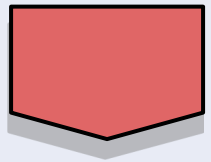
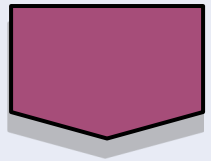
DOER: Critical Stretch Code Series

Fundamentals

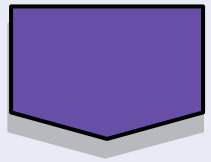
January 20, 2023



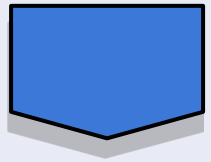
Compliance Pathways: Buckets and Overlays



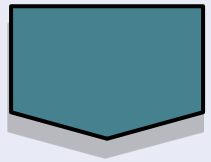
Adoption Timeline



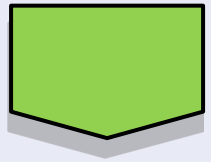
Residential Updated Stretch & Opt-In Stretch



Commercial Updated Stretch and Amendments



Commercial Opt-In Stretch



Resources, Audience Q&A

Moderators and Presenters

Lara Pfadt
Finegold Alexander Architects

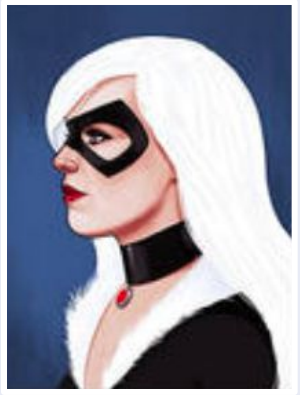
Alison Nash
Sasaki

Amy Sheehan
Latva-Kokko
DSK | Dewing Schmid Kearns

Christiane Perrin
Allied Consulting Engineering

Patrick Murphy
Vanderweil Engineers

Jacob Knowles
BR+A



Michelle Fennell
BR+A

Contributors

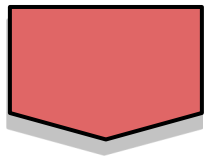
Boston-Area Sustainable Design Leaders

Chen Qin, Gensler (Opt-In)
Kristen Fritsch, Elkus Manfredi
Suni Dillard, HMFH
Kate Bubriski, Arrowstreet

Decision Trees by DiAnn Tufts, PCA and Lauren Gunther, DiMella Shaffer

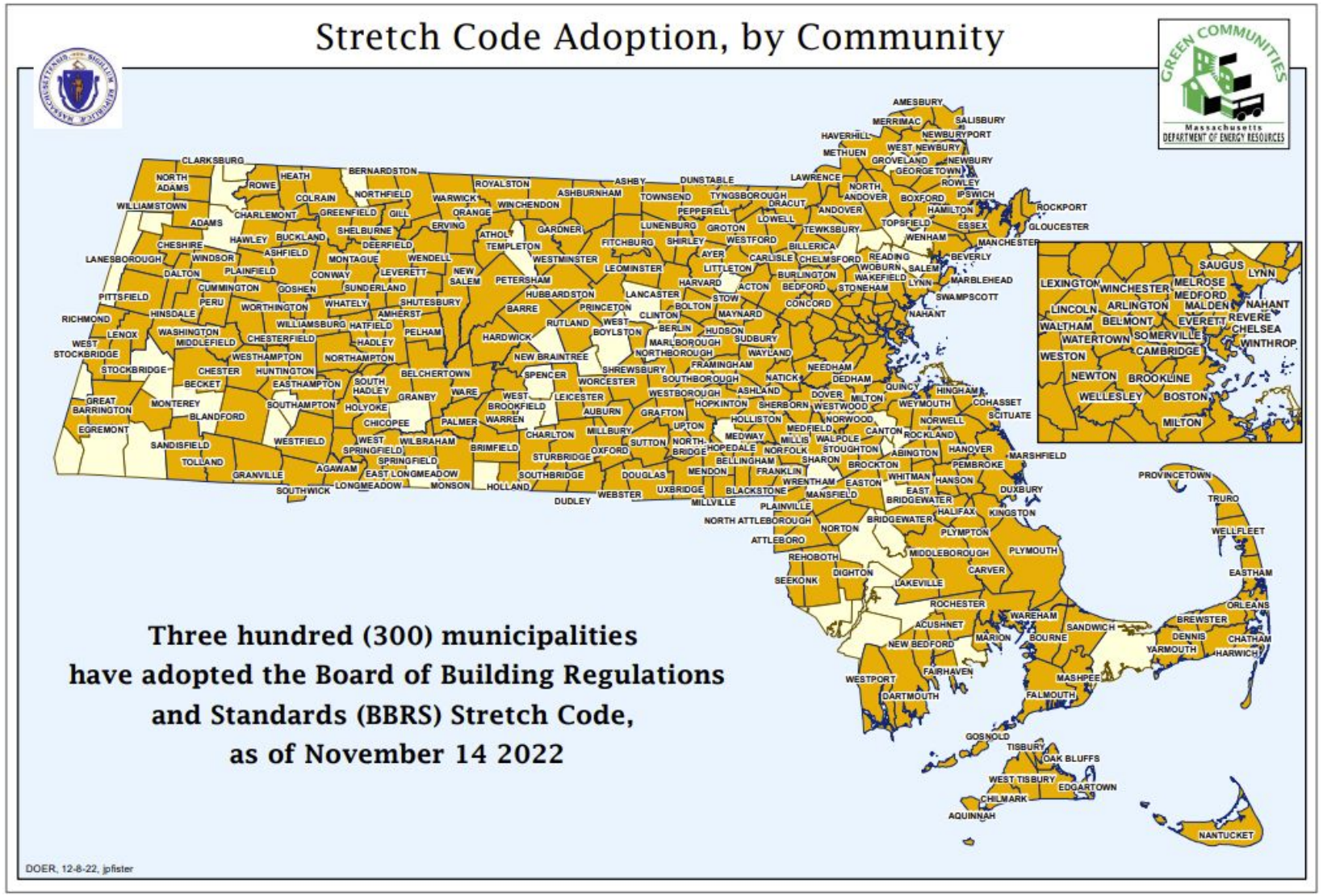
BSA COTE Committee
BSA Codes Committee

Ari Greenberg, BR+A



Compliance Pathways

Green Communities = Stretch Code Applies



Source: https://www.mass.gov/doc/stretch-code-adoption-by-community-map/download

Compliance Pathways

~50 Municipalities

BBRS:
Expected July 2023

OR

~300 Green Communities

Residential: Jan 2023
Commercial: July 2023

OR

as of Jan 2023:
Brookline, Watertown

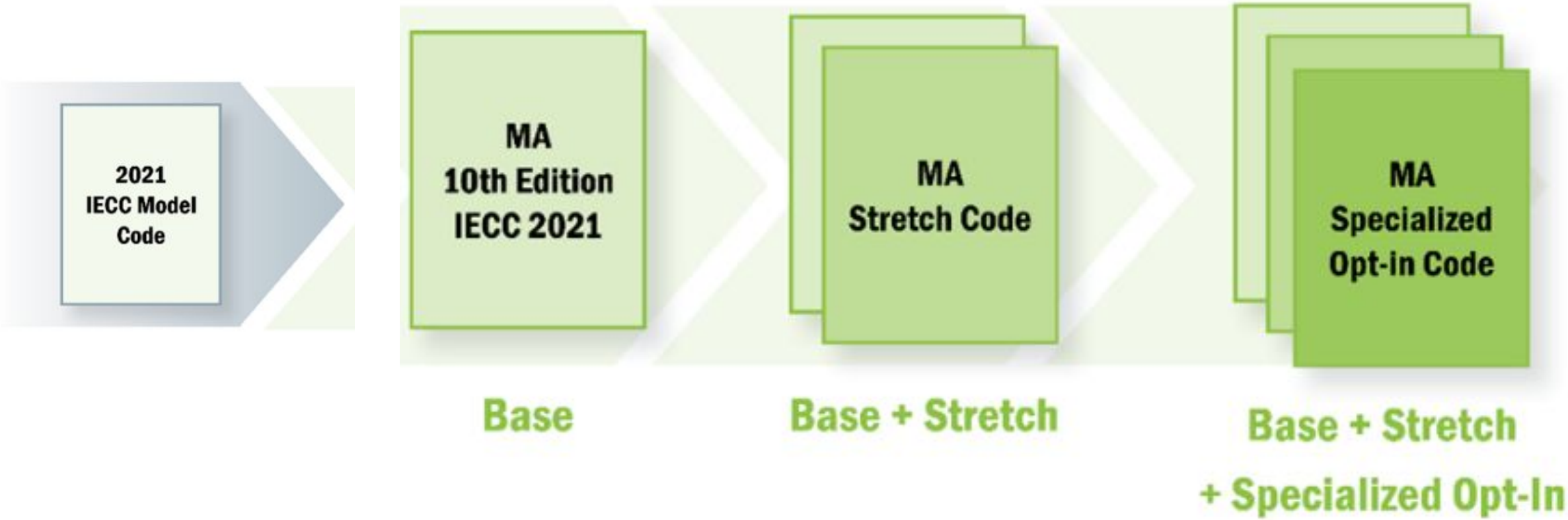
Green Community to "Opt-In"
Typically 6-11 months after Town/
City vote

Compliance Pathways

~50 Municipalities

~300 Green Communities

as of Jan 2023:
Brookline, Watertown



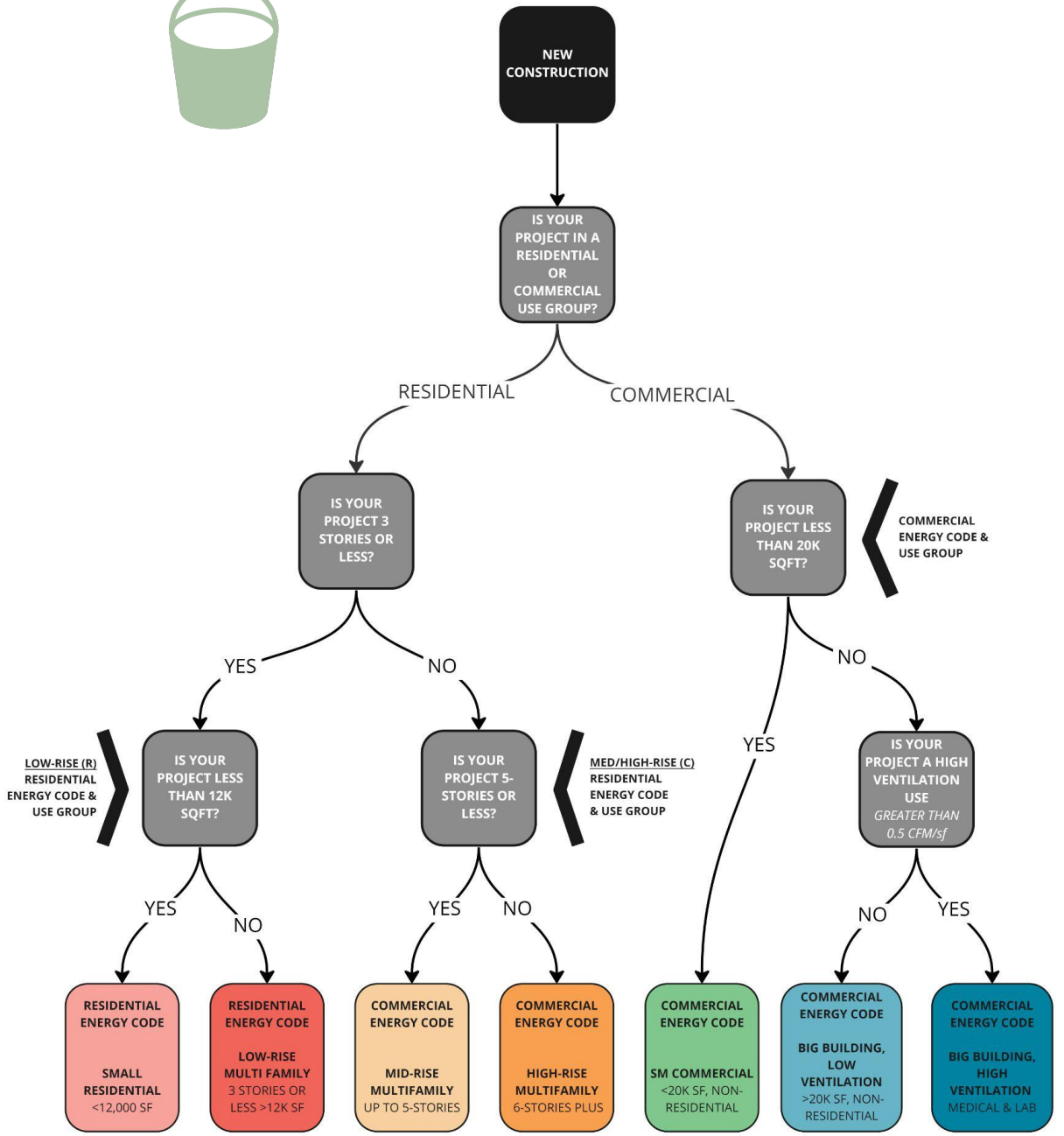
BBRS:
Expected July 2023

Residential: Jan 2023
Commercial: July 2023

Green Community to "Opt-In"
Typically 6-11 months after Town/ City vote

Source: https://www.mass.gov/doc/draft-2023-technical-guidance-for-the-stretch-energy-code-and-specialized-code/download

Stretch Code
New Construction Decision Tree



Three “Buckets”

Regular Energy Code

If a municipality is not a stretch-code community or the project is new construction and additions less than 20,000 SF, a renovation, or interiors only, this becomes its code in July 2023 by default.

IECC 2021 (ref. ASHRAE 90.1-2019), w/ MA amendments including C406—“3 out of 10” rule.

Updated Stretch Code

If a municipality is a stretch-code community, this becomes its code in July 2023 by default for new construction and additions more than 20,000 SF, and newly applies to alterations of existing buildings.

Specialized Opt-In Code

A new code with added requirements that a municipality may elect to follow effective as early as July 2023 or January 2024.

Builds upon the Updated Stretch Code.

Compliance Path	Applicability	Anticipated Requirements*
Prescriptive	New Buildings ≤ 20,000 SF	IECC 2021 plus additional requirements.
Targeted Performance (TEDI Pathway)	Most New Buildings (Offices, Schools, Commercial, etc.)	Meet EUI targets for heating and cooling.
Relative Performance	High Ventilation Buildings (e.g. Labs, Healthcare)	Show 10% improvement over 90.1-2019 App. G. plus partial electrification requirements.
Passive House	Available for All New Buildings	Subject to PHIUS/PHI requirements.
HERS	New Multi-Family Buildings	Achieve HERS rating based on energy source.

Three “Buckets”

Regular Energy Code

If a municipality is not a stretch-code community or the project is new construction and additions less than 20,000 SF, a renovation, or interiors only, this becomes its code in July 2023 by default.

IECC 2021 (ref. ASHRAE 90.1-2019), w/ MA amendments including C406—“3 out of 10” rule.

Updated Stretch Code

If a municipality is a stretch-code community, this becomes its code in July 2023 by default for new construction and additions more than 20,000 SF, and newly applies to alterations of existing buildings.

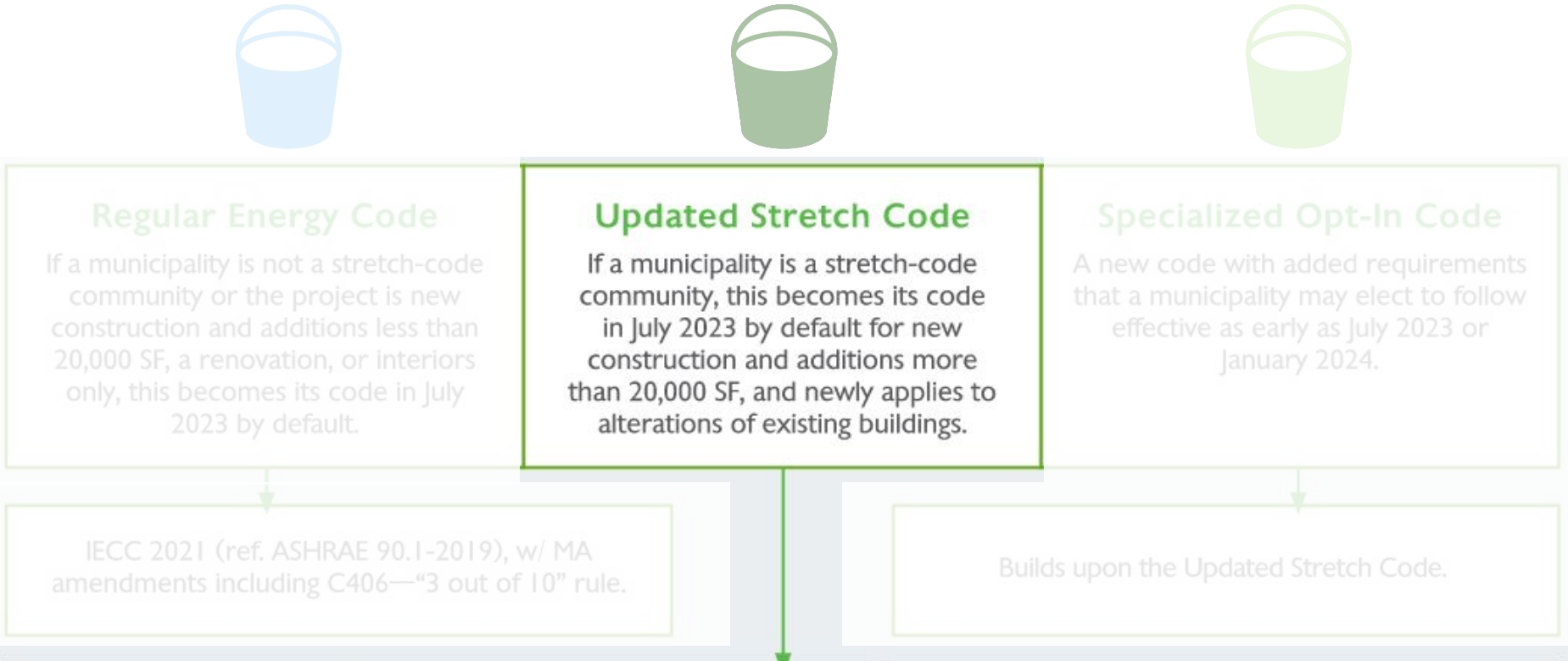
Specialized Opt-In Code

A new code with added requirements that a municipality may elect to follow effective as early as July 2023 or January 2024.

Builds upon the Updated Stretch Code.

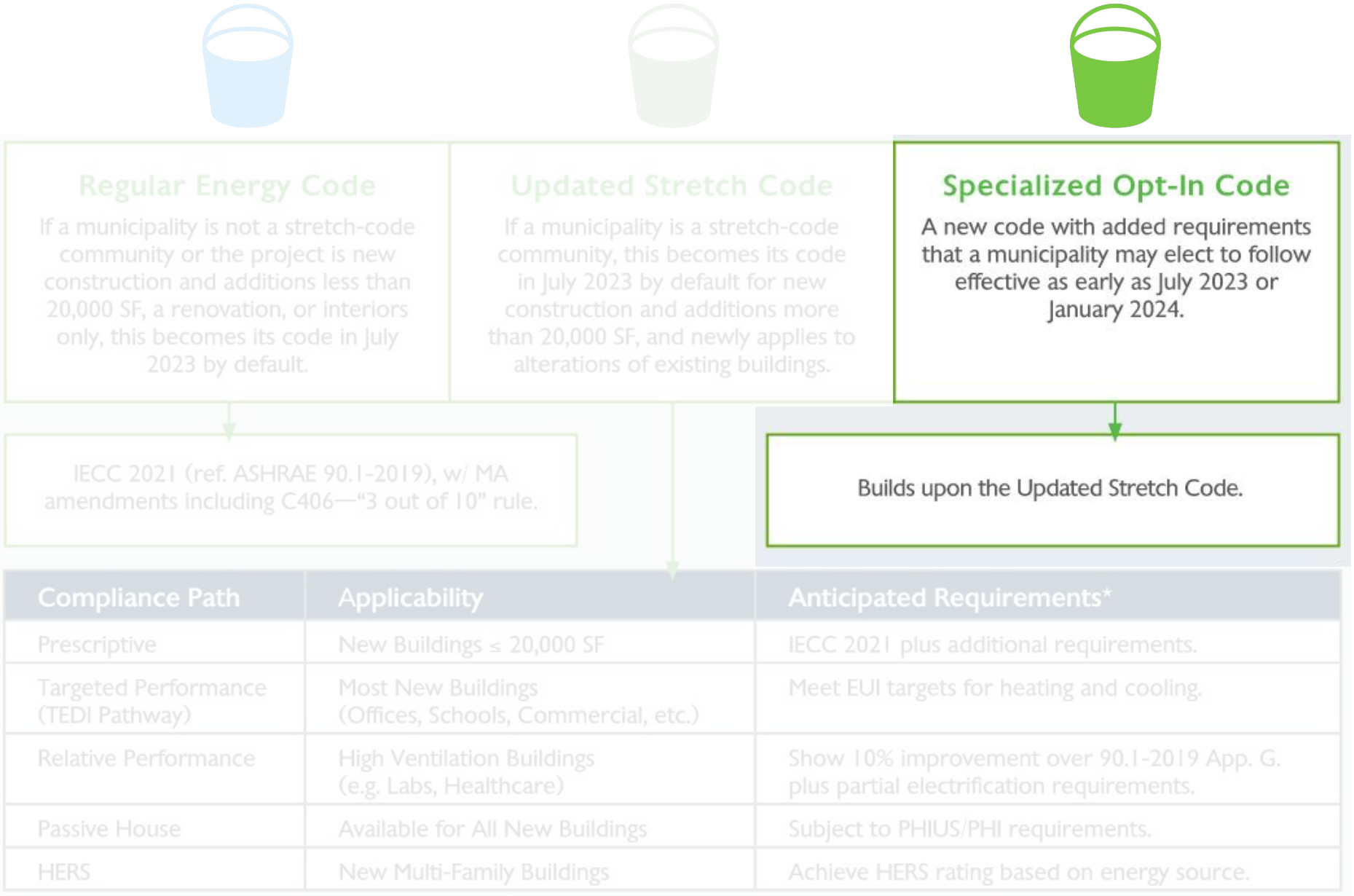
Compliance Path	Applicability	Anticipated Requirements*
Prescriptive	New Buildings ≤ 20,000 SF	IECC 2021 plus additional requirements.
Targeted Performance (TEDI Pathway)	Most New Buildings (Offices, Schools, Commercial, etc.)	Meet EUI targets for heating and cooling.
Relative Performance	High Ventilation Buildings (e.g. Labs, Healthcare)	Show 10% improvement over 90.1-2019 App. G. plus partial electrification requirements.
Passive House	Available for All New Buildings	Subject to PHIUS/PHI requirements.
HERS	New Multi-Family Buildings	Achieve HERS rating based on energy source.

Three “Buckets”



Compliance Path	Applicability	Anticipated Requirements*
Prescriptive	New Buildings ≤ 20,000 SF	IECC 2021 plus additional requirements.
Targeted Performance (TEDI Pathway)	Most New Buildings (Offices, Schools, Commercial, etc.)	Meet EUI targets for heating and cooling.
Relative Performance	High Ventilation Buildings (e.g. Labs, Healthcare)	Show 10% improvement over 90.1-2019 App. G. plus partial electrification requirements.
Passive House	Available for All New Buildings	Subject to PHIUS/PHI requirements.
HERS	New Multi-Family Buildings	Achieve HERS rating based on energy source.

Three “Buckets”



Compliance Path	Applicability	Anticipated Requirements*
Prescriptive	New Buildings ≤ 20,000 SF	IECC 2021 plus additional requirements.
Targeted Performance (TEDI Pathway)	Most New Buildings (Offices, Schools, Commercial, etc.)	Meet EUI targets for heating and cooling.
Relative Performance	High Ventilation Buildings (e.g. Labs, Healthcare)	Show 10% improvement over 90.1-2019 App. G. plus partial electrification requirements.
Passive House	Available for All New Buildings	Subject to PHIUS/PHI requirements.
HERS	New Multi-Family Buildings	Achieve HERS rating based on energy source.

Stretch Code
Existing Construction Pathways

Alteration

New Construction Prescriptive Compliance for envelope, mechanical, service water heating and electrical alterations (+C503 exceptions). Unaltered portions not required to comply.

+

If using the component performance alternative:

The proposed UA shall not be greater than 110 percent of the target UA.

Addition

<100% of size of existing building **and** <20,000 sf

Follow additions section

≥100% of size of existing building **and/or** ≥20,000 sf

Follow New Construction Path (*choose addition only* ***or*** *existing + addition*)

Change of Use

Increase in fossil fuel or electrical demand

New Construction Prescriptive Compliance

+

If space use changes

Lighting Power Density Compliance

+

If space undergoing a change in occupancy or use is in a building with a window:wall ratio above prescriptive limit

Exempt from maximum window:wall ratio, No increase in window:wall ratio allowed

Stretch Code
Existing Construction Pathways

Alteration

New Construction Prescriptive Compliance for envelope, mechanical, service water heating and electrical alterations (+C503 exceptions). Unaltered portions not required to comply.

+

If using the component performance alternative:

The proposed UA shall not be greater than 110 percent of the target UA.

Addition

<100% of size of existing building **and** <20,000 sf

Follow additions section

≥100% of size of existing building **and/or** ≥20,000 sf

Follow New Construction Path (*choose addition only* **or** *existing + addition*)

Change of Use

Increase in fossil fuel or electrical demand

New Construction Prescriptive Compliance

+

If space use changes

Lighting Power Density Compliance

+

If space undergoing a change in occupancy or use is in a building with a window:wall ratio above prescriptive limit

Exempt from maximum window:wall ratio, No increase in window:wall ratio allowed

Stretch Code
Existing Construction Pathways

Alteration

New Construction Prescriptive Compliance for envelope, mechanical, service water heating and electrical alterations (+C503 exceptions). Unaltered portions not required to comply.

+

If using the component performance alternative:

The proposed UA shall not be greater than 110 percent of the target UA.

Addition

<100% of size of existing building **and** <20,000 sf

Follow additions section

≥100% of size of existing building **and/or** ≥20,000 sf

Follow New Construction Path (*choose addition only* ***or*** *existing + addition*)

Change of Use

Increase in fossil fuel or electrical demand

New Construction Prescriptive Compliance

+

If space use changes

Lighting Power Density Compliance

+

If space undergoing a change in occupancy or use is in a building with a window:wall ratio above prescriptive limit

Exempt from maximum window:wall ratio, No increase in window:wall ratio allowed

Stretch Code
Existing Construction Pathways

Alteration

New Construction Prescriptive Compliance for envelope, mechanical, service water heating and electrical alterations (+C503 exceptions). Unaltered portions not required to comply.

+

If using the component performance alternative:

The proposed UA shall not be greater than 110 percent of the target UA.

Addition

<100% of size of existing building **and** <20,000 sf

Follow additions section

≥100% of size of existing building **and/or** ≥20,000 sf

Follow New Construction Path (*choose addition only* **or** *existing + addition*)

Change of Use

Increase in fossil fuel or electrical demand

New Construction Prescriptive Compliance

+

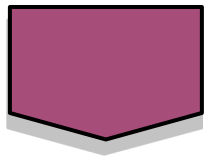
If space use changes

Lighting Power Density Compliance

+

If space undergoing a change in occupancy or use is in a building with a window:wall ratio above prescriptive limit

Exempt from maximum window:wall ratio, No increase in window:wall ratio allowed



Adoption Timeline

Code Timeline

DEC 2022

12/23 DRAFT Technical Guidance Documents Released

JAN 2023

1/1 Residential Stretch Code in Effect (225 CMR 22)

1/4 Warrant Articles due in some Towns for Opt-In Vote

April-June 2023
Town Meetings vote on Opt-In Code (225 CMR A.RC and 225 CMR A.CC)

6-11 months later
Opt-In Code in Effect

JULY 2023

7/1 Commercial Stretch Code in Effect (225 CMR 23)

7/1 Base Energy Code in Effect (780 CMR , IECC 2021 w/ MA Amendments

JAN 2024

1/1 Opt-In Stretch Multifamily ≤ 5 stories to meet Passive House

JULY 2024

7/1 Lower HERS Value for Residential

7/1 Relative Performance path ends for Commercial Multi-family

7/1 Opt-In Stretch Multi-family > 6 stories to meet Passive House

Code Timeline

DEC 2022

12/23 DRAFT Technical Guidance Documents Released

JAN 2023

1/1 Residential Stretch Code in Effect (225 CMR 22)

1/4 Warrant Articles due in some Towns for Opt-In Vote

April-June 2023
Town Meetings vote on Opt-In Code (225 CMR A.RC and 225 CMR A.CC)

6-11 months later
Opt-In Code in Effect

JULY 2023

7/1 Commercial Stretch Code in Effect (225 CMR 23)

7/1 Base Energy Code in Effect (780 CMR , IECC 2021 w/ MA Amendments

JAN 2024

1/1 Opt-In Stretch Multifamily ≤ 5 stories to meet Passive House

JULY 2024

7/1 Lower HERS Value for Residential

7/1 Relative Performance path ends for Commercial Multi-family

7/1 Opt-In Stretch Multi-family > 6 stories to meet Passive House

Code Timeline

DEC 2022

12/23 DRAFT Technical Guidance Documents Released

JAN 2023

Brookline & Watertown Adopt Opt-In Stretch

1/1 Residential Stretch Code in Effect (225 CMR 22)

1/4 Warrant Articles due in some Towns for Opt-In Vote

April-June 2023
Town Meetings vote on Opt-In Code (225 CMR A.RC and 225 CMR A.CC)

6-11 months later
Opt-In Code in Effect

JULY 2023

7/1 Commercial Stretch Code in Effect (225 CMR 23)

7/1 Base Energy Code in Effect (780 CMR , IECC 2021 w/ MA Amendments

JAN 2024

1/1 Opt-In Stretch Multifamily ≤ 5 stories to meet Passive House

JULY 2024

7/1 Lower HERS Value for Residential

7/1 Relative Performance path ends for Commercial Multi-family

7/1 Opt-In Stretch Multi-family > 6 stories to meet Passive House

Code Timeline

DEC 2022

12/23 DRAFT Technical Guidance Documents Released

JAN 2023

1/1 Residential Stretch Code in Effect (225 CMR 22)

1/4 Warrant Articles due in some Towns for Opt-In Vote

Brookline & Watertown
Adopt Opt-In Stretch

April-June 2023
Town Meetings vote on Opt-In Code (225 CMR A.RC and 225 CMR A.CC)

6-11 months later
Opt-In Code in Effect

JULY 2023

7/1 Commercial Stretch Code in Effect (225 CMR 23)

7/1 Base Energy Code in Effect (780 CMR , IECC 2021 w/ MA Amendments

JAN 2024

1/1 Opt-In Stretch Multifamily ≤ 5 stories to meet Passive House

JULY 2024

7/1 Lower HERS Value for Residential

7/1 Relative Performance path ends for Commercial Multi-family

7/1 Opt-In Stretch Multi-family > 6 stories to meet Passive House

Code Timeline

DEC 2022

12/23 DRAFT Technical Guidance Documents Released

JAN 2023

1/1 Residential Stretch Code in Effect (225 CMR 22)

1/4 Warrant Articles due in some Towns for Opt-In Vote

Brookline & Watertown
Adopt Opt-In Stretch

April-June 2023
Town Meetings vote on Opt-In Code (225 CMR A.RC and 225 CMR A.CC)

6-11 months later
Opt-In Code in Effect

JULY 2023

7/1 Commercial Stretch Code in Effect (225 CMR 23)

7/1 Base Energy Code in Effect (780 CMR , IECC 2021 w/ MA Amendments

JAN 2024

1/1 Opt-In Stretch Multifamily ≤ 5 stories to meet Passive House

JULY 2024

7/1 Lower HERS Value for Residential

7/1 Relative Performance path ends for Commercial Multi-family

7/1 Opt-In Stretch Multi-family > 6 stories to meet Passive House

Code Timeline

DEC 2022

12/23 DRAFT Technical Guidance Documents Released

JAN 2023

1/1 Residential Stretch Code in Effect (225 CMR 22)

1/4 Warrant Articles due in some Towns for Opt-In Vote

Brookline & Watertown Adopt Opt-In Stretch

April-June 2023 Town Meetings vote on Opt-In Code (225 CMR A.RC and 225 CMR A.CC)

6-11 months later Opt-In Code in Effect

JULY 2023

7/1 Commercial Stretch Code in Effect (225 CMR 23)

7/1 Base Energy Code in Effect (780 CMR , IECC 2021 w/ MA Amendments

JAN 2024

1/1 Opt-In Stretch Multifamily ≤ 5 stories to meet Passive House

JULY 2024

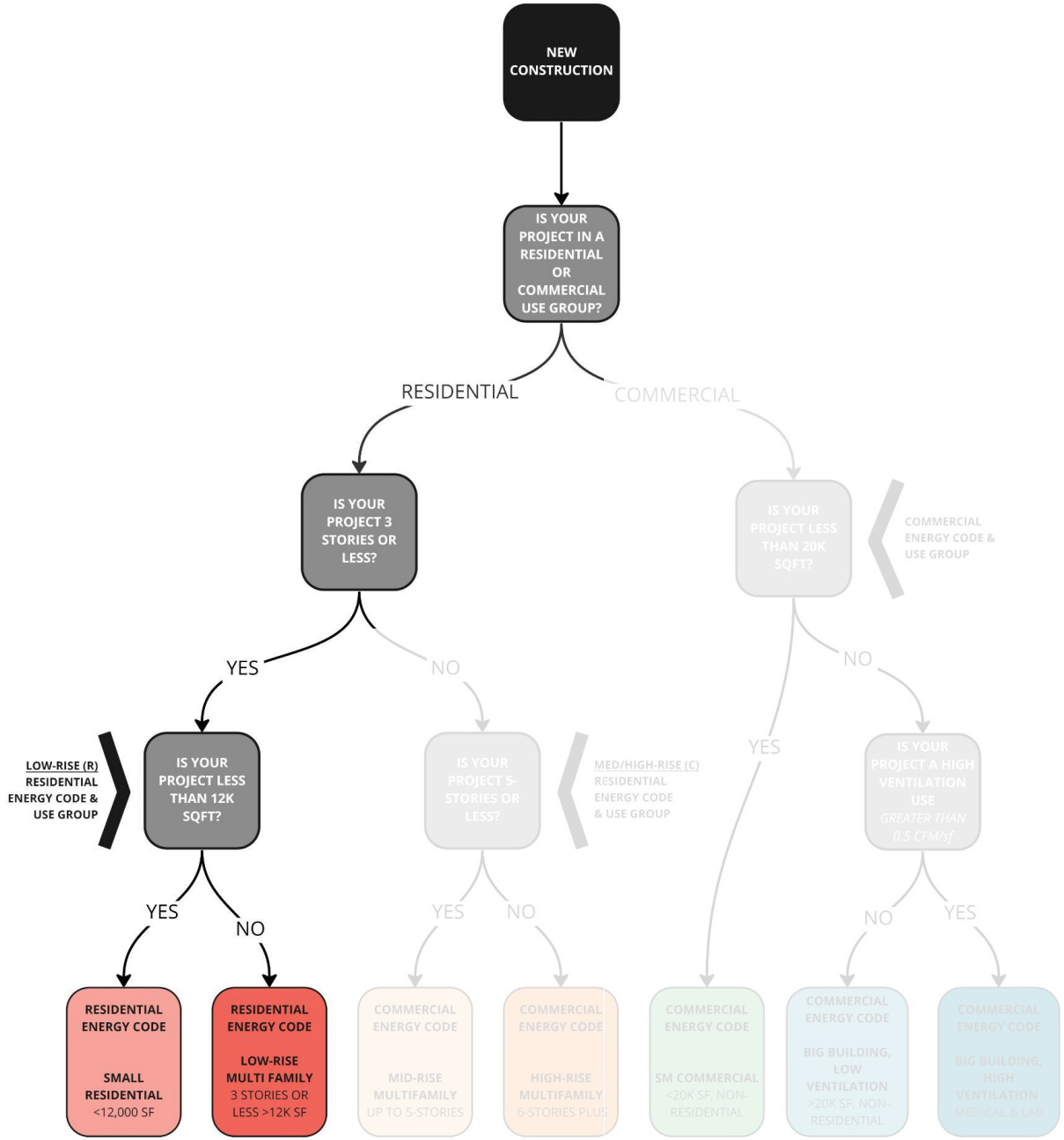
7/1 Lower HERS Value for Residential

7/1 Relative Performance path ends for Commercial Multi-family

7/1 Opt-In Stretch Multi-family > 6 stories to meet Passive House

Residential Updated Stretch & Opt-In

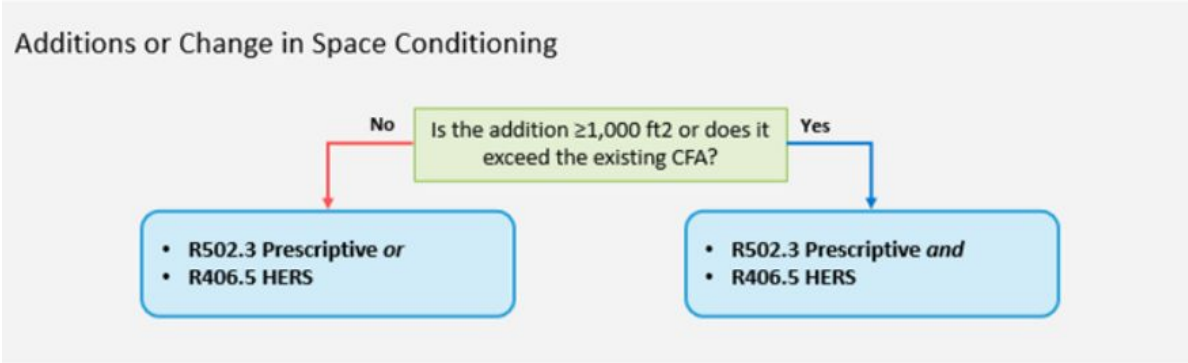
Residential Stretch

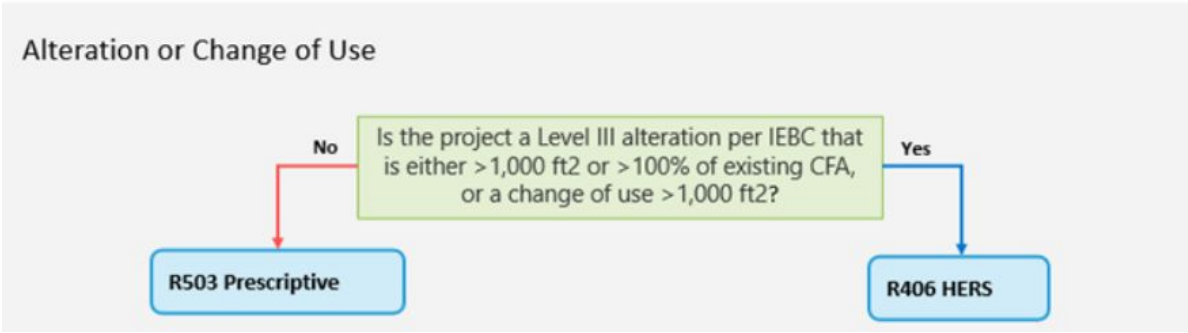


Residential - Chapter 5 - Existing Buildings: Additions, Alterations, Change of Use

- Additions
  - >1000 sf follow Stretch – HERS pathway and follow table R406.5
  - > 100% of existing conditioned floor area must meet HERS and follow table R406.5
  - <1000 sf follow Base Code

- Level 3 Alterations or Change of Use
  - >50% is renovated (IEBC defn) must meet HERS and follow table R406.5





source: DOER technical guidance document, p. 63

Residential - Base Code - Prescriptive thermal envelope updates

IECC 2018 TABLE R402.1.2

TABLE R402.1.2

INSULATION AND FENESTRATION REQUIREMENTS BY COMPONENT[a]

CLIMATE ZONE	FENESTRATION *U*-FACTOR[b]	SKYLIGHT[b] *U*-FACTOR	GLAZED FENESTRATION SHGC[b, e]	CEILING *R*-VALUE	WOOD FRAME WALL *R*-VALUE	MASS WALL *R*-VALUE[i]	FLOOR *R*-VALUE	BASEMENT[c] WALL *R*-VALUE	SLAB[d] *R*-VALUE & DEPTH	CRAWL SPACE[c] WALL *R*-VALUE
5 and Marine 4	0.30	0.55	NR	49	20 or 13+5[h]	13/17	30[g]	15/19	10, 2 ft	15/19

IECC 2021 TABLE R402.1.3

5 and Marine 4	0.30[i]	0.55	0.40	60	30 or 20&5ci[h] or 13& 10ci[h] or 0&20ci[h]	13/17	30	15ci or 19 or 13& 5ci	10ci, 4 ft	15ci or 19 or 13& 5ci

Base Code – change in prescriptive R-values for climate zone 5A from IECC 2018 to IECC 2021

Residential - New Construction - Prescriptive - R401-404, R408, Appendix RB Solar Ready

Prescriptive compliance requires

- R401-404: thermal envelope, HVAC
- two additional efficiency packages from R408, some options are
  - Enhanced envelope performance
  - More efficient HVAC equipment (air source or ground source heat pumps)
  - Reduced energy use in service water heating
- Appendix RB (Solar Ready)

Residential - Stretch Code - Appendix RB - Solar Ready

- Appendix RB:
  - Applies for new construction except additions under 1000 sf
  - With 600 sf or roof area between 110 degrees and 270 of true north

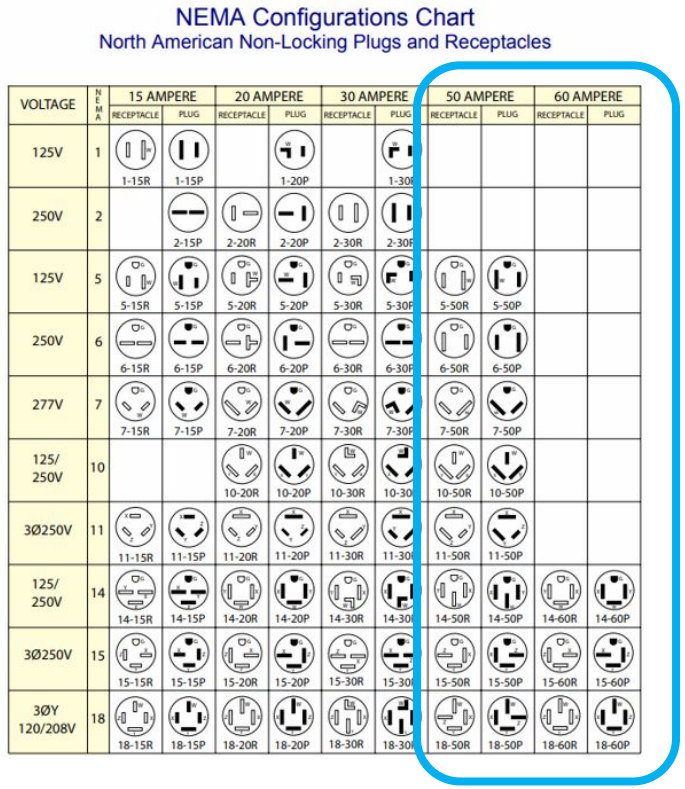
  - Dedicated solar zone for future solar system installation
    - confirm structural loads
    - reserved panel space
    - capped roof penetration sleeve

    - EXCEPT:
      - If permanently installed on-site renewable energy system
      - Solar ready zone that is shaded > 70% of daylight hours annually.

Residential - R404 EV Parking

Table R404.4 EV READY SPACE REQUIREMENTS

Type of Building	Number of parking spaces
1 & 2 family dwellings and townhomes	At least 1 50-amp branch circuit per dwelling unit to provide for AC Level II charging
All other R-use buildings	At least 20% of all installed spaces served with 40-amp, 208-240 volt circuit with a minimum capacity of 9.6kVA



Residential - R406.5 - Maximum Energy Rating Index - HERS Index requirements

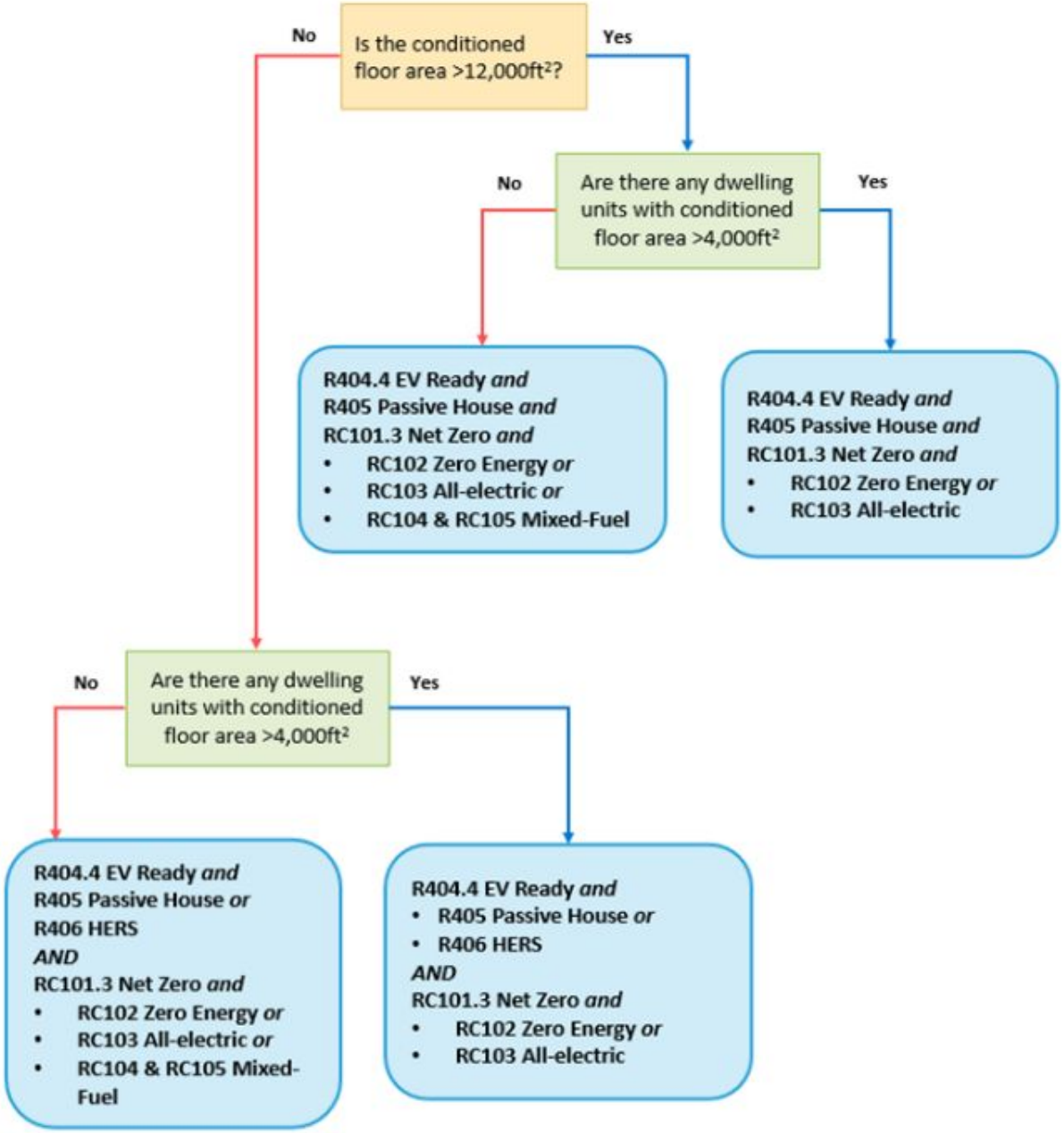
Building Energy Sources	Before July 2024	After July 2024	Alteration or Change of Use
Mixed Fuel	52	42	52
Solar Electric Generation	55	42	55
All-electric	55	45	55
Solar Electric and All-Electric	58	45	58

[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.

Residential - Optional Specialized Code - Appendix RC

1. Zero Energy pathway: (Section RC102)
2. All-Electric pathway: (Section RC103)
3. Mixed-Fuel pathway: (Sections RC104 and RC105)

New homes <4000 sf can do any of the above.
New homes > 4000 sf must do 1 or 2



Residential - Optional Specialized Code - Appendix RC - Mixed Fuel Pathway

- Appendix RC 104.3: Electric Readiness
  - RC 104.3.1 Space Heating
  - RC 104.3.2 Household Ranges and Cooking Appliances
  - RC 104.3.3 household Clothes Dryers and Water heaters
  - RC 104.3.4 Water Heating Space
- Appendix RC 104.4 - onsite renewable energy

TABLE RC102.2 MAXIMUM ENERGY RATING INDEX[a]

FUEL USAGE	ENERGY RATING INDEX NOT INCLUDING OPP	ENERGY RATING INDEX INCLUDING OPP
All Electric	45	0
Mixed-Fuel	42	0

a. The building shall meet the requirements of Table 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 R402.1.3.

Residential - Opt-In Specialized Code

Building Size	Fuel Type	Min Efficiency	Electrification	Min. EV wiring	Renewable Generation
Dwelling units up to 4000 sf	All Electric	HERS 45 or Phius CORE or PHI	Full	1 parking space	demonstrate a HERS rating of 0 or less
Dwelling units up to 4000 sf	Mixed-fuel	HERS 42 or Phius CORE or PHI	Pre-wiring	1 parking space	Solar PV (except shaded sites)
Dwelling units > 4000 sf	All Electric	HERS 45 or Phius CORE or PHI	Full	1 parking space	Optional
Dwelling units > 4000 sf	Mixed-fuel	HERS 42 or Phius ZERO	Pre-wiring	1 parking space	Solar PV or other renewables
Multi-family> 12,000 sf	All Electric	Phius CORE or PHI	Full	20% of spaces	Optional
Multi-family> 12,000 sf	Mixed-fuel	Phius CORE or PHI	Pre-wiring	20% of spaces	Optional

Residential - R403.6 Mechanical Ventilation

-- MANDATORY --

- ➔ Must meet minimum ventilation air requirements per ASHRAE 62.2 and the International Mechanical Code
- ➔ Must be continuously operating

Residential - R403.6 Mechanical Ventilation

HRV or ERV?
Both exhaust air, and bring in fresh outside air

What is the difference?

➔ HRV: Heat recovery ventilator:

Recovers heat/cooling only

Rarely used in New England

➔ ERV: Energy Recovery Ventilator:

Recovers heat/cooling and humidity

Recommended

Residential - R403.6 Mechanical Ventilation

Installation Requirements

- ➔ Outdoor exhaust and intakes ducts must have gravity or motorized dampers that close when the ventilation/exhaust system is not in operation.
- ➔ Must be tested and verified by HERS rater
- ➔ Fan sound rating: maximum 1.0 sone, unless fan is minimum 4 ft distance from exhaust/supply grille

Residential - R403.6 Mechanical Ventilation

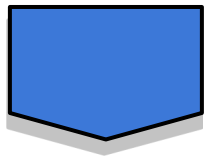
How to Implement?

(2) Approaches

1. Dedicated bathroom exhaust fans and separate dedicated ERVs. The ERVs will exhaust air from common areas and supply air to common areas and/or into fan coil unit return ducts.

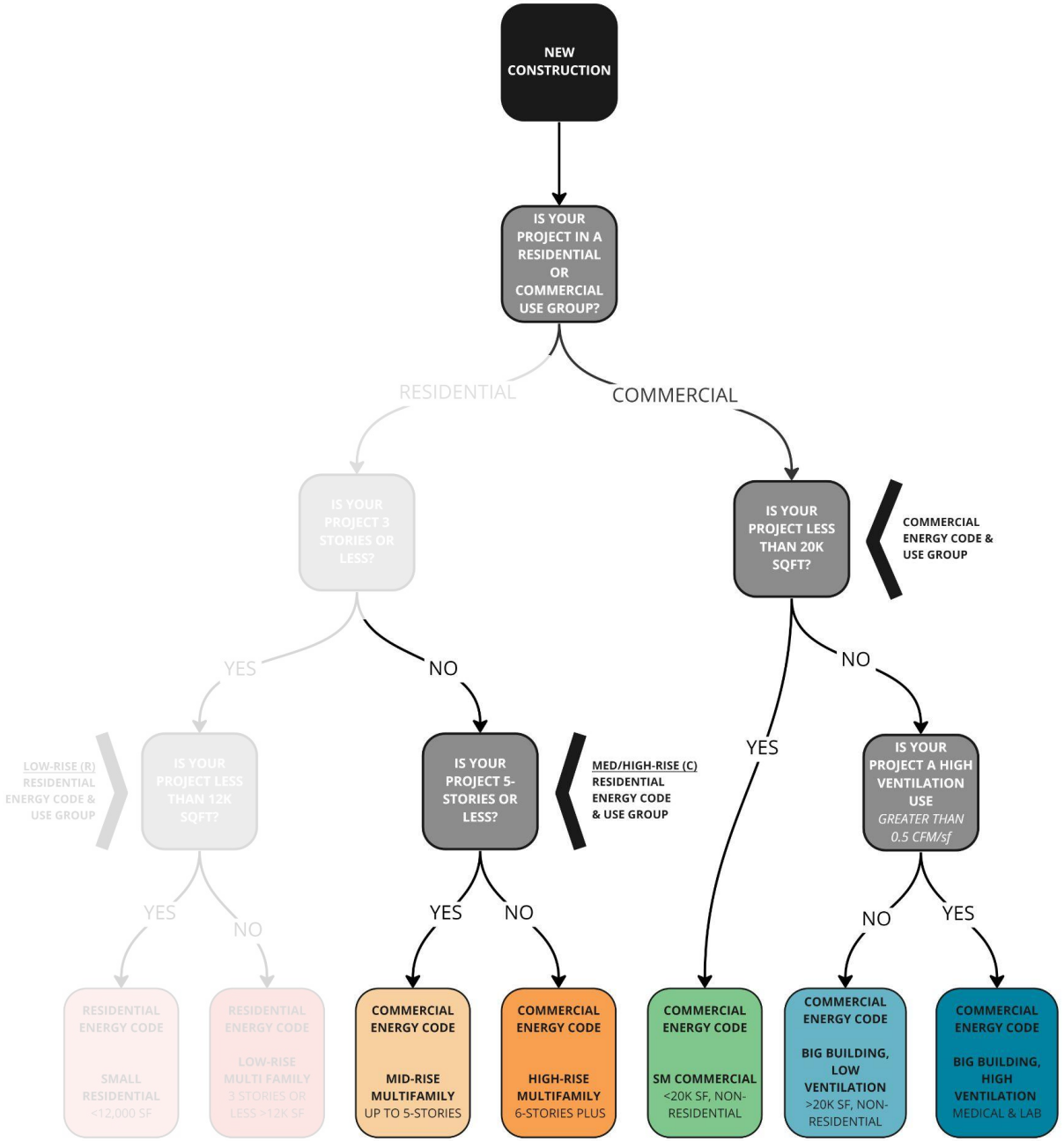
2. Exhaust air from bathrooms via an ERV and introduce fresh air to common areas and/or into fan coil unit return ducts.

Either option can be set up for 2-speed operation: Low fan speed until high speed is activated via a timer wall switch in a bathroom as required.



Commercial Updated Stretch

Commercial Stretch



Stretch Code Compliance Paths

Prescriptive

Targeted Performance

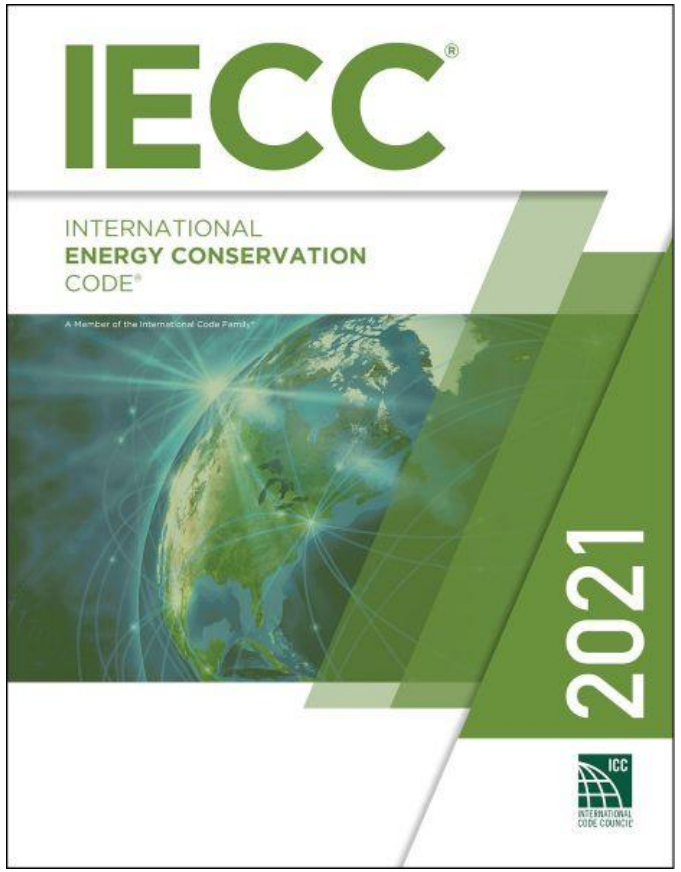
Relative Performance

Passive House

HERS

Stretch Code Compliance Paths

Prescriptive



➔ Only available for bldgs under 20,000 SF

➔ Follow IECC 2021 plus MA amendments

Targeted Performance

Relative Performance

Passive House

HERS

Stretch Code Compliance Paths

Prescriptive

Targeted Performance

Relative Performance

Passive House

HERS

Thermal Energy Demand Intensity (TEDI) Limits

Meet heating & cooling EUI limits:

Occupancy Type	Area (ft²)	Heating TEDI (kBtu/ft²)	Cooling TEDI (kBtu/ft²)
Office, police or fire station, library, post office, town hall	≥ 100,000	1.5	23
	< 100,000	2.5	21
K-12 school	≥ 100,000	2.2	12
	< 100,000	2.4	20
Residential multifamily or residence hall	≥ 100,000	2.8	22
	< 100,000	3.2	15
All other	≥ 100,000	1.5	23
	< 100,000	2.5	21

Stretch Code Compliance Paths

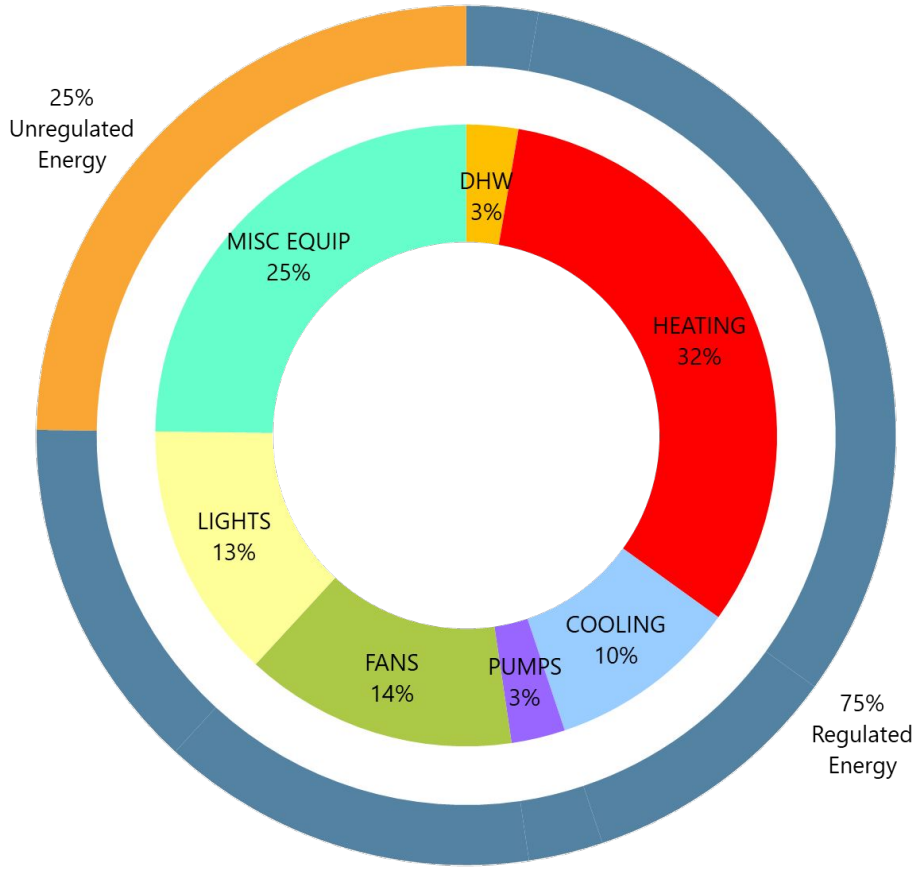
Prescriptive

Targeted Performance

Relative Performance

Passive House

HERS



Stretch Code Compliance Paths

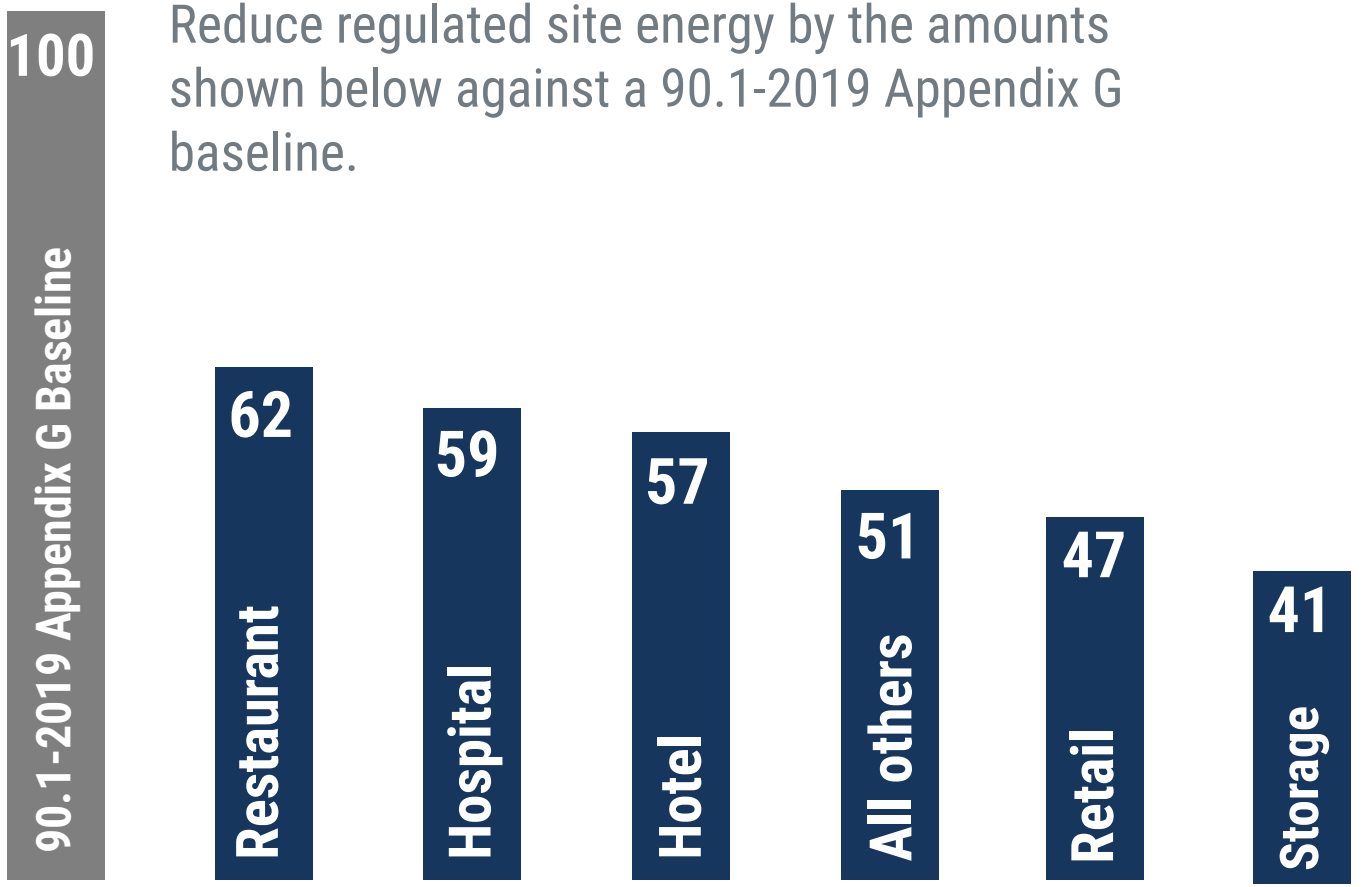
Prescriptive

Targeted Performance

Relative Performance

Passive House

HERS



Reduce regulated site energy by the amounts shown below against a 90.1-2019 Appendix G baseline.

Stretch Code Compliance Paths

Prescriptive

Targeted Performance

Relative Performance

Passive House

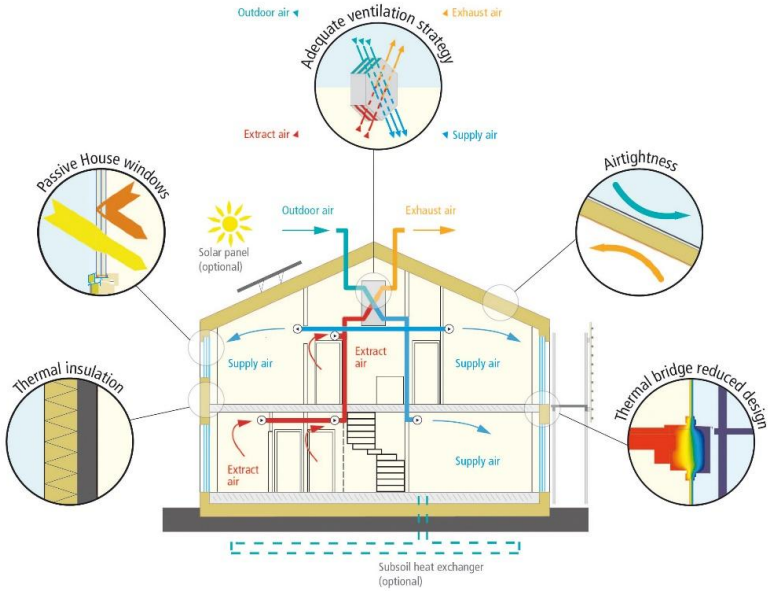
HERS

Achieve Passive House precertification*

Either:

phius CORE

Passive House



*Review C407.3.2.1 Documentation Requirements

Stretch Code Compliance Paths

Prescriptive

Targeted Performance

Relative Performance

Passive House

HERS

Multifamily property maximum HERS ratings:

Energy Type	New construction permits		Major alterations, additions, or use change
	Before 06/30/2024	After 06/30/2024	After 06/30/2023
Mixed-fuel	52	42	52
Includes solar PV	55	42	55
All-electric	55	45	55
Solar PV & all-electric	58	45	58

A lower HERS rating indicates a more efficient building.

MA Amendments

Stretch Code: Additional Requirements

Alterations & Additions
(C502, C503, C505)

Envelope Requirements
(C402.1.5; C402.5)

Additional Efficiency
(C406)

Energy Recovery
(C403.7)

Solar-Readiness
(C402.3; Appendix CB)

EV Charging Infrastructure
(C405.13)

Stretch Code: Additional Requirements

Alterations & Additions
(C502, C503, C505)

Envelope Requirements
(C402.1.5; C402.5)

Additional Efficiency
(C406)

Energy Recovery
(C403.7)

Solar-Readiness
(C402.3; Appendix CB)

EV Charging
(C405.13)

Stretch Code Applicability:
(Changes in blue)

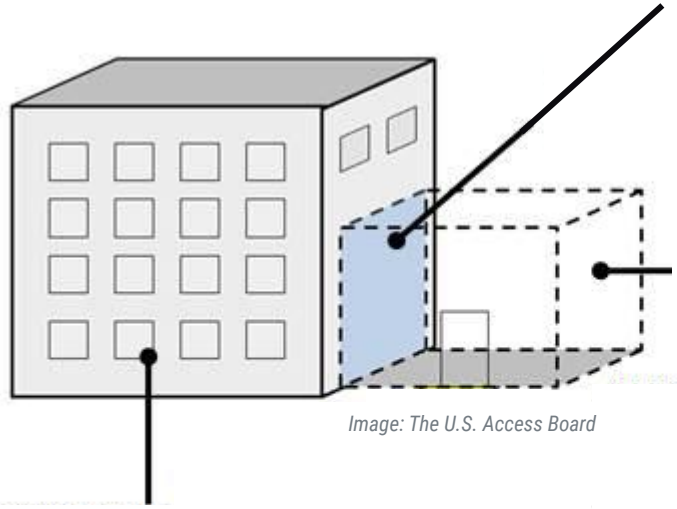


Image: The U.S. Access Board

Alterations:
Follow the stretch code.
Envelope requirements are 10% less stringent than new construction envelope.

Additions:
< 20,000 ft²: Base energy code + MA Amendments
≥ 20,000 ft²: Stretch energy code

New buildings:
< 20,000 ft²: Base energy code
≥ 20,000 ft²: Stretch energy code

Change of Use/Occupancy:
If increasing energy demand, must upgrade systems to meet Stretch code mandatory requirements
(with additional exceptions/modifications per this section)

Stretch Code: Additional Requirements

Alterations & Additions
(C502, C503, C505)

Envelope Requirements
(C402.1.5; C402.5)

Additional Efficiency
(C406)

Energy Recovery
(C403.7)

Solar-Readiness
(C402.3; Appendix CB)

EV Charging
(C405.13)

Envelope Backstop:

- Limits %WWR based on glass thermal performance
- Rule of thumb: **Triple glazing required for > 35%WWR**

Thermal Bridging

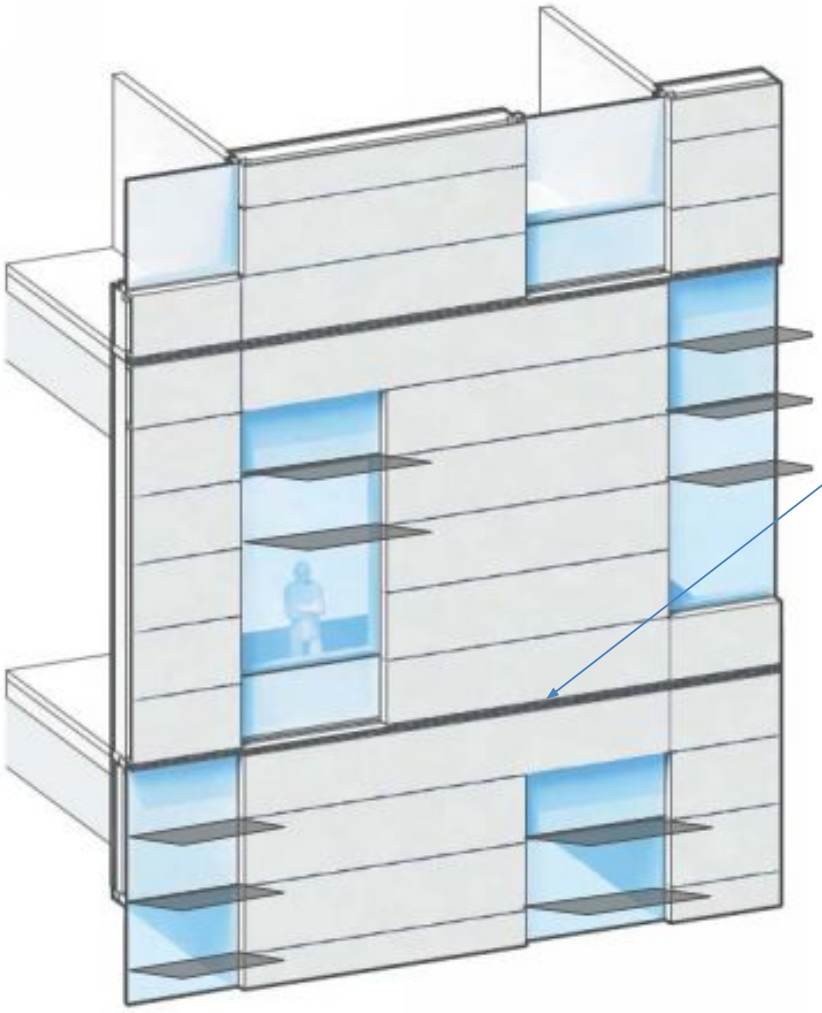
- Derating factors for vertical walls
- Consider interruptions in continuous insulation in prescriptive calculations

Air Leakage Requirements

- Lower level of leakage required (0.35 CFM/ft²; used to be 0.45)
- **Must perform a blower-door test (by a third party).** Buildings over 50,000 ft² can test representative areas. Large Multi-family Buildings can test 20% of dwelling units.

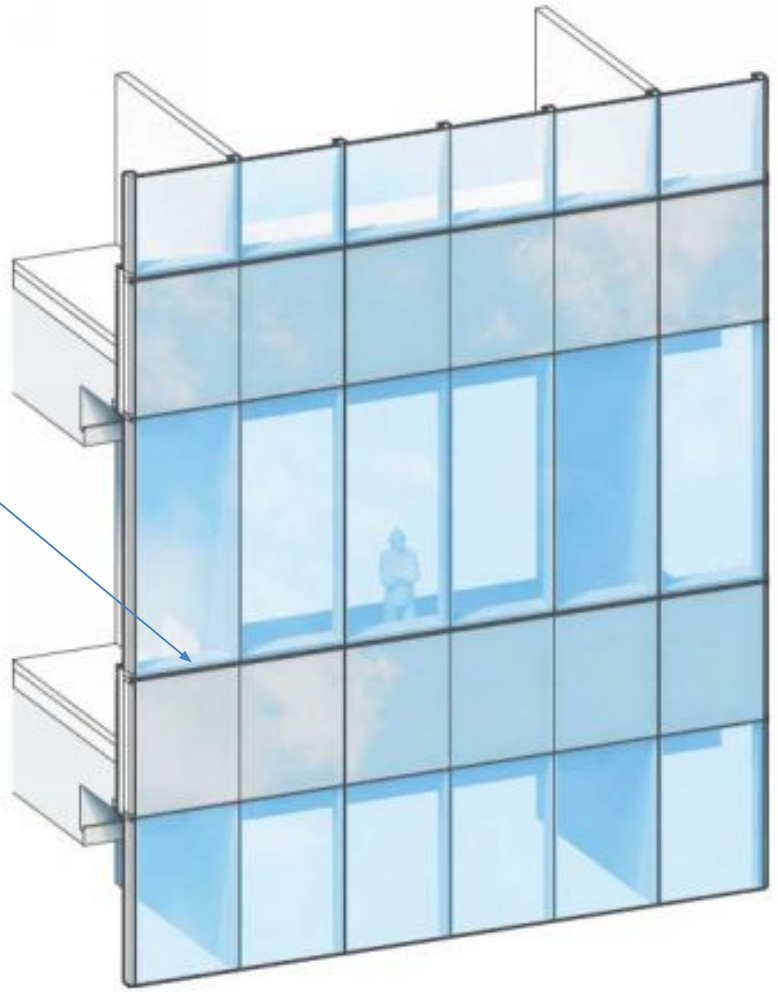
Stretch Code: U-Value Backstop

<50% GLAZED WALL SYSTEM: U-0.1285

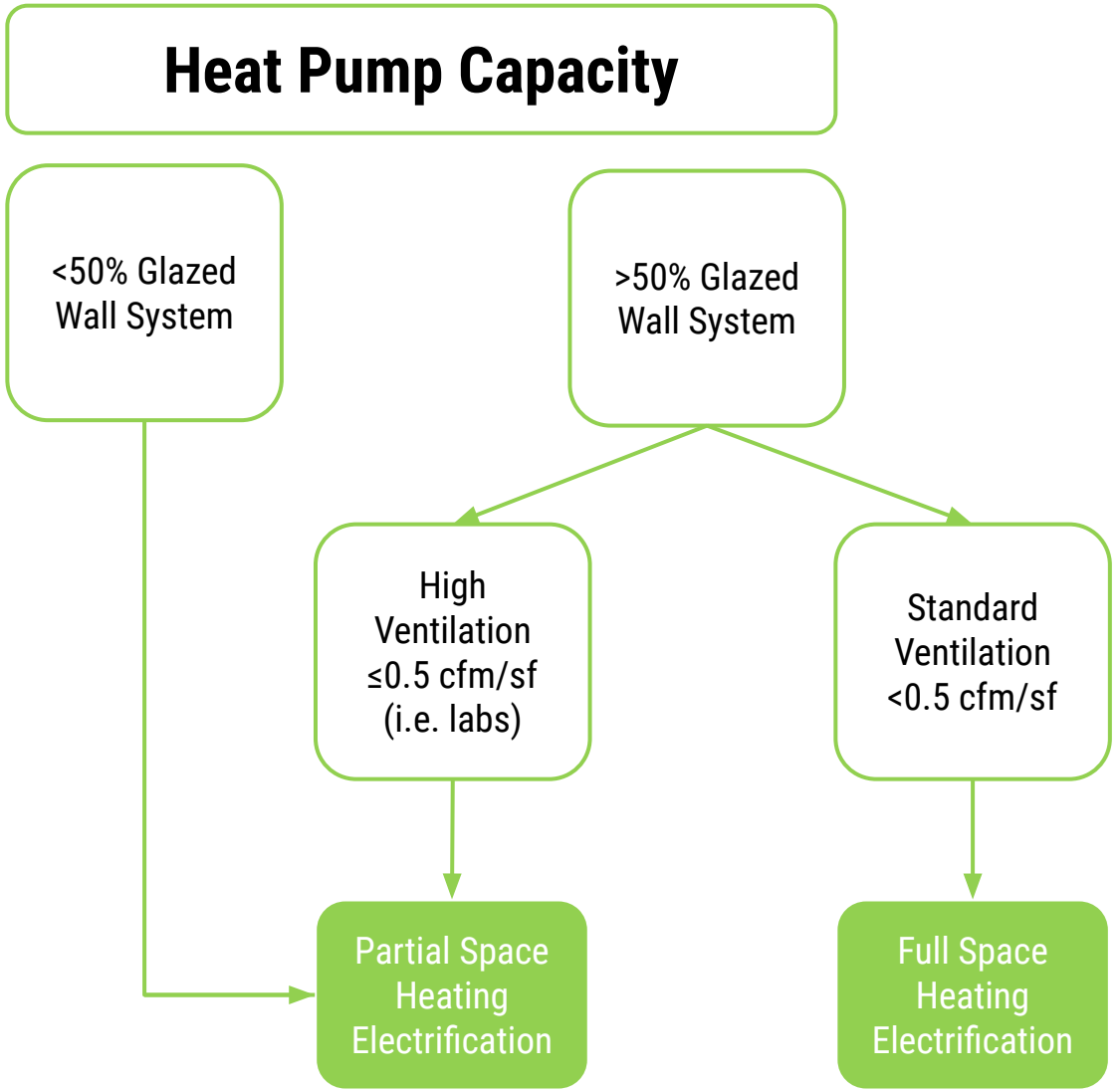


Requires Accounting for Thermal Bridging in Area-Weighted Calculations

>50% GLAZED WALL SYSTEM: U-0.16



Stretch Code: Electrification



Envelope Requirements

- ➔ Air barrier must be shown in envelope details.
- ➔ Revised prescriptive U-value/R-value for all components.
- ➔ **Building leakage testing is *REQUIRED*!**
  - ◆ Residential: < 0.3 cfm/sf @ 75 Pa
  - ◆ Non-residential: < 0.4 cfm/sf @ 75 Pa
    Stretch Code: < 0.35 cfm/sf @ 75 Pa
    C406: < 0.2 cfm/sf @ 75 Pa
  - ◆ If < 0.6 cfm/sf, IR or tracer testing required + corrective action report. If > 0.6 cfm/sf, re-test
    Stretch Code: corrective action and re-test threshold is 0.45 cfm/sf
  - ◆ Buildings over 50,000 sf can test specific floors
- ➔ HVAC interlock required for operable windows over 40 sf.
- ➔ Alterations of existing buildings to comply with C402, C403, C404.

Mechanical Systems + Controls

- ➔ Revised equipment efficiency tables
- ➔ Automated Fault Detection and Diagnostics (FDD) system required for buildings over 100k sf

Lighting + Electrical

- **LPD are the same as previous** (2020) MA amendments, with few exceptions
- When using space-by-space method, lighting allowance for unfinished "**shell" space** is lesser of **0.2 W/sf** or actual installed watts
- **Automatic plug load control** now required in IECC (previously only in ASHRAE)
- **Energy monitoring system** required in buildings over 25k sf

Stretch Code: Additional Requirements

Alterations & Additions
(C502, C503, C505)

Envelope Requirements
(C402.1.5; C402.5)

Additional Efficiency
(C406)

Energy Recovery
(C403.7)

Solar-Readiness
(C402.3; Appendix CB)

EV Charging
(C405.13)

Earn 15 “credits” (Tenant fit-outs earn 10):

Climate Zone 5A		Occupancy			
Section	**B**	**R, I**	**E**	**M**	**Other**
C406.2.2: 5% Cooling Efficiency Improvement	2	1	1	1	1
C406.2.3: Renewable Energy Space Heating	15	15	15	15	15
C406.2.4: 10% Cooling Efficiency Improvement	4	1	2	2	2
C406.3: Reduced Lighting Power	7	2	8	12	7
C406.4: Enhanced Digital Lighting Controls	2	NA	2	3	2
C406.5: On-Site Renewable Energy	9	7	6	7	7
C406.6: Dedicated Outdoor Air System	5	8	NA	2	5
C406.7.2: Recovered or Renewable Water Heating	NA	14	1	NA	14
C406.7.4 Heat Pump Water Heater	NA	5	1	NA	5
C406.8: Enhanced Envelope Performance	10	4	2	4	5
C406.9: Reduced Air Infiltration	11	9	1	3	6
C406.10: Energy Monitoring	2	1	2	3	2
C406.11: Fault Detection and Diagnostics System	1	1	1	1	1
C406.12 Heavy Timber Construction	8	8	8	8	8

Formerly known as the “3-out-of-10 Rule”

Stretch Code: Additional Requirements

Alterations & Additions
(C502, C503, C505)

Envelope Requirements
(C402.1.5; C402.5)

Additional Efficiency
(C406)

Energy Recovery
(C403.7)

Solar-Readiness
(C402.3; Appendix CB)

EV Charging
(C405.13)

Multifamily / Hospitality:

- **70% effectiveness or better** (may require a semi-custom or custom AHU)
- OA must be delivered directly to the space (no corridor delivery & door louvers / undercuts)

Other Occupancy Types:

- Weighted average calculation; projects will likely need recoveries close to 70% (semi-custom or custom AHU)
- Labs required to have sensible recovery of 50% or better

Stretch Code: Additional Requirements

Alterations & Additions
(C502, C503, C505)

Envelope Requirements
(C402.1.5; C402.5)

Additional Efficiency
(C406)

Energy Recovery
(C403.7)

Solar-Readiness
(C402.3; Appendix CB)

EV Charging
(C405.13)

Solar-Ready Requirements Applicability:

- With roof space oriented between 110° and 270°
- Five stories or fewer in height
- Shaded fewer than 70% of daylight hours annually

Requirements:

- **Leave 40% of roof area for future PV**
  (less mechanical space, skylights, decks, etc.)
- Provide a 5 psf dead load in structural calculations
- Indicate conduit pathways to electrical tie-in location
- **Leave a 2'x4' area free for future energy storage**
- Leave a minimum of two dual-pole breakers free for future tie-in of PV and energy storage
- Provide local signage indicating the solar-ready zone

Stretch Code: Additional Requirements

Alterations & Additions
(C502, C503, C505)

Envelope Requirements
(C402.1.5; C402.5)

Additional Efficiency
(C406)

Energy Recovery
(C403.7)

Solar-Readiness
(C402.3; Appendix CB)

EV Charging
(C405.13)

Future EV charging at:

➔ Min. **20%** of spaces or more (Group R and B)*
➔ Min. **10%** of spaces or more (all other projects)

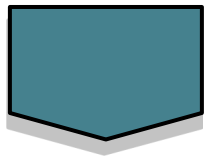
Optimize Electrical Capacity:

➔ Automatic load management system (ALMS)
➔ Multiple spaces may share a branch circuit

TABLE C405.13.1 EV-READY PERFORMANCE REQUIREMENTS

Circuit Breaker Amperage	Maximum Parking Spaces that May Share a Branch Circuit with 10%-60% EV Ready spaces	Maximum Parking Spaces that May Share a Branch Circuit with 61-100% EV Ready spaces
40A	1	2
50A	1	2
60A	2	4
70A	3	6
80A	4	8
90A	5	9
100A	6	10

*** City of Boston requirements are MORE STRINGENT**
(25% EV Chargers Day 1, 75% future)



Commercial Opt-In Stretch

Specialized Opt-In Code: Additional Requirements

Passive House (Multi-family)
(Appendix CC101.2)

Zero Energy Buildings
(Appendix CC101.3, CC101.4, CC101.5)

Specialized Opt-in Code:

- ➔ Massachusetts communities can opt into adding these zero energy building code provisions.
- ➔ Brookline and Watertown voted this month (January) to Opt-In.
- ➔ Effective January 1st or July 1st, whichever is at least **6 months after official adoption** by municipality.

Specialized Opt-In Code: Additional Requirements

Passive House (Multi-family)
(Appendix CC101.2)

Zero Energy Buildings
(Appendix CC101.3, CC101.4, CC101.5)

Code Compliance Pathways:

- In 2023, multi-family projects may pursue energy code compliance via:
  - Targeted Performance (C407.1)
  - Passive House (C407.3)
  - HERS (C407.4)

- **Starting January 1, 2023, commercial multi-family buildings up to 5 stories and >12,000 SF MUST pursue Passive House compliance path**

- **Starting January 1, 2024, commercial multi-family buildings 6 stories and higher and >12,000 SF MUST pursue Passive House compliance path**

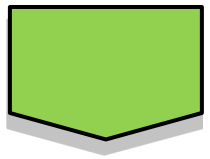
Specialized Opt-In Code: Additional Requirements

Passive House (Multifamily)
(Appendix CC101.2)

Zero Energy Buildings
(Appendix CC101.3, CC101.4, CC101.5)

Code Compliance Pathways:

- **Zero Energy (on-site renewable = 100%)**
  - Wire for all-electric
- **All-Electric**
- **Mixed-Fuel**
  - Wire for all-electric
  - On-site renewable energy



Resources, Audience Q&A

Resources

Northeast Energy Efficiency Partnerships

NEEP FAQs

https://neep.org/sites/default/files/media-files/ma_stretch_and_opt-in_codes_qa_2023-01-10_0.pdf

NEEP Residential

https://neep.org/sites/default/files/media-files/neep_ma_residential_stretch_code_comparison_final.pdf

NEEP Commercial

https://neep.org/sites/default/files/media-files/neep_ma_commercial_stretch_code_comparison_final_0.pdf

DOER: Stretch Code Development

DOER *Draft* Technical Guidance Documents

Technical Guidance Document PDF
https://www.mass.gov/doc/draft-2023-technical-guidance-for-the-stretch-energy-code-and-specialized-code/download

Appendix G & TEDI Modeling Guidelines
https://www.mass.gov/doc/draft-stretch-code-appendices-for-tedi-ashrae-app-g-modelling/download

Schedule and Loads Guideline Supplement
https://www.mass.gov/doc/draft-schedule-and-loads-guideline-supplement-for-stretch-code/download

BBRS: Base Code Promulgation

Unofficial Tenth Edition Base Code (expected July 2023)
https://www.mass.gov/handbook/unofficial-tenth-edition-base-code-draft-780-cmr

Presenter Contacts:

Michelle Fennell <mfennell@brplusa.com>

Jacob Knowles <jknowles@brplusa.com>

Amy Sheehan Latva-Kokko

<alatvakokko@dskap.com>

Patrick Murphy <PMurphy@vanderweil.com>

Alison Nash <anash@sasaki.com>

Christiane Perrin <Christiane@alliedconsulting.net>

Lara Pfadt <lpfadt@faainc.com>

Questions?

Stretch Code Case Study

LABORATORY

	2020 Stretch Code	2023 Stretch Code
Thermal Envelope	➔ U-value Backstop compliant ◆ U-0.159 if 30% WWR ◆ Typically requires triple glazing if > 35% WWR	➔ U-value Backstop compliant ◆ U-0.16 if >50% curtainwall ◆ U-0.1285 if <50% curtainwall ◆ Must account for thermal bridging ◆ If curtainwall, triple glazing and inboard insulation likely
Air Tightness	➔ 0.40 cfm/sf @ 75 Pa – pressure test not mandatory ➔ Additional Efficiency Package: 0.25 cfm/sf @ 75 Pa – pressure test required	➔ Mandatory pressure testing ◆ 0.35 cfm/sf @ 75 Pa ◆ Additional Efficiency Package: 0.25 cfm/sf @ 75 Pa ◆ Corrective action required for failure

Stretch Code Case Study

LABORATORY

	2020 Stretch Code	2023 Stretch Code
Lighting	➔ LPD from MA Amendments: ◆ Lab: 1.33 W/sf ◆ Open Office: 0.61 W/sf ➔ Additional Efficiency Package: 10% LPD reduction (Frequently applied)	➔ LPD from IECC 2021: ◆ Lab: 1.33 W/sf ◆ Open Office: 0.61 W/sf ➔ Additional Efficiency Package: 10%+ LPD reduction
EV Charging	➔ 1 EV-ready space ➔ Local requirements vary (ex: Boston requires 25% EV and 100% EV ready)	➔ Group B Occupancy: 20% EV ready (trade-off options available) ➔ Local requirements vary (ex: Boston requires 25% EV and 100% EV ready)
Energy Monitoring	➔ Required for buildings over 25,000 sf	➔ Required for buildings over 25,000 sf ➔ Additional efficiency package available if not required

Stretch Code Case Study

LABORATORY

	2020 Stretch Code	2023 Stretch Code
Exhaust Energy Recovery	➔ Not explicitly required by Stretch Code, but virtually required to achieve required energy savings	➔ 50%+ sensible effectiveness (Typically requires packaged high-performance energy recovery system and controls)
Cooling System	➔ Additional Efficiency Package available: 10% improved equipment efficiency (Frequently applied)	➔ Revised efficiencies for some equipment in IECC 2021 ➔ Additional Efficiency Package available: 5% improved cooling efficiency 10% improved cooling efficiency
Heating System	➔ Electrification not required by code, however many projects include heat recovery chillers and/or heat pumps to meet local requirements ➔ Condensing boilers typical ➔ Additional Efficiency Package available: 10% improved equipment efficiency (Frequently applied)	➔ Mixed-fuel buildings require electric air-source, ground-source, and/or exhaust-source heat pump capacity totaling 25% of ASHRAE 99.6 winter condition (approx. 8°F in Boston) ➔ Fossil fuel peak/back-up boilers typical ➔ Day 1 all-electric (zero fossil fuel) design not typical

Stretch Code Case Study

LABORATORY

C406 Additional Efficiency Packages

15 Points Required

Item	Additional Efficiency Package (Group B Occupancies)	Points Available
2.2	5% Cooling Efficiency Improvement	2
2.3	Renewable Space Heating	15
2.4	10% Cooling Efficiency Improvement (additional points for greater reduction)	4+
3	Reduced Lighting Power (10% reduction, additional points for greater reduction)	7+
4	Enhanced Digital Lighting Controls	2
5	On-site Renewable Energy (additional points for greater reduction)	9+
6	DOAS	5
8	Enhanced Envelope Performance	10
9	Reduced Infiltration	11
10	Energy Monitoring System	2
11	Fault Detection and Diagnostics System	1
12	Heavy Timber Construction	8

Stretch Code Case Study

HEALTHCARE

	2020 Stretch Code	2023 Stretch Code
Thermal Envelope	➔ U-value Backstop compliant ◆ U-0.159 if 30% WWR ◆ Typically requires triple glazing if > 35% WWR	➔ U-value Backstop compliant ◆ U-0.16 if >50% curtainwall ◆ U-0.1285 if <50% curtainwall ◆ Must account for thermal bridging ◆ If curtainwall, triple glazing and inboard insulation likely
Air Tightness	➔ 0.40 cfm/sf @ 75 Pa – pressure test not mandatory ➔ Additional Efficiency Package: 0.25 cfm/sf @ 75 Pa – pressure test required	➔ Mandatory pressure testing ◆ 0.35 cfm/sf @ 75 Pa ◆ Additional Efficiency Package: 0.25 cfm/sf @ 75 Pa ◆ Corrective action required for failure

Stretch Code Case Study

HEALTHCARE

	2020 Stretch Code	2023 Stretch Code
Lighting	➔ LPD from MA Amendments: ◆ Hospital: 0.96 W/sf ◆ Health Care Clinic: 0.81 W/sf ➔ Additional Efficiency Package: 10% LPD reduction (Frequently applied)	➔ LPD from IECC 2021: ◆ Hospital: 0.96 W/sf ◆ Health Care Clinic: 0.81 W/sf ➔ Additional Efficiency Package: 10%+ LPD reduction
EV Charging	➔ 1 EV-ready space ➔ Local requirements vary (ex: Boston requires 25% EV and 100% EV ready)	➔ Group I Occupancy: 10% EV ready (trade-off options available) ➔ Local requirements vary (ex: Boston requires 25% EV and 100% EV ready)
Energy Monitoring	➔ Required for buildings over 25,000 sf	➔ Required for buildings over 25,000 sf ➔ Additional efficiency package available if not required

Stretch Code Case Study

HEALTHCARE

	2020 Stretch Code	2023 Stretch Code
Exhaust Energy Recovery	➔ Not explicitly required by Stretch Code, but sometimes used to achieve required energy savings	➔ 70%+ total (enthalpy) effectiveness (Note: effectiveness calculated based on supply air, so must limit exfiltration and non-exempt exhaust)
Cooling System	➔ Additional Efficiency Package available: 10% improved equipment efficiency (Frequently applied)	➔ Revised efficiencies for some equipment in IECC 2021 ➔ Additional Efficiency Package available: 5% improved cooling efficiency 10% improved cooling efficiency
Heating System	➔ Electrification not required by code, however many projects include heat recovery chillers and/or heat pumps to meet local requirements ➔ Condensing boilers typical ➔ Additional Efficiency Package available: 10% improved equipment efficiency (Frequently applied)	➔ Mixed-fuel buildings require electric air-source, ground-source, and/or exhaust-source heat pump capacity totaling 25% of ASHRAE 99.6 winter condition (approx. 8°F in Boston) ➔ Fossil fuel peak/back-up boilers typical ➔ Day 1 all-electric (zero fossil fuel) design not typical

Stretch Code Case Study

HEALTHCARE

C406 Additional Efficiency Packages

15 Points Required

Item	Additional Efficiency Package (Group R and I)	Points Available
2.2	5% Cooling Efficiency Improvement	1
2.3	Renewable Space Heating	15
2.4	10% Cooling Efficiency Improvement (additional points for greater reduction)	1
3	Reduced Lighting Power (10% reduction, additional points for greater reduction)	2+
5	On-site Renewable Energy (additional points for greater reduction)	7+
6	DOAS	8
7.2	Recovered or Renewable Water Heating	14
7.4	Heat Pump Water Heater	5
8	Enhanced Envelope Performance	4
9	Reduced Infiltration	9
10	Energy Monitoring System	1
11	Fault Detection and Diagnostics System	1
12	Heavy Timber Construction	8

Example of Home w/ HERS 47 and Onsite Power Production that Brings it to -13

Building Information

Conditioned Area [ft²]	1,955.00
Conditioned Volume [ft³]	18,572.50
Thermal Boundary Area [ft²]	5,753.86
Number Of Bedrooms	3
Housing Type	Single family detached

Rating

HERS Index	-13
HERS Index w/o PV	47

Building Shell

Ceiling w/ Attic	None
Vaulted Ceiling	None
Above Grade Walls	2x6 with 4" Rigid, Trespa U-0.02
Found. Walls	4" EPS R-20
Framed Floors	9 1/2" TJI Dense Packed with 4" Mineral Woo R-53
Slabs	4" Conc. with 4" EPS R-20

Windows (largest)	U-Value: 0.14	SHGC: 0.36
Window / Wall Ratio	0.34	
Infiltration	2 ACH50	
Duct Lkg to Outside	Untested	
Total Duct Leakage	Untested	

Mechanical Systems

Heating	Air Source Heat Pump • Electric • 10 HSPF
Cooling	Air Source Heat Pump • Electric • 16 SEER
Water Heating	Water Heater • Electric • 3.7 Energy Factor
Programmable Thermostat	Yes
Ventilation System	100 CFM • 45 Watts

Lights and Appliances

Refrigerator (kWh/yr)	691.0
Dishwasher Efficiency	0.46 EF
Ceiling Fan	None

Clothes Dryer Fuel	Electric
Clothes Dryer CEF	3.9
Clothes Washer LER (kWh/yr)	105.0
Clothes Washer Capacity	4.5
Range/Oven Fuel	Propane

ekotrope

HERS Certificate Example

Home Energy Rating Certificate

Final Report

Rating Date: 2022-07-12
Registry ID:
Ekotrope ID:

HERS® Index Score: 51

Your home's HERS score is a relative performance score. The lower the number, the more energy efficient the home. To learn more, visit www.hersindex.com

Annual Savings $8,169

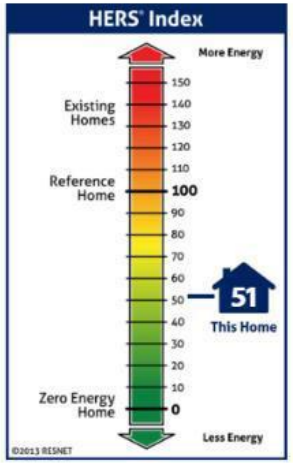
*Relative to an average U.S. home

Home: MA

Builder: Construction

Your Home's Estimated Energy Use:

	Use [MBtu]	Annual Cost
Heating	23.8	$2,036
Cooling	2.0	$175
Hot Water	11.6	$382
Lights/Appliances	39.2	$3,178
Service Charges		$120
Generation (e.g. Solar)	0.0	$0
Total:	**76.7**	**$5,891**



Home Feature Summary:

Home Type:	Single family detached
Model:	N/A
Community:	N/A
Conditioned Floor Area:	4,971 ft²
Number of Bedrooms:	5
Primary Heating System:	Air Source Heat Pump • Electric • 10 HSPF
Primary Cooling System:	Air Source Heat Pump • Electric • 20 SEER
Primary Water Heating:	Residential Water Heater • Propane • 0.86 UEF
House Tightness:	741 CFM50 (0.92 ACH50)
Ventilation:	89 CFM, 89 CFM • 111 Watts, 111 Watts
Duct Leakage to Outside:	1 CFM @ 25Pa (0.03 / 100 ft²)
Above Grade Walls:	R-29
Ceiling:	Vaulted Roof, R-52
Window Type:	U-Value: 0.29, SHGC: 0.25
Foundation Walls:	R-16
Framed Floor:	R-52

This home meets or exceeds the criteria of the following:

2015 International Energy Conservation Code

Rating Completed by:

Energy Rater:

Rating Company:

Rating Provider:

ekotrope

Ekotrope RATER - Version:4.0.1.2961
The Energy Rating Disclosure for this home is available from the Approved Rating Provider.
This report does not constitute any warranty or guarantee.