Northeast Energy Efficiency Partnerships

MODEL RESIDENTIAL 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 Building Energy Codes page for the latest version.

See also NEEP's Model Commercial Stretch Code.

I. More Efficient Windows

(source: proposed MA 2015 IECC)

Require improved thermal performance level (U-0.30) for fenestration, which is already used in new construction in many cases.

R402.1.2 Insulation and fenestration criteria. The *building thermal envelope* shall meet the requirements of Table R402.1.2 based on the climate zone specified in Chapter 3.

TABLE R402.1.2
INSULATION AND FENESTRATION REQUIREMENTS BY COMPONENT[a]

CLIMATE ZONE	**FENESTRATION *U* FACTOR [b]**
4	**0.35~~0~~**
5 – 8	**0.32~~0~~**

TABLE R402.1.4
EQUIVALENT *U*-FACTORS[a]

CLIMATE ZONE	**FENESTRATION *U* FACTOR [b]**
4	**0.35~~0~~**
5 - 8	**0.32~~0~~**

II. Comprehensive Ventilation Improvements

(source: proposed MA 2015 IECC)

Improve indoor environmental quality by requiring increased ventilation rates, certifying equipment quality, ensuring inlets and exhausts are well located, and reducing fan noise.

R403.6 Mechanical ventilation (Mandatory).

~~The building shall be provided with ventilation that meets the requirements of Section M1507 of this code or the *International Mechanical Code*, as applicable, or with other approved means of ventilation. Outdoor air intakes and exhausts shall have automatic or gravity dampers that close when the ventilation system is not operating.~~

Each *dwelling unit* of a *residential building* shall be provided with continuously operating exhaust, supply or balanced mechanical ventilation that has been site verified to meet a minimum airflow per

1. the Energy Star Homes' Version 3.1 or
2. ASHRAE 62.2 - 2013 or
3. the following formula for one- and two-family dwellings and townhouses of three or less *stories above grade plane*:

$$Q = .03 \times CFA + 7.5 \times (N_{br} + 1) - 0.052 \times Q_{50} \times S \times WSF$$

Where: CFA is the *conditioned floor area* in sq ft

N_{br} is the number of bedrooms

Q_{50} is the verified blower door air leakage rate in cfm measured at 50 Pascals

S is the building height factor determined by this table:

stories above grade plane	1	2	3
S	1.00	1.32	1.55

WSF is the shielded weather factor as determined by this table:

Following are MA values. Replace as appropriate for your jurisdiction.

County	**WSF**
Barnstable	0.60
Berkshire	0.52
…	…

R403.6.2 Verification: Installed performance of the mechanical ventilation system shall be tested and verified by a HERS Rater, HERS Rating Field Inspector, or an applicable BPI Certified Professional, and measured using a flow hood, flow grid, or other airflow measuring device in accordance with either RESNET Standard Chapter 8 or ACCA Standard 5.

R403.6.3 Air-moving equipment, selection and installation. As referenced in ASHRAE Standard 62.2-2013, Section 7.1, ventilation devices and equipment shall be tested and certified by AMCA (Air Movement and Control Association) or HVI (Home Ventilating Institute) and the certification label shall be found on the product. Installation of systems or equipment shall be carried out in accordance with manufacturers' design requirements and installation instructions. Where multiple duct sizes and/or exterior hoods are standard options, the minimum size shall not be used.

R403.6.4 Sound Rating. Sound ratings for fans used for whole building ventilation shall be rated at a maximum of 1.0 sone.

> **Exception:** HVAC air handlers and remote-mounted fans need not meet sound requirements. There must be at least 4 ft of ductwork between the remote-mounted fan and intake grille.

R403.6.5 Documentation. The owner and the occupant of the *dwelling unit* shall be provided with information on the ventilation design and systems installed, as well as instructions on the proper operation and maintenance of the ventilation systems. Ventilation controls shall be labeled with regard to their function, unless the function is obvious.

R403.6.6 Air Inlets and Exhausts. All ventilation air inlets shall be located a minimum of 10 ft from vent openings for plumbing drainage systems, appliance vent outlets, exhaust hood outlets, vehicle exhaust, or other known contamination sources; and shall not be obstructed by snow, plantings, or any other material. Outdoor forced air inlets shall be covered with rodent screens having mesh openings not greater than ½ inch. A *whole house mechanical ventilation system* shall not extract air from an unconditioned basement unless *approved* by a *registered design professional*. Where wall inlet or exhaust vents are less than seven (7) feet above finished grade in the area of the venting, including but not limited to decks and porches, a metal or plastic identification plate shall be permanently mounted to the exterior of the building at a minimum height of eight (8) feet above grade directly in line with the vent terminal. The sign shall read, in print size no less than one-half (1/2) inch in size, "MECH. VENT DIRECTLY BELOW. KEEP CLEAR OF ALL OBSTRUCTIONS".

> **Exceptions**:
>
> 1. Ventilation air inlets in the wall $\geq$ 3 ft. from dryer exhausts and contamination sources exiting through the roof.
> 2. No minimum separation distance shall be required between local exhaust outlets in kitchens/bathrooms and windows.
> 3. Vent terminations that meet the requirements of the *National Fuel Gas Code* (NFPA 54/ ANSI Z223 .1) or equivalent.

III. Electric Vehicle Readiness

(source: proposed MA 2015 IECC / VT 2015 IECC-based stretch code)

Ensure minimum circuitry is in place to support future installation of electric vehicle charging infrastructure. Massachusetts's and Vermont's approaches are shown below.

A. MA approach – for all homes, based on building type

R404.2 Electric Vehicle Service Equipment (EVSE) Ready (Mandatory). At least one minimum 40-ampere branch circuit shall be provided to garages and/or the exterior of the building to accommodate a future dedicated Society of Automotive Engineers (SAE) standard J1772-approved Level 2 EVSE. The circuits shall have no other outlets. The service panel shall provide sufficient capacity and space to accommodate the circuit and over-current protective device. A permanent and visible label stating "EV READY" shall be posted in a conspicuous place at both the service panel and the circuit termination point.

The location and number of "EV READY" parking spaces shall be identified on construction documents as follows:

Type of Building	Number of spaces
Single-family dwelling:	1
Two-family dwelling:	1
3 or more unit building:	1 per two units

B. VT approach – only for multi-family, based on # of spaces

R407.3 Electric Vehicle Charging. For multifamily developments of 10 or more dwelling units, 4% of parking spaces (rounded up to the nearest whole number) 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.

Number of Parking Spots	Required Number of EV Charging Parking Spots
10-25	1
26-50	2
51-75	3
76-100	4, etc.

IV. ERI Path Renewable Energy Clarification

(source: proposed MA 2015 IECC / Vermont 2015 IECC-based stretch code)

Establish HERS Index targets or caps for on-site energy generation in HERS Index calculations. Massachusetts's and Vermont's approaches are shown below.

A. MA approach – four HERS Index threshold options for renewables/alternative energy integration

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

R406.4.1 Trade-off for onsite renewable energy systems
New construction following R406.3 or existing buildings and additions following R407.3 may use any combination of the following renewable energy trade-offs to increase the maximum allowable HERS rating for each unit separately served by any combination of the following:

1. Solar photovoltaic array rated at 2.5kW or higher shall offset 5 HERS points.
2. *Clean Biomass Heating System*, solar thermal array, or geothermal heat pump, or a combination of these systems, operating as the primary heating system shall offset 5 HERS points.
3. Solar thermal array for primary domestic hot water heating or a *Clean Biomass Stove* shall offset 2 HERS points.

Note: A *Clean Biomass Stove* offset may not be combined with a primary heating system offset.

Table R406.4.1
Maximum HERS ratings with onsite renewable energy systems.

Renewable energy	None	Solar PV >2.5kW or Renewable primary heating system	Solar PV or Renewable Primary heating & Solar thermal DHW	Solar PV & Renewable Primary Heating & Solar thermal DHW
Maximum HERS index for new construction	**55**	**60**	**62**	**67**
Maximum HERS index for whole house	**65**	**70**	**72**	**77**

renovations or additions				

R502.1.2 Existing plus addition compliance (Simulated Performance Alternative). Where non conditioned space is changed to conditioned space, the addition shall comply where the annual energy cost or energy use of the addition and the existing building, and any alterations that are part of the project, is less than or equal to the annual energy usage of the existing building when the addition and any alterations that are part of the project shall comply with Section N1105 in its entirety.

Exception: Alternatively, the addition and any alterations that are part of the project shall comply with R406 and shall achieve a maximum HERS index using Table R406.4.1.

B. VT approach – cap amount of points that renewables can be contribute to the home's HERS Index (for code compliance purposes only)

Table R407. 2 Maximum Stretch Energy Code Energy Rating Index

Stretch Code Target	54	Maximum HERS Index to demonstrate code compliance
Sub-Target	65	Maximum HERS Index without any renewables incorporated
Renewables Adder	11	Maximum HERS Index points that can be counted towards Code Target

Note: Based on REM/Rate version 14. If the HERS Index scale is revised, the [authority having jurisdiction] may updated these Index points.

V. CAZ testing/Worst Case Depressurization

(source: 2015 IECC Appendix)

Verify that appliances will not backdraft combustion byproducts into the home under the worst case depressurization scenario.

APPENDIX RA
RECOMMENDED PROCEDURE FOR WORST-CASE TESTING OF ATMOSPHERIC VENTING SYSTEMS UNDER R402.4 OR R405 CONDITIONS ≤ 5ACH

SECTION RA101
SCOPE

RA101.1 General.
This appendix is intended to provide guidelines for worst-case testing of atmospheric venting systems. Worst-case testing is recommended to identify problems that weaken draft and restrict combustion air.

SECTION RA201
GENERAL DEFINITIONS

COMBUSTION APPLIANCE ZONE (CAZ). A contiguous air volume within a building that contains a Category I or II atmospherically vented appliance or a Category III or IV direct-vent or integral vent appliance drawing combustion air from inside the building or dwelling unit. The CAZ includes, but is not limited to, a mechanical closet, a mechanical room, or the main body of a house or dwelling unit.

DRAFT. The pressure difference existing between the *appliance* or any component part and the atmosphere that causes a continuous flow of air and products of *combustion* through the gas passages of the *appliance* to the atmosphere.

Mechanical or induced draft. The pressure difference created by the action of a fan, blower or ejector that is located between the *appliance* and the *chimney* or vent termination.

Natural draft. The pressure difference created by a vent or *chimney* because of its height and the temperature difference between the *flue* gases and the atmosphere.

SPILLAGE. Combustion gases emerging from an appliance or venting system into the combustion appliance zone during burner operation.

SECTION RA301
TESTING PROCEDURE

RA301.1 Worst-case testing of atmospheric venting systems.
Buildings or dwelling units containing a Category I or II atmospherically vented appliance; or a Category III or IV direct-vent or integral vent appliance drawing combustion air from inside of the building or dwelling unit, shall have the Combustion Appliance Zone (CAZ) tested for spillage, acceptable draft and carbon monoxide (CO) in accordance with this section. Where required by the *code official*, testing shall be conducted by an *approved* third party. A written report of the results of the test shall be signed by the party conducting the test and provided to the *code official*. Testing shall be performed at any time after creation of all penetrations of the *building thermal* envelope and prior to final inspection.

Exception: Buildings or dwelling units containing only Category III or IV direct-vent or integral vent appliances that do not draw combustion air from inside of the building or dwelling unit.

The enumerated test procedure as follows shall be complied with during testing:
1. Set combustion appliances to the pilot setting or turn off the service disconnects for combustion appliances. Close exterior doors and windows and the fireplace damper. With the building or dwelling unit in this configuration, measure and record the baseline ambient pressure inside the building or dwelling unit CAZ. Compare the baseline ambient pressure of the CAZ to that of the outside ambient pressure and record the difference (Pa).
2. Establish worst case by turning on the *clothes dryer* and all exhaust fans. Close all interior doors that make the CAZ pressure more negative. Turn on the air handler, where present, and leave on if, as a result, the pressure in the CAZ becomes more negative. Check interior door positions again, closing only the interior doors that make the CAZ pressure more negative. Measure net change in pressure from the CAZ to outdoor ambient pressure, correcting for the base ambient pressure inside the home. Record "worst case depressurization" pressure and compare to Table RA301.1(1). Where CAZ depressurization limits are exceeded under worst-case conditions in accordance with Table A301.1(1), additional combustion air shall be provided or other modifications to building air-leakage performance or exhaust appliances such that depressurization is brought within the limits prescribed in Table RA301.1(1).
3. Measure worst-case spillage, acceptable draft and carbon monoxide (CO) by firing the fuel-fired appliance with the smallest Btu capacity first.
a. Test for spillage at the draft diverter with a mirror or smoke puffer. An appliance that continues to spill flue gases for more than 60 seconds fails the spillage test.
b. Test for CO measuring undiluted flue gases in the throat or flue of the appliance using a digital gauge in parts per million (ppm) at the 10-minute mark. Record CO ppm readings to be compared with Table RA301.1(3) upon completion of Step 4. Where the spillage test fails under worst case, go to Step 4.
c. Where spillage ends within 60 seconds, test for acceptable draft in the connector not less than 1 foot (305 mm), but not more than 2 feet (610 mm) downstream of the draft diverter. Record draft pressure and compare to Table RA301.1(2).
d. Fire all other connected appliances simultaneously and test again at the draft diverter of each appliance for spillage, CO and acceptable draft using procedures 3a through 3c.
4. Measure spillage, acceptable draft, and carbon monoxide (CO) under natural conditions—without *clothes dryer* and exhaust fans on—in accordance with the procedure outlined in Step 3, measuring the net change in pressure from worst case condition in Step 3 to natural in the CAZ to confirm the worst case depressurization taken in Step 2. Repeat the process for each appliance, allowing each vent system to cool between tests.
5. Monitor indoor ambient CO in the breathing zone continuously during testing, and abort the test where indoor ambient CO exceeds 35 ppm by turning off the appliance, ventilating the space, and evacuating the building. The CO problem shall be corrected prior to completing combustion safety diagnostics.
6. Make recommendations based on test results and the retrofit action prescribed in Table RA301.1(3).

TABLE RA301.1(1)
CAZ DEPRESSURIZATION LIMITS

VENTING CONDITION	LIMIT (Pa)
Category I, atmospherically vented water heater	–2.0
Category I or II atmospherically vented boiler or furnace common-vented with a Category I atmospherically vented water heater	–3.0
Category I or II atmospherically vented boiler or furnace, equipped with a flue damper, and common vented with a Category I atmospherically vented water heater	–5.0
Category I or II atmospherically vented boiler or furnace alone	–5.0

Category I or II atmospherically vented, fan-assisted boiler or furnace common vented with a Category I atmospherically vented water heater –5.0

Decorative vented, gas appliance –5.0

Power-vented or induced-draft boiler or furnace alone, or fan-assisted water heater alone –15.0

Category IV direct-vented appliances and sealed combustion appliances –50.0

For SI: 6894.76 Pa = 1.0 psi.

TABLE RA301.1(2)
ACCEPTABLE DRAFT TEST CORRECTION

OUTSIDE TEMPERATURE (°F) MINIMUM DRAFT PRESSURE REQUIRED (Pa)

< 10 –2.5

10 – 90 (Outside Temperature ÷ 40) – 2.75

> 90 –0.5

For SI: 6894.76 Pa = 1.0 psi.

TABLE RA301.1(3)
ACCEPTABLE DRAFT TEST CORRECTION

CARBON DIOXIDE LEVEL (ppm) AND OR SPILLAGE AND ACCEPTABLE DRAFT TEST RESULTS RETROFIT ACTION

0 – 25 and Passes Proceed with work

25 < x ≤ 100 and Passes Recommend that CO problem be resolved

25 < x ≤ 100 and Fails in worst case only Recommend an appliance service call and repairs to resolve the problem

100 < x ≤ 400 or Fails under natural conditions Stop! Work shall not proceed until appliance is serviced and problem resolved

> 400 and Passes Stop! Work shall not proceed until appliance is serviced and problem resolved

> 400 and Fails under any condition Emergency! Shut off fuel to appliance and call for service immediately

VI. Solar Ready Roofs

(source: 2015 IECC Appendix)

Verify that minimal steps are taken to identify possible areas for future solar PV installation on new roofs.

APPENDIX RB
SOLAR-READY PROVISIONS—DETACHED ONE- AND TWOFAMILY DWELLINGS, MULTIPLE SINGLE-FAMILY DWELLINGS (TOWNHOUSES)

SECTION RB101
SCOPE
RB101.1 General.
These provisions shall be applicable for new construction where solar-ready provisions are required.

SECTION RB102
GENERAL DEFINITION
SOLAR-READY ZONE. A section or sections of the roof or building overhang designated and reserved for the future installation of a solar photovoltaic or solar thermal system.

SECTION RB103
SOLAR-READY ZONE
RB103.1 General.
New detached one- and two-family dwellings, and multiple single-family dwellings (townhouses) with not less than 600 square feet (55.74 m^2) of roof area oriented between 110 degrees and 270 degrees of true north shall comply with Sections RB103.2 through RB103.8.

Exceptions:

1. New residential buildings with a permanently installed on-site renewable energy system.
2. A building with a solar-ready zone that is shaded for more than 70 percent of daylight hours annually.

RB103.2 Construction document requirements for solar-ready zone.
Construction documents shall indicate the solar-ready zone.

RB103.3 Solar-ready zone area.
The total solar-ready zone area shall be not less than 300 square feet (27.87 m^2) exclusive of mandatory access or set back areas as required by the *International Fire Code*. New multiple single-family dwellings (townhouses) three stories or less in height above grade plane and with a total floor area less than or equal to 2,000 square feet (185.8 m^2) per dwelling shall have a solar-ready zone area of not less than 150 square feet (13.94 m^2). The solar-ready zone shall be composed of areas not less than 5 feet (1524 mm) in width and not less than 80 square feet (7.44 m^2) exclusive of access or set back areas as required by the *International Fire Code*.

RB103.4 Obstructions.
Solar-ready zones shall be free from obstructions, including but not limited to vents, chimneys, and roof-mounted equipment.

RB103.5 Roof load documentation.

The structural design loads for roof dead load and roof live load shall be clearly indicated on the construction documents.

RB103.6 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.

RB103.7 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.” The reserved space shall be positioned at the opposite (load) end from the input feeder location or main circuit location.

RB103.8 Construction documentation certificate.

A permanent certificate, indicating the solar-ready zone and other requirements of this section, shall be posted near the electrical distribution panel, water heater or other conspicuous location by the builder or registered design professional.