



HERS Index

52
Base

42
Stretch



Electric Heat Pump

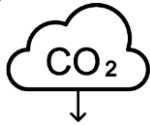
2030 Annual Greenhouse Gas

1.19

Stretch Tons

4.43

Tons Saved



Home Details

- 4000 sq.ft.
- Large Single Family
- 5 Bedrooms
- Worcester, MA

DOER

Massachusetts Department of Energy Resources



PERFORMANCE SYSTEMS DEVELOPMENT

MA 10th Edition Building Code | 2023

Large Single Family - Electric

Costs and Benefits to Meet Stretch Code

	COSTS	BENEFITS	NET
BUILDER	-\$3,062 Total Adjustments	\$17,000 Rebates & Tax Rebates ¹	-\$20,062 Cost Compared to Base Code
HOME BUYER	-\$4,013 Change to Downpayment ³	-\$873 Change to Annual Mortgage Payment ³	-\$325 Estimated Energy Cost Savings per Year ²
			-\$548 Buyer Annual Net

1. Rebates are calculated on a per unit basis, using Mass Save® residential new home construction incentives & Tax credit allows for up to \$2,000 for new homes independently rated below HERS 50.
2. Energy costs are based on 22 cents/kWh, \$1.53/therm, and \$3.09/gal propane
3. 30-year mortgage assumes 10% down payment at 4% APR
4. In addition to the Mass Save® rebates, HERS Rated homes are eligible for the \$2,000/unit residential builder energy efficiency tax credit under section 1332, Credit for Construction of New Energy Efficient Homes, of the Energy Policy Act of 2005



MA 10th Edition Building Code | 2023

Large Single Family - Electric

HERS Index (ERI)

52
Base

42
Stretch



Electric
Heat Pump

4000 sq.ft. Large Single Family
5 Bedroom - Worcester, MA

Breakdown of Construction Costs to Meet Stretch Code

FEATURE	BASE CODE	STRETCH CODE	ADDITIONAL COSTS 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 100ft ² , 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
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 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.



Massachusetts Department
of Energy Resources



PERFORMANCE
SYSTEMS
DEVELOPMENT



Large Single Family - Gas

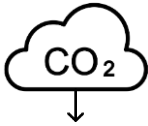
HERS Index

52 **42**
Base Stretch



2030 Annual Greenhouse Gas

4.13 | **1.49**
Stretch Tons | Tons Saved



Home Details

- 4000 sq.ft.
- Large Single Family
- 5 Bedrooms
- Worcester, MA

Costs and Benefits to Meet Stretch Code

	COSTS	BENEFITS	NET
BUILDER	\$10,892 Total Adjustments	\$7,708 Rebates & Tax Rebates ¹	\$3,184 Cost Compared to Base Code
HOME BUYER	\$637 Change to Downpayment ³	\$139 Change to Annual Mortgage Payment ³	\$440 Estimated Energy Cost Savings per Year ²
			-\$302 Buyer Annual Net

1. Rebates are calculated on a per unit basis, using Mass Save® new construction program pay-for-savings Incentive calculations & Tax credit allows for up to \$2,000 for new homes independently rated below HERS 50.
2. Energy costs are based on 22 cents/kWh, \$1.53/therm, and \$3.09/gal propane
3. 30-year mortgage assumes 10% down payment at 4% APR
4. In addition to the Mass Save® rebates, HERS Rated homes are eligible for the \$2,000/unit residential builder energy efficiency tax credit under section 1332, Credit for Construction of New Energy Efficient Homes, of the Energy Policy Act of 2005



MA 10th Edition Building Code | 2023

Large Single Family - Gas

HERS Index (ERI)

52
Base

42
Stretch



Gas

4000 sq.ft. Large Single Family
5 Bedrooms - Worcester, MA

Breakdown of Construction Costs to Meet Stretch Code

FEATURE	BASE CODE	STRETCH CODE	ADDITIONAL COSTS 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	-\$361
Cooling	SEER 14.2	SEER 16	\$553
Duct Leakage to Outside	2 CFM25 per 100ft ² , 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., 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
TOTAL			\$10,892

- *Cost included in basement and/or attic thermal boundary change
- 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.
- 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.
- Additional Costs are the costs above Base Code to reach Stretch Code.



Massachusetts Department
of Energy Resources



PERFORMANCE
SYSTEMS
DEVELOPMENT



Small Single Family - Electric

Costs and Benefits to Meet Stretch Code

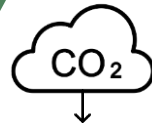
HERS Index (ERI)

52 Base **42** Stretch



2030 Annual Greenhouse Gas

Stretch Tons: **0.75** | Tons Saved: **2.56**



Home Details

- 2,100 sq.ft.
- Small Single Family
- 3 Bedrooms
- Worcester, MA

	COSTS		BENEFITS	NET
BUILDER	-\$11,597 Total Adjustments		\$17,000 Rebates & Tax Rebates ¹	-\$28,597 Cost Compared to Base Code
HOME BUYER	-\$5,719 Change to Downpayment ³	-\$1,244 Change to Annual Mortgage Payment ³	-\$191 Estimated Energy Cost Savings per Year ²	-\$1,053 Buyer Annual Net

1. Rebates are calculated on a per unit basis, using Mass Save® residential new home construction incentives & Tax credit allows for up to \$2,000 for new homes independently rated below HERS 50.
2. Energy costs are based on 22 cents/kWh, \$1.53/therm, and \$3.09/gal propane
3. 30-year mortgage assumes 20% down payment at 3.5% APR
4. In addition to the Mass Save® rebates, HERS Rated homes are eligible for the \$2,000/unit residential builder energy efficiency tax credit under section 1332, Credit for Construction of New Energy Efficient Homes, of the Energy Policy Act of 2005



MA 10th Edition Building Code | 2023

Small Single Family - Electric

HERS Index (ERI)

52 ▶ **42**
Base Stretch



2100 sq.ft. Small Single Family
3 Bedrooms - Worcester, MA

Breakdown of Construction Costs to Meet Stretch Code

FEATURE	BASE CODE	STRETCH CODE	ADDITIONAL COSTS 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 100ft ² , 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
TOTAL			-\$11,597

1. Additional Cost are the costs above Base Code to reach Stretch Code.
2. 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.
3. 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.



Small Single Family - Gas

HERS Index

52

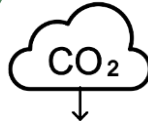
Base

42

Stretch



Gas



2030 Annual Greenhouse Gas

2.92

Stretch Tons

0.38

Tons Saved

Home Details

- 2,100 sq.ft.
- Small Single Family
- 3 Bedrooms
- Worcester, MA

Costs and Benefits to Meet Stretch Code

	COSTS		BENEFITS	NET
BUILDER	\$14,064 Total Adjustments		\$6,157 Rebates & Tax Credits ¹	\$7,907 Cost Compared to Base Code
HOME BUYER	\$1,581 Change to Downpayment ³	\$344 Change to Annual Mortgage Payment ³	-\$153 Estimated Energy Cost Savings per Year ²	\$496 Buyer Annual Net

1. Rebates are calculated on a per unit basis, using Mass Save® new construction program pay-for-savings Incentive calculations & Tax credit allows for up to \$2,000 for new homes independently rated below HERS 50.
2. Energy costs are based on 22 cents/kWh, \$1.53/therm, and \$3.09/gal propane
3. 30-year mortgage assumes 20% down payment at 3.5% APR
4. In addition to the Mass Save® rebates, HERS Rated homes are eligible for the \$2,000/unit residential builder energy efficiency tax credit under section 1332, Credit for Construction of New Energy Efficient Homes, of the Energy Policy Act of 2005



Massachusetts Department of Energy Resources



PERFORMANCE SYSTEMS DEVELOPMENT



MA 10th Edition Building Code | 2023

Small Single Family - Gas

HERS Index (ERI)

52
Base

42
Stretch



Gas

2100 sq.ft. Small Single Family
3 Bedrooms - Worcester, MA

Breakdown of Construction Costs to Meet Stretch Code

FEATURE	BASE CODE	STRETCH CODE	ADDITIONAL COSTS 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 100ft ² , 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
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.



Massachusetts Department
of Energy Resources



PERFORMANCE
SYSTEMS
DEVELOPMENT

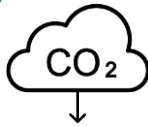


HERS Index

52 ▶ **42**
Base Stretch



2030 Annual Greenhouse Gas
Stretch Tons **0.72** | Tons Saved **2.35**



Home Details

- 2,100 sq.ft.
- Townhouse
- 3 Bedrooms
- Worcester, MA



Massachusetts Department of Energy Resources



PERFORMANCE SYSTEMS DEVELOPMENT

MA 10th Edition Building Code | 2023

Townhouse - Electric

Costs and Benefits to Meet Stretch Code

	COSTS	BENEFITS	NET
BUILDER	\$5,508 Total Adjustments	\$17,000 Rebates & Tax Rebates ¹	\$-11,492 Cost Compared to Base Code
HOME BUYER	-\$2,298 Change to Downpayment ³	-\$500 Change to Annual Mortgage Payment ³	-\$184 Estimated Energy Cost Savings per Year ²
			\$316 Buyer Annual Net

1. Rebates are calculated on a per unit basis, using Mass Save® residential new home construction incentives & Tax credit allows for up to \$2,000 for new homes independently rated below HERS 50.
2. Energy costs are based on 22 cents/kWh, \$1.53/therm, and \$3.09/gal propane
3. 30-year mortgage assumes 10% down payment at 4% APR
4. In addition to the Mass Save® rebates, HERS Rated homes are eligible for the \$2,000/unit residential builder energy efficiency tax credit under section 1332, Credit for Construction of New Energy Efficient Homes, of the Energy Policy Act of 2005
5. Additional Costs are the costs above Base Code to reach Stretch Code.



MA 10th Edition Building Code | 2023

Townhouse - Electric

HERS Index (ERI)

52 ▶ **42**
Base Stretch



2100 sq.ft. Townhouse
3 Bedrooms - Worcester, MA

Breakdown of Construction Costs to Meet Stretch Code

FEATURE	BASE CODE	STRETCH CODE	ADDITIONAL COSTS ¹
HERS INDEX	52	42	
Windows (U-Value/SHGC)	U-0.28, 0.29 SHGC	U-0.18, 0.29 SHGC	\$1,530
DHW	Gas Tankless 0.94 EF	HPWH, 50 gal, 2.35 EF	-\$316
Heating	Gas, 95% AFUE	HP SEER 20, 12 HSPF	-\$4,276
Cooling	SEER 14.2		
Duct Leakage to Outside	2 CFM25 per 100ft ² , R-6	In Conditioned Space*	\$0
Foundation Insulation	NA	Basement Walls R-21	\$2,740
Floor Insulation	R-30 Fiberglass Batt	NA	
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-30 Open Cell Spray Foam, Unvented	\$5,054
Air Infiltration	3 ACH50	2 ACH50	\$776
Mechanical Ventilation	HRV, 75%	HRV, 75%	\$0
TOTAL			\$5,508

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.





HERS Index

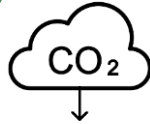
52
Base

42
Stretch



Gas

2030 Annual Greenhouse Gas
2.63 | **0.44**
 Stretch Tons | Tons Saved



Home Details

- 2,100 sq.ft.
- Townhouse
- 3 Bedroom
- Worcester, MA

Townhouse - Gas

Costs and Benefits to Meet Stretch Code

	COSTS		BENEFITS	NET
BUILDER	\$5,707 Total Adjustments		\$5,646 Rebates & Tax Credits ¹	\$61 Cost Compared to Base Code
HOME BUYER	\$12 Change to Downpayment ³	\$3 Change to Annual Mortgage Payment ³	\$14 Estimated Energy Cost Savings per Year ²	\$-11 Buyer Annual Net

1. Rebates are calculated on a per unit basis, using Mass Save® new construction program pay-for-savings Incentive calculations & Tax credit allows for up to \$2,000 for new homes independently rated below HERS 50.
2. Energy costs are based on 22 cents/kWh, \$1.53/therm, and \$3.09/gal propane
3. 30-year mortgage assumes 10% down payment at 4% APR
4. In addition to the Mass Save® rebates, HERS Rated homes are eligible for the \$2,000/unit residential builder energy efficiency tax credit under section 1332, Credit for Construction of New Energy Efficient Homes, of the Energy Policy Act of 2005



Massachusetts Department of Energy Resources



PERFORMANCE SYSTEMS DEVELOPMENT



MA 10th Edition Building Code | 2023

Townhouse - Gas

HERS Index (ERI)

52
Base

42
Stretch



Gas

2100 sq.ft. Townhouse
3 Bedrooms - Worcester, MA

Breakdown of Construction Costs to Meet Stretch Code

FEATURE	BASE CODE	STRETCH CODE	ADDITIONAL COSTS ¹
HERS INDEX	52	42	
Windows (U-Value/SHGC)	U-0.28, 0.29 SHGC	U-0.18, 0.29 SHGC	\$1,530
DHW	Gas Tankless 0.94 EF	Gas Tankless 0.94 EF	\$0
Heating	Gas, 95% AFUE	Gas, 98% AFUE	\$688
Cooling	SEER 14.2	SEER 16	\$646
Duct Leakage to Outside	2 CFM25 per 100ft ² , R-6	2 CFM25 per 100ft ² , R-6	\$0
Foundation Insulation	NA	Basement Walls R-21	\$1,955
Floor Insulation	R-30 Fiberglass Batt	NA	-\$1,110
Walls Insulation	R-21, 2x6, 16 in o.c.	R-21, 2x6, 16 in o.c., R-5 XPS	\$1,746
High Efficacy Lighting	100% LED	100% LED	\$0
Ceiling Insulation	Ceiling R-49, Vented	Ceiling R-38, Vented	-\$1,446
Air Infiltration	3 ACH50	1.5 ACH50	\$1,698
Mechanical Ventilation	HRV, 75%	HRV, 75%	\$0
TOTAL			\$5,707

1. Additional Cost are the costs above Base Code to reach Stretch Code.
2. 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.
3. 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.



Massachusetts Department
of Energy Resources



PERFORMANCE
SYSTEMS
DEVELOPMENT



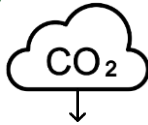
6-unit Multifamily - Electric

HERS Index

52 ▶ **42**
Base Stretch



2030 Annual Greenhouse Gas
0.51 | **1.75**
Stretch Tons Tons Saved



Home Details

- 1,400 sq.ft. per unit
- 6-Unit Multifamily
- 3 Bedrooms
- Worcester, MA

Costs and Benefits to Meet Stretch Code

	COSTS		BENEFITS	NET
BUILDER	-\$11,086 Total Adjustments		\$4,604 Rebates & Tax Credits ¹	-\$15,690 Cost Compared to Base Code
HOME BUYER	-\$3,138 Change to Downpayment ³	-\$683 Change to Annual Mortgage Payment ³	\$0 Estimated Energy Cost Savings per Year ²	-\$683 Buyer Annual Net

1. Rebates are calculated on a per unit basis, using Mass Save® new construction program pay-for-savings Incentive calculations & Tax credit allows for up to \$2,000 for new homes independently rated below HERS 50.
2. Energy costs are based on 22 cents/kWh, \$1.53/therm, and \$3.09/gal propane
3. 30-year mortgage assumes 10% down payment at 4% APR
4. In addition to the Mass Save® rebates, HERS Rated homes are eligible for the \$2,000/unit residential builder energy efficiency tax credit under section 1332, Credit for Construction of New Energy Efficient Homes, of the Energy Policy Act of 2005



Massachusetts Department of Energy Resources



PERFORMANCE SYSTEMS DEVELOPMENT

6-unit Multifamily - Electric

HERS Index (ERI)

52 ▶ **42**
Base Stretch



1400 sq.ft. per unit
6-Unit Multifamily
3 Bedrooms - Worcester, MA

Breakdown of Construction Costs to Meet Stretch Code

FEATURE	BASE CODE	STRETCH CODE	ADDITIONAL COSTS ¹
HERS INDEX	52	42	
Windows (U-Value/SHGC)	U-0.28, 0.29 SHGC	U-0.28, 0.29 SHGC	\$0
DHW	Gas Tankless 0.94 EF	HPWH, 50 gal, 2.35 EF	-\$316
Heating	Gas, 95% AFUE	SEER 20, 12 HSPF, Ductless	-\$5,898
Cooling	SEER 14.2		
Duct Leakage to Outside	2 CFM25 per 100ft ² , R-6	Ductless	-\$4,591
Foundation Insulation	NA (upper-level unit)	NA (upper-level unit)	\$0
Floor Insulation	NA (upper-level unit)	NA (upper-level unit)	\$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	Ceiling R-38, Vented	-\$803
Air Infiltration	3 ACH50	2 ACH50	\$521
Mechanical Ventilation	Exhaust Only	Exhaust Only	\$0
TOTAL			-\$11,086

1. Additional Cost are the costs above Base Code to reach Stretch Code.
2. 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.
3. 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.



Massachusetts Department of Energy Resources



PERFORMANCE SYSTEMS DEVELOPMENT

6-unit Multifamily - Gas



HERS Index

52 Base

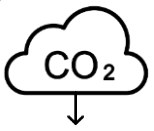
42 Stretch



2030 Annual Greenhouse Gas

1.68 Stretch Tons

0.58 Tons Saved



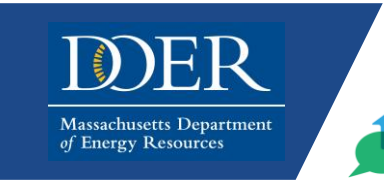
Costs and Benefits to Meet Stretch Code

	COSTS		BENEFITS	NET
BUILDER	\$5,848 Total Adjustments		\$3,571 Rebates & Tax Credits ¹	\$2,277 Cost Compared to Base Code
HOME BUYER	\$455 Change to Downpayment ³	\$99 Change to Annual Mortgage Payment ³	\$114 Estimated Energy Cost Savings per Year ²	-\$14 Buyer Annual Net

Home Details

- 1,400 sq.ft. per unit
- 6-Unit Multifamily
- 3 Bedrooms
- Worcester, MA

1. Rebates are calculated on a per unit basis, using Mass Save® new construction program pay-for-savings Incentive calculations & Tax credit allows for up to \$2,000 for new homes independently rated below HERS 50.
2. Energy costs are based on 22 cents/kWh, \$1.53/therm, and \$3.09/gal propane
3. 30-year mortgage assumes 10% down payment at 4% APR
4. In addition to the Mass Save® rebates, HERS Rated homes are eligible for the \$2,000/unit residential builder energy efficiency tax credit under section 1332, Credit for Construction of New Energy Efficient Homes, of the Energy Policy Act of 2005



6-unit Multifamily - Gas

HERS Index (ERI)

52
Base

42
Stretch



Gas

1400 sq.ft. per unit
6-Unit Multifamily
3 Bedrooms - Worcester, MA

Breakdown of Construction Costs to Meet Stretch Code

FEATURE	BASE CODE	STRETCH CODE	ADDITIONAL COSTS ¹
HERS INDEX	52	42	
Windows (U-Value/SHGC)	U-0.28, 0.29 SHGC	U-0.18, 0.29 SHGC	\$2,025
DHW	Gas Tankless 0.94 EF	Gas Tankless 0.94 EF	\$0
Heating	Gas, 95% AFUE	Gas, 98% AFUE	\$686
Cooling	SEER 14.2	SEER 16	408
Duct Leakage to Outside	2 CFM25 per 100ft ² , R-6	In Conditioned Space*	\$0
Foundation Insulation	NA (upper-level unit)	NA (upper-level unit)	\$0
Floor Insulation	NA (upper-level unit)	NA (upper-level unit)	\$0
Walls Insulation	R-21, 2x6, 16 in o.c.	R-21, 2x6, 16 in o.c., R-5 XPS	\$1,038
High Efficacy Lighting	100% LED	100% LED	\$0
Ceiling Insulation	Ceiling R-49, Vented	Ceiling R-38, Vented	-\$803
Air Infiltration	3 ACH50	1.5 ACH50	\$1,140
Mechanical Ventilation	Exhaust Only	HRV, 75%	\$1,352
TOTAL			\$5,848

1. Additional Cost are the costs above Base Code to reach Stretch Code.
2. 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.
3. 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.



Massachusetts Department
of Energy Resources



PERFORMANCE
SYSTEMS
DEVELOPMENT



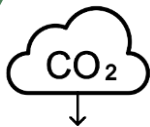
4-story Multifamily - Electric

HERS Index

52 ▶ **42**
Base Stretch



2030 Annual Greenhouse Gas
0.39 | **1.12**
Stretch Tons



Home Details

- 1,200 sq.ft. per unit
- 4-Story Multifamily
- 2 Bedrooms
- Worcester, MA

Costs and Benefits to Meet Stretch Code

	COSTS		BENEFITS	NET
BUILDER	-\$12,705 per unit Total Adjustments		\$3,621 Rebates & Tax Credits ¹	-\$16,326 Cost Compared to Base Code
HOME BUYER	-\$3,265 Change to Downpayment ³	-\$710 Change to Annual Mortgage Payment ³	\$28 Estimated Energy Cost Savings per Year ²	-\$738 Buyer Annual Net

1. Rebates are calculated on a per unit basis, using Mass Save® new construction program pay-for-savings Incentive calculations & Tax credit allows for up to \$2,000 for new homes independently rated below HERS 50.
2. Energy costs are based on 22 cents/kWh, \$1.53/therm, and \$3.09/gal propane
3. 30-year mortgage assumes 10% down payment at 4% APR
4. In addition to the Mass Save® rebates, HERS Rated homes are eligible for the \$2,000/unit residential builder energy efficiency tax credit under section 1332, Credit for Construction of New Energy Efficient Homes, of the Energy Policy Act of 2005



Massachusetts Department
of Energy Resources



PERFORMANCE
SYSTEMS
DEVELOPMENT

4-story Multifamily - Electric

HERS Index (ERI)

52 ▶ **42**
Base Stretch



Electric Heat Pump

1200 sq.ft. per unit
4-Story Multifamily
2 Bedrooms - Worcester, MA

Breakdown of Construction Costs to Meet Stretch Code

FEATURE	BASE CODE	STRETCH CODE	ADDITIONAL COSTS ¹
HERS INDEX	52	42	
Windows (U-Value/SHGC)	U-0.18, 0.29 SHGC	U-0.28, 0.29 SHGC	-\$2,305
DHW	Gas Tankless 0.94 EF	HPWH, 50 gal, 2.35 EF	-\$316
Heating	98% AFUE	SEER 20, 12 HSPF, Ductless	-\$6,331
Cooling	SEER 14.2		
Duct Leakage to Outside	In Conditioned Space	Ductless	-\$3,765
Foundation Insulation	NA (upper-level unit)	NA (upper-level unit)	\$0
Floor Insulation	NA (upper-level unit)	NA (upper-level unit)	\$0
Walls Insulation	R-21, 2x6, 16 in o.c., R-5 XPS	R-21, 2x6, 16 in o.c.	-\$497
High Efficacy Lighting	100% LED	100% LED	\$0
Ceiling Insulation	R-30, 2x10	R-30, 2x10	\$0
Air Infiltration	2 ACH50	1.5 ACH50	\$508
Mechanical Ventilation	Exhaust Only	Exhaust Only	\$0
TOTAL			-\$12,705

1. Additional Cost are the costs above Base Code to reach Stretch Code.
2. 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.
3. 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.





4-story Multifamily - Gas

HERS Index

52
Base

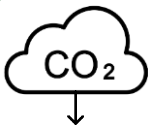
42
Stretch



2030 Annual Greenhouse Gas

0.92
Stretch Tons

0.59
Tons Saved



Home Details

- 1,200 sq.ft. per unit
- 4-Story Multifamily
- 2 Bedrooms
- Worcester, MA

Costs and Benefits to Meet Stretch Code

	COSTS		BENEFITS	NET
BUILDER	\$2,652 per unit Total Adjustments		\$3,220 Rebates & Tax Credits ¹	\$568 Cost Compared to Base Code
HOME BUYER	-\$114 Change to Downpayment ³	-\$25 Change to Annual Mortgage Payment ³	\$51 Estimated Energy Cost Savings per Year ²	-\$75 Buyer Annual Net

1. Rebates are calculated on a per unit basis, using Mass Save® new construction program pay-for-savings Incentive calculations & Tax credit allows for up to \$2,000 for new homes independently rated below HERS 50.
2. Energy costs are based on 22 cents/kWh, \$1.53/therm, and \$3.09/gal propane
3. 30-year mortgage assumes 10% down payment at 4% APR
4. In addition to the Mass Save® rebates, HERS Rated homes are eligible for the \$2,000/unit residential builder energy efficiency tax credit under section 1332, Credit for Construction of New Energy Efficient Homes, of the Energy Policy Act of 2005



Massachusetts Department of Energy Resources



PERFORMANCE SYSTEMS DEVELOPMENT

4-story Multifamily - Gas

HERS Index (ERI)

52
Base

42
Stretch



Gas

1200 sq.ft. per unit
4-Story Multifamily
2 Bedrooms - Worcester, MA

Breakdown of Construction Costs to Meet Stretch Code

FEATURE	BASE CODE	STRETCH CODE	ADDITIONAL COSTS 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	98% AFUE	98% AFUE	-\$34
Cooling	SEER 14.2	SEER 16	\$479
Duct Leakage to Outside	In Conditioned Space	In Conditioned Space	\$0
Foundation Insulation	NA (upper-level unit)	NA (upper-level unit)	\$0
Floor Insulation	NA (upper-level unit)	NA (upper-level unit)	\$0
Walls Insulation	R-21, 2x6, 16 in o.c., R-5 XPS	R-21, 2x6, 16 in o.c., R-5 XPS	\$0
High Efficacy Lighting	100% LED	100% LED	\$0
Ceiling Insulation	R-30, 2x10	R-30, 2x10	\$0
Air Infiltration	2 ACH50	1 ACH50	\$855
Mechanical Ventilation	Exhaust Only	HRV, 75%	\$1,352
TOTAL			\$2,652

1. Additional Cost are the costs above Base Code to reach Stretch Code.
2. 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.
3. 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.

