COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF ENERGY RESOURCES
Maura Healey, Governor
Kim Driscoll , Lt. Governor
Rebecca Tepper, Secretary
Elizabeth Mahony, Commissioner
Joanne Bissetta, Director

MASSACHUSETTS
DEPARTMENT OF ENERGY RESOURCES

Town of Barnstable

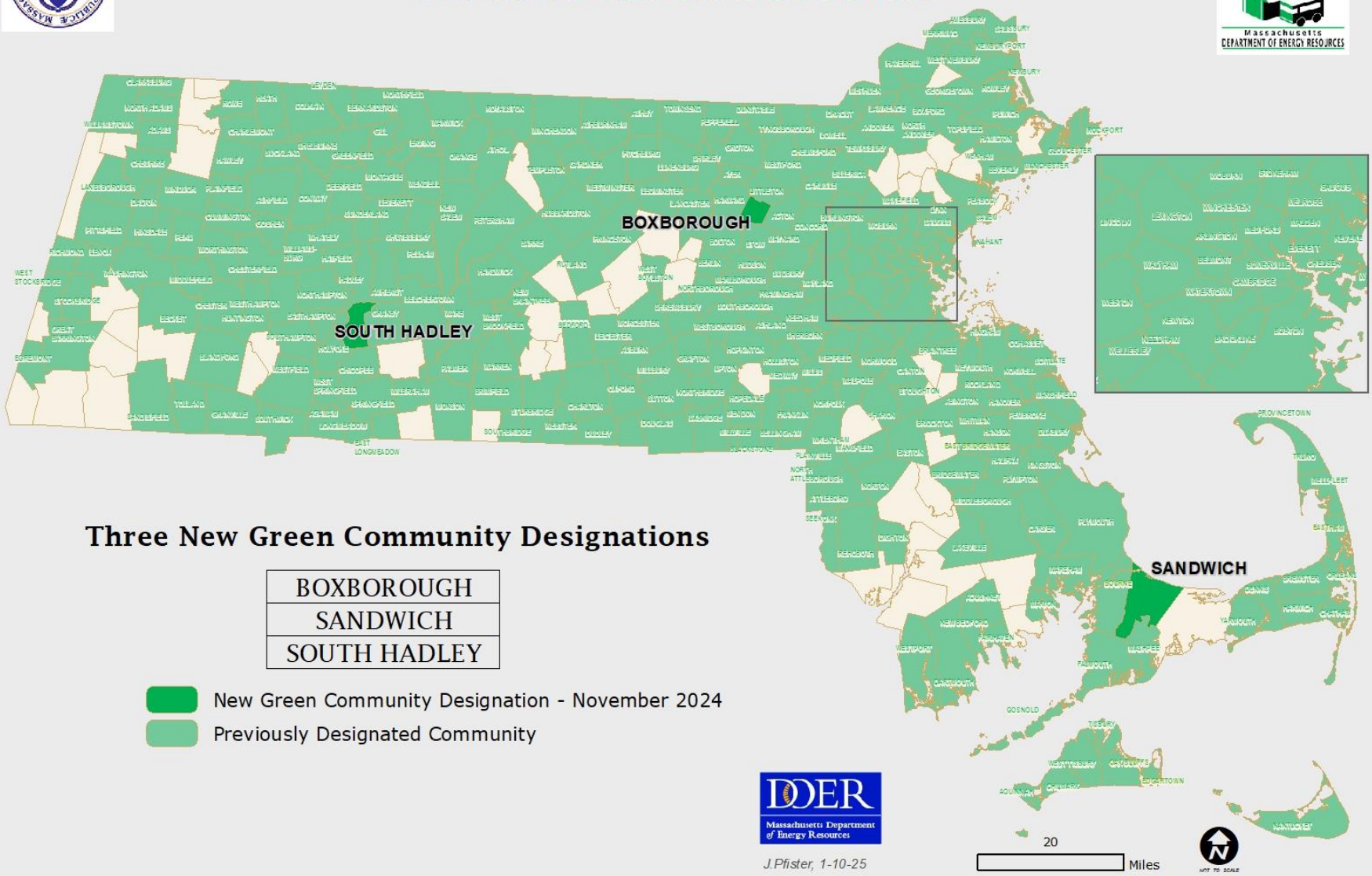
Green Communities & the Stretch Energy Code.

March 20, 2025

Lisa Sullivan, Green Communities-Southeast Regional Coordinator

Mike Rossi, Code Specialist, PSD Consulting

GREEN COMMUNITY DESIGNATIONS REACH TWO HUNDRED NINETY-SEVEN



Three New Green Community Designations

BOXBOROUGH
SANDWICH
SOUTH HADLEY

New Green Community Designation - November 2024

Previously Designated Community

DOER Massachusetts Department of Energy Resources

J.Pfister, 1-10-25

Green Communities Designation and Grant Program

Up to $20M/yr in grants to qualifying communities.

Grants fund energy efficiency initiatives & renewable energy, innovative projects

Creating a Clean, Affordable and Resilient Energy Future for the Commonwealth

Green Communities Designation and Grant Program

>$192 M grants awarded

>44.4m Utility Incenitives

>$29.7 M savings/yr

1049 grants completed

Projected Savings

967,868 MMBTUs x 7,504

71,683 mt CO_2 eq. x 13,305

Creating a Clean, Affordable and Resilient Energy Future for the Commonwealth

Green Communities Designation and Grant Program

- Designation grant allocations based on a $125k base plus a population/per capita income formula; maximum $1M.
- Competitive grants available annually for eligible Green Communities. More than $192 M awarded in total for both designation and competitive grant programs to date
- Projects being funded include energy conservation measures

Barnstable's Green Communities Neighbors

Community	Designation Year	Total Grants
Harwich	2018	$449,250
Mashpee	2010	$770,319
Orleans	2017	$134,709
Provincetown	2011	$541,158
Truro	2011	$510,516
Wellfleet	2014	$598,184

All towns on Cape & Islands except Barnstable are Green Communities

Green Communities Designation and Grant Program

- Designation Grant = $125K + population & per capita income formula

Barnstable's estimated designation grant amount:

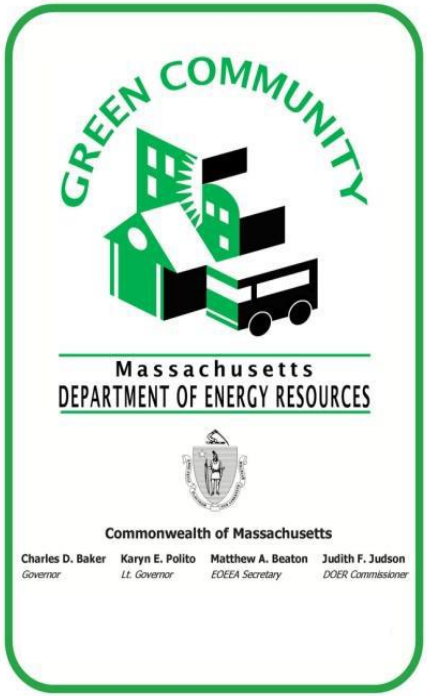
$220,000

- Competitive grants available annually for Green Communities that have expended all prior grant funds.

Green Communities Designation and Grant Program

- Designation grant allocations based on a $125k base plus a population/per capita income formula; maximum $1M.
- Competitive grants 100K-250k available annually for eligible Green Communities.
- Multi year decarbonization grants up to 500k.

Green Communities Designation and Grant Program



Qualification Criteria - Designation

1. Adopt as-of-right siting for RE/AE generation, R&D, or manufacturing -
2. Adopt expedited permitting process
3. Create an Energy Reduction Plan to reduce energy use by 20% in 5 years
4. Adopt Fuel Efficient Vehicle Purchase Policy
5. Minimize life cycle cost in new construction and some additions/renovations→ adopt the Stretch Code

A link to all of our guidance documents:

https://www.mass.gov/guides/becoming-a-designated-green-community

GREEN COMMUNITIES
Massachusetts
DEPARTMENT OF ENERGY RESOURCES

DOER
Massachusetts Department of Energy Resources

Criterion 5 – Minimize Life Cycle Costs

Documentation for Criterion #5:

- **Stretch Energy Code**
  - Documentation of the Town/City Council or Town Meeting vote adopting Code codified by a combination of 225 CMR 22 and 23, Stretch Energy Code.

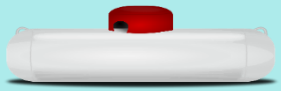
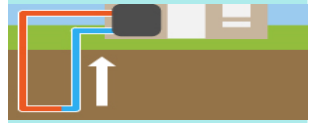
When a town adopts the stretch code, they are adopting future editions.

Climate Act 2021

The legislation signed into law updates the greenhouse gas emissions limits related to the 2008 Global Warming Solutions Act, commits Massachusetts to achieve **Net Zero emissions in 2050**, and authorizes the Secretary of Energy and Environmental Affairs (EEA) to establish an emissions limit of no less than **50% for 2030**, and no less than **75% for 2040**.

2020

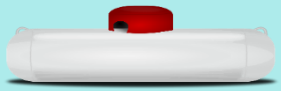
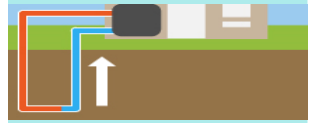
Current grid emissions: ~680 lbs./MWh

OIL	PROPANE	GAS	ELECTRIC RESISTANCE	ELECTRIC COLD CLIMATE AIR SOURCE HEAT PUMP	ELECTRIC GROUND SOURCE HEAT PUMP
					
Pounds of emissions to deliver 1 MMBtu of heat					
170	145	120	205	65	45

45% Less

2050

Future grid emissions: ~200 lbs./MWh

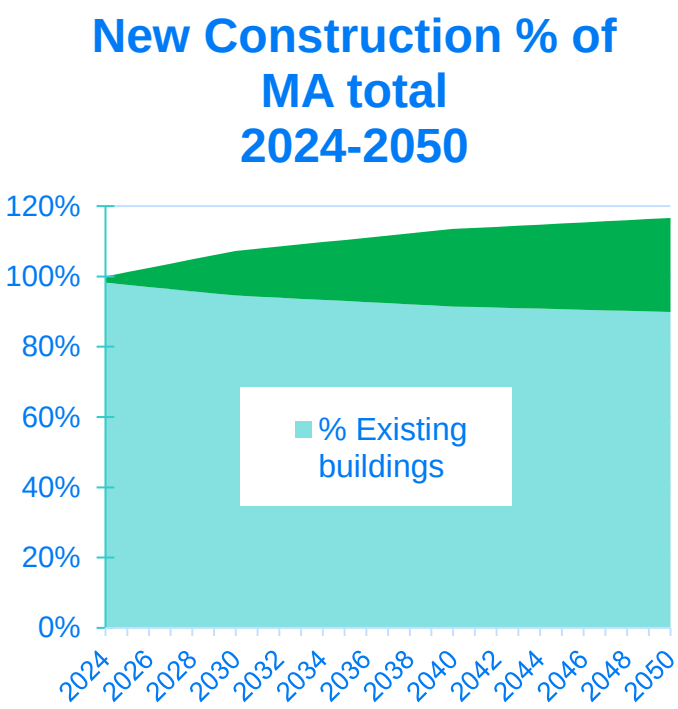
OIL	PROPANE	GAS	ELECTRIC RESISTANCE	ELECTRIC COLD CLIMATE AIR SOURCE HEAT PUMP	ELECTRIC GROUND SOURCE HEAT PUMP
					
Pounds of emissions to deliver 1 MMBtu of heat					
170	145	120	~~205~~ 59	~~65~~ 18	~~45~~ 13

85% Less

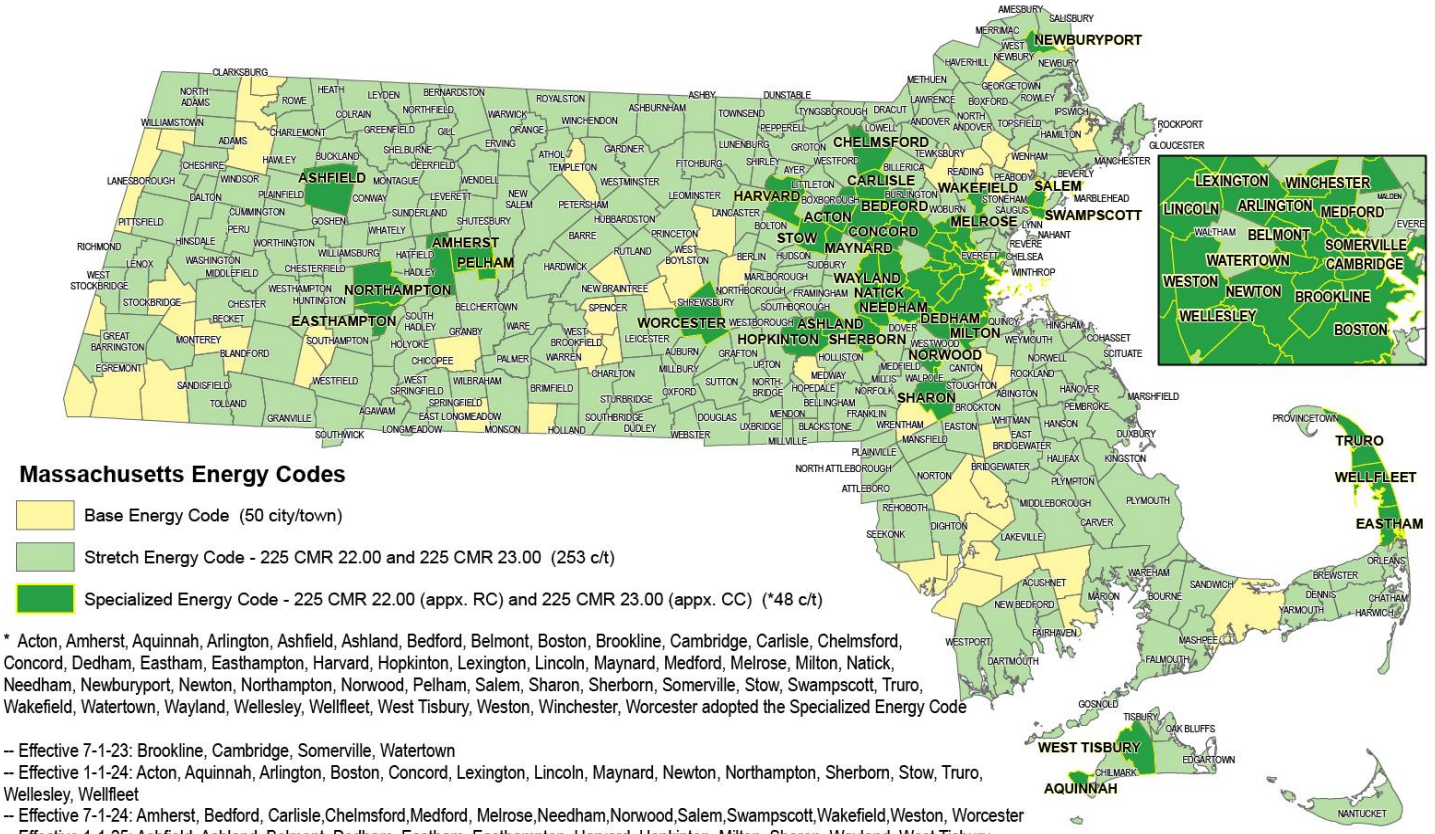
Creating a Clean, Affordable and Resilient Energy Future for the Commonwealth

Building Energy Code's role in reducing emissions

- Minimize lifecycle costs in new construction
- Building code is the primary policy impacting new buildings.
- New buildings (built after 2023) **~27% of all building space by 2050**
- New buildings are easiest and cheapest to make 2050-compliant
- New construction market helps drive cost reductions in building retrofits
- 2030: Massachusetts legal limit is at least 50% reduction in GHG from 1990



Massachusetts Building Energy Code Adoption by Municipality

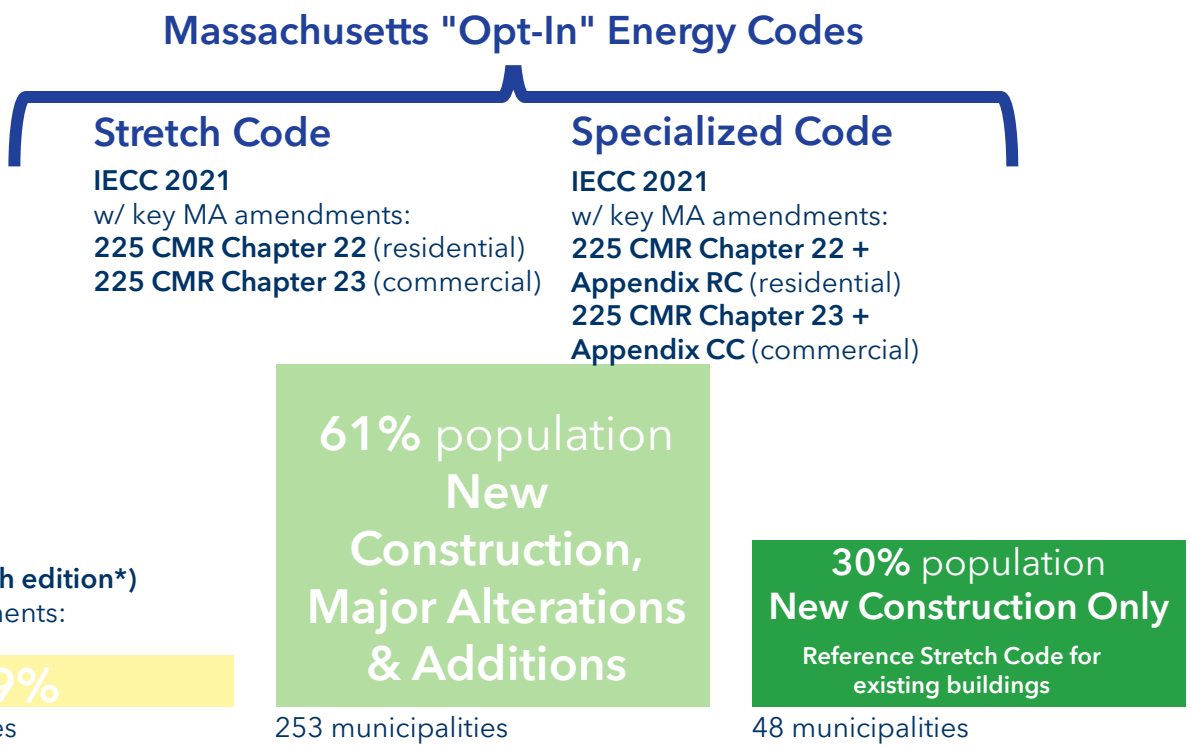


* Acton, Amherst, Aquinnah, Arlington, Ashfield, Ashland, Bedford, Belmont, Boston, Brookline, Cambridge, Carlisle, Chelmsford, Concord, Dedham, Eastham, Easthampton, Harvard, Hopkinton, Lexington, Lincoln, Maynard, Medford, Melrose, Milton, Natick, Needham, Newburyport, Newton, Northampton, Norwood, Pelham, Salem, Sharon, Sherborn, Somerville, Stow, Swampscott, Truro, Wakefield, Watertown, Wayland, Wellesley, Wellfleet, West Tisbury, Weston, Winchester, Worcester adopted the Specialized Energy Code

-- Effective 7-1-23: Brookline, Cambridge, Somerville, Watertown
-- Effective 1-1-24: Acton, Aquinnah, Arlington, Boston, Concord, Lexington, Lincoln, Maynard, Newton, Northampton, Sherborn, Stow, Truro, Wellesley, Wellfleet
-- Effective 7-1-24: Amherst, Bedford, Carlisle,Chelmsford,Medford, Melrose,Needham,Norwood,Salem,Swampscott,Wakefield,Weston, Worcester
-- Effective 1-1-25: Ashfield, Ashland, Belmont, Dedham, Eastham, Easthampton, Harvard, Hopkinton, Milton, Sharon, Wayland, West Tisbury
-- Effective 7-1-25: Natick, Newburyport, Pelham (9-1-25), Winchester

Creating a Clean, Affordable and Resilient Energy Future for the Commonwealth

3 tiers of Energy Code
available to MA towns & cities:



What is a HERS Rating? (Home Energy Rating System)

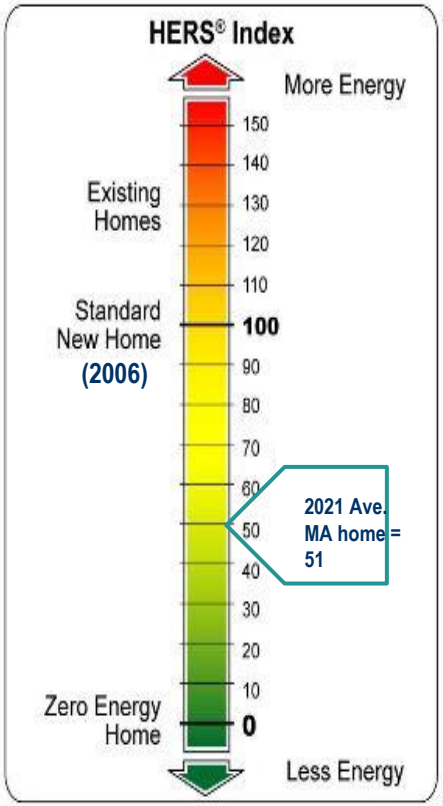
Annualized energy analysis

- Heating, cooling, water heating
- Lighting and appliances

Reference Home

- Based on IECC **2006** Code
  (International Energy Conservation Code)
  Defined as 100 Points
- 1 percent change in consumption = 1 point

HERS 51 means about
49% more efficient than reference home



Why Test Performance?

- Prescriptive codes don't guarantee good installation,

  air and water tightness,

  or that thermal insulation is effective.
- Small air gaps can

  reduce insulation R-values by 50% or more.
- HERS Raters provide third party verification

February 2025 Stretch Code Update

1. Large additions (low-rise residential)
   a. Narrowed/clarified scope so fewer projects will be subject to the stretch code
   b. Made the performance standards more lenient

2. Other changes softening standards/allowing more flexibility

Examples of narrowed/clarified scope of HERS rating requirements for large additions

a. Finishing attics and basements do not require HERS ratings (as long as building footprint or roofline is not changed); otherwise, additions larger than 1,000 sq. ft. or 100% of the existing floor area will require HERS rating for combined dwelling unit
b. Alterations or additions to historic buildings do not require HERS ratings

Examples of more lenient performance standards (large additions)

a. Mixed-fuel buildings: 52 increased to 65
b. Solar electric generation: 55 increased to 70
c. All-electric building: 55 increased to 70
d. Solar electric + all-electric building: 58 increased to 75
e. Note: more lenient standards for Accessory Dwelling Units-- 52-58 (regardless of whether connected to existing house)

Examples of more flexibility to meet performance standards; more lenient standards

a. 3 HERS point bonus credit for embodied carbon in insulation or concrete
b. Ceiling R-value reduced from R-60 to R-49 (prescriptive path)
c. Compliance pathway for passive houses narrowly failing passive house certification

- More details in appendix.
- See https://www.mass.gov/info-details/2025-massachusetts-building-energy-codes#:~:text=DOER%20expects%20the%20final%20regulations,the%20readability%20of%20the%20code.

MASSACHUSETTS
DEPARTMENT OF
ENERGY RESOURCES

Appendix A

Residential Stretch Code Detail/Graphics

Significant Updates Effective 2/14/25 Residential Low-Rise

The following are some of the more notable changes from the 2023 Stretch Code found in the **2025 Stretch Code update:**

HERS rating updates:

1. **HERS credit for embodied carbon** in new construction: 3 HERS points for either insulation or concrete
2. **ADU HERS maximum** for Accessory Dwelling Units: HERS 52-58
3. **HERS ratings for existing building** permits in Chapter 5 are relaxed: HERS 65-75
4. **Exception for historic homes** allows them to follow the prescriptive path

Prescriptive path updates:

5. **Ceiling R-value** reduced from R-60 to R-49
6. **SHGC for windows** – no maximum required

Summary of Other Updates:

Stretch code: Residential Low-Rise

1. **R403.6 Ventilation requirements:** Now reference AHRI standard 1060.
2. **R404.4 EV ready spaces:** Now allows NACS(Tesla) or J1772 EV charger, or NEMA electric outlet.
3. **R405.2 Passive House certification:** Revised language/corrected wording for PHI and Phius certifications.
4. **R405.3 Near Passive House documentation:** Compliance path for projects narrowly failing Passive House certification.

Stretch code: Existing Building Alterations

1. **R501.2 & R506 Adds EnerPHit compliance option** for existing building permits.
2. **R503.1.1 Exception allows min. of R-3.7/inch insulation** in exposed cavities.

HERS Rating Requirements- Updated Stretch Code 2/14/2025

TABLE R406.5 MAXIMUM ENERGY RATING INDEX

Clean Energy Application	Maximum HERS Index score [a,b]				
	~~New construction until June 30, 2024~~	New construction permits after July 1, 2024	New Construction with R406.5.2 embodied carbon credit	Accessory Dwelling Units	Major alterations, additions, or change of use[c]
Mixed-Fuel Building	~~52~~	42	45	52	~~52~~ 65
Solar Electric Generation	~~55~~	42	45	55	~~55~~ 70
All-Electric Building	~~55~~	45	48	55	~~55~~ 70
Solar Electric & *All-Electric Building*	~~58~~	45	48	58	~~58~~ 75

[a] Maximum HERS rating prior to onsite renewable electric generation in accordance with Section R406.5

[b] The building shall meet the mandatory requirements of Section R406.2~~., and the building thermal envelope shall be greater than or equal to the levels of efficiency and SHGC in Table R402.1.2 or Table R402.1.4 of the 2015 International Energy Conservation Code.~~

[c] Alterations, Additions or Change of use covered by Section R502.1.1 or R503.1.5 are subject to this maximum HERS rating~~.~~, except for *Historic Buildings* which may opt to follow R503.1.1 for *alterations, additions, and change of use*.

Updates to Residential

Clarifying When a HERS Rating **is/isn't** Required

R503.1.5 *Add new Subsection R503.1.5 as follows:*

R503.1.5 Extensive Alterations and Level 3 Alterations. Alterations that meet either of the following criteria shall require the building or *dwelling unit* to comply with the maximum HERS ratings for alterations, additions or change of use shown in Table R406.5:

1) Meet the IRC definition for *Extensive Alteration* and that exceeds 1000 sq ft or 100% of the existing conditioned floor area of the dwelling unit for one- and two-family dwellings and multiple single-family dwellings(townhouses).
2) Meet the IEBC definition for *Level 3 Alteration* and that exceeds 1000 sq ft or 100% of the existing conditioned floor area of the building area for Group R-2, R-3, and R-4 buildings with three stories or less in height above grade plane, other than one- and two-family dwellings and multiple single-family dwellings(townhouses).

This means if a project satisfies both **a** + **b**, then it triggers HERS:

a work area is **>50%** of existing project

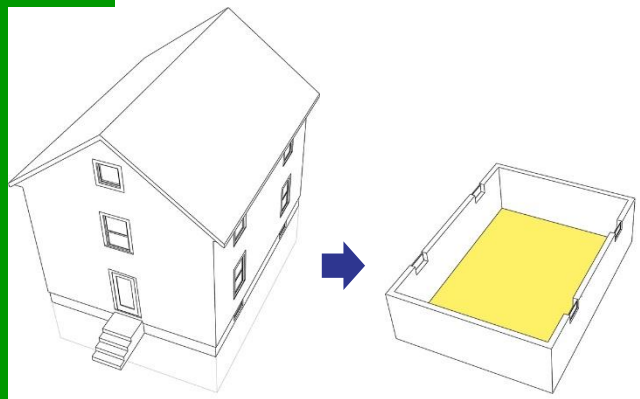
+

b Exceeds **1,000** SF *or* Exceeds **100%** of the existing conditioned floor area

=HERS

Updates to Residential

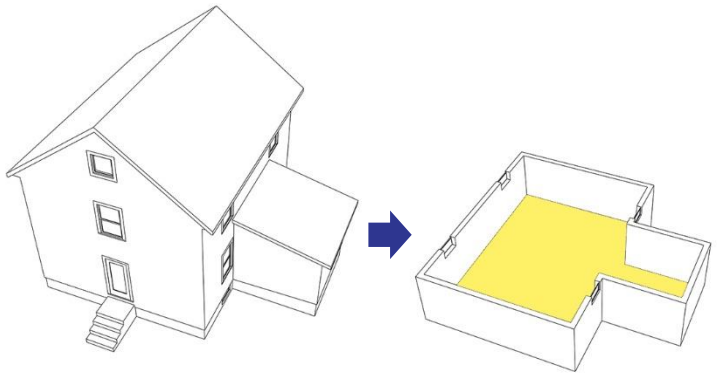
Clarifying When a HERS Rating **is/isn't** Required



An existing house with an unconditioned basement will be remodeled. The basement is 1,200 SF and will be insulated and fully conditioned. This does **NOT** trigger a HERS rating because the existing basement is not growing in SF.

R502.1.1 Large additions. *Additions* to a *dwelling unit* exceeding 1,000 sq ft or exceeding 100% of the existing *conditioned floor area*, shall require the combined *dwelling unit* to comply with the maximum HERS ratings for alterations, additions or change of use shown in Table R406.5.

Exception: *Additions* that add existing basement or attic spaces to the *conditioned floor area* of an existing *dwelling unit* due to changing the thermal boundary but not changing the building footprint or roofline do not require a HERS rating.



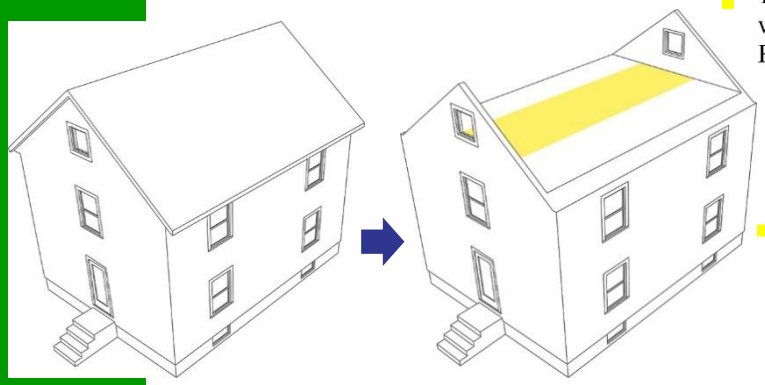
If an addition is added to the house with a full basement connecting to the existing basement, and the new larger basement is conditioned, the project **will** require a HERS rating.

Updates to Residential

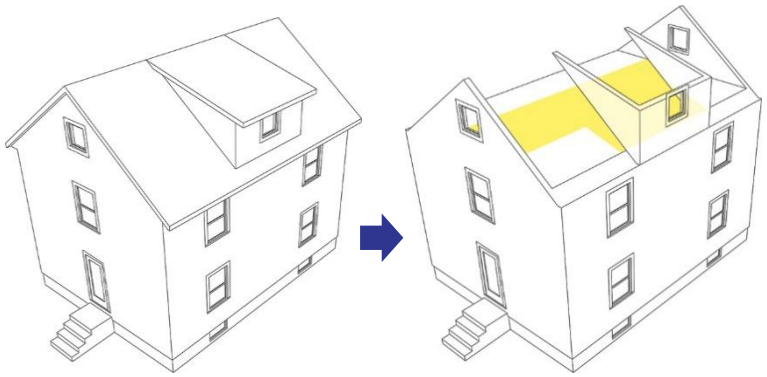
Clarifying When a HERS Rating **is/isn't** Required

R502.1.1 Large additions. *Additions* to a *dwelling unit* exceeding 1,000 sq ft or exceeding 100% of the existing *conditioned floor area*, shall require the combined *dwelling unit* to comply with the maximum HERS ratings for alterations, additions or change of use shown in Table R406.5.

Exception: *Additions* that add existing basement or attic spaces to the *conditioned floor area* of an existing *dwelling unit* due to changing the thermal boundary but not changing the building footprint or roofline do not require a HERS rating.



An existing attic space, 1200 SF, will be finished and insulated so that it is part of the conditioned building envelope. No changes to the roof will be made to "grow" the space. This does **NOT** trigger a HERS rating.



If a dormer is added to the existing roof, thereby increasing the occupiable SF of the existing attic, and the attic is insulated and finished to become part of the conditioned building envelope, this **WILL** trigger a HERS rating.

Updates to Residential

Prescriptive changes

R503.1.1 Revise Exception 2 as follows:

R503.1.1 Building envelope. Building envelope assemblies that are part of the *alteration* shall comply with Section R402.1.2 or R402.1.4, Sections R402.2.1 through R402.2.12, R402.3.1, R402.3.2, R402.4.3 and R402.4.5.

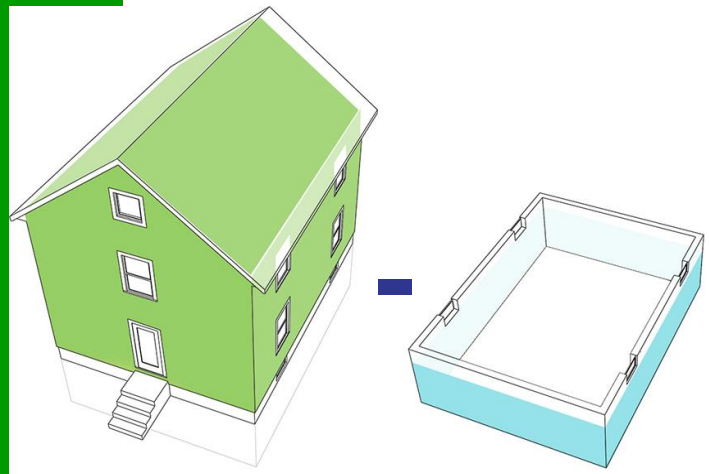
Exception: The following alterations shall not be required to comply with the requirements for new construction provided that the energy use of the building is not increased:

1. Storm windows installed over existing fenestration.
2. Existing ceiling, wall or floor cavities exposed during construction provided that these cavities are filled with insulation with a minimum of R-3.7 per inch for the depth of the cavity.
3. Construction where the existing roof, wall or floor cavity is not exposed.
4. Roof recover.
5. Roofs without insulation in the cavity and where the sheathing or insulation is exposed during reroofing shall be insulated either above or below the sheathing.
6. Surface-applied window film installed on existing single pane fenestration assemblies to reduce solar heat gain provided that the code does not require the glazing or fenestration assembly to be replaced.

This exception for ***Alterations*** also applies to ***Major Alterations, Additions,*** or ***Change of Use*** that would otherwise trigger a HERS rating on Table R406.5 but are determined to be ***Historic Buildings*** by a governing authority.

Updates to Residential

Bonus 3 HERS points for Embodied Carbon: net zero insulation



Buildings typically use one or two insulation types for above grade walls and ceilings, and different board insulation products below-grade. In order to achieve insulation that is net zero embodied carbon, typically the carbon storage above grade must exceed the carbon content embodied in the below grade insulation.

TABLE R406.5.3 DEFAULT INSULATION GLOBAL WARMING POTENTIAL VALUES

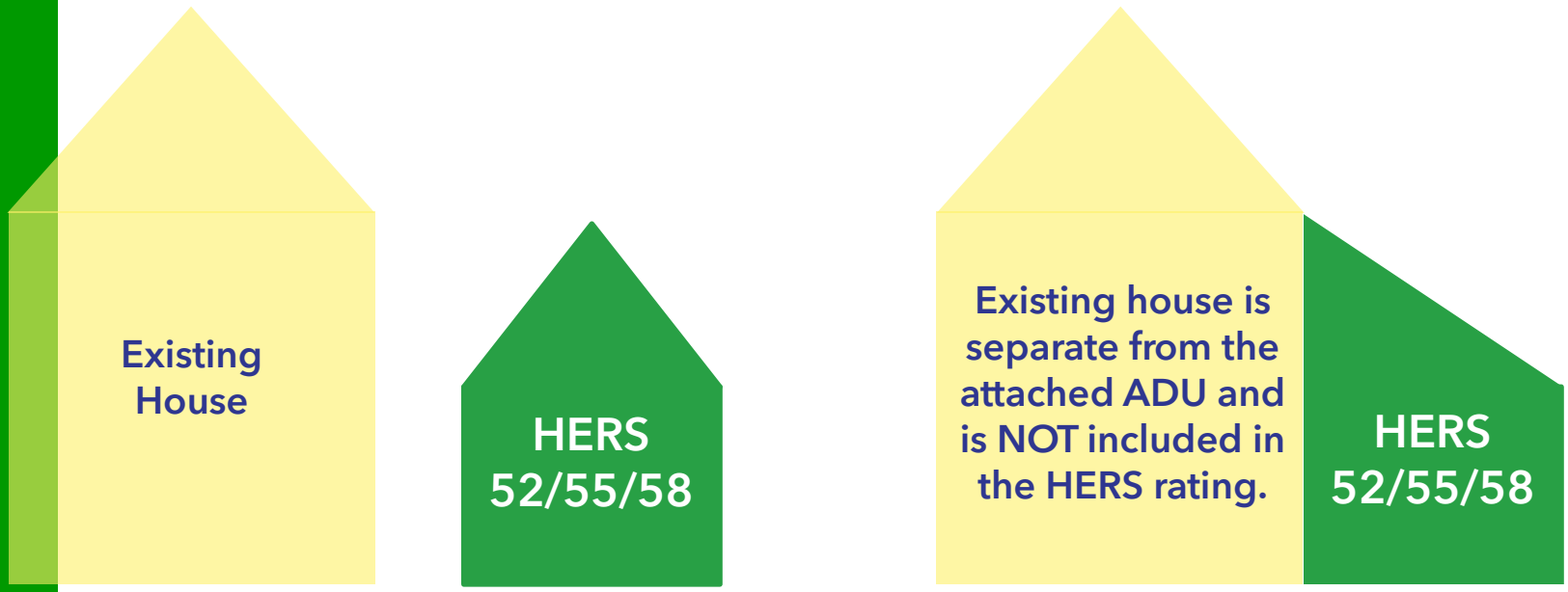
All values are from Building Emissions Accounting for Materials (BEAM)[a], unless noted.

Insulation Material	Default Global Warming Potential (GWP) in Kg CO^2e/ sq.m. RSI-1
Cellular glass – Aggregate	3.93[b]
Cellulose – Densepack	-2.00
Cellulose – Blown/loosefill	-0.90
Cork – Board	-4.30
EPS/graphite – Board, unfaced, Type II – 15 psi	2.30
EPS/graphite – Board, unfaced, Type IX – 25 psi	3.10
EPS – Board, unfaced, Type I – 10 psi	2.50
EPS – Board, unfaced, Type II – 15 psi	3.40

DOER will provide a standard calculation sheet, to enter values from Table R406.5.3 or from product EPDs to show the insulation products used by area (Square meters) and then calculate whether the net GWP is positive or negative. Homes where total insulation is net negative earn the 3 bonus HERS points.

Updates to Residential

Accessory Dwelling Unit HERS Rating:



Stand-alone ADU

ADU attached to existing house

Updates to Residential
Prescriptive Insulation R (& U) Values

TABLE R402.1.3 INSULATION MINIMUM R-VALUES AND FENESTRATION REQUIREMENTS BY COMPONENT[a]

CLIMATE ZONE	FENESTRATION U-FACTOR[f]	SKYLIGHT U-FACTOR	GLAZED FENESTRATION SHGC[d,e]	CEILING R-VALUE	WOOD FRAME WALL R-VALUE	MASS WALL R-VALUE[b]	FLOOR R-VALUE	BASEMENT[c,g] WALL R-VALUE	SLAB[d] R-VALUE & DEPTH	CRAWL SPACE[c,g] WALL R-VALUE
5 and Marine 4	0.30[i]	0.55	~~0.40~~ NR	~~60~~ 49	30 or 20&5ci or 13&10ci or 0&20	13/17	30	15ci or 19 or 13+5ci	10ci, 4 ft	15ci or 19 or 13+5ci

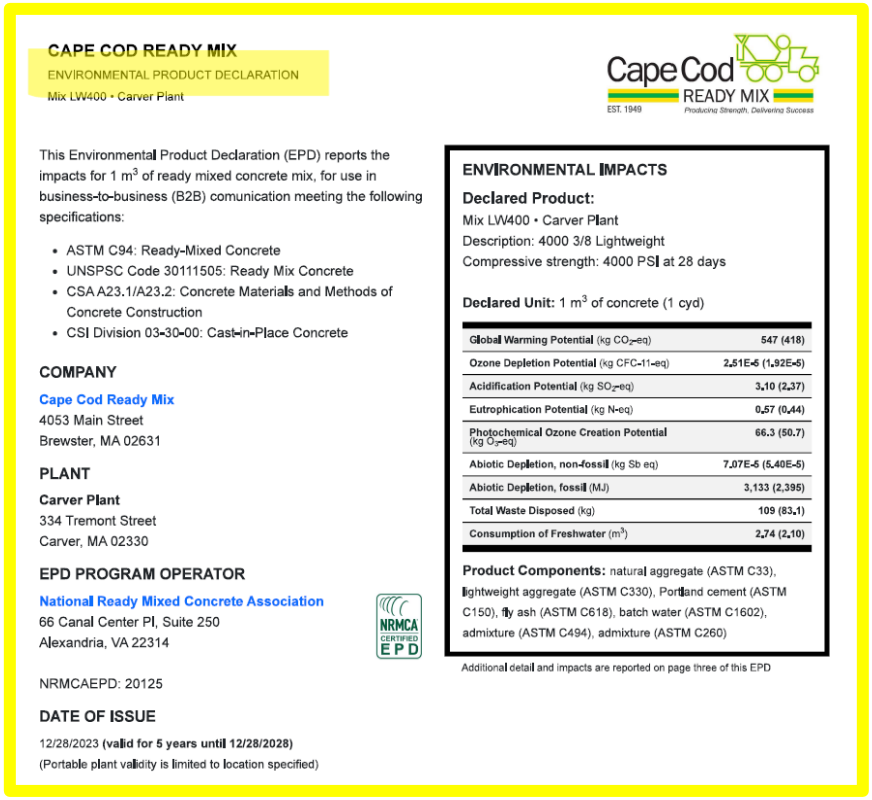
Applications: Small Additions / Alterations / Historic Buildings

Updates to Residential

Bonus 3 HERS points for Embodied Carbon: Concrete

Many of the concrete ready-mix suppliers in Massachusetts have invested in providing Environmental Product Declarations (EPDs) for their concrete ready-mix products. If a project selects ready-mixes that are lower in embodied carbon than the Eastern Region average, shown in Table R406.5.4 then they qualify for 3 bonus HERS points.
Copies of the relevant concrete EPDs must be shared with the HERS rater and building inspector.

R406.5.4 Documentation for low GWP concrete mix credit. In order to apply the low GWP concrete mix credit for one or more new dwelling units, the HERS rater of the unit must submit specific EPDs for concrete used in the unit. Where multiple concrete mixes are used, a complete calculation to summarize estimated embodied carbon emissions from at least 90% of all concrete materials used in the project is required. The output



CAPE COD READY MIX

ENVIRONMENTAL PRODUCT DECLARATION

Mix LW400 • Carver Plant

Cape Cod READY MIX
EST. 1949 Producing Strength, Delivering Success

This Environmental Product Declaration (EPD) reports the impacts for 1 m^3 of ready mixed concrete mix, for use in business-to-business (B2B) comunication meeting the following specifications:

- ASTM C94: Ready-Mixed Concrete
- UNSPSC Code 30111505: Ready Mix Concrete
- CSA A23.1/A23.2: Concrete Materials and Methods of Concrete Construction
- CSI Division 03-30-00: Cast-in-Place Concrete

COMPANY

Cape Cod Ready Mix
4053 Main Street
Brewster, MA 02631

PLANT

Carver Plant
334 Tremont Street
Carver, MA 02330

EPD PROGRAM OPERATOR

National Ready Mixed Concrete Association
66 Canal Center Pl, Suite 250
Alexandria, VA 22314

NRMCA CERTIFIED EPD

NRMCAEPD: 20125

DATE OF ISSUE

12/28/2023 **(valid for 5 years until 12/28/2028)**
(Portable plant validity is limited to location specified)

ENVIRONMENTAL IMPACTS

Declared Product:
Mix LW400 • Carver Plant
Description: 4000 3/8 Lightweight
Compressive strength: 4000 PSI at 28 days

Declared Unit: 1 m^3 of concrete (1 cyd)

Global Warming Potential (kg CO_2-eq)	547 (418)
Ozone Depletion Potential (kg CFC-11-eq)	2,51E-5 (1,92E-5)
Acidification Potential (kg SO_2-eq)	3,10 (2,37)
Eutrophication Potential (kg N-eq)	0,57 (0,44)
Photochemical Ozone Creation Potential (kg O_3-eq)	66.3 (50.7)
Abiotic Depletion, non-fossil (kg Sb eq)	7,07E-5 (5,40E-5)
Abiotic Depletion, fossil (MJ)	3,133 (2,395)
Total Waste Disposed (kg)	109 (83,1)
Consumption of Freshwater (m^3)	2,74 (2,10)

Product Components: natural aggregate (ASTM C33), lightweight aggregate (ASTM C330), Portland cement (ASTM C150), fly ash (ASTM C618), batch water (ASTM C1602), admixture (ASTM C494), admixture (ASTM C260)

Additional detail and impacts are reported on page three of this EPD

Example ***EPD***

UPDATES TO TECHNICAL GUIDANCE

- Timeline for updated Technical Guidance documents is late March 2025 through June 2025
- New Technical guidance materials:
    - Calculation of embodied carbon credits (R406 HERS & C406 options)
    - Templates for District Energy Systems – DOER order of conditions application
    - Revised/expanded case studies for residential additions/alterations

Upcoming Trainings:

email anytime for help:

stretchcode@mass.gov

or

psdtraininghelpma@psdconsulting.com

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Appendix B

Residential Cost Analysis -Comparing the Base Code to Stretch Energy Code

Small Single Family - Electric

Costs and Benefits to Meet Stretch Code*

HERS Index (ERI)
52 ▸ 42
Base Stretch

Electric Heat Pump

	COSTS		BENEFITS[5]	NET
Total Added Construction Costs	$11,597 Cost Savings		$12,000 Rebates[1,4]	$23,597 Cost Compared to Base Code
HOME BUYER	$2,360 Reduction to Downpayment[3]	$1,586 Reduction to Annual Mortgage Payment[3]	$242 Estimated Additional Energy Costs per Year[2]	$1,344 Buyer Annual Net

*Green shaded boxes indicate cost savings, while red shaded boxes indicate added costs.

Home Details

- 2100 ft^2
- Small Single Family
- 3 Bedrooms
- Worcester, MA

1. Rebates are calculated on a per unit basis, using Mass Save ® new construction program Base Tier Incentives of $7,500 without any Market Transformation Adders. These incentives are not applicable to mixed fuel projects.
2. Energy costs are based on 28.7 cents/kWh, $2.08/therm, and $3.62/gal propane
3. 30-year mortgage assumes 10% down payment at 6.35% APR
4. In addition to the Mass Save ® rebates, projects may be eligible for $2,500/unit rebate as part of the 45L Federal Tax Credit. Additionally, projects with ASHPs may be eligible for a Federal 30% Tax Credit of the ASHP install, up to $2,000.
5. Mass Save Incentives are not available in communities with municipal light plans, which are locally owned utilities which represent 52 towns that make up about 13% of the MA population

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Small Single Family - Electric

HERS Index (ERI)
52 ▸ 42
Base Stretch

Electric Heat Pump

2100 ft² Small Single Family
3 Bedroom - Worcester, MA

Breakdown of Construction Costs to Meet Stretch Code

FEATURE	BASE CODE[3]	STRETCH CODE[4]	COST DIFFERENTIAL[1]
HERS INDEX	**52**	**42**	
Windows (U-Value/SHGC)	**U-0.18, 0.29 SHGC**	**U-0.28, 0.29 SHGC**	**-$5,343**
DHW	**Gas Tankless 0.94 EF**	**HPWH, 50 gal**	**-$316**
Heating	**Gas, 95% AFUE**	**SEER 20, 12 HSPF, Ductless**	**-$2,487**
Cooling	**SEER 14.2**		
Duct Leakage to Outside	**2 CFM25 per 100ft2, R-6**	**Ductless**	**-$6,749**
Foundation Insulation	NA	NA	$0
Floor Insulation	Basement Ceiling R-30	Basement Ceiling R-30	$0
Wall Insulation	R-21, 2x6, 16 in o.c.	R-21, 2x6, 16 in o.c.	$0
High Efficacy Lighting	100% LED	100% LED	$0
Ceiling Insulation	**Ceiling R-49, Vented**	**Roof R-38 Spray Foam, Unvented**	**$2,511**
Air Infiltration	**3 ACH50**	**2 ACH50**	**$787**
Mechanical Ventilation	HRV, 75%	HRV, 75%	$0
Pre-Wiring[5]	N/A	N/A	$0
Solar Array[5]	N/A	N/A	$0
TOTAL			**-$11,597**

1. Additional Costs are the costs above Base Code to reach Stretch Code.
2. Cost included in basement and/or attic thermal boundary change
3. Base Code home features are based on an analysis of typical practices for achieving a HERS 52 using HERS Provider data on pre viously built homes in Massachusetts.
4. Stretch Code home features are based on cost optimization modeling using BEopt software. Some individual features are less cost-effective than the Base Code home, but they are more than offset by other features that are more efficient. One benefit of using a HERS Index target as the basis of the Stretch Code is that it give builders the flexibility to make different design choice to allow for optimization of cost effectiveness, home around other design constraints, and accommodate client-specific requests. The stretch code model was developed used REM/rate Version [illegible]
5. Pre-wiring and solar costs are only applicable to mixed-fuel projects following the specialized code and do not apply to the Base or Stretch Code.

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Small Single Family - Gas

Costs and Benefits to Meet Stretch Code*

HERS Index (ERI)
52 ▸ 42
Base Stretch

Gas

	COSTS		BENEFITS[6]	NET
Total Added Construction Costs	**$14,064** Extra Costs		**$2,500** Rebates[1,4]	**$11,564** Cost Compared to Base Code
HOME BUYER	**$1,156** Increase in Downpayment[3]	**$777** Increase in Annual Mortgage Payment[3]	**$190** Estimated Additional Energy Costs per Year[2]	**$967** Buyer Annual Net

*Green shaded boxes indicate cost savings, while red shaded boxes indicate added costs.

Home Details

- 2100 ft^2
- Small Single Family
- 3 Bedrooms
- Worcester, MA

1. Rebates are calculated on a per unit basis, using Mass Save ® new construction program Base Tier Incentives of $7,500 without any Market Transformation Adders. These incentives are not applicable to mixed fuel projects.
2. Energy costs are based on 28.7 cents/kWh, $2.08/therm, and $3.62/gal propane
3. 30-year mortgage assumes 10% down payment at 6.35% APR
4. In addition to the Mass Save ® rebates, projects may be eligible for $2,500/unit rebate as part of the 45L Federal Tax Credit
5. Mass Save Incentives are not available in communities with municipal light plants, which are locally owned utilities, which represent 52 towns that make up about 13% of the MA population

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Small Single Family - Gas

HERS Index (ERI)
52 ▸ 42
Base Stretch

Gas

2100 ft² Small Single Family
3 Bedroom - Worcester, MA

Breakdown of Construction Costs to Meet Stretch Code

FEATURE	BASE CODE[3]	STRETCH CODE[4]	COST DIFFERENTIAL[1]
HERS INDEX	**52**	**42**	
Windows (U-Value/SHGC)	U-0.18, 0.29 SHGC	U-0.18, 0.29 SHGC	$0
DHW	Gas Tankless 0.94 EF	Gas Tankless 0.94 EF	$0
Heating	Gas, 95% AFUE	Gas, 98% AFUE	**$708**
Cooling	**SEER 14.2**	**SEER 16**	**$671**
Duct Leakage to Outside	**2 CFM25 per 100ft2, R-6**	**In Finished Space***	$0
Foundation Insulation	**NA**	**Basement Walls R-21**	**$6,547**
Floor Insulation	**Basement Ceiling R-30**	**NA**	**-$1,426**
Walls Insulation	**R-21, 2x6, 16 in o.c.**	**R-21, 2x6, 16 in o.c. R-5 XPS**	**$3,015**
High Efficacy Lighting	100% LED	100% LED	$0
Ceiling Insulation	**Ceiling R-49, Vented**	**Roof R-38 Spray Foam, Unvented**	**$2,187**
Air Infiltration	**3 ACH50**	**1 ACH50**	**$2,362**
Mechanical Ventilation	HRV, 75%	HRV, 75%	$0
Pre-Wiring[5]	N/A	N/A	$0
Solar Array[5]	N/A	N/A	$0
TOTAL			**$14,064**

1. Additional Cost are the costs above Base Code to reach Stretch Code.
2. Cost included in basement and/or attic thermal boundary change
3. Base Code home features are based on an analysis of typical practices for achieving a HERS 52 using HERS Provider data on previously built homes in Massachusetts.
4. Stretch Code home features are based on cost optimization modeling using BEopt software. Some individual features are less efficient than the Base Code home, but they are more than offset by other features that are more efficient. One benefit of using a HERS Index target as the basis of the Stretch Code is that it give builders the flexibility to make different design choice to allow for optimization of cost effectiveness, work around other design constraints, and accommodate client-specific requests. The stretch code model was developed using REM/rate Version 16.1.1.
5. Pre-wiring and solar costs are only applicable to mixed fuel projects following the Specialized code and do not apply to the Base or Stretch Code.

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Large Single Family - Electric

Costs and Benefits to Meet Stretch Code*

HERS Index (ERI)
52 ▸ 42
Base Stretch

Electric Heat Pump

	COSTS		BENEFITS[5]	NET
Total Added Construction Costs or Savings	**$3,062** Cost Savings		**$12,000** Rebates[1,4]	**$15,062** Savings Compared to Base Code
HOME BUYER	**$1,506** Reduction to Downpayment[3]	**$1,012** Reduction to Annual Mortgage Payment[3]	**$379** Estimated Additional Energy Costs per Year[2]	**$633** Buyer Annual Net

*Green shaded boxes indicate cost savings, while red shaded boxes indicate added costs.

Home Details

- 4000 ft²
- Large Single Family
- 5 Bedrooms
- Worcester, MA

1. Rebates are calculated on a per unit basis, using Mass Save ® new construction program Base Tier Incentives of $7,500 without any Market Transformation Adders. These incentives are not applicable to mixed fuel projects.
2. Energy costs are based on 28.7 cents/kWh, $2.08/therm, and $3.62/gal propane
3. 30-year mortgage assumes 10% down payment at 6.35% APR
4. In addition to the Mass Save ® rebates, projects may be eligible for $2,500/unit rebate as part of the 45L Federal Tax Credit. Additionally, projects with ASHPs may be eligible for a Federal 30% Tax Credit of the ASHP install, up to $2,000
5. Mass Save Incentives are not available in communities with municipal light plans, which are locally owned utilities with approximately 52 towns that make up about 13% of the MA population.

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Large Single Family - Electric

HERS Index (ERI)
52 ▸ 42
Base Stretch

Electric Heat Pump

4000 ft² Large Single Family
5 Bedroom - Worcester, MA

Breakdown of Construction Costs to Meet Stretch Code

FEATURE	BASE CODE[3]	STRETCH CODE[4]	COST DIFFERENTIAL[1]
HERS INDEX	**52**	**42**	
Windows (U-Value/SHGC)	**U-0.25, 0.29 SHGC**	**U-0.28, 0.29 SHGC**	**-$4,110**
DHW	**Gas Tankless 0.94 EF**	**HPWH, 50 gal, 2.35 EF**	**-$316**
Heating	**Gas, 98% AFUE**	**SEER 20, 12 HSPF, Ducted**	**-$35**
Cooling	**SEER 14.2**		
Duct Leakage to Outside	2 CFM25 per 100ft2, R-6	In Conditioned Space*	$0
Foundation Insulation	NA	NA	$0
Floor Insulation	R-30 Fiberglass Batt	R-30 Fiberglass Batt	$0
Walls Insulation	R-21, 2x6, 16 in o.c.	R-21, 2x6, 16 in o.c.	$0
High Efficacy Lighting	100% LED	100% LED	$0
Ceiling Insulation	**Ceiling R-49, Vented**	**R-38 Open Cell Spray Foam, Unvented**	**-$1,847**
Air Infiltration	**3 ACH50**	**1.5 ACH50**	**$3,246**
Mechanical Ventilation	HRV, 75%	HRV, 75%	$0
Pre-Wiring[5]	N/A	N/A	$0
Solar Array[5]	N/A	N/A	$0
TOTAL			**-$3,062**

1. Additional Cost are the costs above Base Code to reach Stretch Code.
2. Cost included in basement and/or attic thermal boundary change
3. Base Code home features are based on an analysis of typical practices for achieving a HERS 52 using HERS Provider data on pre viously built homes in Massachusetts.
4. Stretch Code home features are based on cost optimization modeling using BEopt software. Some individual features are less efficient than the Base Code home, but they are more than offset by other features that are more efficient. One benefit of using a HERS Index target as the basis of the Stretch Code is that it give builders the flexibility to make different design choice to allow for optimization of cost e ffectiveness, work around other design constraints, and accommodate client-specific requests. The stretch code model was developed used REM
5. Pre-wiring and solar costs are only applicable to mixed-fuel projects following the Specialized Code and do not apply to the Base or Stretch Code.

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Large Single Family - Gas

HERS Index (ERI)
52 ▸ 42
Base Stretch

Gas

Costs and Benefits to Meet Stretch Code*

	COSTS		BENEFITS[5]	NET
Total Added Construction Costs	**$10,892** Extra Costs		**$2,500** Rebates[1,4]	**$8,392** Cost Compared to Base Code
HOME BUYER	**$839** Increase in Downpayment[3]	**$563** Increase in Annual Mortgage Payment[3]	**$598** Estimated Energy Cost Savings per Year[2]	**$35** Buyer Annual Net

*Green shaded boxes indicate cost savings, while red shaded boxes indicate added costs.

Home Details

- 4000 ft²
- Large Single Family
- 5 Bedrooms
- Worcester, MA

1. Rebates are calculated on a per unit basis, using Mass Save ® new construction program Base Tier Incentives of $7,500 without any Market Transformation Adders. These incentives are not applicable to mixed fuel projects.
2. Energy costs are based on 28.7 cents/kWh, $2.08/therm, and $3.62/gal propane
3. 30-year mortgage assumes 10% down payment at 6.35% APR
4. In addition to the Mass Save ® rebates, projects may be eligible for $2,500/unit rebate as part of the 45L Federal Tax Credit
5. Mass Save Incentives are not available in communities with municipal light plants, which are locally owned utilities (MLPs) which represent 52 towns that make up about 13% of the MA population

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Large Single Family - Gas

HERS Index (ERI)
52 ▸ 42
Base Stretch

Gas

4000 ft² Large Single Family
5 Bedroom - Worcester, MA

Breakdown of Construction Costs to Meet Stretch Code

FEATURE	BASE CODE[3]	STRETCH CODE[4]	COST DIFFERENTIAL[1]
HERS INDEX	**52**	**42**	$0
Windows (U-Value/SHGC)	**U-0.25, 0.29 SHGC**	**U-0.18, 0.29 SHGC**	**$4,951**
DHW	Gas Tankless 0.94 EF	Gas Tankless 0.94 EF	$0
Heating	Gas, 98% AFUE	Gas, 98% AFUE	$0
Cooling	**SEER 14.2**	**SEER 16**	**$553**
Duct Leakage to Outside	**2 CFM25 per 100ft2, R-6**	**In Conditioned Space***	-$361
Foundation Insulation	NA	NA	$0
Floor Insulation	R-30 Fiberglass Batt	R-30 Fiberglass Batt	$0
Walls Insulation	**R-21, 2x6, 16 in o.c.**	**R-21, 2x6, 16 in o.c., R-5 XPS**	**$4,728**
High Efficacy Lighting	100% LED	100% LED	$0
Ceiling Insulation	**Ceiling R-49, Vented**	**R-38 Open Cell Spray Foam, Unvented**	**-$2,226**
Air Infiltration	**3 ACH50**	**1.5 ACH50**	**$3,246**
Mechanical Ventilation	HRV, 75%	HRV, 75%	$0
Pre-Wiring[5]	N/A	N/A	$0
Solar Array[5]	N/A	N/A	$0
TOTAL			**$10,892**

1. Additional Costs are the costs above Base Code to reach Stretch Code. .
2. Cost included in basement and/or attic thermal boundary change
3. Base Code home features are based on an analysis of typical practices for achieving a HERS 52 using HERS Provider data on previously built homes in Massachusetts.
4. Stretch Code home features are based on cost optimization modeling using BEopt software. Some individual features are less efficient than the Base Code home, but they are more than offset by other features that are more efficient. One benefit of using a HERS Index target as the basis of the Stretch Code is that it give builders the flexibility to make different design choice to allow for optimization of cost effectiveness around other design constraints, and accommodate client specific requests. The stretch code model was developed using REM/Rate Version 16.1.1.
5. Pre-wiring and solar costs are only applicable to mixed fuel projects following the Specialized code and do not apply to the Base or Stretch Code.

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Appendix C

Commercial Stretch Code

Commercial Stretch Code
Mechanical Updates

Commercial STRETCH CODE updates to Mechanical and Electrical (C403 & C405):

C403.3.2 Approved Software Calculation Tables (8) and (9); Updates the reference tables for VRF air conditioners (table 8) and heat pumps (table 9) from IECC 2021 to IECC 2024 versions to reflect recent changes in the testing standards used.

C403.7.4. Energy Recovery Systems. Enthalpy Recovery Ratio and Sensible Energy Recovery Ratios are better defined in these sections per feedback from various HVAC public comments. The required values and ventilation rates are fine-tuned per this feedback as well.

C405.13 EV Ready Spaces. Adds Tesla (NACS) standard as a charging option.

Commercial Stretch Code
C406 Credit Options

Commercial STRETCH CODE updates to credit options (C406):

C406.1 Additional energy efficiency credit requirements. **Embodied carbon credits** are added as additional options to the commercial code in response to several requests received in public comments.

C406.13 Low GWP concrete mix. This section is added to provide an embodied carbon credit incentive in accordance with C406.1.

C406.14 Net zero GWP insulation. This section is added to provide an embodied carbon credit incentive is accordance with C406.1.

C406.2.3. Renewable space heating. This section is amended to state that electric resistance shall not be used except for defrost function, and to note that the COP value at 5F shall be the COP of the outdoor unit of the cold-climate air source heat pump.

Commercial Stretch Code
District Energy Systems

Commercial STRETCH CODE updates to District Energy Systems (C407.2):

C407.2.1 Electrification and documentation for highly ventilated buildings. An exception is added that allows District Energy Systems (DES) that include an **inter-building heat recovery** function (a DES that is able to use excess heat from one building for useful heating in other buildings) to be exempted from the partial electrification requirement for highly ventilated buildings. Examples of DES's that are planning to include inter-building heat recovery include: Harvard University, Tufts University, and some state-owned systems, and typically requires conversion of building HVAC systems to be compatible. This has received strong support from various DES stakeholders.

Commercial Stretch Code
Passive House & HERS

Commercial STRETCH CODE updates to Passive House + HERS performance paths (C407.3 & C407.4):

C407.3 Passive House. DOER received a lot of feedback on the specific wording for both Phius and PHI compliance, in addition to a large amount of support for a "third option" for compliance. This "third option" will allow projects to proceed through funding and final occupancy, where projects narrowly fail to meet the full Passive House certification standards but still exceed other building code performance pathways.

C407.4 HERS Index for multi-family buildings. The HERS ratings are relaxed to incentivize the use of embodied carbon credits, and ease the requirements on for major alterations, additions or change-of use projects. This has received broad and very positive feedback. A note has been added to Table C407.4 allowing historic buildings to follow the prescriptive compliance pathway. Finally, references to residential chapters in the footnotes are updated to reference commercial chapters at the request of designers.

Commercial Stretch Code
HERS Rating Requirements

TABLE C407.4 MAXIMUM ENERGY RATING INDEX

~~Building~~ Clean Energy ~~Application Sources~~	Maximum HERS Index score [a]			
	~~New Construction until June 30, 2024~~	New construction permits after July 1, 2024	New Construction with R406.5.2 embodied carbon credit[c]	Major alterations, additions, or Change of use[b]
Mixed-Fuel Building	~~52~~	42	45	~~52~~ 55
Solar Electric Generation	~~55~~	42	45	~~55~~ 58
All-Electric Building	~~55~~	45	48	~~55~~ 58
Solar Electric & *All-Electric Building*	~~58~~	45	48	~~58~~ 61

[a] Maximum HERS rating prior to onsite renewable electric generation in accordance with Section C407.4

[b] Alterations, Additions or Change of use covered by Sections C502, C503 or C505 ~~R502.1.1 or R503.1.5~~ are subject to this maximum HERS rating, except for Historic buildings which may opt to follow the prescriptive compliance pathway in C401 as applicable.

[c] New multi-family and mixed-use buildings may follow Sections R406.5.2 – R406.5.4 from 225 CMR 22 (Residential Stretch code) to demonstrate eligibility where applicable.

Commercial Stretch Code
Existing Buildings (Chapter 5)

Commercial STRETCH CODE updates to existing building alterations, additions and change-of-use permits (IECC Chapter 5):

C502.3.7 Air Infiltration Testing. Clarifies that air infiltration testing on additions is for the addition only.

C503.1 General. Clarifies how and when **Alterations** trigger the requirements of Chapter 4. Most of the text is from IECC 2021, but item 7 is added to allow limited openings into walls without having to then upgrade the entire structure.

C503.2.4 Derating and Thermal Bridges. This new provision allows thermal bridges that are inaccessible to not have to count toward derating calculations.

C505.1 General. This **Change-of-use** text from IECC 2021 is amended to add the term "total modeled annual" before both "fossil fuel use" and "energy use". The unamended text was vague and created some confusion. This update allows many tenant fit outs to occur without triggering the entire building envelope to be upgraded. Further, an exception is added that allows new windows (and upgrading the thermal quality of the connection of the window to surrounding wall) without triggering a whole envelope upgrade.

C506 EnerPHit Standard. Added in response to stakeholders requesting that the EnerPHit Standard (a PHI version of Passive House for existing buildings) be sanctioned within the code.

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Thank You!

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