computer rooms under 5 tons.

2. New cooling systems serving an existing computer room in an existing building up to a total of 50 tons of new cooling equipment per building.

3: New cooling systems serving a new computer room in an existing building up to a total of 20 tons of new cooling equipment per building.

4: A computer room may be served by a fan system without an economizer if it is also served by a fan system with an economizer that also serves non-computer room(s) provided that all of the following are met:

(1) The economizer system is sized to meet the design cooling load of the computer room(s) when the non-computer room(s) are at 50% of their design load; and

(2) The economizer system has the ability to serve only the computer room(s), e.g. shut off flow to noncomputer rooms when unoccupied; and

(3) The non-economizer system does not operate when the cooling load of the noncomputer room(s) served by the economizer system is less than 50% of design load.

**C703.1.2 HVAC controls.** Each computer room zone shall have controls that prevent reheating, recooling, and simultaneous provisions of heating and cooling to the same zone, such as mixing or simultaneous supply of air that has been previously mechanically heated and air that has been previously cooled, either by cooling equipment or by economizer systems.

**C703.1.3 Humidification**. Non-adiabatic humidification (e.g. steam, infrared) is prohibited. Where humidification is needed, only adiabatic humidification (e.g. direct evaporative, ultrasonic) is permitted.

**C703.1.4 Fan power limitation.** The total fan power at design conditions of each fan system shall not exceed 27 W/kBtu·h of net sensible cooling capacity.

**C703.1.5 Fan power controls.** Each unitary air conditioner with mechanical cooling capacity exceeding 60,000 Btu/hr and each chilled water fan system shall be designed to vary the airflow rate as a function of actual load and shall have controls and/or devices (such as two-speed or variable speed control) that will result in fan motor demand of no more than 50 percent of design wattage at 66 percent of design fan speed.

**C703.1.6 Air sealing.** Computer rooms with air-cooled computers in racks and with a design load exceeding 175 kW/room shall include air barriers such that there is no significant air path for computer discharge air to recirculate back to computer inlets without passing through a cooling system.

**Exception:** Computer racks with a design load less than 1 kW/rack.

# VIII. EV Charging Stations

(source: proposed VT Stretch Code)

Requires two of the C406 Additional Efficiency Packages to be chosen instead of one.

**C708.1 Electric Vehicle Charging.** Parking spots shall have a socket capable of providing either a level 1 or level 2 charge within 5 feet of the centerline of the parking space ("EV Charging Parking Space"). Level 1 requires one 120V 20 amp grounded AC outlet, or equivalent, for each EV Charging Parking Space. Level 2 requires one 208/240V 40 amp grounded AC outlet, or equivalent, for each EV Charging Parking Space.

#### TABLE C708.1 ELECTRIC VEHICLE CHARGING PARKING SPACES

Facility Type	Minimum Number of Chargers (rounded up to nearest whole number)						
	<25		≥25 and <500		≥500		
	Level 1	Level 2	Level 1	Level 2	Level 1	Level 2	
Retail	0%	0%	2%	1%	1%	5	
Hotel/Motel	4%	0%	2%	1%	1%	5	
Restaurant	4%	4%	2%	2%	1%	5	
Hospital/Health Care	4%	0%	2%	2%	1%	5	
Office	4%	0%	4%	1%	2%	5	
School/University	0%	0%	4%	2%	2%	5	

## **IX. Solar Ready Provisions**

(source: proposed MA base code, ICC proposal CE328-13)

Requires "solar ready zone" to be identified on building plans to streamline any future PV installation. → This language was designed for use in Massachusetts (see comments for other states).

**C402.3 Rooftop solar readiness.** New low-rise commercial buildings and additions of less than 4 stories above grade, with not less than 2,400 square feet of roof area that is either flat or oriented between 110 degrees and 270 degrees of true north shall comply with Sections C402.3.1 through C402.3.6.

### **Exceptions:**

- 1. Assembly Group A-2 and A-3, and High Hazard Group H buildings.
- 2. Buildings with a permanently installed on-site renewable energy system.
- 3. Flat roof areas designed for rooftop vehicle parking facilities.
- 4. Buildings with a solar-ready zone that is shaded for more than 50 percent of daylight hours annually.

C402.3.1 Construction document requirements for solar ready zone. Construction documents shall indicate the solar ready zone.

**C402.3.2 Solar-ready zone area.** The total solar-ready zone area shall be not less than 1,600 square feet, or 50% of the roof area that is either flat or oriented between 110 degrees and 270 degrees of true north, exclusive of mandatory access or set back areas as required by the [authority having jurisdiction/local fire code].

**C402.3.3 Obstructions.** Solar-ready zones shall be free from obstructions, including but not limited to vents, chimneys, and roof-mounted equipment.

**C402.3.4 Roof load documentation.** The structural design loads for roof dead load and roof live load shall be clearly indicated on the construction documents.

**C402.3.5 Interconnection pathway.** Construction documents shall indicate pathways for routing of conduit or plumbing from the solar-ready zone to the electrical service panel or service hot water system.

**C402.3.6 Electrical service reserved space.** The main electrical service panel shall have a reserved space to allow installation of a dual pole circuit breaker for future solar electric installation and shall be labeled "For Future Solar Electric."

## X. Outcome Based Compliance

(source: 2015 IgCC)

This new pathway sets energy use targets by building type and climate zone with the goal of actually achieving expected energy results rather than relying on prescriptive measures or predicted models.

### SECTION 612 OUTCOME-BASED PATHWAY REQUIREMENTS

**612.1 Outcome-based requirements.** Compliance for buildings and their sites to be designed on an outcome basis shall be determined by actual measurement of all the energy being used once the building and the energy using elements associated with the building site are in full operation in accordance with Equation 6-3. Where a building has multiple occupancy types, the maximum allowable energy use shall be based on total gross floor area of each occupancy type in relation to the total gross floor area of all occupancy types within the building. Buildings and building sites complying with this section shall also comply with the International Energy Conservation Code. Compliance shall be based on a determination of actual energy use in accordance with this section.

**Exception:** Buildings having one or more uses or occupancies not listed in Table 612.1 or where a mixed use building in accordance with the International Building Code includes any occupancies not shown in Table 612.1, shall not be eligible to demonstrate compliance with this code in accordance with Section 612.

Climate Zone <sup>a</sup>	4A	5A	6A	7	8	
Use and Occupancy <sup>b</sup>	Reference EUI <sub>r</sub> skBtu/sf/yr					
Business (B)						
Office	167	179	190	208	282	
Bank	167	179	190	208	282	
Medical Office (non-	125	134	148	156	210	
diagnostic)						
Storage (S-2)						
Distribution/	75	87	104	119	186	
Shipping Center						
Mercantile (M)						
Grocery/	522	554	592	633	758	
Food Store						
Assembly (A)						
Library (A-3)	254	275	304	327	434	
Educational (E)						
Elementary/	149	160	182	193	274	
Middle School						
Institutional (I-2)						
Hospital/	425	425	439	446	532	
Inpatient Health						

#### TABLE 612.1 REFERENCE ANNUAL ENERGY USE INDEX (EUIr)

<sup>a</sup> Climate zones as determined in accordance with by Section C301 of the *International Energy Conservation Code*.

<sup>b</sup> Use and occupancy as determined by Chapter 3 of the *International Building Code*.

**612.1.1 zEPI.** All outcome-based designs shall demonstrate a zEPI of not more than 51 as determined in accordance with Equation 6-3.

 $zEPI = 100 (EUI_a / EUI_r)$  (Equation 6-3)

Where:

EUl<sub>a</sub> = the Actual Annual Energy Use Index for the *building* and *building site* expressed in accordance with Section 612.1.2 and Equation 6-4.

 $EUI_r$  = the Reference Annual Energy Use Index for the building use and occupancy in Table 612.1 as adjusted by Section 612.1.3 where applicable

**612.1.2 Actual energy use intensity (EUI**<sub>a</sub>). The actual energy use intensity (EUI<sub>a</sub>) of the building and building site shall be expressed in accordance with this section. On-site renewable energy generation in excess of the generation requirements of Section 610 shall be included in the calculation of the EUI<sub>a</sub>. The EUIa shall be determined in accordance with Equation 6-4 and Sections 612.1.2.1.

 $EUI_a = (AEU_{consumption} - AEU_{renewable})/TCFA$  (Equation 6-4)

Where:

EUI<sub>a</sub> = the energy use intensity of the *building* and *building site* 

AEU<sub>consumption</sub> = the annual energy consumed by the building and building site from all forms of energy specified in Sections 603.3.1 through 603.3.6 and converted to source Btus in accordance with Sections 602.1.2.2 and 602.1.2.3.

AEU<sub>renewable</sub> = the annual energy produced by *onsite renewable energy systems* in excess of the production required by Section 610 and converted to source Btus by multiplying onsite Btu production by a factor of 1.

TCFA = the total conditioned floor area of the building

**612.1.2.1 Measurement of AEUs.** The AEUs shall be determined from metering, utility billing or other form of measurement in accordance with Section 603.

**612.1.3 Reference energy use intensity (EUI**<sub>r</sub>**).** The reference energy use intensity shall be determined utilizing Table 612.1. The EUI<sub>r</sub> value from Table 603.1 shall be adjusted based on the monthly weighted average percentage of occupied floor area during the 12- month compliance period as documented in accordance with 612.3.2. For buildings with multiple use or occupancy designations in Table 612.1, the EUI<sub>r</sub> shall be adjusted based on the weighted area average of the use or occupancy.

**612.2** Annual direct and indirect CO2e emissions. The emissions associated with the  $EUI_a$  shall be less than or equal to the CO2e emissions associated with the CO2e emissions in accordance with the  $EUI_r$  determined in Section 612.1.3. The CO2e emissions calculations for the building and building site shall be determined in accordance with Sections 612.2.1 and 612.2.2 and Equation 6-5. CO2ea  $\leq$  (CO2er x zEPI) / 100 (Equation 6-5)

Where:

zEPI = the minimum score as prescribed by Section 612.1.1

CO2ea = emissions associated with the  $EUI_a$  of the building as determined in accordance with Section 612.1.2

CO2er = emissions associated with the EUI<sub>r</sub> as determined in accordance with Section 612.1.3

**612.2.1 Onsite electricity.** For the purpose of determining compliance with the provisions of Section 612.2, the CO2e emissions associated with onsite electricity use shall be calculated in accordance with Section 602.2.1.

**612.2.2 Onsite nonrenewable energy.** For the purpose of determining compliance with the provisions of Section 612.2, the CO2e emissions associated with onsite non-renewable energy use shall be calculated in accordance with Section 602.2.2.

**612.3 Compliance.** Compliance with Section 612 shall be determined in accordance with Sections 612.3.1 through 612.3.4

**612.3.1 Issuance of temporary certificate of occupancy.** Where the code official determines a building and its site are in compliance with this code other than Section 612, the code official shall issue a Temporary Certificate of Occupancy as authorized in Section 111.3 of the *International Building Code*.

**612.3.2 Reporting of energy use and CO2e emissions.** Within 36 months of issuance of the temporary certificate of occupancy, the building owner shall provide the code official with documentation, in a form acceptable to the code official and certified by a registered design professional, of a continuous 12-month period where the building complies with Sections 612.1 and 612.2. The occupancy or use type for the occupied period utilized in Section 612.1.3 shall be indicated in the documentation and include the time periods and square footage of the building occupied by all building tenants.

**612.3.3 Certificate of occupancy.** Upon compliance with Section 612.3.2, the building shall be issued a Certificate of Occupancy.

**612.3.4 Non-compliance.** Should the building owner fail to comply with Section 612.3.2, the owner shall be deemed non-compliant and be issued a violation.