Part 2:
Overview of Key Changes

mass save

2025 Massachusetts Commercial Stretch Code

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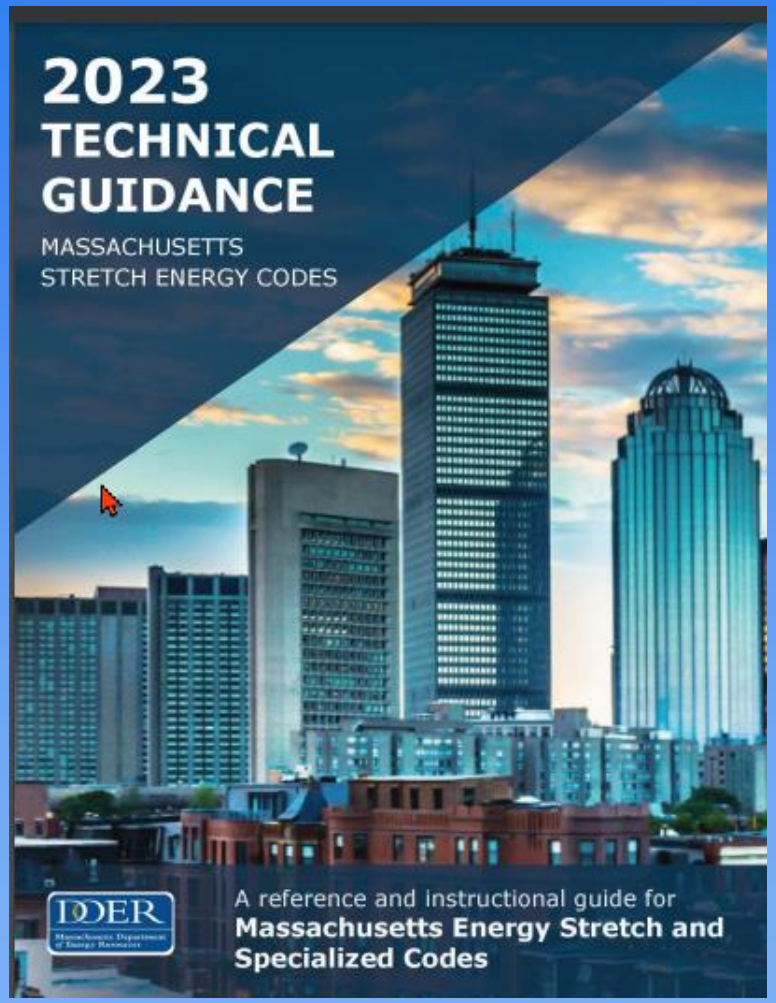
Massachusetts Department of Energy Resources (DOER)

Some of the content of this course is sourced from 2023 Technical Guidance provided by Massachusetts Department of Energy Resources (DOER)



Presented by:

PSD

Moving Energy Efficiency Forward

We combine building science with technology to help utility companies, program implementers, and building performance professionals achieve energy savings.

Agenda

- Massachusetts Energy Code
- 2025 Commercial Stretch Energy Code
- Scope and Administration
- Definitions
- Commercial Energy Efficiency
- Compliance Pathways
- Existing Buildings
- Summary

Learning Objectives

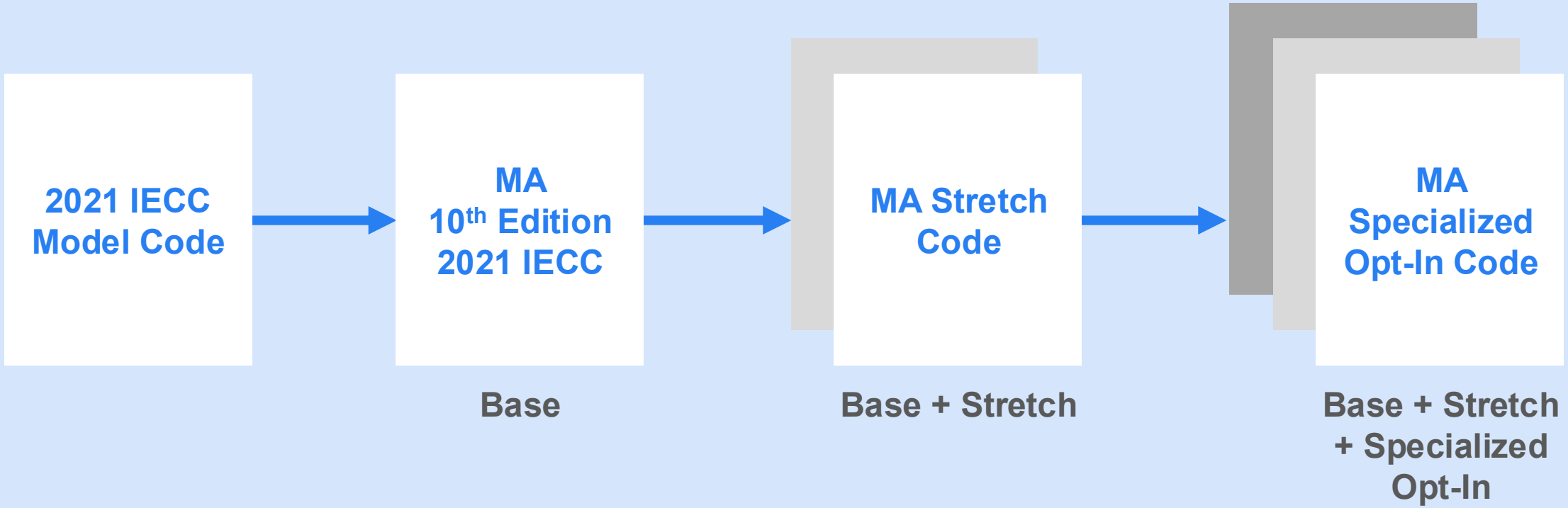
- Have a knowledge of the major changes to the commercial provision of the Stretch Code.
- Be able to apply the appropriate compliance path to a proposed commercial project.
- Gain an understanding of how the code addresses thermal bridging in the thermal boundary.
- Be familiar with electrification requirements for commercial buildings.

Poll Question #1

Which of the following best describes your field of work?

A. Builder
B. Architect
C. Code Official
D. HERS Rater
E. Passive House Consultant

The 2025 Massachusetts Energy Code



Commercial Provisions

Chapter 1 [CE]
Scope and Administration

Chapter 2 [CE]
Definitions

Chapter 3 [CE]
General Requirements

Chapter 4 [CE]
Commercial Energy Efficiency

Chapter 5 [CE]
Existing Buildings

2025 Commercial Stretch Code

Overview of Changes

Summary of Minor Code Changes

These are straightforward changes and not a comprehensive list.

Code Section	Summary of Measure
C103.2	Adds documentation requirements for Solar Ready, EV Ready Spaces, ventilation rate for Relative Performance (see Additional Information for more guidance), and Mixed-Fuel systems' plans for electrification for the Specialized Code. Clarification of COMcheck submittal documentation.
C202	Adds definitions for All-Electric Building, Automatic Load Management System, Class 3 Exhaust, Class 4 Exhaust, Clean Biomass Heating System, Combustion Equipment, Glazed Wall System, Dedicated Outdoor Air System, Electric Vehicle, Electric Vehicle Ready Parking Space, Enthalpy Recovery Ratio, Exempt Exhaust, Fuel Gas, Fuel Oil, Mixed-Fuel Building, Other Exhaust, Sensible Energy Recovery Ratio, Spandrel Section, Thermal Bridge
C402.2.4.1	Insulation Installation, Delete C402.2.4.1 Exception
C402.2.8	New section listing specifications for fireplaces.
C402.4	Lowers fixed and operable U-factors and makes performance documentation explicit for all fenestration.
C402.6	Approved Calculation Software Tools, Allows MA Stretch COMcheck
C405.2	Lowers existing threshold requiring controls in daylight zones to 100W.
Appendix CB	Solar-Ready Zone – Commercial, included without modification

Simple code measures that don't require further explanation. Refer to code for specific requirements.

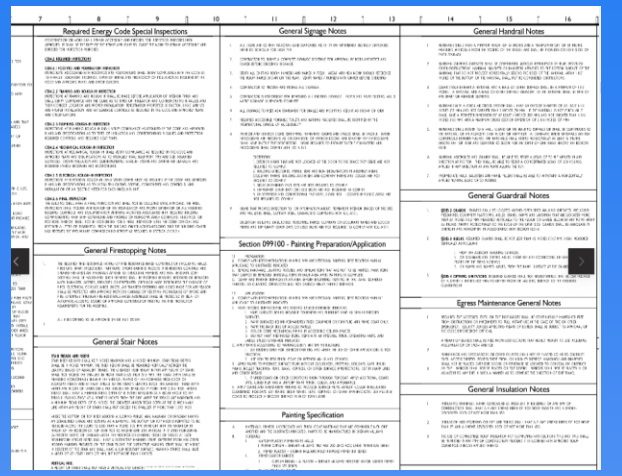
Courtesy of DOER: 2023 Technical Guidance, Massachusetts Stretch Energy Codes

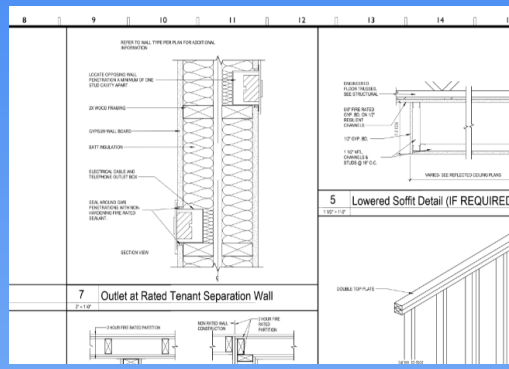
Chapter 1
Scope and Administration

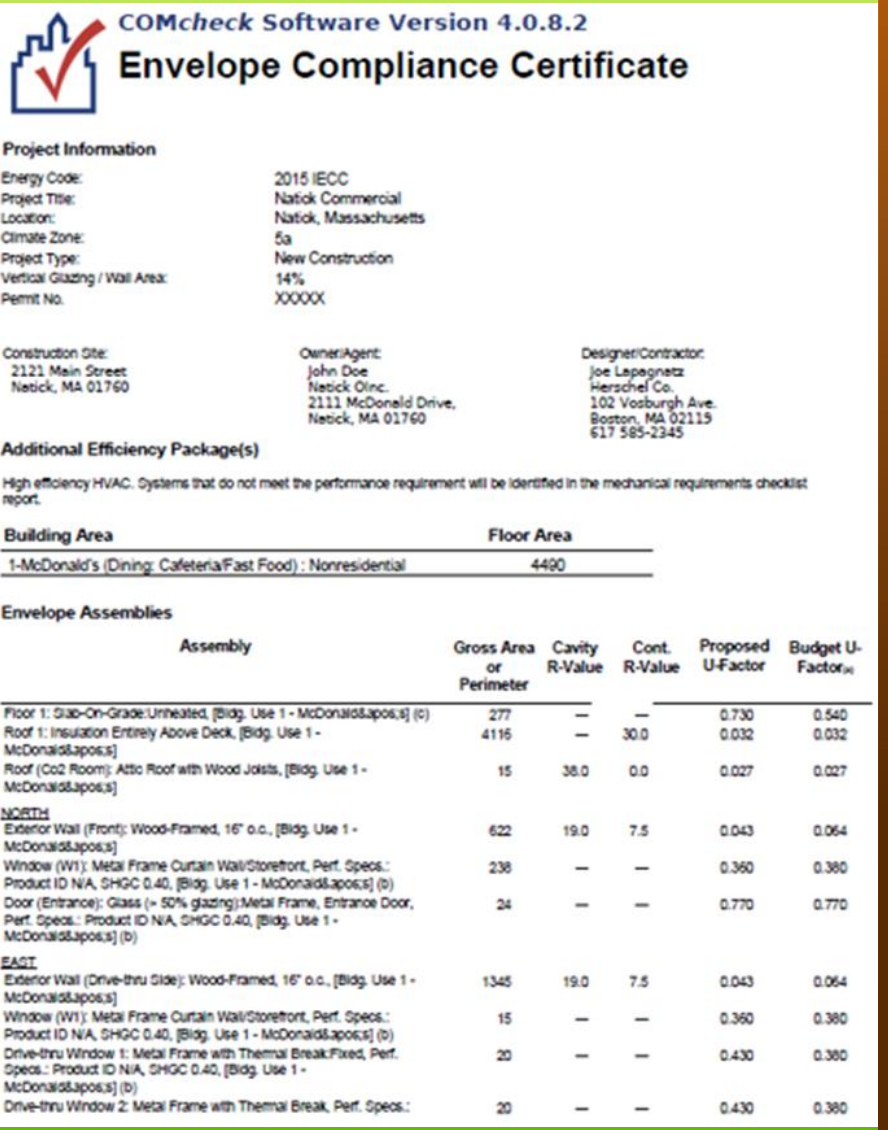
C103.2 Construction Documents

New Requirements for inclusion on Construction Documents (CDs):

- Compliance Path used for project
- Solar Ready Roof Zone or Potential Solar Zone Area
- EV Ready Spaces
- Relative Performance Pathway ventilation documentation, schedules, and calculations
- District Energy System Order of Conditions issued by the DOER, if applicable
- For Opt-in Communities – electric HVAC retrofit design







COMcheck Software Version 4.0.8.2

Envelope Compliance Certificate

Project Information

Energy Code:	2015 IECC
Project Title:	Natick Commercial
Location:	Natick, Massachusetts
Climate Zone:	5a
Project Type:	New Construction
Vertical Glazing / Wall Area:	14%
Permit No.	XXXXX

Construction Site:
2121 Main Street
Natick, MA 01760

Owner/Agent:
John Doe
Natick Olnc.
2111 McDonald Drive,
Natick, MA 01760

Designer/Contractor:
Joe Lapegnetz
Herschel Co.
102 Vosburgh Ave.
Boston, MA 02115
617 585-2345

Additional Efficiency Package(s)

High efficiency HVAC. Systems that do not meet the performance requirement will be identified in the mechanical requirements checklist report.

Building Area	Floor Area
1-McDonald's (Dining: Cafeteria/Fast Food) : Nonresidential	4490

Envelope Assemblies

Assembly	Gross Area or Perimeter	Cavity R-Value	Cont. R-Value	Proposed U-Factor	Budget U-Factor(a)
Floor 1: Slab-On-Grade:Unheated, [Bldg. Use 1 - McDonald's] (c)	277	—	—	0.730	0.540
Roof 1: Insulation Entirely Above Deck, [Bldg. Use 1 - McDonald's]	4116	—	30.0	0.032	0.032
Roof (Co2 Room): Attic Roof with Wood Joists, [Bldg. Use 1 - McDonald's]	15	38.0	0.0	0.027	0.027
NORTH					
Exterior Wall (Front): Wood-Framed, 16" o.c., [Bldg. Use 1 - McDonald's]	622	19.0	7.5	0.043	0.064
Window (W1): Metal Frame Curtain Wall/Storefront, Perf. Specs.: Product ID N/A, SHGC 0.40, [Bldg. Use 1 - McDonald's] (b)	238	—	—	0.360	0.380
Door (Entrance): Glass (> 50% glazing):Metal Frame, Entrance Door, Perf. Specs.: Product ID N/A, SHGC 0.40, [Bldg. Use 1 - McDonald's] (b)	24	—	—	0.770	0.770
EAST					
Exterior Wall (Drive-thru Side): Wood-Framed, 16" o.c., [Bldg. Use 1 - McDonald's]	1345	19.0	7.5	0.043	0.064
Window (W1): Metal Frame Curtain Wall/Storefront, Perf. Specs.: Product ID N/A, SHGC 0.40, [Bldg. Use 1 - McDonald's] (b)	15	—	—	0.360	0.380
Drive-thru Window 1: Metal Frame with Thermal Break:Fixed, Perf. Specs.: Product ID N/A, SHGC 0.40, [Bldg. Use 1 - McDonald's] (b)	20	—	—	0.430	0.380
Drive-thru Window 2: Metal Frame with Thermal Break, Perf. Specs.:	20	—	—	0.430	0.380

Source: COMcheck

COMcheck Required

For projects up to 20,000 ft^2 Permits Shall Include Completed COMcheck including:

- Envelope Compliance Certificate
- Lighting Compliance Certificate
- Mechanical Compliance Certificates
- Plan Review/Inspection Checklist

Exception:
Buildings following either of the Certified Performance Standard Compliance pathways in Section C401.2.2 (Passive House or HERS Compliance). In the case of buildings over 20,000 ft^2 which are showing compliance with C401.2.2 for only a portion of the building, this exception does not apply to the portion of the building which is not showing compliance with Section C401.2.2.

COMcheck-Web™

COMcheck-Web simplifies commercial and high-rise residential energy code compliance.

energycode.pnl.gov/COMcheckWeb/

Construction Documents for Projects Over 20,000 ft^2

For projects greater than 20,000 ft^2	Completed COMcheck Lighting and Mechanical Compliance Certificates, and a Plan Review Inspection Checklist.
Relative Performance Compliance	Completed calculations performed in accordance with latest edition of Massachusetts Stretch Energy Code Technical Guidance, Attachment B, ASHRAE Appendix G Relative Performance Simulation Guidelines.
Targeted Performance Compliance	Completed calculations performed in accordance with latest edition of Massachusetts Stretch Energy Code Technical Guidance, Attachment C, Targeted Performance Simulation Guidelines

For projects over 20,000 ft^2, COMcheck may not be used for envelope compliance. Per Section C103.2(2), backstop compliance and thermal bridge derating calculations performed in accordance with latest edition of Massachusetts Stretch Energy Code Technical Guidance, Attachment A, Envelope Performance and Thermal Bridge Derating shall be provided.

Chapter 2
Definitions

Definitions

- Chapter 2 as always includes definitions of terms/words related to the scope applicable to this code.
- Helps maintain the context in which the terms are being used.
- Some new definitions in the version include:
  - Dedicated Outdoor Air System (DOAS)
  - District Energy System
  - District Energy System, Heat Recovery Enabled
  - District Energy System Order of Conditions
  - Efficient Electrification
  - Thermal Bridge
  - Spandrel Section
  - Tenant Fit Out Zone
  - Enthalpy Recovery Ratio
  - Sensible Energy Recovery Ratio
  - Sensible Recovery Efficiency
  - Total Recovery Efficiency
  - Automatic Load Management System (ALMS)
  - Thermal Distribution Efficiency

Chapter 3
General Requirements

No Major Changes to Report

Chapter 4
Commercial Energy Efficiency

Compliance Pathways

Prescriptive Compliance
Nonresidential buildings ≤ 20,000 ft^2

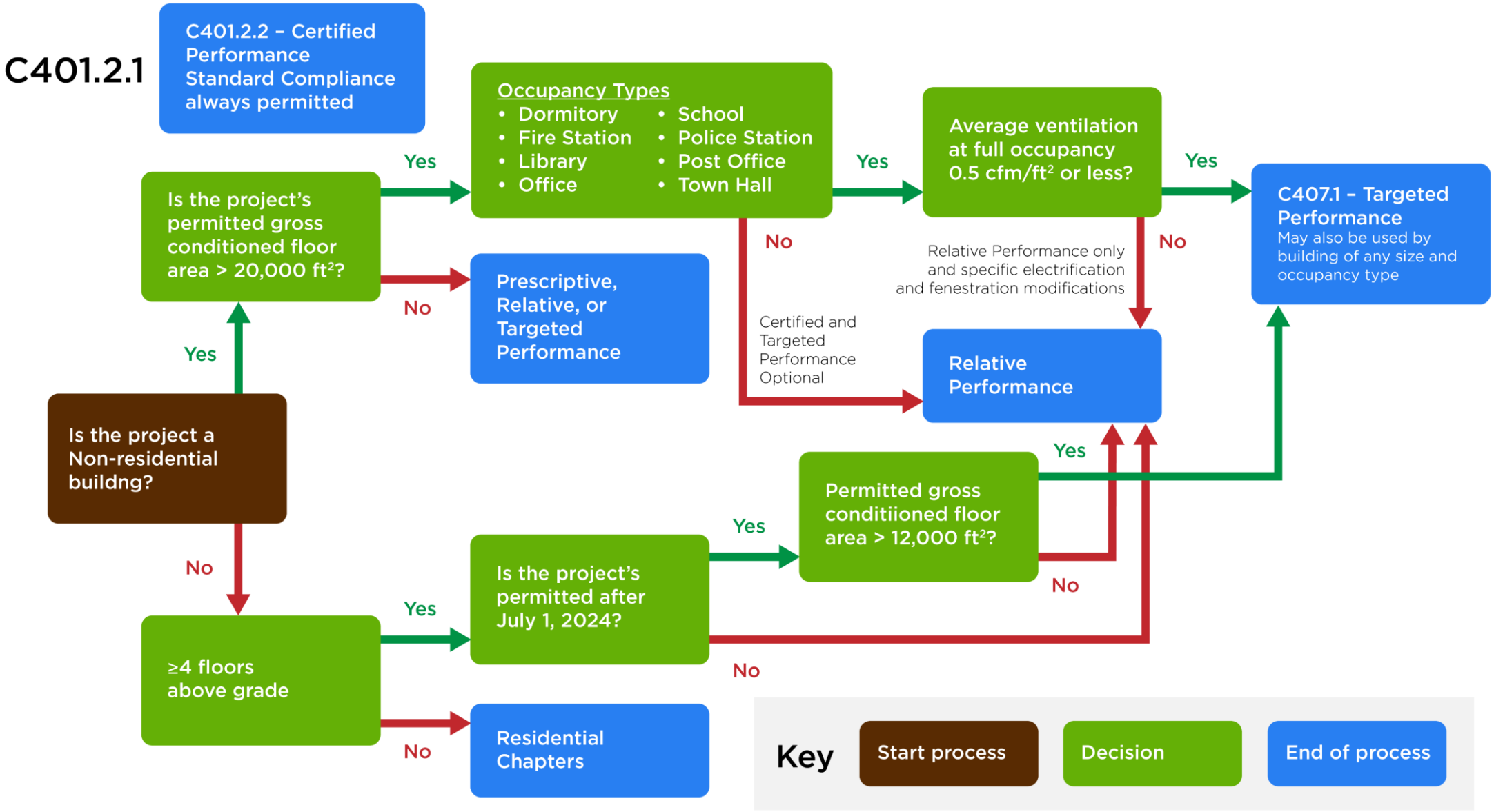
Targeted Performance Compliance
Dormitories, fire stations, libraries, offices, schools, police stations, post offices and town halls over 20,000 ft^2 and having average ventilation at full occupancy of 0.5 cfm/ft^2 or less

Relative Performance Compliance
Buildings not required to use Targeted Performance are permitted to use this path

Certified Performance - Passive House
All buildings or spaces are permitted to use Passive House compliance

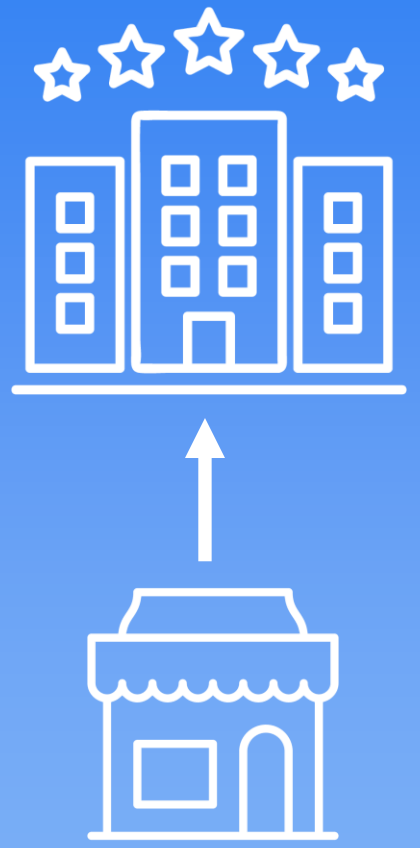
Certified Performance - HERS Compliance
All Group R buildings and Group R spaces in buildings with multiple dwelling units are permitted to use HERS compliance

Compliance Path Flow Chart



Mixed Use Buildings

- Where there are 2 or more uses within a building each use shall separately and independently show compliance
- Where different compliance paths are required – each use shall follow the appropriate path
- Exception: Enclosed or unenclosed parking garages that are part of a larger building may follow the Prescriptive Compliance path even where they exceed 20,000 ft^2.



IBC

Group R

The use of a building or structure, or a portion thereof, for sleeping purposes when not classified as an Institutional Group I for when no regulated by the International Residential Code

IBC

Group M

The use of a building or structure, or a portion thereof, for the display and sale of merchandise, and involves stocks of goods, wares, or merchandise incidental to such purposes and where the public has access

Thermal Envelope Certificate

The 2021 IECC requires a permanent thermal envelope certificate to be posted in the furnace or utility room.

Information required includes:

- R-Values for the envelope components
- U-factors and SHGCs of fenestration
- Results from any building envelope air leakage testing performed on the building

Energy Code Compliance Certificate

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Energy Code Edition _____

Compliance Path _____

Building Thermal Envelope

Ceiling R-Value: _____
Roof R-Value: _____
Wall R-Value: _____
Slab R-Value: _____
Basement Wall R-Value: _____
Crawl Wall R-Value: _____
Floor R-Value: _____
Window U-Factor: _____
Window SHGC: _____
Air Infiltration Rate: _____

Mechanical Systems

Duct R-Value: _____
Duct Leakage Rate: _____
Heating Equip Eff: _____
Cooling Equip Eff: _____

Photovoltaic System

Capacity: _____
Inverter Eff: _____
Panel Tilt: _____
Panel Orientation: _____

Energy Rating Index

With Onsite Power: _____

W/O Onsite Power: _____

Address: _____ **Date:** _____

Builder or Design Professional Signature: _____

THIS LABEL MUST BE PERMANENTLY AFFIXED BY HOME BUILDERS TO THE BREAKER PANEL ON ALL NEW RESIDENTIAL BUILDINGS.

Amended Sections

Code Requirements		C407.1 Targeted Performance	C407.2 Relative Performance	C407.3 Passive House	C407.4 HERS
C401.3 Thermal envelope certification Requirement to post thermal envelope certificate with the key performance characteristics of the opaque envelope and fenestration and air leakage testing results.		Yes	Yes	Yes	Yes
C401.4.1 Partial Space Heating Electrification		No	Yes	No	No
C401.4.2 Full Space Heating Electrification		Note 1	Note 1	No	No
C402 Building Envelope Requirements	**C402.1.5** Component Performance Alternative Maximum area-weighted U-factor of the opaque above-grade walls and the maximum U-factor of the glazed wall systems specified in either Section C402.1.5.1 or C402.1.5.2 depending on the percentage of the exterior wall taken by glazed wall systems; the maximum SHGC of the glazed wall systems	Yes	Yes	No	No
	C402.2.8 Requirement for combustion fireplaces	Yes	Yes	No	No
	C402.3 Rooftop solar readiness	Yes	Yes	Yes	Yes
	C402.4.6 Fenestration Documentation Allowed methods for determining fenestration performance.	Yes	Yes	No	No
	C402.5 Air Leakage – Thermal Envelope Air barrier design and testing requirements; maximum allowed air leakage rates.	Yes	Yes	No	No
	C402.7 Derating and Thermal Bridges Methodology that must be used to account for thermal bridging losses in exterior walls	Yes	Yes	No	No

This table from DOER Technical Guidance illustrates the IECC amended sections that apply for each compliance pathway

C403 Building Mechanical Systems	Yes	No except must meet C403.5 (Economizer) and C403.7 (Exhaust Air Energy Recovery)	No	No
C404 Service Water Heating The minimum equipment efficiency and controls; piping insulation.	Yes	No	No	No
C405 Electric Power and Lighting Systems Interior and exterior lighting power and controls; electric metering; transformers; motors; vertical and horizontal transportation systems and equipment; voltage drop; automatic receptacle controls; energy monitoring; provisions for the electric vehicles ready parking spaces.	Yes	Yes	Yes	Yes
C406 Additional Efficiency Requirements Projects must implement efficiency measures to achieves at least 15 credits.	(Note 2)	(Note 2)	No	No
C408 Maintenance Information and System Commissioning Requirements related to systems commissioning, functional testing and maintenance information.	Yes	Yes	Yes	Yes

Note 1: Full heating electrification is required for high *glazed wall system* buildings (C402.1.5.2) except buildings using Relative Performance Path because average ventilation at full occupancy is greater than 0.5 cfm/sf in which case partial heating electrification is required.

Note 2: Some specified systems and equipment that contribute toward compliance with Section C406 may be included in the whole building energy models and thus contribute toward compliance with the performance thresholds of a given compliance path. Others cannot be modeled as specified following the simulation rules of the given compliance option. **Error! Reference source not found.** shows energy efficiency credits that may contribute toward modeled performance for each performance-based compliance path.

Building Electrification

This is a new section!

- Projects following Relative Performance paths require partial electrification (25%)
- High Glazed Wall Projects require full electrification – except they can do partial electrification when following Relative Performance path due to high ventilation rate
- All-Electric pathway of the Specialized Code requires full space and water heating electrification (C401.4.3)

Source: PSD

Building Envelope Thermal Requirement

- Insulation R-Value is no longer permitted.
- Vertical assemblies must meet an area-weighted U-factor
- COMcheck –Web is approved for Prescriptive Compliance
- Thermal Bridging mitigation is required – more on that later
- Table C402.1.4 – Assembly U-Factors

C402.1.4 Assembly *U*-factor, *C*-Factor or *F*-Factor-Based Method

Building thermal envelope opaque assemblies shall meet the requirements of Sections C402.2 and C402.4 based on the climate zone spec
Building thermal envelope opaque assemblies intended to comply on an assembly *U*-, *C*- or *F*-factor basis shall have a *U*-, *C*- or *F*-factor not
specified in Table C402.1.4. Commercial buildings or portions of commercial buildings enclosing *Group R* occupancies shall use the *U*-, *C*-
"*Group R*" column of Table C402.1.4. Commercial buildings or portions of commercial buildings enclosing occupancies other than *Group*
F-factor from the "All other" column of Table C402.1.4

TABLE C402.1.4

OPAQUE THERMAL ENVELOPE ASSEMBLY MAXIMUM REQUIREMENTS, *U*-FACTOR METHOD[a, b]

CLIMATE	0 AND 1	2	3	4 EXCEPT MARINE	5 AND MARINE 4	6	7

R-13 + R-10ci → U-0.055

Source: PSD

Component Performance Alternative

- This section allows for more flexible glazing limits.
- Differentiates between low glazed and high glazed wall systems
- Tradeoffs between roof/floors and walls/windows are not allowed.
- “Intra-vertical” tradeoffs are allowed

Source: PSD

- Thermal Bridging still must be addressed
- Provides U-factor area-weighting for Prescriptive Compliance
- Prepares inputs for Appendix G calculations

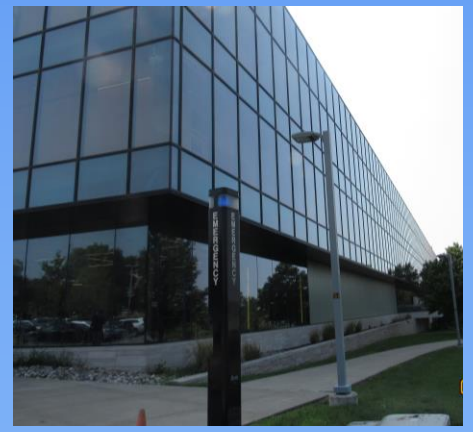
Low Glazed Wall System Buildings

- Glazed Wall System area is **not greater** than 50% of the above-grade wall area
- Low Glazed Wall System **max. allowed** area-weighted U-factor is U=0.1285
- Maximum allowed vision glass assembly is U=0.25
- New exception for existing building changes of use to create new R-use residential dwelling units that have vision glass with a maximum whole assembly U Factor of U-0.30; where it must comply with:
  - The HERS Index for multifamily Dwellings as per C407.4 OR
  - Full space heating electrification as per Section C401.4.2 and the max. allowed area weighted U-factor is U=0.1440

Source: PSD

High Glazed Wall System Buildings

- Glazed Wall System area **is greater** than 50% of the above-grade wall area
- High Glazed Wall System max. allowed area-weighted U-factor is U=0.1600
- Maximum allowed vision glass assembly is U=0.25



Source: PSD

Poll Question #2

Which one of the following conditions require full electrification?

A. Buildings with Low Glazed Walls
B. Buildings with ventilation rate greater than 0.5 cfm/ft^2
C. Buildings using the Relative Performance Path
D. Buildings with High Glazed Walls

Air Leakage – Thermal Envelope (C402.5)

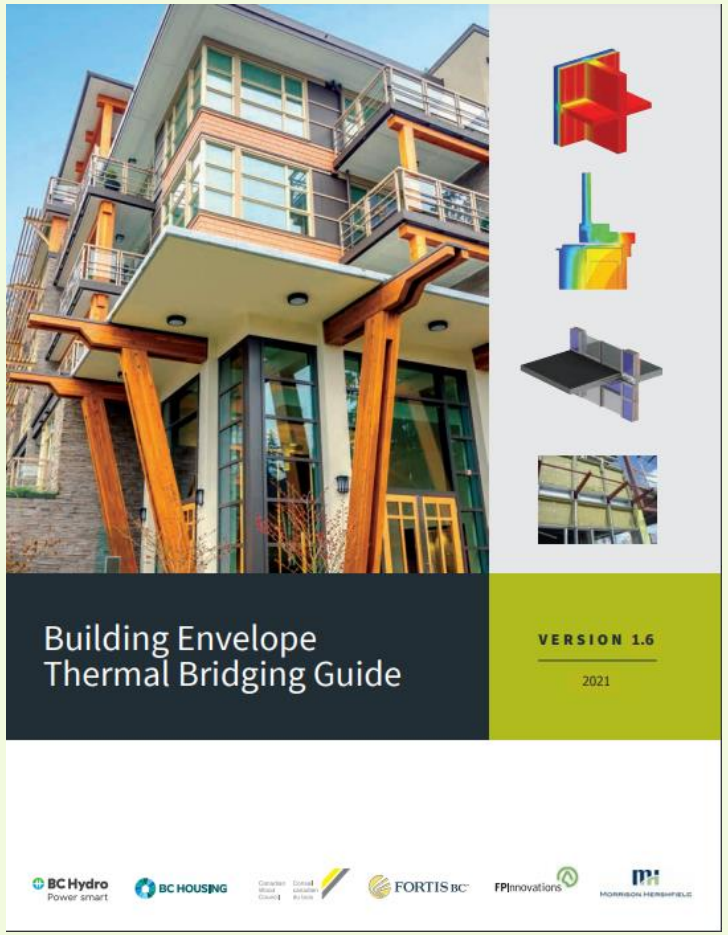
- Air Leakage Testing is Mandatory
- Tested by approved third party
- All Prescriptive and Performance Compliance pathways require compliance
- Two testing options:
  - Whole-building
  - Dwelling units
- Options for buildings over 50,000 ft^2
- Max. Allowance: 0.35cfm/ft^2 @ 75Pa
- Group R and I buildings can use a different standard (allowance 0.27 cfm/ft^2)

Source: Building America Solutions Center

Source: PSD

C402.7 Derating and Thermal Bridging

- New section – includes exterior insulation layers.
- Also addressed opaque portions of glazed wall systems
- Required for all Prescriptive and Performance paths.
- Must include method and selections on Construction Documents (CDs)
- Reference: “Building Envelope Thermal Bridging Guide by BC Hydro/BS Housing Research Center)

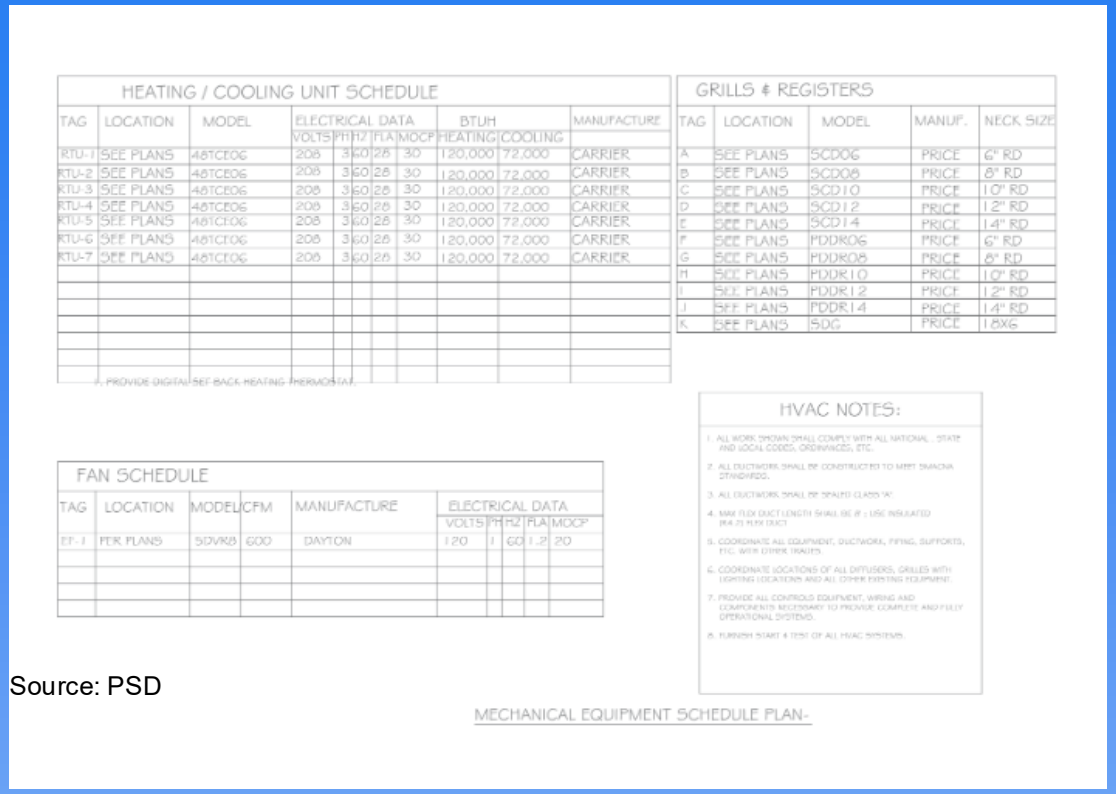


Source: PSD

Building Mechanical Systems

C403.2.1 Zone Isolation Is Required

- Zones > 25,000 ft^2 in floor area OR
- Spanning more than 1story
- Shall be divided into isolated areas
- Each area must be equipped with isolation devices and controls to control the supply of conditioned and exhaust air into the zone.



HEATING / COOLING UNIT SCHEDULE

TAG	LOCATION	MODEL	ELECTRICAL DATA VOLTS	PH	HZ	FLA	MOCP	BTUH HEATING	BTUH COOLING	MANUFACTURE
RTU-1	SEE PLANS	48TCED06	208	3	60	28	30	120,000	72,000	CARRIER
RTU-2	SEE PLANS	48TCED06	208	3	60	28	30	120,000	72,000	CARRIER
RTU-3	SEE PLANS	48TCED06	208	3	60	28	30	120,000	72,000	CARRIER
RTU-4	SEE PLANS	48TCED06	208	3	60	28	30	120,000	72,000	CARRIER
RTU-5	SEE PLANS	48TCED06	208	3	60	28	30	120,000	72,000	CARRIER
RTU-6	SEE PLANS	48TCED06	208	3	60	28	30	120,000	72,000	CARRIER
RTU-7	SEE PLANS	48TCED06	208	3	60	28	30	120,000	72,000	CARRIER

GRILLS & REGISTERS

TAG	LOCATION	MODEL	MANUF.	NECK SIZE
A	SEE PLANS	SCD06	PRICE	6" RD
B	SEE PLANS	SCD08	PRICE	8" RD
C	SEE PLANS	SCD10	PRICE	10" RD
D	SEE PLANS	SCD12	PRICE	12" RD
E	SEE PLANS	SCD14	PRICE	14" RD
F	SEE PLANS	PDDR06	PRICE	6" RD
G	SEE PLANS	PDDR08	PRICE	8" RD
H	SEE PLANS	PDDR10	PRICE	10" RD
I	SEE PLANS	PDDR12	PRICE	12" RD
J	SEE PLANS	PDDR14	PRICE	14" RD
K	SEE PLANS	SDG	PRICE	18X6

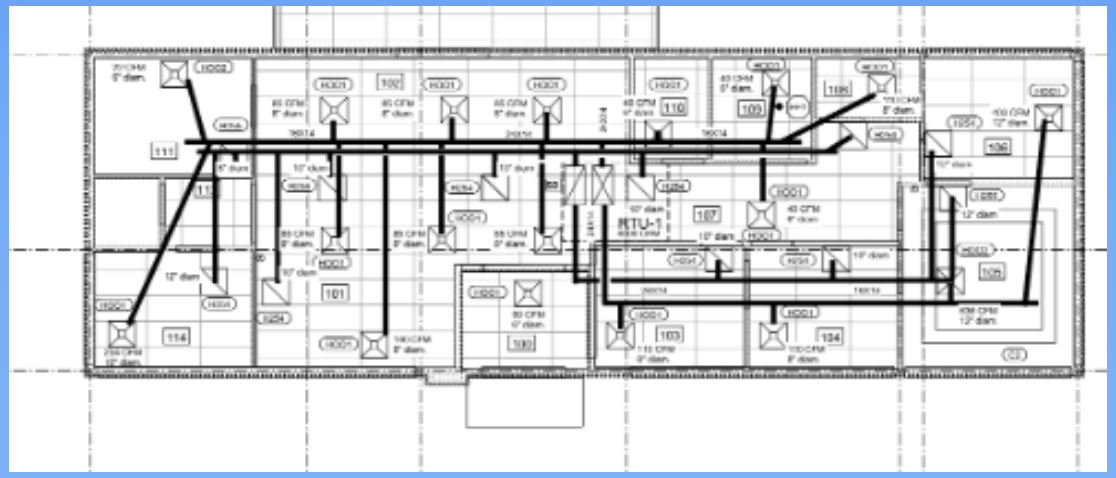
FAN SCHEDULE

TAG	LOCATION	MODEL	CFM	MANUFACTURE	ELECTRICAL DATA VOLTS	PH	HZ	FLA	MOCP
EF-1	PER PLANS	SIDVR8	600	DAYTON	120	1	60	1.2	20

HVAC NOTES:

MECHANICAL EQUIPMENT SCHEDULE PLAN-

Source: PSD



Poll Question #3

Air Leakage Testing is required in all buildings except those over 50,000 ft^2

A. True

B. False

Building Mechanical Systems

C403.2.3 Fault Detection Diagnostics (FDD)

Required on new buildings of 100,000 ft^2 or larger

FDD system to include:

- Include permanently installed sensors to monitor performance
- Sample performance at 15 min. intervals
- Automatically identify and report faults
- Automatically provide prioritized recommendations for repairs
- Be capable of transmitting recommendations to authorized personnel

Exceptions: R1 & R2 occupancies

Building Mechanical Systems

C403.4.1.1 Heat Pump Supplementary Heat

HP w/ supplementary electric resistance heat shall have controls that limit supplemental heat operation to one of the following conditions:

- Vapor compression cycle cannot meet the demand for the set point temperature
- HP is in defrost mode
- Vapor Compression cycle malfunctions
- Thermostat malfunctions

Building Mechanical Systems

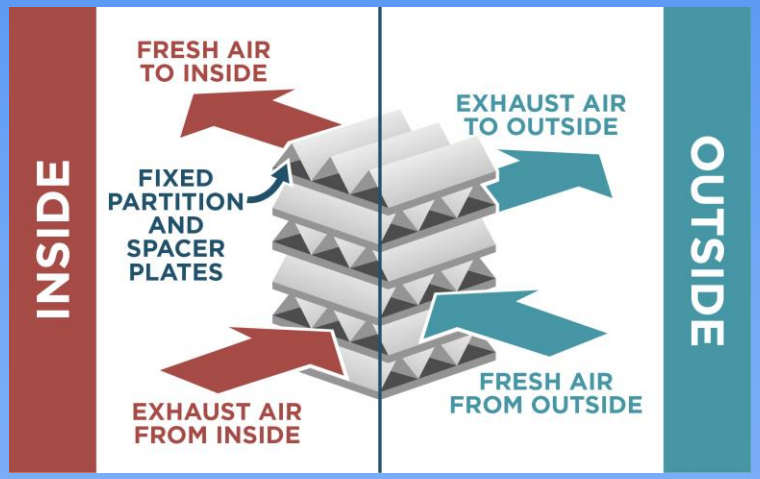
- Multiple-zone HVAC systems shall include controls that are capable of and configured to automatically reset the supply-air temperature in response to representative building loads, or to outdoor air temperature.
- The controls shall be configured to reset the supply air temperature not less than 25 percent of the difference between the design supply-air temperature and the design room air temperature.

Source: PSD

TABLE C403.7.4.2(1)

ENERGY RECOVERY REQUIREMENT (Ventilation systems operating less than 8,000 hours per year)

CLIMATE ZONE	PERCENT (%) OUTDOOR AIR AT FULL DESIGN AIRFLOW RATE							
	≥=10% and <20%	≥=20% and <30%	≥=30% and <40%	≥=40% and <50%	≥=50% and <60%	≥=60% and <70%	≥=70% and < 80%	≥=80%
	Design Supply Fan Airflow Rate (cfm)							
5A	10,000	8,000	2,750	0	0	0	0	0



Source: PSD

Building Mechanical Systems

Energy Recovery Systems

Required for:

- Non-transient Dwelling Units
  - Enthalpy Recovery Ratio not less than 60% cooling; 75% heating
  - Sensible recovery efficiency (SRE) that is not less than 72% at 32°F; Total recovery efficiency (TRE) rating that is not less than 50% at 95°F.
- Spaces other than Non-transient Dwelling Units
  - Required when supply airflow rate of a fan system (dwelling unit) exceeds Tables C403.7.4.2(1) and C403.7.4.2(2)
  - Sensible Energy Recovery Ratio at least 50% heating – Class 3 or Class 4 Exhaust
  - Sensible Energy Recovery Ratio not less than 70% at heating design conditions and airflows; Enthalpy Recovery Ratio of not less than 60% at heating & cooling design conditions and airflows- for all other systems

C403.7.4.2 – Spaces Other Than Nontransient Dwelling Units

If the supply airflow rate of a fan system serving a space exceeds the values specified in Tables C403.7.4.2(1) and C403.7.4.2(2), the system must include an energy recovery system.

Exceptions:

Prohibited by the International Mechanical Code, spaces < 40°F, operate < 10 hours per week at specified outdoor air percentages.

Systems exhausting toxic, flammable, paint, or corrosive fumes, or for commercial kitchen hoods used to remove grease vapors and smoke.

Building Mechanical Systems

C403.8.5 Low-Capacity Ventilation Fans

Mechanical Ventilation fans < 1/12 HP in capacity shall meet the efficacy requirements of Table C403.8.5 at one or more rating points

Exceptions:

1. Fan is part of heating/cooling system
2. Dryer exhaust duct power ventilators, domestic range hoods and domestic range booster fans that operate intermittently

TABLE C403.8.5

LOW-CAPACITY VENTILATION FAN EFFICACY[a]

FAN LOCATION	AIRFLOW RATE MINIMUM (CFM)	MINIMUM EFFICACY (CFM/WATT)	AIRFLOW RATE MAXIMUM (CFM)
HRV or ERV	Any	1.2 cfm/watt	Any
In-line fan	Any	3.8 cfm/watt	Any
Bathroom, utility room	10	2.8 cfm/watt	< 90
Bathroom, utility room	90	3.5 cfm/watt	Any

Source: MA DOER

Building Mechanical Systems

C404.2 Service Water-Heating Equipment Performance Efficiency

Water-heating equipment and hot water storage tanks shall meet Table C404.2

Manufacturer's published data sheets to be provided.

Also applies to water-heating equipment used for space heating

TABLE C404.2

MINIMUM PERFORMANCE OF WATER-HEATING EQUIPMENT

EQUIPMENT TYPE	SIZE CATEGORY (input)	SUBCATEGORY OR RATING CONDITION	PERFORMANCE REQUIRED[a, b]	TEST PROCEDURE
Water heaters, electric	≤ 12 kW[d]	Tabletop[e], ≥ 20 gallons and ≤ 120 gallons	0.93 — 0.00132*V*, EF	DOE 10 CFR Part 430
		Resistance ≥ 20 gallons and ≤ 55 gallons	0.960 — 0.0003*V*, EF	
		Grid-enabled[f] > 75 gallons and ≤ 120 gallons	1.061 — 0.00168V, EF	
	> 12 kW	Resistance	(0.3 + 27/V_m), %/h	ANSI Z21.10.3
	≤ 24 amps	Heat pump ≥		

Source: MA DOER

Lighting for Dwelling Units

- 90% (min) High Efficacy lighting is required in all permanently installed lighting
- Exceptions Appliance lighting

High-efficacy light sources:

- Lamps with at least 65 lumens per watt
- Luminaires with at least 45 lumens per watt

Occupancy Sensor Controls

Required areas added:

- Corridors
- Warehouse Storage Areas
- Must incorporate a manual off switch

Source: PSD

Source: Ikea.com

Daylight-Responsive Controls – Section C405.2.4

Daylight-responsive controls required for electric lights within daylight zones

- Spaces with > 100 W of general lighting within primary *sidelit* daylight zones
- Spaces with > 300 W of general lighting within *sidelit* daylight zones
- Spaces with > 100 W of general lighting within *toplit* daylight zones

Exceptions:

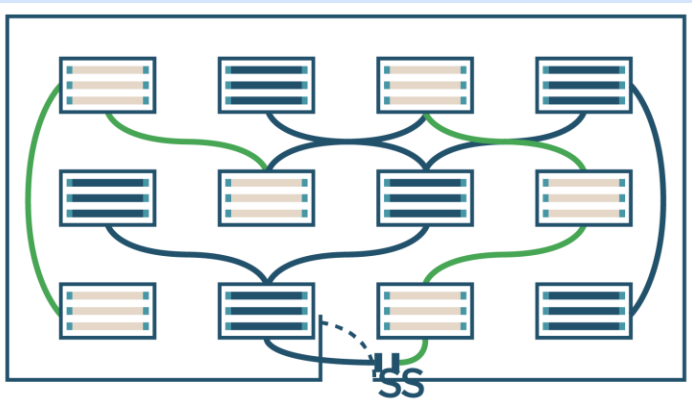
- Spaces in health care facilities where patient care is directly provided
- Sidelit daylight zones on the first floor above grade in Group A-2 or Group M occupancies
- New buildings meeting an adjusted lighting power allowance (Eq. 4-9)

Light-Reduction Controls

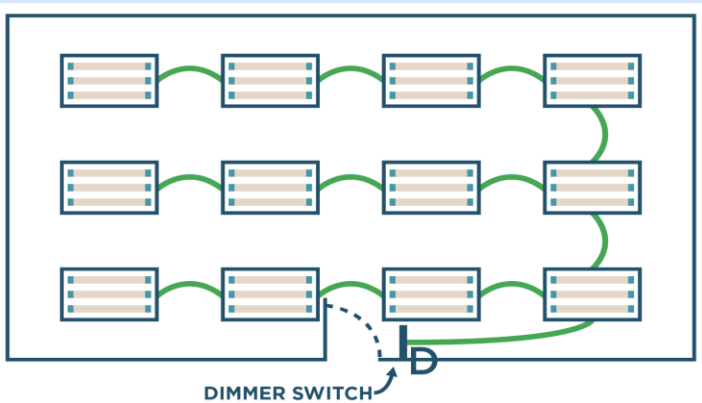
Light Reduction Controls must allow the occupant to reduce connected lighting load

- By **not less than** 50%
- In a reasonably uniform illumination pattern

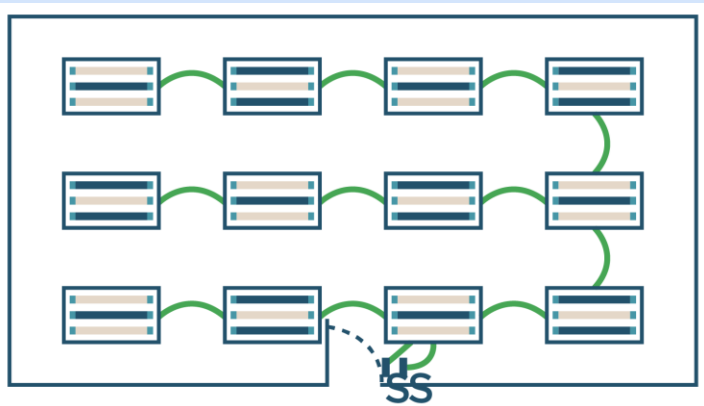
Alternating Luminaires



Dimming



Alternating Lamps



Source: PSD

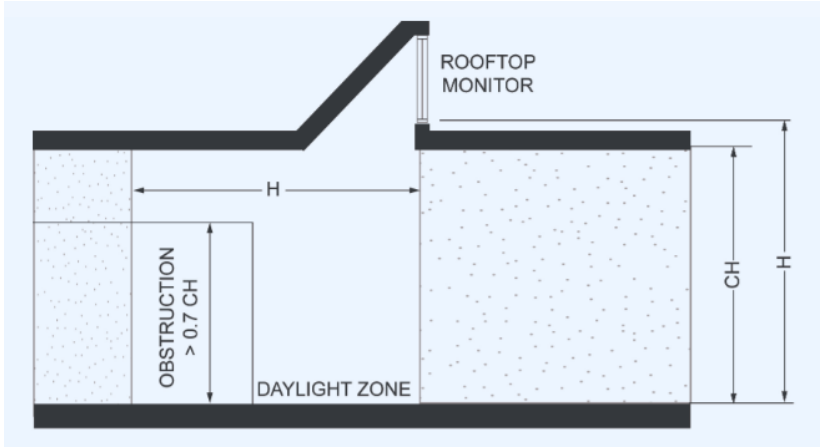
Exception: Light Reduction Control Not required in daylight zones with daylight responsive controls complying with C405.2.3

C405.2.4.2 Sidelit Daylight Zone

The Sidelit Daylight Zone requirements have changed.

Added:

- Requirements for roof top monitors
- Secondary sidelit daylight zone
- Visible transmittals not less than 0.20
- Added requirements of projection factor



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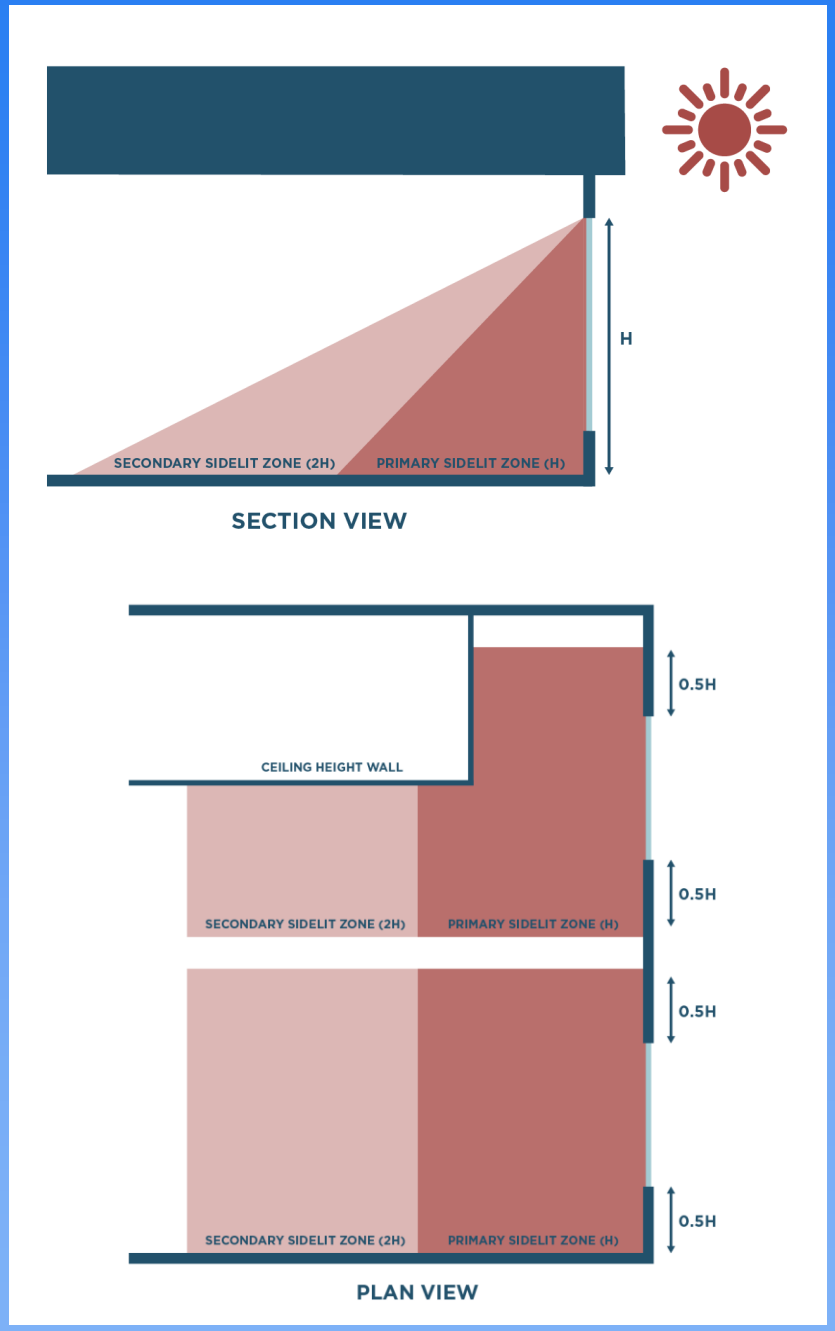
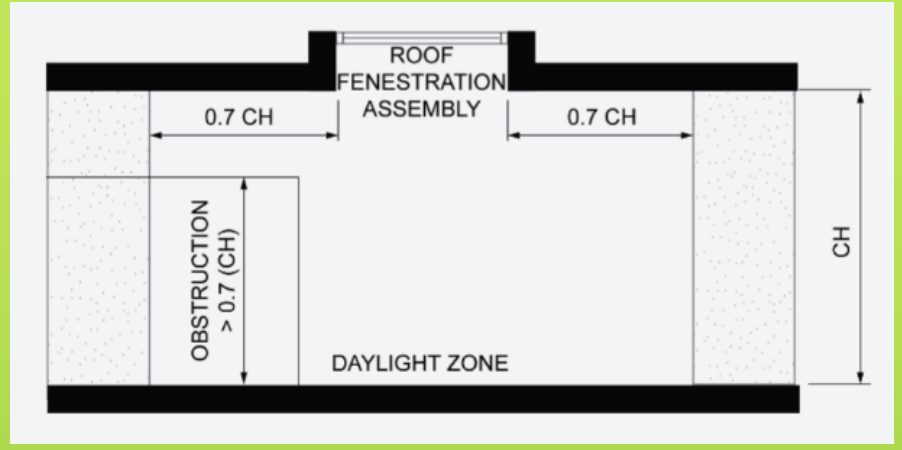


Source: PSD

C405.2.4.3 Toplit Daylight Zone

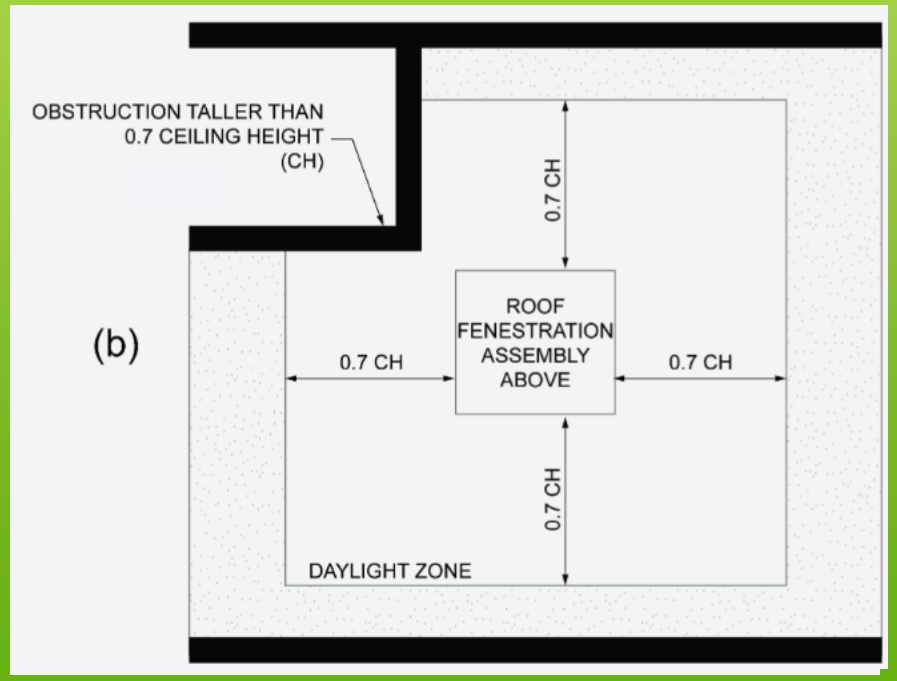
The toplit daylight zone is the floor area underneath a roof fenestration assembly that complies with all the following:

- To nearest obstruction that is taller than 0.7 times the ceiling height or up to 0.7 times the ceiling height, whichever is less.
- Direct sunlight is not blocked from hitting the roof fenestration assembly at the peak solar angle on the summer solstice by buildings or geological formations
- The product of the visible transmittance of the roof fenestration assembly and the area of the rough opening of the roof fenestration assembly divided by the area of the toplit zone is not less than 0.008



Source: ICC

(a) Section View



Source: ICC

(b) Plan View

C405.2.8 Parking Garage Lighting Control

Parking garage lighting shall be controlled by an occupant sensor or a time-switch control

- Lighting power to each luminaire shall be automatically reduced by not less that 30% when not activity for 20 minutes
- Lighting zones to be no more than 3600 ft^2
- Separately control and reduce power by 50% areas with lighting is provided for eye adaptation
- Power to luminaires within 20 feet of the perimeter walls shall have daylight responsive controls to reduce power by at least 50%

Source: PSD

C405.11 Automatic Receptacle Control

50% of all 125V 15- and 20-amp receptacles installed in:

- Offices
- Conference Rooms
- Rooms used for printing
- Breakrooms
- Classrooms
- Workstations

25% of branch circuit feeder to modular workstations not shown on CDs

C405.12 Energy Monitoring

Required in new buildings w/ CFA of ≥ 25,000 ft^2

Systems must:

- Measure
- Monitor
- Record
- Report consumption data

C406 Additional Efficiency Requirements

1. C406.1 -New Buildings are required to achieve a min. of 15 credits
2. C406.2 - Tenant Spaces are required to achieve a min. of 10 credits

Credits based on Table C406.1

TABLE C406.1(1)

ADDITIONAL ENERGY EFFICIENCY CREDITS FOR GROUP B OCCUPANCIES

SECTION	CLIMATE ZONE																
	0A & 1A	0B & 1B	2A	2B	3A	3B	3C	4A	4B	4C	5A	5B	5C	6A	6B	7	8
C406.2.2: 5% cooling efficiency improvement	6	6	5	5	4	4	3	3	3	2	2	2	1	2	2	2	1
C406.2.3: Renewable space heating	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	15	1	1	2	2	NA	1

Source: MA DOER

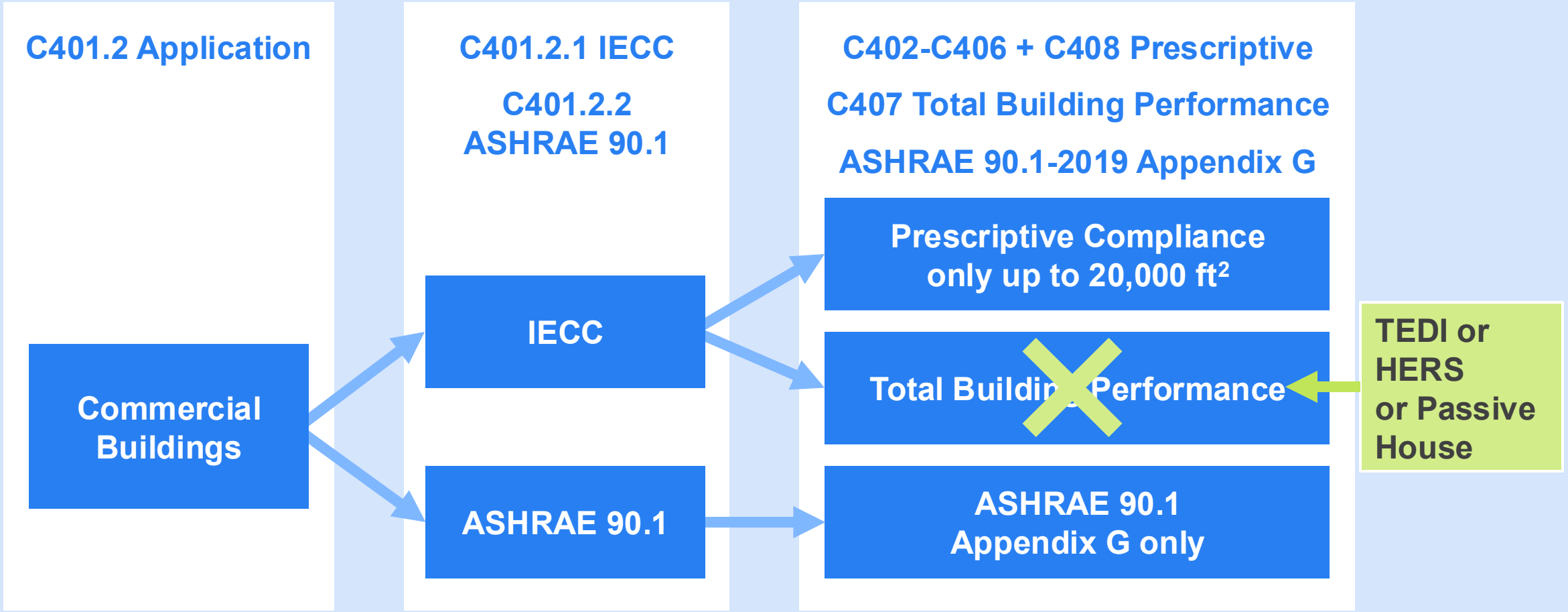
Compliance Paths

Compliance Paths

Scenario	Pathway Name	What CODE and SOFTWARE
Less than 20,000 ft^2	**Prescriptive**	Based on IECC 2021, No modeling, can use COMcheck Web MA Stretch version
Over 20,000 ft^2 and residential, office, dorm, fire station, library, school, police station, post office, or town hall	**"Targeted" performance**	TEDI path – can use Equest (or other) model – show heating/cooling demand below limits
More than 20,000 ft^2 and not use above, or any use for high ventilation building	**"Relative" performance**	ASHRAE 90.1 Appendix G – can use Equest (or other) model – show EUI improvement over baseline
Passivehouse	**Passivehouse**	Passivehouse Certified – can use WUFI or PHPP models, and certify with PHIUS or PHI
HERS (Group R Buildings)	**HERS**	HERS Certified, work with HERS rater – can use Ekotrope or REMrate

Courtesy of DOER: 2023 Technical Guidance, Massachusetts Stretch Energy Codes

Compliance Paths



Courtesy of DOER: 2023 Technical Guidance, Massachusetts Stretch Energy Codes

Poll Question #4

Given: 30,000 ft^2, Dormitory, 3 stories tall.
Ventilation rate at peak is 0.60 cfm/ft^2.
What is required compliance path?

A. Prescriptive Path
B. Targeted Performance Path
C. Relative Performance Path
D. ERI (HERS) Index

Compliance Paths

C402	Building Envelope Requirements
C403	Building Mechanical Systems
C404	Service Water Heating
C405	Electrical Power and Lighting Systems
C406	Additional Efficiency Requirements
C408	Maintenance Information and System Commissioning

C402-C406 + C408 Prescriptive

Prescriptive Compliance

Commercial Code

		IECC 2018	IECC 2021
Envelope	Fenestration	**Skylight:** U 0.50 (CZ 4-8) **Vertical (fixed):** U 0.38-0.29 (CZ 4-8)	**Skylight:** U 0.50-0.41 (CZ 4-8) **Vertical (fixed):** U 0.36-0.26 (CZ 4-8)
	Opaque Surfaces	N/A	Updated to align with ASHRAE 90.1 2016 & 2019 for all surfaces
Refrigeration Efficiency		N/A	Updated to match federal requirements
Lighting		**Office:** 0.79 **School:** 0.81 **Hospital:** 1.05	**Office:** 0.64 **School:** 0.72 **Hospital:** 0.96

Source: NEEP, Key Changes in the 2021 IECC for the Northeast and Mid-Atlantic

Targeted Performance Pathway (TEDI)

Stretch Code now directly regulated heating and cooling demand for:

- Office
- Municipal buildings
- Schools
- Residential Buildings

Courtesy of DOER: 2023 Technical Guidance, Massachusetts Stretch Energy Codes

Important: even though they have the same units, TEDI is not the same as energy use intensity (EUI)

TEDI is demand while EUI is consumption

Heating TEDI

*Total annual energy **delivered to** the building for space conditioning and conditioning of ventilation air, normalized by area (kBtu/sf-yr)*

Cooling TEDI

*Total annual energy **removed from** the building for space conditioning and conditioning of ventilation air, normalized by area (kBtu/sf-yr)*

Targeted Performance Pathway (TEDI) Continued

"Targeted" performance pathway (e.g. "TEDI"), must be used if one of the building use types is over 20,000 ft^2 (12,000 ft^2 for Multi-family)

Building Type	Heating TEDI limit (kBtu/sf-yr)	Cooling TEDI limit (kBtu/sf-yr)
K-12 school	2.2 – 2.4	12 – 20
Office, fire & police station, library, post office, town hall	1.5 – 2.5	21 – 23
Multi-family (including dorms)	2.8 – 3.2	15 – 22

Courtesy of DOER: 2023 Technical Guidance, Massachusetts Stretch Energy Codes

The same models currently used for stretch code compliance also produce TEDI information

IES

EnergyPlus

eQUEST

Poll Question #5

TEDI refers to the building energy demand. EUI refers to the building energy consumption.

A. True

B. False

Relative Performance Pathway (ASHRAE 90.1 Appendix G)

- “Relative” performance pathway (e.g. “Appendix G”), you can only use if:
  - Highly ventilated (0.5 cfm/ft^2) OR
  - If not one of the building types called in for Targeted compliance
- Show site energy use reduction per Table 4.2.1.1 of ASHRAE 2019 Appendix G
- If following Appendix G due to high ventilation
  - Must have heat pumps sized for 25% of peak space heating

Multi-Family and Mixed-Use Residential

Overview of Changes

July 2024

- Maximum HERS Index decreased from 52 to 42 for new construction

All-electric homes qualify for a three-point increase in maximum HERS Index

February 14, 2025

Update to Stretch code:

- Introduced new Embodied Carbon Credit for new construction
- Maximum HERS Index revised for large alterations and additions

Passive House Building Certification Option

- Projects may document compliance with either PHIUS certification or PHI certification.
- Must use the most recent version of the software for the Passive House approach

Source: Phius

Source: PHI

Poll Question #6

The project consists of a dormitory, 35,000 ft^2 of conditioned floor area with a ventilation rate of 2.5 cfm/sf. What is the appropriate compliance path?

A. Prescriptive

B. Targeted Performance

C. Relative Performance

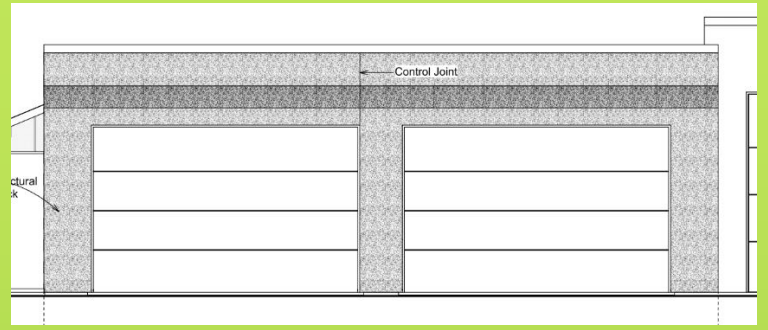
D. ASHRAE 90.1, 2016 Appendix G

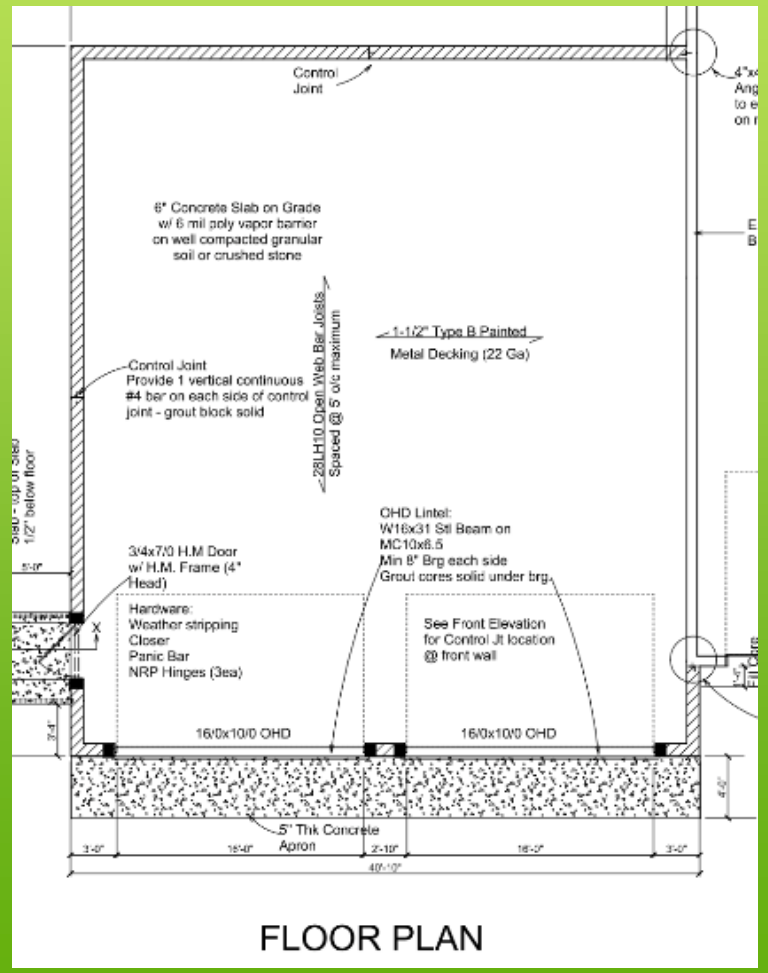
Existing Buildings

Existing Buildings – Chapter [CE] 5

Projects in existing buildings shall comply with:

- C502 – Additions
- C503 – Alterations
- C504 – Repairs
- C505 – Change of Occupancy or Use
- C506– EnerPHIt Standard





Source: PSD

Additions C502.1

- < 20,000 ft^2 and < 100% of existing building – Prescriptive new construction
  - C401.3 Envelope Certificate
  - C402-406 Component Requirements
  - C408 Maintenance and Commissioning
- ≥ 20,000 ft^2 and 100% = new construction TEDI, ASHRAE

Commercial Overview Summary

- New commercial provisions offer opportunities to save energy and decarbonization
- Prescriptive R-values have been replaced by U-factors in determining compliance
- Target Performance pathway considers the energy demand when determining compliance
- Thermal bridging at walls is being addressed
- Additional mechanical systems efficiencies are part of the new code.
- COMcheck is still required for most compliance pathways
- Relative Performance compliance pathway is based on ASHRAE 90.1-2019, Appendix G

Energy Code Support

Questions about the energy code?

Energy Code Support Hotline:

855-757-9717

Energy Code Support Email:

energycodesma@psdconsulting.com

Mass Save Incentive Programs

Residential Rebates and Incentives

Rebates for appliances, heating systems and more.

www.masssave.com/en/residential/rebates-and-incentives

Thank you.

Massachusetts Energy Code Technical Support Program

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