



Are You Ready for Solar-Ready? And Other Energy Code Updates Residential

Massachusetts Energy Code Technical
Support Program



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Who Is Mass Save®?

- Mass Save® is an initiative sponsored by Massachusetts' gas and electric utilities and energy efficiency service providers, including
 - The Berkshire Gas Company
 - Blackstone Gas Company
 - Cape Light Compact
 - Columbia Gas of Massachusetts
 - Eversource Energy
 - Liberty Utilities
 - National Grid
 - Unitil

- The Sponsors of Mass Save work closely with the Massachusetts Department of Energy Resources to provide a wide range of services, incentives, trainings, and information promoting energy efficiency that help residents and businesses manage energy use and related costs.



Agenda



- 9th Edition Changes
- Significant changes from IECC 2012 to IECC 2015 with MA amendments
 - Major changes impacting energy efficiency
- Changes to 9th Edition Stretch Code

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January 24, 2017

Massachusetts Energy Code Technical
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PERFORMANCE SYSTEMS
DEVELOPMENT

We Speak  Building

Presented by:
Performance Systems Development

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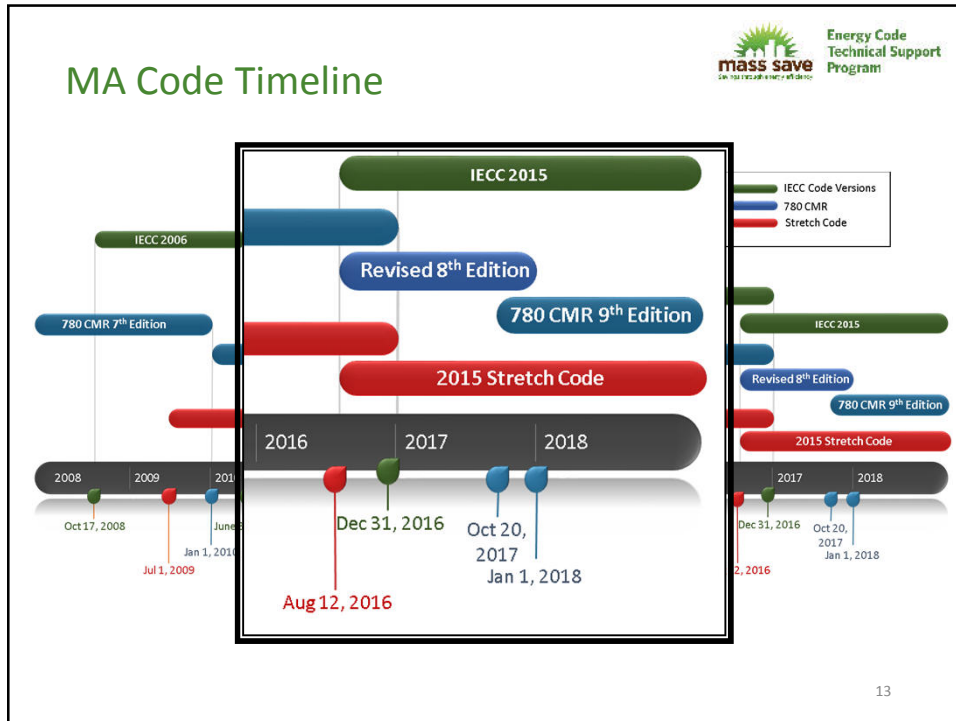
ACEEE State Energy Efficiency Scorecard 2017



Table ES1. Summary of state scores in the 2017 State Scorecard

Rank	State	Utility & public benefits programs & policies (20 pts.)	Transportation policies (10 pts.)	Building energy efficiency policies (8 pts.)	Combined heat & power (4 pts.)	State government initiatives (6 pts.)	Appliance efficiency standards (2 pts.)	TOTAL SCORE (50 pts.)	Change in rank from 2016	Change in score from 2016
1	Massachusetts	19.5	8	7	4	6	0	44.5	0	-0.5
2	California	13	9	8	4	6	2	42	-1	-3
3	Rhode Island	20	7	5	4	5.5	0	41.5	1	2
4	Vermont	18	6	7	2	5.5	0.5	39	-1	-1
5	Oregon	12.5	7.5	7	2.5	6	1	36.5	2	1.5
6	Connecticut	14.5	6.5	6	2.5	6	0	35.5	-1	0
7	New York	10	8	7.5	3.5	5.5	0	34.5	-2	-1
7	Washington	11.5	7	7.5	2.5	6	0	34.5	1	0
9	Minnesota	14.5	4	6	2.5	6	0	33	1	2
10	Maryland	8.5	6.5	6.5	4	5.5	0	31	-1	-1
11	Illinois	9.5	4.5	6	3	4	0	27	2	0.5

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9th Edition Concurrency & Changes

Concurrency period: Oct 20, 2017 to Jan 1, 2018.

“Solar-ready roof-tops” is the only change from 8th Edition to 9th Edition with respect to Residential Energy

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Appendix U: Solar-Ready Provisions



2015 IECC Appendix RB
SOLAR-READY PROVISIONS - DETACHED ONE- AND TWO-FAMILY
 DWELLINGS, MULTIPLE SINGLE-FAMILY DWELLINGS



Adopted by MA and replaced by Appendix U in
 780 CMR

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Appendix U: Solar-Ready Provisions



General

AU 101.1 General

- These provisions shall be applicable for new construction, **except additions**.

AU102 GENERAL DEFINITIONS

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.

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Appendix U: Solar-Ready Provisions

Scope



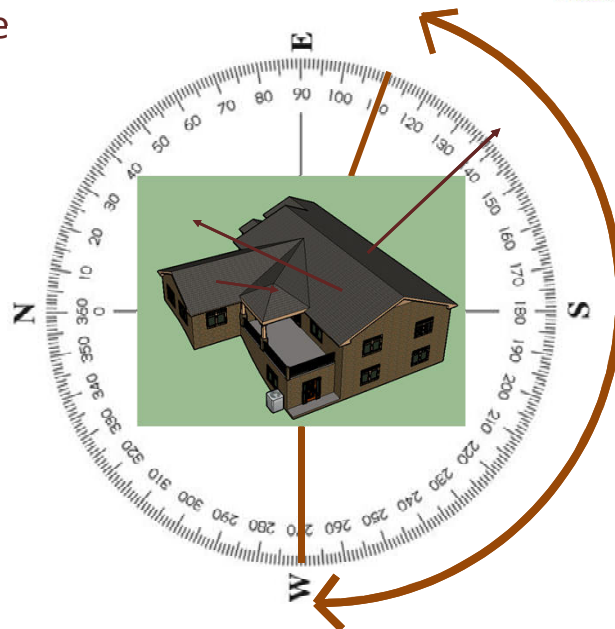
AU103.2 General:

- Applies to new detached one- and two-family dwelling units and townhouses with:
 - Not less than 600 sqft. of roof area
 - Oriented between 110 to 270 degrees of true north

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Appendix U: Solar-Ready Provisions

Scope



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Appendix U: Solar-Ready Provisions – Exceptions



Exception 1: Buildings with permanently installed on-site renewable energy systems

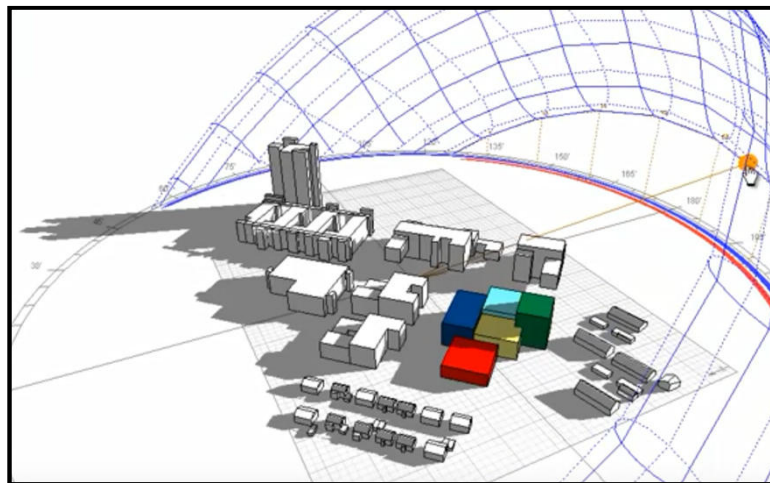


Exception 2: Solar-ready zone shaded for more than 70% of daylight hours



Exception 3: Shown in construction docs to be outside of scope

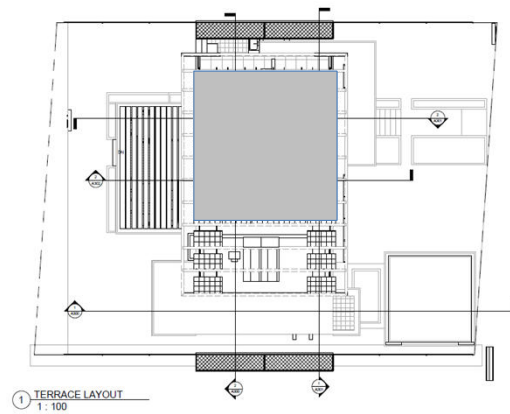
Appendix U: Solar-Ready Provisions – Exceptions



Appendix U: Solar-Ready Provisions – AU 103.2 Construction Documentation



Solar panel layout or solar-ready zone indicated on plans



Solar panel layout

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Appendix U: Solar-Ready Provisions – AU 103.3 Solar-ready zone area



- The solar-ready zone shall not be less than **300 sqft.**
- Or
- If the house is
 - A **townhouse** three stories or less, **and**
 - Total floor area less than 2000 sq.ft
 The solar ready zone shall not be less than **150 sqft.**

These areas are **exclusive** of mandatory access or set-back areas as required by 527 CMR (fire safety code)

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Appendix U: Solar-Ready Provisions – AU 103.3 Solar-ready zone area



- The solar-ready zone areas shall be composed of:
 - Areas not less than 80 square feet
 - At least 5 ft. wide



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Appendix U: Solar-Ready Provisions – AU 103.4 Obstructions



The solar-ready zone should not be obstructed, including but not limited to:

- Vents
- Chimneys
- Roof-mounted

Nothing in Appendix U shall require the construction documents to be redesigned/reconfigured for solar-ready zone

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Appendix U: Solar-Ready Provisions – AU 103.5 Roof Load Documentation



The **structural design loads** for live and dead loads should be clearly indicated on construction documentation

ROOF LOADS:	
GROUND SNOW LOAD, P_g	= 20 PSF
TERRAIN CATEGORY	= C
SNOW EXPOSURE FACTOR, C_e	= 1.0
THERMAL FACTOR, C_t	= 1.1
SLOPE REDUCTION FACTOR, C_s	= 1.0
IMPORTANCE FACTOR, I	= 1.1
MINIMUM FLAT ROOF SNOW LOAD, P_f	= 22 PSF
LIVE LOAD	= 20 PSF
MISCELLANEOUS MECHANICAL AND ELECTRICAL LOADS	= 5 PSF

Image Source: <http://seblog.strongtie.com/2017/01/snow-loading-trusses-specifying-roof-snow-load-isnt-enough/>

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Appendix U: Solar-Ready Provisions – AU 103.6 Interconnection Pathway

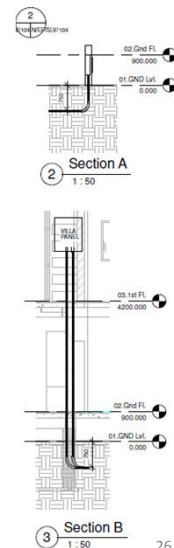


Construction drawings should indicate:

Electrical conduit **pathway** from the solar-ready zone to the electrical panel (PV)

Or

Plumbing **pathway** from the solar-ready zone to the service hot water system (solar thermal)



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Appendix U: Solar-Ready Provisions –

~~AU 103.7 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 installation~~
- ~~• It shall be labeled "For Future Solar Electric"~~

The BBRS voted to delete this section
at their June 5, 2018 meeting

Appendix U: Solar-Ready Provisions –

AU 103.8 Construction Documentation Certificate



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

Duct insulation
 Duct leakage
 Piping insulation
 Mechanical Ventilation
 ERI Path

SIGNIFICANT CHANGES BETWEEN 2012 IECC AND 2015 IECC

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Ducts

R403.3.1 Duct insulation

2012 IECC	
Location of ducts	R-value of duct insulation
Supply ducts in attics	R – 8
All other ducts elsewhere	R – 6

2015 IECC	
Location of ducts	R-value of duct insulation
Supply and Return ducts in attic	R-8 when \geq 3 inch diameter
	R-6 when \leq 3 inch diameter
Supply and Return ducts elsewhere	R-6 when \geq 3 inch diameter
	R-4.2 when \leq 3 inch diameter

No duct insulation required in conditioned space.

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Ducts



R403.3.4 Duct leakage (Amended)

- Prescriptive leakage rates are unchanged
- New distinction between Mandatory vs. Prescriptive
 - Leakage testing is **mandatory** regardless of compliance path
 - Leakage **limits** (below) only apply to prescriptive path

2012 IECC & 2015 IECC	
Location of ducts	R-value of duct insulation
Rough-in test total duct leakage	4 cfm/100 sf when air handler installed
	3 cfm/100 sf when air handler not installed
Postconstruction test	Total leakage less than or equal to 4 cfm/100 sf

N1103.3.3: Testing and verification of ducts to be done by HERS Rater, HERS Field Inspector or BPI Certified Professional

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Pipe Insulation



R403.5.3 Hot water pipe insulation (Prescriptive)

IECC 2012
R-3 required for hot water piping larger than ¾ inch nominal diameter
R-3 for piping from water heater to kitchen outlets

IECC 2015
R-3 required for hot water piping ¾ inch nominal diameter and larger
R-3 for piping from water heater to kitchen outlets

Decreases energy efficiency

Increases energy efficiency

¾ inch is the most common size for long trunk lines in typical residences, this change is likely to improve efficiency as a whole.

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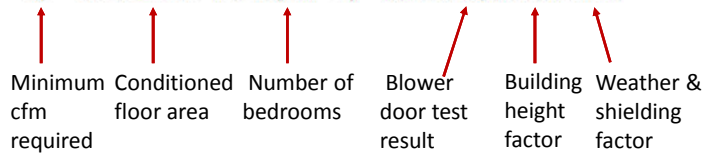
Mechanical Ventilation



R403.6 Mechanical Ventilation (Replaced by MA Code Amendment - Mandatory)

- Each dwelling unit of a residential building shall be provided with continuously operating exhaust, supply or balanced ventilation that meets the requirements of:
 - Energy Star Homes Version 3.1
 - ASHRAE 62.2 – 2013; or
 - Per formula

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



N1103.6.2: Testing and verification of mechanical ventilation system to be done by HERS Rater, HERS Field Inspector or BPI Certified Professional ³⁴

R403.6.2 Verification(Code Amendment)



The performance of the installed mechanical ventilation system shall be tested and verified by

- HERS Rater, or (www.nehers.org)
- HERS Rating Field Inspector, or
- BPI Certified Professional

R403.6.3 Air moving Equipment Selection and Installation(Code Amendment)

Equipment should be tested and verified by AMCA (Air Movement and Control Association) or HVI (Home Ventilating institute).

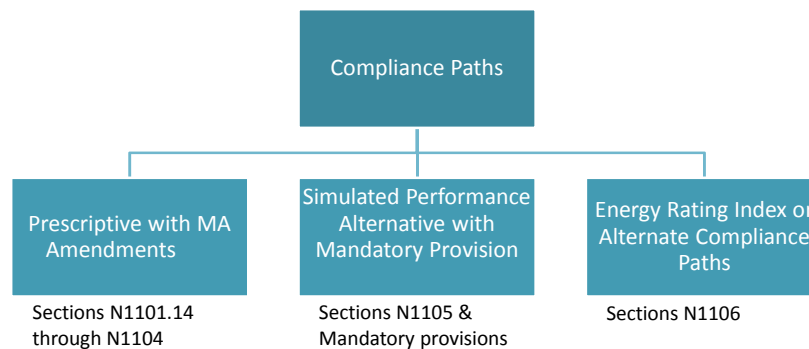
Significant changes between 2012 IECC and 2015 IECC



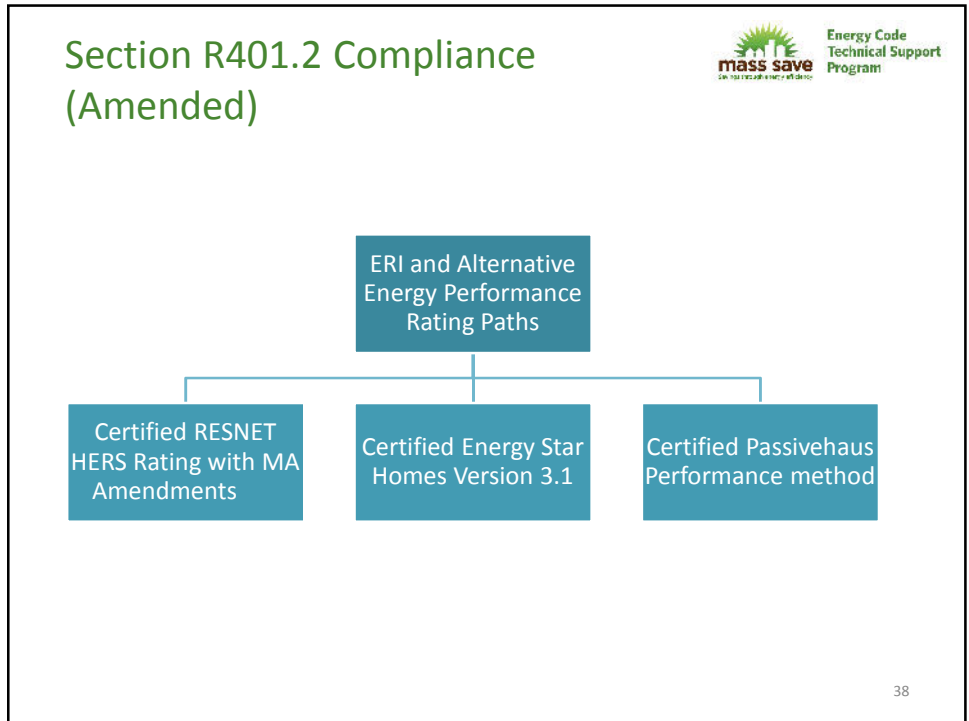
ERI Compliance Path and Alternative Energy Performance Rating Methods

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5. ERI Path/HERS Index Section R401.2 Compliance (Amended)



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Maximum HERS Index Score




Table R406.4.1 (N1106.4.1): Max. HERS index with onsite renewable energy systems

Renewable Energy Source	Maximum HERS Index	
	New Construction	Whole House Renovations; Additions
None	55	65
1 Renewable System: Solar PV > 2.5 kW, or Renewable primary heating system	60	70
2 Renewable Systems: Solar PV + Solar thermal DHW, or Renewable primary heating + solar thermal DHW	62	72
3 Renewable Systems: Solar PV + Renewable primary heating + solar thermal DHW	67	77

Section N1106.4: The building should have a HERS score less than the score listed in the table **prior to credit for onsite renewable electric generation.**

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Energy Performance Index/HERS Index



Table R406.4.1 (N1106.4.1): Maximum HERS index scores with onsite renewable energy systems		
Renewable Energy Source	Maximum HERS Index	
	New Construction	Whole House Renovations; Additions
None	55	65

HERS score should not exceed 55 for New Construction

Section N1103.3.3: Post-construction or rough-in testing and verification shall be done by

- HERS Rater
- HERS Rating Field Inspector
- BPI Certified Professional

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Energy Performance Index/HERS Index

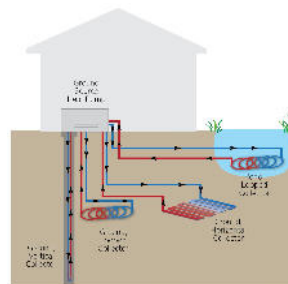


Renewable Primary Heating:

1. Clean biomass heating system
2. Solar thermal (hot water) array
3. Geothermal heat pump
4. Or a combination of all the above

These systems offset 5 HERS points

Wood-pellet fired central boilers and furnaces with a thermal efficiency of at least 80% and ≤ 0.15 lb/MMBtu particulate matter emissions



<https://bascc.pnnl.gov>

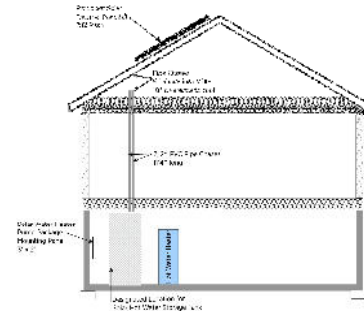
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Energy Performance Index/HERS Index



Two points may be offset by:

Solar thermal array for DHW



<https://bascc.pnnl.gov>

Clean biomass stove*



Creative Commons

*Wood or pellet-fired stoves, EPA certified, PME \leq 3.5 g/hr or 2.0 g/hr for catalytic

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Energy Performance Index/HERS Index



• Renewable offset summary:

Primary heating systems

- Solar Photovoltaic \geq 2.5 kW
- Clean Biomass Heating system
- Ground Source heat Pumps

} Offset 5 HERS points

DHW and stoves

- Solar thermal array for Domestic Water Heating
- Clean Biomass Stove

} Offset 2 HERS points

Clean Biomass stove offset cannot be combined with primary heating system offset.

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Appendix AA – Stretch Energy Code

9TH EDITION STRETCH CODE

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9th Edition Stretch Code

Simplified for 9th Edition

8 th Edition Stretch Code requirements for New Construction (3 stories or less)		9 th Edition Stretch Code for New Construction (4 stories or less)
Dwelling unit size (CFA)	Maximum HERS score	Maximum HERS Score of 55 for New Construction (can be higher if renewables are installed)
Units ≥ 3000 sq.ft.	65	Passive House Institute US (PHIUS) Approved Software
Units < 3000 sq.ft.	70	ENERGY STAR Homes 3.1 Path
Must also comply with Energy Star Thermal Bypass Inspection Checklist		Must also comply with Mandatory Air leakage requirements of IECC 2015 and Table R402.4.1.1

The 9th Edition Stretch Code includes 4 story residential buildings.

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9th Edition Stretch Code

Existing Buildings



For alterations, renovations, additions and repairs of existing buildings, Stretch Code refers back to MA Residential Energy Code (780 CMR 51.00).

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Energy Code Support



Questions about the energy code?

Energy Code Support Hotline:

855-757-9717

Energy Code Support Email:

energycodesma@psdconsulting.com

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Residential New Construction

Incentives for energy efficient building and renovating



- **Low-Rise New Construction**

- Performance Path – based upon Electric and Fuel savings, plus a % adder as compared to MA baseline – incentives up to \$10,000

- **High-Rise New Construction and all Master Metered Natural Gas**

- Incentives based upon modeling by Program Manager

Incentives also offered for existing buildings.
Visit www.MassSave.com for the details.

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Residential New Construction – Incentives



Blended Savings Approach (BSA)

Single Family BSA Incentive Calculation	
A	Electric Savings * \$0.35 / kWh
B	Fuel Savings * \$35 / MMBtu
C	Percent Savings * \$3,000
Participant Incentive	A +B +C
Rater Incentive	\$350

Multifamily BSA Incentive Calculation	
A	Electric Savings * \$0.35 / kWh
B	Fuel Savings * \$35 / MMBtu
C	Percent Savings * \$2,000
Participant Incentive	A +B +C
Rater Incentive	\$100

Details at:
www.masssave.com/en/saving/residential-rebates/new-construction

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Thanks!

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GAS COMPANY



Columbia Gas
of Massachusetts
A Millstone Company

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Unitil
51 my for life