

Changes from 2020 CBES to 2023 CBES

1. Multifamily Alignment
 - a. Aligned RBES and CBES standards for multifamily buildings to ensure that regardless of the building height, the base package energy standards, not including C406, would remain consistent.
2. Section C406
 - a. Complete rewrite of additional points requirement.
 - b. Renamed Additional Efficiency, Renewable, and Load Management Requirements.
 - c. Energy efficiency points required now depend on the building type.
 - i. Now have 31 efficiency measure options.
 - d. Additional points requirement for renewable, load management, and embodied carbon.
 - i. Ten renewable, load management, and embodied carbon measure options.
3. Definitions
 - a. Updated and added a number of definitions.

SECTION C401 GENERAL

4. Energy Modeling
 - a. Updated Building Performance Factors for those using the energy modeling compliance path. See Table C4.2.1 below.
5. CBES Certificate
 - a. CBES Certificate and Affidavits will now also include thermal envelope details and an indication of the solar-ready zone.

SECTION C402 BUILDING ENVELOPE REQUIREMENTS

6. Opaque Envelope Requirements
 - a. Improved thermal envelope. See Table C402.1(2) below.
 - i. Improved roof, wall, framed floor insulation
 - ii. Lowered requirement on slab-on-grade floors
7. Fenestration Requirements
 - a. Added a separate requirement for storefront fenestration
 - b. Improved windows. See Table C402.3 below.
8. Air Leakage Requirements
 - a. Removed air barrier compliance path through air barrier commissioning unless over 250,000 SF or where blower door tests are unfeasible; must now do blower door and not exceed a maximum CFM/SF
 - b. After failing a blower door test and taking corrective actions, you now must pass the original air barrier performance requirement as opposed to the relaxed requirement that existed in 2020 CBES.
 - c. Air leakage requirement improved from 0.30 CFM/SF to 0.25 CFM/SF at 75 Pa.
 - d. Added exception for R-2 buildings six stories or less to be 0.15 CFM/SF at 50 Pa.
 - e. Rewrote requirement on which dwelling and sleeping units need to be individually blower door tested.
9. Operable Openings Interlocking
 - a. For large doors, 40 SF or larger, the doors must be interlocked with the HVAC system to change the setpoint when open.
10. Solar-ready Zone

- a. Included "Solar Ready" requirements to ensure that it will be easy to install solar photovoltaic panels in the future.
- b. Includes an energy storage ready area for future battery storage.

SECTION C403 BUILDING MECHANICAL SYSTEMS

- 11. New Additional Efficiency, Renewable, and Load Management Requirements listed in section C406 are developed to achieve the required credits associated with specific building types.
- 12. Data Centers
 - a. Data center requirements were added, as per IECC 2021.
- 13. HVAC total system performance ratio (HVAC TSPR)
 - a. HVAC total system performance ratio (HVAC TSPR) was added as an alternative compliance method.
- 14. Fault detection and diagnostics
 - a. As per IECC 2021, new buildings with an HVAC system serving a gross conditioned floor area of 100,000 square feet or larger shall include a fault detection and diagnostics (FDD) system to monitor the HVAC system's performance and automatically identify faults.
- 15. Equipment sizing
 - a. Heat pump equipment sizing has been limited to avoid oversized, and therefore less efficient, heat pump systems.
- 16. HVAC equipment performance requirements
 - a. All mechanical equipment efficiencies were adjusted to meet the federal standards, as per IECC 2021.
 - b. Combined Energy Efficiency Ratio (CEER) specifically used for window or room air conditioner efficiency measurement was added to match IECC 2021. This rating combines the efficiency of the unit both in standby mode and in cooling mode.
- 17. Hot gas bypass limitation
 - a. Hot gas bypass limitation was reintroduced from Vermont CBES 2015.
- 18. Ventilation and exhaust systems
 - a. Demand control ventilation is required for spaces with less occupants than in Vermont CBES 2020 and exceptions verbiage was more clearly defined
 - b. Outdoor air energy recovery ventilation system's enthalpy recovery ratio was increased 10%.
- 19. Fan efficiency
 - a. A new fan energy index (FEI) rating was introduced, as per IECC 2021.
 - b. Exceptions are expanded to include specialty end uses.
 - c. Low-capacity ventilation fans, with motors less than 1/12 hp, minimum efficacy requirement was added, as per IECC 2021.
- 20. Refrigeration equipment performance
 - a. Commercial refrigerators and freezer efficiency requirements were updated in new tables, as per IECC 2021.
- 21. Construction of HVAC system elements
 - a. Ductwork insulation level was increased and verbiage for ductwork that will transport or hold air at temperature differentials greater than 40F between inside and outside the duct was clarified.
- 22. Mechanical systems located outside of the building thermal envelope
 - a. Operable opening interlocking controls section was added, as per IECC 2021.

SECTION C404 SERVICE WATER HEATING

23. New Additional Efficiency, Renewable, and Load Management Requirements listed in section C406 are developed to achieve the required credits associated with specific building types.
24. High input service water-heating systems
 - a. Singular, high input service water-heating system equipment size was defined, as per IECC 2021.

SECTION C405 ELECTRICAL POWER AND LIGHTING SYSTEMS

25. Dwelling and Sleeping Unit Lighting
 - a. Dwelling and sleeping units are required to have 100% LED lighting.
26. Parking Garage Lighting
 - a. New parking garage lighting control requirement.
27. Lighting Power Density
 - a. Lighting power density improved, approximately 15% more efficient but varies by building area type or space-by-space type. See table C405.3.2(1) below.
28. Escalators
 - a. Escalators are required to perform energy recovery when resisting overspeed in the down direction.
29. Automatic Receptacle Control
 - a. 50% of electrical receptacles in offices, conference rooms, copy/print rooms, breakrooms, classrooms, and individual workstations shall be controlled by a time clock, occupant sensor or automated signal from another control.
30. Energy Monitoring
 - a. Energy monitoring is now required in buildings 25,000 SF or larger.
31. Electric Vehicle Charging Stations
 - a. All required charging stations must be Level 2 chargers or better.
 - b. Revised requirements for charging stations and future ready/capable spaces, see Table C405.13.1 and Equation 4-11 below.
32. Electric Ready
 - a. Electric readiness for future electric space heating, electric water heating, electric cooking equipment, and electric dryers.
 - b. Exception for R-2 buildings, but R-2 buildings may get points in Section C406 for including electric ready systems.

SECTION C502 EXISTING BUILDINGS

33. Vertical fenestration
 - 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.

CHAPTER 6 REFERENCED STANDARDS

34. Updated referenced standards.

**TABLE 4.2.1
BUILDING PERFORMANCE FACTOR (BPF)**

BUILDING AREA TYPE	VERMONT BPF
Multifamily	0.60
Healthcare/hospital	0.52
Hotel/motel	0.44
Office	0.48
Restaurant	0.57
Retail	0.42
School	0.33
Warehouse	0.50
All Others	0.46

**TABLE C402.1(2)
CONDITIONED SPACE BUILDING ENVELOPE REQUIREMENTS—OPAQUE ASSEMBLIES
AND ELEMENTS ^{a,b}**

COMPONENT	MAXIMUM OVERALL U-FACTOR		EXAMPLE ASSEMBLIES MEETING U-FACTOR REQUIREMENT	
	All Other Occupancy Classifications	R-2 Occupancy Classifications	All Other Occupancy Classifications	R-2 Occupancy Classifications
Roofs				
Insulation entirely above deck	U-0.022	Same as All Other ←	R-45ci	Same as All Other ←
Metal buildings	U-0.023	Same as All Other ←	R-10 + R-10 + R-32ci	Same as All Other ←
Attic and Other	U-0.017	U-0.020	R-60	R-49
Walls, Above grade				
Mass	U-0.037	Same as All Other ←	R-25ci	Same as All Other ←
Metal Building	U-0.039	Same as All Other ←	R-13 + R-19.5ci or R-25ci	Same as All Other ←
Metal-framed	U-0.037	Same as All Other ←	R-13 + R-18.8ci or R-25ci	Same as All Other ←
Wood-framed and other	U-0.036	U-0.033	R-13 + R-16ci or R-19 + R-12ci or R-25ci	R-13 + R-18ci or R- 19 + R-14ci or R-27ci

Walls, Below Grade				
Below-grade wall	C-0.048	Same as All Other ←	R-20ci	Same as All Other ←
Floors				
Mass	U-0.038	Same as All Other ←	R-23ci	Same as All Other ←
Joist/Framing—Metal	U-0.027	Same as All Other ←	R-38 + R-6ci	Same as All Other ←
Joist/Framing—Wood and Other	U-0.027	Same as All Other ←	R-38	Same as All Other ←
Slab-on-Grade Floors				
Unheated slabs	F-0.434	Same as All Other ←	R-20 for 48" below	Same as All Other ←
Heated slabs	F-0.433	Same as All Other ←	R-20 for 48" below + R-15 full slab	Same as All Other ←
Opaque Doors				
Swinging	U-0.37		N/A	
Non-Swinging	N/A		R-4.75	
Garage door <14% glazing	N/A		R-10	

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

VERTICAL FENESTRATION		
U-factor		
Fixed fenestration other than <i>storefront</i>	0.29	
<i>Storefront</i> fenestration	0.33	
Operable fenestration, R-2 <i>occupancy classifications</i>	0.27	
Operable fenestration, <i>occupancy classifications</i> other than R-2	0.36	
Entrance doors	0.63	
SHGC		
PF	Fixed	Operable
PF < 0.2	0.38	0.34

0.2 ≤ PF < 0.5	0.46	0.41
PF ≥ 0.5	0.61	0.54
SKYLIGHTS		
<i>U</i> -factor	0.41	
SHGC	0.38	

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

BUILDING AREA TYPE	LPD (w/ft ²)
Automotive facility	0.56
Convention center	0.55
Courthouse	0.64
Dining: bar lounge/leisure	0.64
Dining: cafeteria/fast food	0.59
Dining: family	0.58
Dormitory ^{a,b}	0.41
Exercise center	0.54
Fire station ^a	0.43
Gymnasium	0.58
Health care clinic	0.62
Hospital ^a	0.74
Hotel/Motel ^{a, b}	0.50
Library	0.66
Manufacturing facility	0.68
Motion picture theater	0.44
Multifamily ^c	0.38
Museum	0.55
Office	0.53
Parking garage	0.13
Penitentiary	0.54
Performing arts theater	0.77
Police station	0.55

Post office	0.52
Religious building	0.60
Retail	0.73
School/university	0.57
Sports arena	0.61
Town hall	0.56
Transportation	0.42
Warehouse	0.36
Workshop	0.72

**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

$$R2EVC = D/SU + 0.25 * (APS - D/SU) \quad \text{(Equation 4-11)}$$

where:

- $R2EVC$ = Total requirement for EV Capable Spaces in R-2 building occupancies.
- D/SU = Total number of dwelling and sleeping units in the R-2 building.
- APS = Total number of *automobile parking spaces* provided.