The Codes They Are A-Changin'

What to expect in the 2024 CBES

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I am not the
code police,
please go easy
on me

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2024 CBES based on the following:

- 2020 CBES which is based on 2018 IEEC (*International Energy Conservation Code)*
- Elements of 2021 IECC
- Select language updates and additional more stringent Vermont requirements
- 2019 ASHRAE 90.1 *Energy Standard for Buildings Except Low-Rise Residential Buildings*

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Target Effective Date

- The 2024 CBES will likely be effective on July 1, 2024
- Permit application date determines what version of CBES applies
  - A permit, in this context, is limited to a building permit or an Act 250 permit

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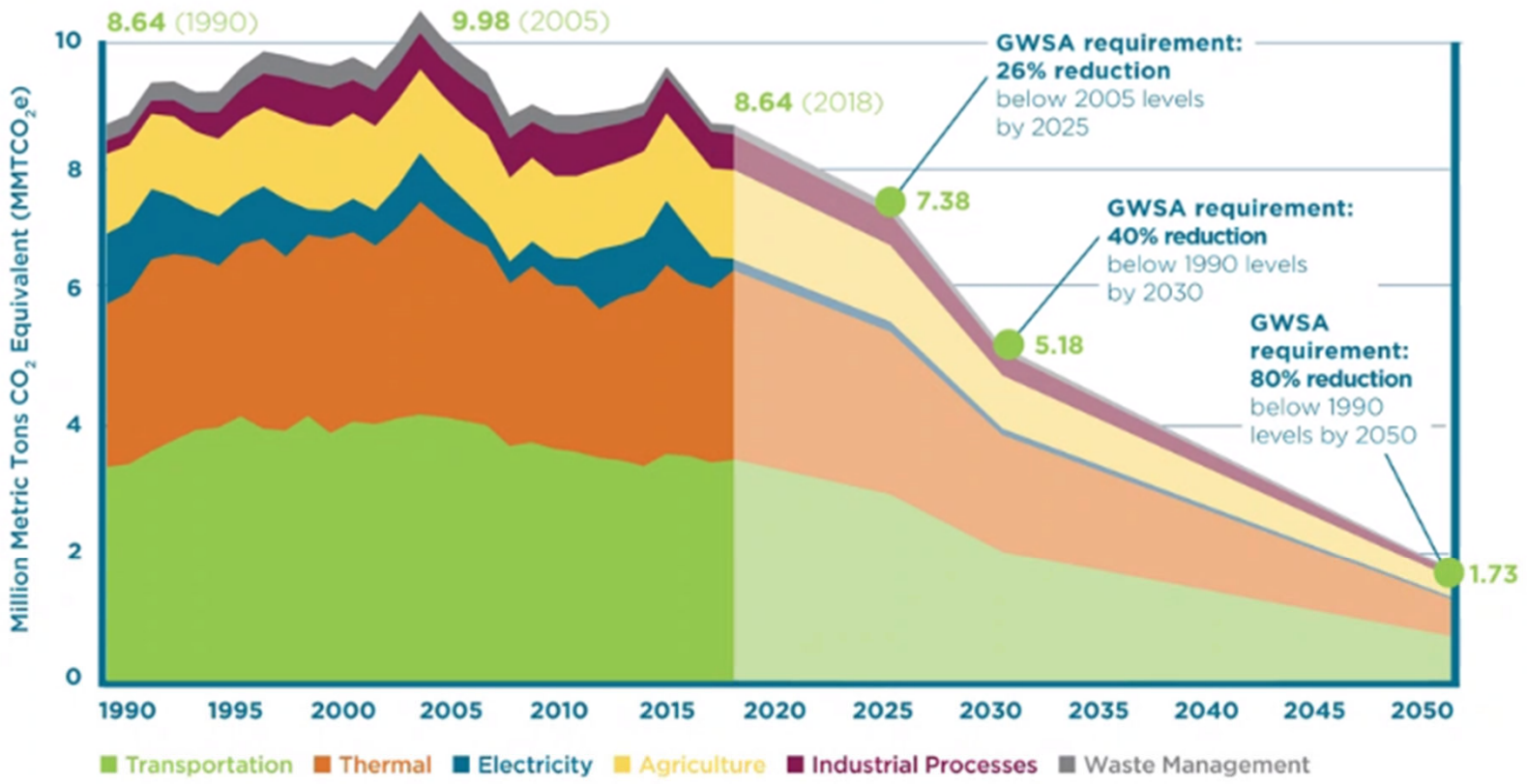
Vermont's historical GHG emissions and future requirements



Source: Vermont Agency of Natural Resources, Vermont GHG Emissions Inventory and Forecast (1990-2017), 2021.

ENERGY ACTION NETWORK

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Stretch Code/Guidelines

Same as 2020 CBES

- There are NO Stretch Guidelines for 2024
- Act 250 Commercial Construction projects follow 2024 CBES

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Chapter 1

~~Scope &~~ Administration

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State & Local Roles

- PSD is authorized to create and update CBES but not enforce the code
- Vermont employs a self-certification process
- No current Code Official designated in Code language
- Natural Resource Board does enforce the code for ACT 250

State & Local Roles, cont.

- State Historic Preservation Office can provide exemptions from specific sections of the energy code
- Cities and Towns can elect to inspect and enforce code compliance
- Cities and Towns can adopt different standards from CBES (if at least as stringent)

State & Local Roles, cont.

Act 47 Building Energy Codes Study Committee (BECSC)

1. Assess how the building energy codes interact with the fire and building safety codes
2. Consider and recommend strategies to increase awareness of and compliance with the RBES and CBES
3. Evaluate current cost-effectiveness analyses for the RBES and the CBES

C101 Scope and General Requirements

- *C101.2 Scope*
  - calls for Code to provide minimum energy-efficient, Renewable Energy, and Energy Storage requirements for the design, construction, and a plan for operation and maintenance

- *C102.1 Alternative Materials, Design and Methods*
  - Public Service Department has authority to approve written applications

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C103 Construction Documents

C103.2 Information on Construction Documents

- 16. Air barrier and air sealing details, including the location of the air barrier, a diagram showing the building's pressure boundary in plan(s) and section(s), and calculation of the area of the pressure boundary as specified in Section C402.4.1.3.

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Chapter 2

Definitions

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C202 General Definitions

Authority Having Jurisdiction

- For purposes of this code, neither the Vermont Public Service Department nor the Division of Fire Safety should be considered the authority having jurisdiction.

Code Official

- See above

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C202 General Definitions cont.

Semi-Conditioned Space

- New language: "An enclosed space within a building that is not a conditioned space, but is directly or indirectly mechanically heated or cooled"
- *Removed language:* "by a heating system whose output capacity is less than or equal to 14 Btu/h · ft2 of floor area; or if the space is directly or indirectly or cooled and the cooling system's sensible output capacity is less than 3.4 Btu/h · ft2"

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Chapter 4

Commercial Energy Efficiency

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C401.2.2 ASHRAE 90.1

Buildings using ANSI/ASHRAE/IESNA 90.1 2019 compliance paths have new Building Performance Factors

BUILDING AREA TYPE	2020 CBES BPF	2023 CBES BPF
Multifamily	0.62	0.55
Healthcare/hospital	0.46	0.46
Hotel/motel	0.48	0.43
Office	0.43	0.43
Restaurant	0.50	0.50
Retail	0.44	0.37
School	0.39	0.34
Warehouse	0.53	0.53
All Others	0.45	0.45

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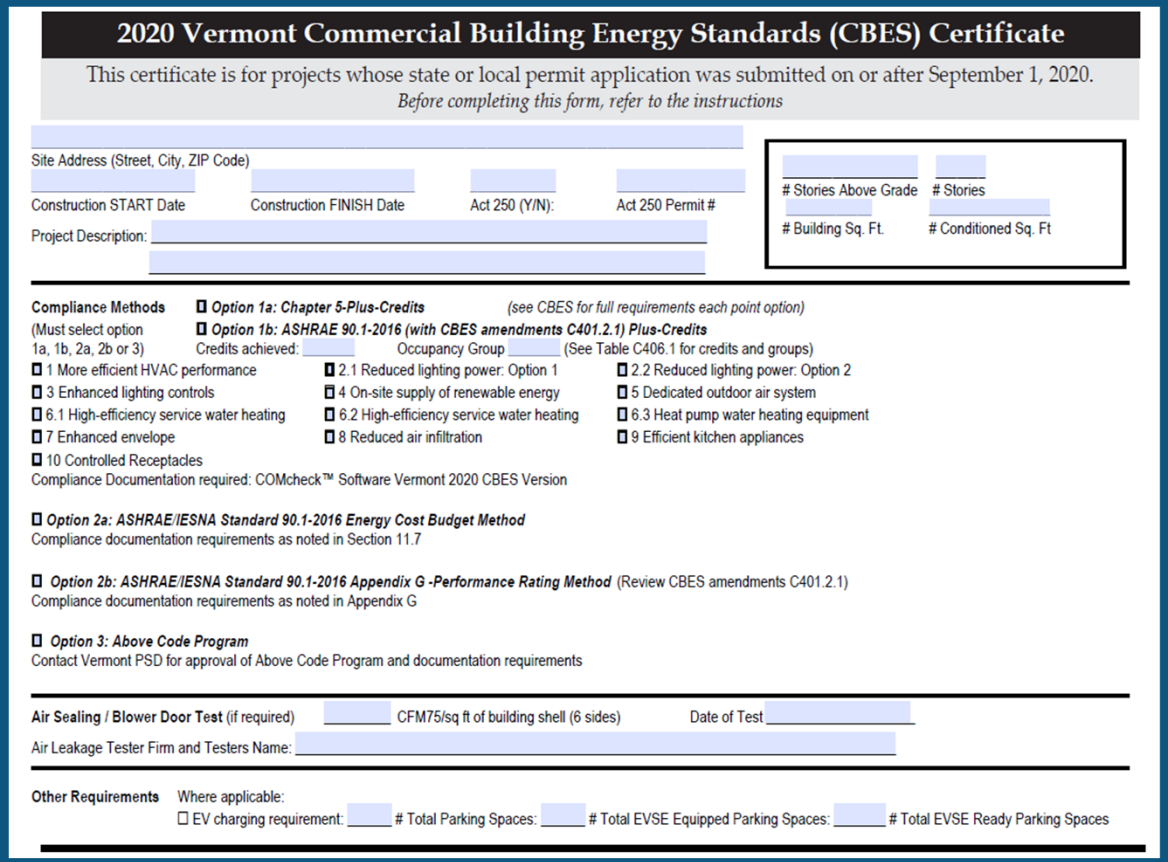
C401.3 CBES Certificate and Affidavits



2020 Vermont Commercial Building Energy Standards (CBES) Certificate

This certificate is for projects whose state or local permit application was submitted on or after September 1, 2020.

Before completing this form, refer to the instructions

Site Address (Street, City, ZIP Code)

Construction START Date | Construction FINISH Date | Act 250 (Y/N): | Act 250 Permit #

Project Description:

Stories Above Grade | # Stories

Building Sq. Ft. | # Conditioned Sq. Ft

Compliance Methods (Must select option 1a, 1b, 2a, 2b or 3)

☐ ***Option 1a: Chapter 5-Plus-Credits*** *(see CBES for full requirements each point option)*

☐ ***Option 1b: ASHRAE 90.1-2016 (with CBES amendments C401.2.1) Plus-Credits***

Credits achieved: _____ Occupancy Group _____ (See Table C406.1 for credits and groups)

- ☐ 1 More efficient HVAC performance
- ☐ 2.1 Reduced lighting power: Option 1
- ☐ 2.2 Reduced lighting power: Option 2
- ☐ 3 Enhanced lighting controls
- ☐ 4 On-site supply of renewable energy
- ☐ 5 Dedicated outdoor air system
- ☐ 6.1 High-efficiency service water heating
- ☐ 6.2 High-efficiency service water heating
- ☐ 6.3 Heat pump water heating equipment
- ☐ 7 Enhanced envelope
- ☐ 8 Reduced air infiltration
- ☐ 9 Efficient kitchen appliances
- ☐ 10 Controlled Receptacles

Compliance Documentation required: COMcheck™ Software Vermont 2020 CBES Version

☐ ***Option 2a: ASHRAE/IESNA Standard 90.1-2016 Energy Cost Budget Method***
Compliance documentation requirements as noted in Section 11.7

☐ ***Option 2b: ASHRAE/IESNA Standard 90.1-2016 Appendix G -Performance Rating Method*** (Review CBES amendments C401.2.1)
Compliance documentation requirements as noted in Appendix G

☐ ***Option 3: Above Code Program***
Contact Vermont PSD for approval of Above Code Program and documentation requirements

Air Sealing / Blower Door Test (if required) _____ CFM75/sq ft of building shell (6 sides) Date of Test _____

Air Leakage Tester Firm and Testers Name: _____

Other Requirements Where applicable:

☐ EV charging requirement: _____ # Total Parking Spaces: _____ # Total EVSE Equipped Parking Spaces: _____ # Total EVSE Ready Parking Spaces

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C401.3 CBES Certificate and Affidavits

The 2024 certificate will require the following information:

- Thermal envelope details including R-values of assembly insulation and U-factors & SHGC of fenestrations
- Results from any building envelope air leakage testing
- An indication of the solar-ready zone and other requirements of C402.5

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C402.1(2) Conditioned Space Building Envelope Requirements

Highlights:

- Adjustments to all U-value requirements
- Better alignment with RBES for R-2 occupancy classifications
- An indication of the solar-ready zone and other requirements of C402.5
- Example assemblies for meeting U-factor requirement

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C402.1(2) Conditioned Space Building Envelope Requirements

TABLE C402.1(2)
***CONDITIONED SPACE* BUILDING ENVELOPE REQUIREMENTS—OPAQUE ASSEMBLIES**

COMPONENT	MAXIMUM OVERALL *U*-FACTOR			EXAMPLE ASSEMBLIES MEETING U-FACTOR REQUIREMENT	
	2020 CBES	All Other *Occupancy Classifications*	R-2 *Occupancy Classifications*	All Other *Occupancy Classifications*	R-2 *Occupancy Classifications*
Roofs					
Insulation above deck	U-0.025	U-0.022	←Same	R-45ci	←Same
Metal buildings	U-0.026	U-0.023	←Same	R-10 + R-10 + R-32ci	←Same
Attic and Other	U-0.021	U-0.017	U-0.020	R-60	R-49
Walls, Above grade					
Mass	U-0.048	U-0.037	←Same	R-25ci	←Same
Metal Building	U-0.044	U-0.039	←Same	R-13 + R-19.5ci or R-25ci	←Same
Metal-framed	U-0.044	U-0.037	←Same	R-13 + R-18.8ci or R-25ci	←Same
Wood-framed and other	U-0.042	U-0.036	U-0.042	R-13 + R-16ci or R-19 + R-12ci or R-25ci	R-13 + R-12ci or R-19 + R-8ci or R-20ci

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C402.1(2) Conditioned Space Building Envelope Requirements

TABLE C402.1(2)
***CONDITIONED SPACE* BUILDING ENVELOPE REQUIREMENTS—OPAQUE ASSEMBLIES**

COMPONENT	MAXIMUM OVERALL *U*-FACTOR			EXAMPLE ASSEMBLIES MEETING U-FACTOR REQUIREMENT	
	2020 CBES	**All Other *Occupancy Classifications***	**R-2 *Occupancy Classifications***	**All Other *Occupancy Classifications***	**R-2 *Occupancy Classifications***
Walls, Below Grade					
Below-grade wall	C-0.063	C-0.048	←Same	R-20ci	←Same
Floors					
Mass	U-0.051	U-0.038	←Same	R-23ci	←Same
Joist/Framing—Metal	U-0.032	U-0.027	←Same	R-38 + R-6ci	←Same
Joist/Framing—Wood	U-0.033	U-0.027	←Same	R-38	←Same
Slab-on-Grade Floors					
Unheated slabs	F-0.036	F-0.434	←Same	R-20 for 48" below	←Same
Heated slabs	F-0.073	F-0.433	←Same	R-20 for 48" below + R-15 full slab	←Same

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C402.1(3) Semi-Conditioned Space Building Envelope Requirements

TABLE C402.1(3)
***SEMI-CONDITIONED SPACE* BUILDING ENVELOPE REQUIREMENTS**

COMPONENT	MAXIMUM OVERALL *U*-FACTOR		EXAMPLE ASSEMBLIES MEETING U-FACTOR REQUIREMENT
	2020 CBES	All *Occupancy Classifications*	All *Occupancy Classifications*
Roofs			
Insulation above deck	U-0.025	U-0.039	R-25ci
Metal buildings	U-0.026	U-0.037	R-19 + R-11 LS or R-25 + R-8 LS
Attic and Other	U-0.021	U-0.027	R-38
Walls, Above grade			
Mass	U-0.048	U-0.104	R-9.5ci
Metal Building	U-0.044	U-0.060	R-15.8ci
Metal-framed	U-0.044	U-0.064	R-13 + R-7.5ci
Wood-framed and other	U-0.042	U-0.051	R-13 + R-7.5ci
Walls, Below Grade			
Below-grade wall	C-0.063	C-0.119	R-7.5ci
Floors			
Mass	U-0.051	U-0.064	R-12.5ci
Joist/Framing—Metal	U-0.032	U-0.052	R-19
Joist/Framing—Wood	U-0.033	U-0.033	R-30
Slab-on-Grade Floors			
Unheated slabs	F-0.036	F-0.540	R-10 for 24 in. below
Heated slabs	F-0.073	F-0.860	R-15 for 24 in below

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C402.1(4) Metal Building Assembly Descriptions

Roofs:

- 2020 CBES defined liner system and filled cavity assemblies
- 2024 CBES adds single-layer, double-layer and continuous insulation definitions

Walls:

- 2020 CBES defined single layer compressed and continuous insulation
- 2024 CBES adds single-layer in cavity and double-layer definitions

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C402.1.2.1.1 Tapered above-deck insulation based on thickness

"Where used as a component of a maximum roof/ceiling assembly U-factor calculation, the sloped roof insulation R-value contribution to that calculation shall use the average thickness in inches (mm) along with the material R-value-per-inch (per-mm) solely for U-factor compliance as prescribed in Section C402.1.1."

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C402.2.1 Roof Assembly

- 2020 CBES had different language regarding minimum R-value for tapered roof insulation and low-pitch sloped roofs with continuous insulation
- 2024 CBES cleans this up by simply requiring a minimum of R-12 at the lowest point, gutter edge, roof drain or scupper
- Still need to meet the average R-value requirement for the whole roof!

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C402.2.3 Floors

Floor framing cavity insulation or structural slab insulation shall be installed to maintain permanent contact with the underside of the subfloor decking or structural slabs

- Exception 1. The floor framing cavity insulation or structural slab insulation shall be permitted to be in contact with the top side of sheathing or continuous insulation installed on the bottom side of floor assemblies where combined with insulation that meets or exceeds the minimum U-values and extends from the bottom to the top of all perimeter floor framing or floor assembly members.

- Exception 2. Insulation applied to the underside of concrete floor slabs shall be permitted an airspace of not more than 1 inch (25 mm) where it turns up and is in contact with the underside of the floor under walls associated with the building thermal envelope.

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C402.3 Fenestration Maximum U-Factor and SHGC

TABLE C402.3
BUILDING ENVELOPE FENESTRATION MAXIMUM U-FACTOR AND SHGC REQUIREMENTS

VERTICAL FENESTRATION				
U-factor	2020 CBES		2023 CBES	
Fixed fenestration *other than storefront*	0.33		0.29	
Storefront fenestration	n/a		0.33	
Operable fenestration, R-2 occupancy classifications	n/a		0.30	
Operable fenestration, occupancy classifications *other than R-2*	0.37		0.36	
Entrance doors	0.68		0.63	
SHGC				
Orientation PF	SEW Fixed	N Operable	SEW Fixed	N Operable
PF < 0.2	0.40	0.53	0.38	0.34
0.2 ≤ PF < 0.5	0.48	0.58	0.46	0.41
PF ≥ 0.5	0.64	0.64	0.61	0.54
SKYLIGHTS				
U-factor	0.48		0.41	
SHGC	0.38		0.38	

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C402.4.1.1 Air Barrier Performance Testing

Air leakage shall not exceed 0.25 cfm/ft^2 tested at 75Pa

- Exceptions:
  - R-2 building occupancies six stories or less shall be tested at a pressure differential of 50 Pa, and the measured air leakage shall not exceed 0.15 cfm/ft2 of the building thermal envelope area.
  - Larger than 250,000 ft^2 that do not include Group R or Group I occupancies: test or commission
  - Unfeasible to test (as determined by VTDPS): commission

Efficiency Vermont

C402.4.2 Dwelling and sleeping unit enclosure testing

Air leakage shall not exceed 0.15 cfm/ft^2 tested at 50Pa

- Fewer than 8 units: test all units
- More than 8 units: test 20% of units

Efficiency Vermont

C402.4.6 Operable openings interlocking

Openings greater than 40 ft^2 – interlock with heating and cooling systems

- Raise cooling to 90°F
- Lower heating to 55 °F

- Exceptions:
  - Separately zoned areas associated with food prep
  - Warehouses utilizing overhead doors
  - 1st entrance of vestibules

Efficiency Vermont

C402.5 Solar-ready zone

Located on roof

- Buildings oriented between 110° and 270° of true north; or
- Low slope roofs

- Not less than 40% of roof area

- Can be single area or smaller, separated sub-zones

Efficiency Vermont

C402.5 Solar-ready zone

- Construction drawings indicate
  - Roof loads specified: not less than 5psf
  - Drawings show interconnection pathways for conduit etc
  - Electrical energy storage system-ready floor area

- Main panel shall have reserve space to allow installation of
  - Dual-pole circuit breaker for future solar electric
  - Dual-pole circuit breaker for future electrical energy storage system installation

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C402.5 Solar-ready zone

Exceptions:

- On-site renewable energy system pre-exists
- Solar-ready zone is shaded 70% of daylight hours
- Incident solar radiation available is not suitable
- Extensive rooftop equipment, skylights, vegetation, other obstructions (certified by licensed professional)

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Chapter 4

Building Mechanical Systems

Efficiency Vermont

C403.2.2 Ventilation

Meet ASHRAE 62.1

Exceptions?

All Residential occupancies. See the ventilation requirements of Section 304 of the *Vermont Residential Building Energy Standards*.

Efficiency Vermont

C403.2.4 Fault detection and diagnostics

Buildings >100,000sf require monitoring of HVAC performance and identifying faults. Systems must include

- Permanently installed sensors, sampling every 15 minutes
- Automatically ID faults and notify personnel
- Automatically provide recommendations for repair

Exceptions? Group R-1 and R-2 occupancies

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C403.1.3 HVAC total system performance ratio (HVAC TSPR)

Creates alternative compliance method for some HVAC systems

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C403.3.1 Equipment sizing

Heat pump equipment shall not be sized greater than the calculated peak heating and cooling loads

Efficiency Vermont

C403.3.2 Equipment Efficiency Tables

General Themes

Equipment efficiencies adjusted to meet federal standards as per IECC 2021

- AC & heat pump cooling efficiencies now reported in SEER2
- Heat pump heating efficiencies now reported in HSPF2
- Increase in efficiencies:
  - PTACs, PTHPs, Room AC units and similar
  - Non-ducted furnaces, slight increase (example 80% TE to 81% TE)
  - Floor-Mounted AC and condensing units serving computer rooms

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C403.3.2 Equipment Efficiency Tables

Most Equipment remaining the same:

- Chillers, boilers
- Heat rejection equipment
- VRF AC and Heat Pumps

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C403.3.2 Equipment Efficiency Tables

A few new tables

TABLE C403.3.2(12)
ELECTRICALLY OPERATED DX-DOAS UNITS, SINGLE-PACKAGE AND REMOTE CONDENSER, WITHOUT ENERGY RECOVERY– MINIMUM EFFICIENCY REQUIREMENTS

EQUIPMENT TYPE	SUBCATEGORY OR RATING CONDITION	MINIMUM EFFICIENCY	TEST PROCEDURE[a]
Air cooled (dehumidification mode)	-	4.0 ISMRE	AHRI 920
Air-source heat pumps (dehumidification mode)	-	4.0 ISMRE	AHRI 920
Water cooled (dehumidification mode)	Cooling tower condenser water	4.9 ISMRE	AHRI 920
	Chilled water	6.0 ISMRE	
Air-source heat pump (dehumidification mode)	-	2.7 ISCOP	AHRI 920
Water-source heat pump (dehumidification mode)	Ground source, closed loop	4.8 ISMRE	AHRI 920
	Groundwater source	5.0 ISMRE	
	Water source	4.0 ISMRE	
Water-source heat pump (heating mode)	Ground source, closed loop	2.0 ISCOP	AHRI 920

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C403.3.2 Equipment Efficiency Tables

A few new tables

TABLE C403.3.2(16)
CEILING-MOUNTED COMPUTER-ROOM AIR CONDITIONERS-MINIMUM EFFICIENCY REQUIREMENTS

EQUIPMENT TYPE	STANDARD MODEL	NET SENSIBLE COOLING CAPACITY	MINIMM NET SENSIBLE COP	RATING CONDITIONS RETURN AIR (Dry bulb/dew point)	TEST PROCEDURE
Air cooled with free air discharge condenser	Ducted	<29,000 Btu/h	2.05	75°F/52°F (Class 1)	AHRI 1360
		≥29,000 Btu/h and <65,000 Btu/h	2.02		
		≥65,000 Btu/h	1.92		
	Non ducted	<29,000 Btu/h	2.08		
		≥29,000 Btu/h and <65,000 Btu/h	2.05		
		≥65,000 Btu/h	1.94		
		<29,000 Btu/h	2.01		
		≥29,000 Btu/h and <65,000 Btu/h	1.97		
		≥65,000 Btu/h	1.87		
		<29,000 Btu/h	2.04		
		≥29,000 Btu/h and <65,000 Btu/h	2.00		
		≥65,000 Btu/h	1.89		

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C403.3.3 Hot gas bypass

Back from the past! 2015!

Cooling systems shall not use hot gas bypass or other evaporator pressure control systems unless the system is designed with multiple steps of unloading or continuous capacity modulation

Efficiency Vermont

C403.4.1.1 Heat pump supplementary heat

Supplemental electric resistance heat operation shall be controlled to only those times when one of the following applies:

1. The vapor compression cycle cannot provide the necessary heating energy to satisfy the thermostat setting.

2. The heat pump is operating in defrost mode.

3. Only for buildings that require heat for health and safety:
   - the vapor compression cycle malfunctions
   - the thermostat malfunctions.

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C403.4.2.3 Automatic start and stop

Automatic stop controls shall be provided for each HVAC system with direct digital control of individual zones

The automatic stop controls shall be configured to reduce the HVAC system's heating temperature setpoint and increase the cooling temperature setpoint by not less than 2°F (0.6ºC) before scheduled unoccupied periods based on the thermal lag and acceptable drift in space temperature that is within comfort limits.

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C403.7.1 Demand control ventilation

DCV is required for spaces with less occupants than in VT CBES 2020. Occupant load reduced from 25 to 15 people per 1,000sf

Exceptions language more clearly defined

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C403.7.2 Enclosed parking garage ventilation controls

Sensors must detect NO_x in addition to CO_2

Exceptions for garage ventilation systems that do not utilize heating or cooling:

1. Total exhaust capacity less than 4,000 cfm
2. Garage area to ventilation system motor nameplate power ratio that exceeds 1,125 cfm/hp

Efficiency Vermont

C403.7.3 Ventilation air heating control

C403.7.4.1 Nontransient dwelling units shall have ERVs

- 60% enthalpy recovery efficiency at cooling design condition
- 70% recovery efficiency at heating design condition

Exception: Systems with a minimum sensible recovery efficiency (SRE) of 75 percent at 32°F at design airflow

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C403.7.6.2 Ventilation controls

Unoccupied guest rooms: ventilation turnoff time decreased from 30 minutes to 20 minutes

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C403.8.3 Fan efficiency

A new fan energy index rating was introduced per IECC 2021

Each fan and fan array shall have a fan energy index (FEI) of not less than 1.00 at the design point.

Exceptions are expanded to include specialty end uses

Low-capacity ventilation fans (<1/12hp) minimum efficiency requirement was added per IECC 2021

Efficiency Vermont

C403.10 Refrigeration equipment performance

Applies to commercial refrigerators, freezers, refrigerator-freezers, walk-in coolers, walk-in freezers and refrigeration equipment

New efficiency requirement tables updated to reflect IECC 2021

Efficiency Vermont

C403.12.1 Duct and plenum insulation and sealing

Supply and return air ducts and plenums shall be insulated with not less than:

- R-12 insulation where located in unconditioned spaces
  - (2020 CBES = R-8)
- R-20 insulation where located outside the building
  - (2020 CBES = R-12)

Efficiency Vermont

C404 Service water heating

C404.2.1 High input service water-heating system equipment size now defined as per IECC 2021:

1,000,000 Btu/h (293 kW) or greater

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Chapter 4

Electrical Power and Lighting Systems

Efficiency Vermont

Electrical Power and Lighting Systems

- Dwelling and Sleeping Units required to have 100% LED lighting
- Parking Garage Lighting has new lighting control requirement
- Lighting Power Density improved, approximately 15% more efficient but varies by building area type or space-by-space type
- Escalators are required to perform energy recovery when resisting overspeed in the down direction
- Automatic Receptacle Control: 50% of electrical receptacles in offices, conference rooms, copy/print rooms, breakrooms, classrooms, and individual workstations shall be controlled

Electrical Power and Lighting Systems

- Energy Monitoring is now required in buildings >25,000 SF
- Electric Vehicle Charging Stations:
  - Must be Level 2 chargers or better
  - Revised requirements for charging stations and future ready/capable spaces
- Electric Ready:
  - Electric readiness for future electric space heating, electric water heating, electric cooking equipment, and electric dryers.
  - Exception for R-2 buildings. R-2 buildings may get points in Section C406 for including electric ready systems

TABLE C405.3.2(1)
INTERIOR LIGHTING POWER ALLOWANCES: BUILDING AREA METHOD

BUILDING AREA TYPE	LPD (w/sf)	
	2020 CBES	2023 CBES
Automotive facility	0.60	0.56
Convention center	0.70	0.55
Courthouse	0.76	0.64
Dining: bar lounge/leisure	0.76	0.64
Dining: cafeteria/fast food	0.67	0.59
Dining: family	0.69	0.58
Dormitory	0.47	0.41
Exercise center	0.59	0.54
Fire station	0.48	0.43
Gymnasium	0.64	0.58
Health care clinic	0.69	0.62
Hospital	0.84	0.74
Hotel/Motel	0.65	0.50
Library	0.78	0.66
Manufacturing facility	0.82	0.68
Motion picture theater	0.64	0.44

BUILDING AREA TYPE	LPD (w/sf)	
	2020 CBES	2023 CBES
Multifamily	0.48	0.38
Museum	0.83	0.55
Office	0.64	0.53
Parking garage	0.14	0.13
Penitentiary	0.62	0.54
Performing arts theater	1.02	0.77
Police station	0.67	0.55
Post office	0.61	0.52
Religious building	0.77	0.60
Retail	0.92	0.73
School/university	0.67	0.57
Sports arena	0.71	0.61
Town hall	0.67	0.56
Transportation	0.52	0.42
Warehouse	0.43	0.36
Workshop	0.83	0.72

C405.2.1. Occupant sensor controls

Added new required space: <300sf enclosed by floor-to-ceiling height partitions

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C405.6 Dwelling electrical meter

Nothing new: Each dwelling unit located in a Group R-2 building shall have a separate electrical meter

New Exception: Buildings where a majority of the living units serve tenants at or below 80% of area median income

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C405.12 Energy monitoring.

Buildings > 25,000sf shall be equipped to monitor, record and report energy consumption

Exception: R-2 occupancies and individual tenant spaces provided that each space

- has its own utility services and meters
- and has <5,000 square feet of conditioned floor area

Efficiency Vermont

C405.13 Electric vehicle Power Transfer Infrastructure

TABLE C405.13.1
REQUIRED EV POWER TRANSFER INFRASTRUCTURE

COMMERCIAL BUILDING OCCUPANCY	EVSE SPACES	EV READY SPACES	EV CAPABLE SPACES
Groups A, M	2%	0%	20%
Group B	6%	0%	30%
Group E	4%	0%	20%
Groups F, H, S	2%	0%	10%
Groups I, R-3, R-4	3%	0%	10%
Group R-1	8%	7%	50%
Group R-2	0%	0%	Determined in Equation 4-11

Equation 4-11: *R2EVC = D/SU + 0.25 * (APS – D/SU)*

R2EVC = Total requirement for EV Capable Spaces

D/SUI = Total number of dwelling and sleeping units

APS = Total number of *automobile parking spaces* provided

Efficiency Vermont

C405.13 Electric vehicle Power Transfer Infrastructure

A few definitions:

Level 1 charger: with a charge rate of 1-2 kVA this is no longer permitted under 2024 CBES

Level 2 charger: 2024 CBES minimum charge rates specified effectively make this the minimum requirement

Electric Vehicle Fast Charger: Also referred to as a Level 3 charger

Efficiency Vermont

C405.13 Electric vehicle Power Transfer Infrastructure

EVSE space: An *automobile parking space* that is provided with a dedicated *EVSE* connection

EV ready spaces: An *automobile parking space* that is provided with a branch circuit and either an outlet, junction box or receptacle, that will support an installed *EVSE*.

EV capable spaces: A designated *automobile parking space* that is provided with all the requisite infrastructure in place within five feet to allow installation of electrical wiring and connection to power for EVSE

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C405.13 Electric vehicle Power Transfer Infrastructure

TABLE C405.13.1
REQUIRED EV POWER TRANSFER INFRASTRUCTURE

COMMERCIAL BUILDING OCCUPANCY	EVSE SPACES	EV READY SPACES	EV CAPABLE SPACES
Groups A, M	2%	0%	20%
Group B	6%	0%	30%
Group E	4%	0%	20%
Groups F, H, S	2%	0%	10%
Groups I, R-3, R-4	3%	0%	10%
Group R-1	8%	7%	50%
Group R-2	0%	0%	Determined in Equation 4-11

One of the first Elcar vehicles. Flickr/Alden Jewell

- EVSE equipment minimum charging rate of 6.2 kVA (30A @ 208/240V)
- Each installed EVSE space with an EV fast charger shall count as 4 EVSE spaces

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C405.13 Electric vehicle Power Transfer Infrastructure

TABLE C405.13.1
REQUIRED EV POWER TRANSFER INFRASTRUCTURE

COMMERCIAL BUILDING OCCUPANCY	EVSE SPACES	EV READY SPACES	EV CAPABLE SPACES
Groups A, M	2%	0%	20%
Group B	6%	0%	30%
Group E	4%	0%	20%
Groups F, H, S	2%	0%	10%
Groups I, R-3, R-4	3%	0%	10%
Group R-1	8%	7%	50%
Group R-2	0%	0%	Determined in Equation 4-11

One of the first Elcar vehicles. Flickr/Alden Jewell

- Installed EVSE spaces that exceed minimum requirements may be used to meet EV Ready and EV capable spaces requirement
- Installed EV Ready spaces that exceed minimum requirements may be used to meet EV capable spaces requirement

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C405.13 Electric Vehicle Power Transfer Infrastructure

New Exceptions:

1. Parking facilities, serving occupancies other than R-2 with fewer than 10 automobile parking spaces

2. Stand-alone retail stores with fewer than 50 spaces
   - Still required to provide EV Ready and EV Capable spaces in if there are ≥10 automobile parking spaces

3. Motor liquid fuel-dispensing facilities

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C405.13.2 EV Capable Spaces

Exception: 1. R-2 Occupancies with multifamily building garage or covered parking

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C405.14 Additional electric infrastructure

Exception: Buildings with R-2 Occupancies

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C405.14 Additional electric infrastructure

Buildings with low-capacity combustion space heating (<225 kbtu/h furnaces, <400 kbtu/h boilers)

- Condensate drains installed within 3’ of heating equipment
- Dedicated branch circuit installed and labeled “For Future Heat Pump Space Heater” (unless large enough circuit already exists to serve cooling equip.)

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C405.14 Additional electric infrastructure cont.

Buildings with high-capacity combustion space heating:

- Conduit only between junction box located <3’ away from space heating equipment and an electrical panel
- Junction box, conduit, bus bar in electrical panel shall be rated and sized to accommodate a future branch circuit with sufficient capacity for equivalent electric equipment
- Box and panel shall have labels stating “For Future Electric Space Heating Equipment”

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C405.14 Additional electric infrastructure cont.

Other combustion systems with similar circuit and signage requirements as for combustion heating systems:

- Service water heating
- Commercial cooking appliances
- Commercial clothes drying
- Residential clothes drying equipment serving multiple dwelling units

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Chapter 4

Additional Efficiency, Renewable, and Load Management Requirements

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C406.1.1 Compliance

Buildings shall comply as follows:

1. Buildings >1,000 s.f.:

   comply with Additional Energy Credits Requirement:

2. Buildings >2,500 s.f.:

   comply with Additional Energy Credits Requirement AND

   comply with Additional Renewable & Load Management Credits

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C406.1.1 Additional Energy Efficiency Credit Requirements

How many points does my building need?

TABLE C406.1.1
ENERGY CREDIT REQUIREMENTS BY BUILDING OCCUPANCY GROUP

	Building Occupancy Group								
	R-2, R-4, and I-1	I-2	R-1	B	A-2	M	E	S-1 and S-2	All Other
Energy Credit Requirements	79	46	83	30	60	75	90	65	36

What about mixed occupancy?

Calculate weighted average of credit requirements based on square footage of floor area

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C406.2 Energy Efficiency Measures and Credits by Occupancy Group

TABLE C406.2.1

ENERGY EFFICIENCY MI

ID	Energy Credit Measure	R-2, R and I
E01	Envelope Performance	
E02	UA Reduction	19
E03	Envelope Leak Reduction	13
E04	Add Roof Insulation	7
E05	Add Wall Insulation	13
E06	Improve Fenestration	42
H01	HVAC Performance	6
H02	Heating Efficiency	14
H03	Cooling Efficiency	3
H04	Residential HVAC Control	21
H05	Energy Recovery	46
W01	SHW Preheat Recovery	93
W02	Heat Pump Water Heater	81
W04	SHW Pipe Insulation	6
W05	Point of Use Water Heaters	
W06	Thermostatic Balance Valves	3

TABLE C406.2.1

ENERGY EFFICIENCY MEASURES AND CREDITS BY OCCUPANCY GROUP

ID	Energy Credit Measure	Building Occupancy Group								
		R-2, R-4, and I-1	I-2	R-1	B	A-2	M	E	S-1 and S-2	All Other
W07	SHW Heat Trace System	11	1	7	5	3	5	5	2	5
W08	SHW Submeters	17								17
W09	SHW Distribution Sizing	68		26						47
W10	Shower Heat Recovery	25	1	9						10
P01	Energy Monitoring	3	3	2	3	2	5	3	5	3
L01	Lighting Performance									
L02	Enhanced Digital Lighting Controls	1	4	1	4	1	5	4	3	3
L03	Increase Occupancy Sensors	1	4	2	4	1	6	3	4	3
L04	Increase Daylight Area	2	5	3	6	1	8	5	4	4
L05	Residential Light Control	3								
L06	Reduced Lighting Power	1	5	1	5	1	6	5	4	4
Q01	Efficient Elevator Equipment	4	2	2	4	0	3	4	5	3
Q02	Commercial Kitchen Equipment					21				
Q03	Residential Kitchen Equipment	13		10						
Q04	Fault Detection	3	3	2	3	3	3	4	6	4

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C406.1.2 Additional Energy Efficiency Credit Requirements

AEECR Exceptions:

1. Core & shell buildings and build-out construction that does not have final lighting or HVAC systems installed under a prior building permit have reduced credit requirements
2. Unconditioned parking garages that achieve 50% of credits required for use groups S-1 and S-2
3. Portions of buildings devoted to manufacturing or industrial use

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C406.1.2 Renewable & Load Management Credit Requirements

How many points does my building need?

TABLE C406.1.2
RENEWABLE AND LOAD MANAGEMENT CREDIT REQUIREMENTS BY BUILDING OCCUPANCY GROUP

	Building Occupancy Group								
	R-2, R-4, and I-1	I-2	R-1	B	A-2	M	E	S-1 and S-2	All Other
Renewable and Load Management Credit Requirements	16	11	14	24	4	25	22	20	17

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C406.3 Renewable and Load Management Credit Requirements

TABLE C406.3.1
Renewable and Load Management Credit Requirements by Building Occupancy Group

ID	Renewable and Load Management Credit	Building Occupancy Group								
		R-2, R-4, and I-1	I-2	R-1	B	A-2	M	E	S-1 and S-2	All Other
R01	On-Site Renewable Energy	9	6	8	14	2	9	13	24	11
G01	Lighting Load Management	5	14	9	10	4	18	16	36	14
G02	HVAC Load Management	10	12		8	16	14	18	14	13
G03	Automated Shading	1		1	5		8	14		5
G04	Electric Energy Storage	14	13	13	16	4	11	20	24	14
G05	Cooling Energy Storage	7	11	12	12	2	9	16	1	9
G06	SHW Energy Storage	18	4	26	6	15	4	7	2	10
G07	Building Thermal Mass	27	26	26	8	6	13	31	20	20
C01	Insulation Embodied Carbon	5	3	4	8	1	8	7	6	5
E01	Additional Electric Infrastructure	16								

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C406.1.2 Renewable & Load Management Credit Requirements

R&LM Exceptions:

1. Building achieves additional 70% of Energy Efficiency Credits from Table C406.1.1:

   only 50% of R&LM credits required

2. Building achieves additional 120% of Energy Efficiency Credits from Table C406.1.1:

   Zero R&LM credits required

3. Buildings 1,000-2,500 s.f. do not need to achieve R&LM Credits (only have to comply with Energy Credits Requirement)

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Chapter 5

Existing Buildings

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Existing Buildings

Vertical fenestration language added

- a. Where some or all of an existing fenestration unit is replaced with a new fenestration product, including sash and glazing, the replacement fenestration unit shall meet the applicable requirements for U-factor and SHGC in Table C402.4.
- b. If the fenestration involves a historic building consult with SHPO regarding the “Historic Building Exemption Report” (R501.6 Historic buildings).
- c. An exception for an area-weighted average of the U-factor of replacement fenestration products.

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