June 3, 2021

2020 Vermont Commercial Building Energy Standards

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Efficiency Vermont

Disclaimer

Efficiency Vermont

Sections of the CBES

Administration & New Definitions

Envelope Requirements

Mechanical Systems

Service Water Heating

Lighting Systems

Additional Efficiency Packages

Commissioning

Existing Buildings

Efficiency Vermont

Chapter 1
Scope & Administration

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Code Effective Date

The 2020 Commercial Building Energy Standard (CBES) was effective on September 1, 2020

For Commercial/Industrial projects, the following rules apply

1. 2015 CBES applicable if projects applied for or obtained a permit before 9/1/2020
2. 2020 CBES applicable if projects applied for or obtained a permit after 9/1/2020

A permit, in this context, is limited to a building permit or an Act 250 permit

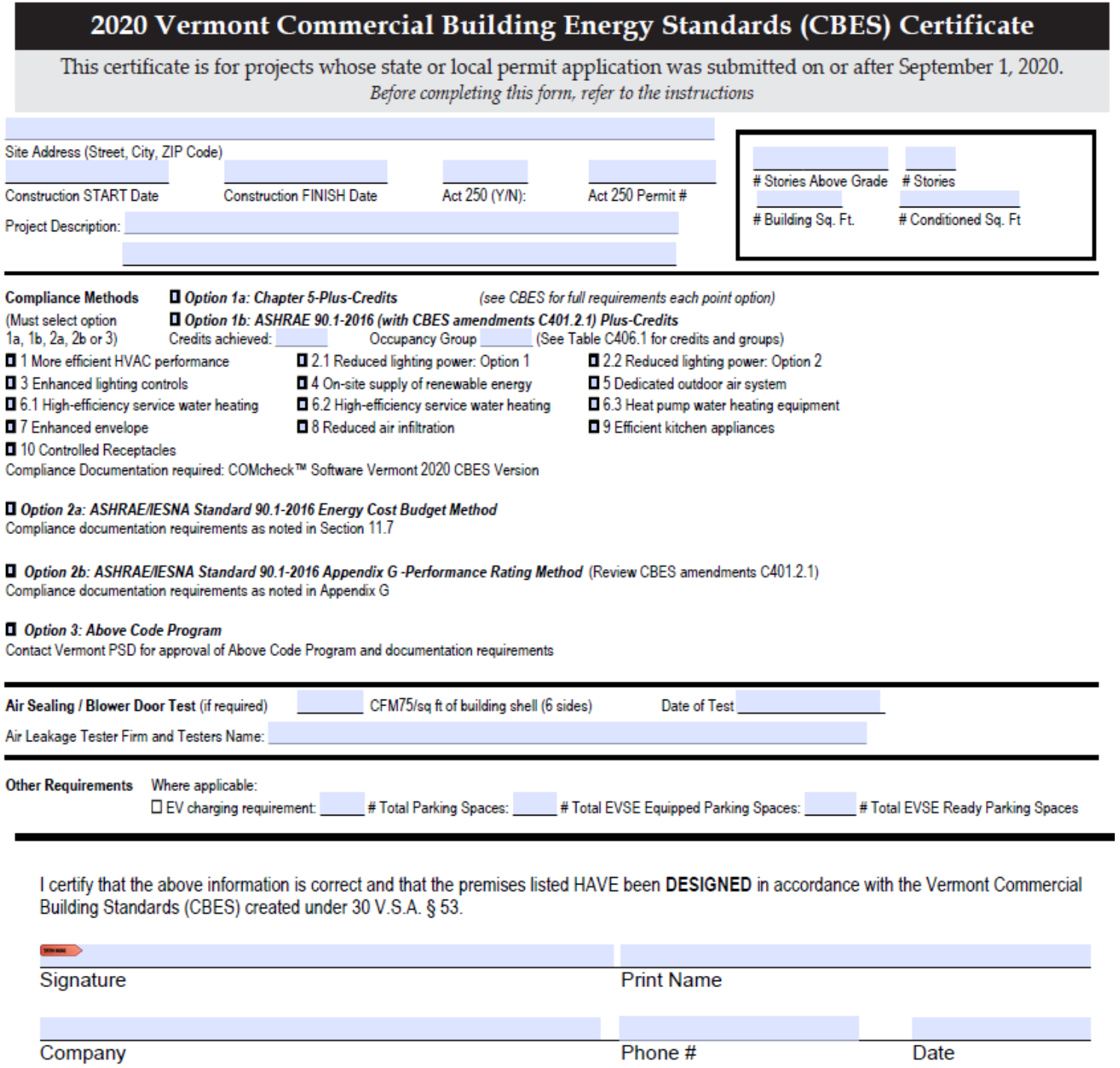
Stretch Code/Guidelines

There are NO Stretch Guidelines for 2020

- Act 250 Commercial Construction projects follow only 2020 CBES

CBES Certificate

- Certificate
- Affidavits
- Documentation
- Displayed in building
- Sent to PSD



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:

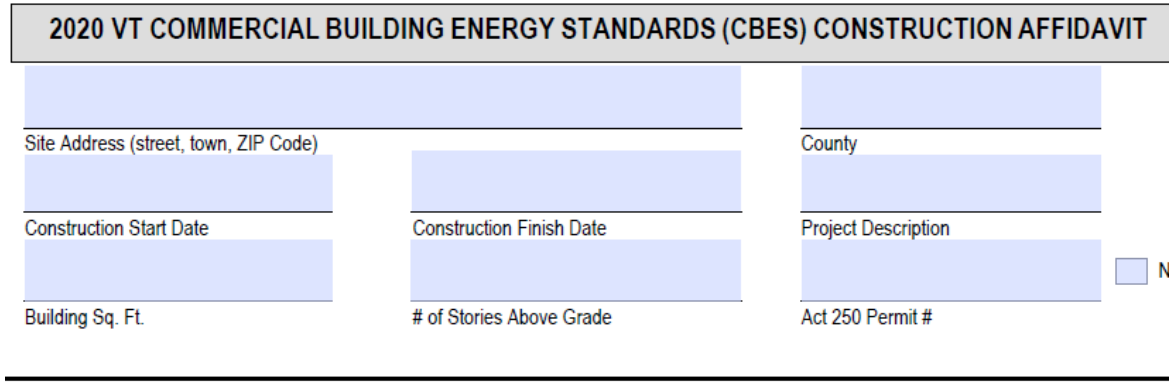
Other Requirements Where applicable:
☐ EV charging requirement: _____ # Total Parking Spaces: _____ # Total EVSE Equipped Parking Spaces: _____ # Total EVSE Ready Parking Spaces

I certify that the above information is correct and that the premises listed HAVE been **DESIGNED** in accordance with the Vermont Commercial Building Standards (CBES) created under 30 V.S.A. § 53.

Signature | Print Name

Company | Phone # | Date

CBES Construction Affidavit



2020 VT COMMERCIAL BUILDING ENERGY STANDARDS (CBES) CONSTRUCTION AFFIDAVIT

Site Address (street, town, ZIP Code)

County

Construction Start Date

Construction Finish Date

Project Description

N

Building Sq. Ft.

# of Stories Above Grade

Act 250 Permit #

I certify the premise listed above has been constructed in accordance with the ordinary standard of care applicable to the participating construction trades, and that the subject commercial building was constructed substantially in accordance with the construction documents including the plans and specifications certified herein, and in accordance to 30 V.S.A. §53.

Signature

Print Name

Company

Phone #

Date

CBES Design Affidavit

2020 VT COMMERCIAL BUILDING ENERGY STANDARDS (CBES) DESIGN AFFIDAVIT

Site Address (street, town, ZIP Code)

County

Construction Start Date

Construction Finish Date

Project Description

N/

Building Sq. Ft.

# of Stories Above Grade

Act 250 Permit #

I certify the premise listed above has been **designed** in accordance with the designer's professional duty of care, and that the building was designed in substantial compliance with the requirements of the Vermont Commercial Building Energy Standards (CBES) created under 30 V.S.A. § 53.

Signature

Print Name

Company

Phone #

Date

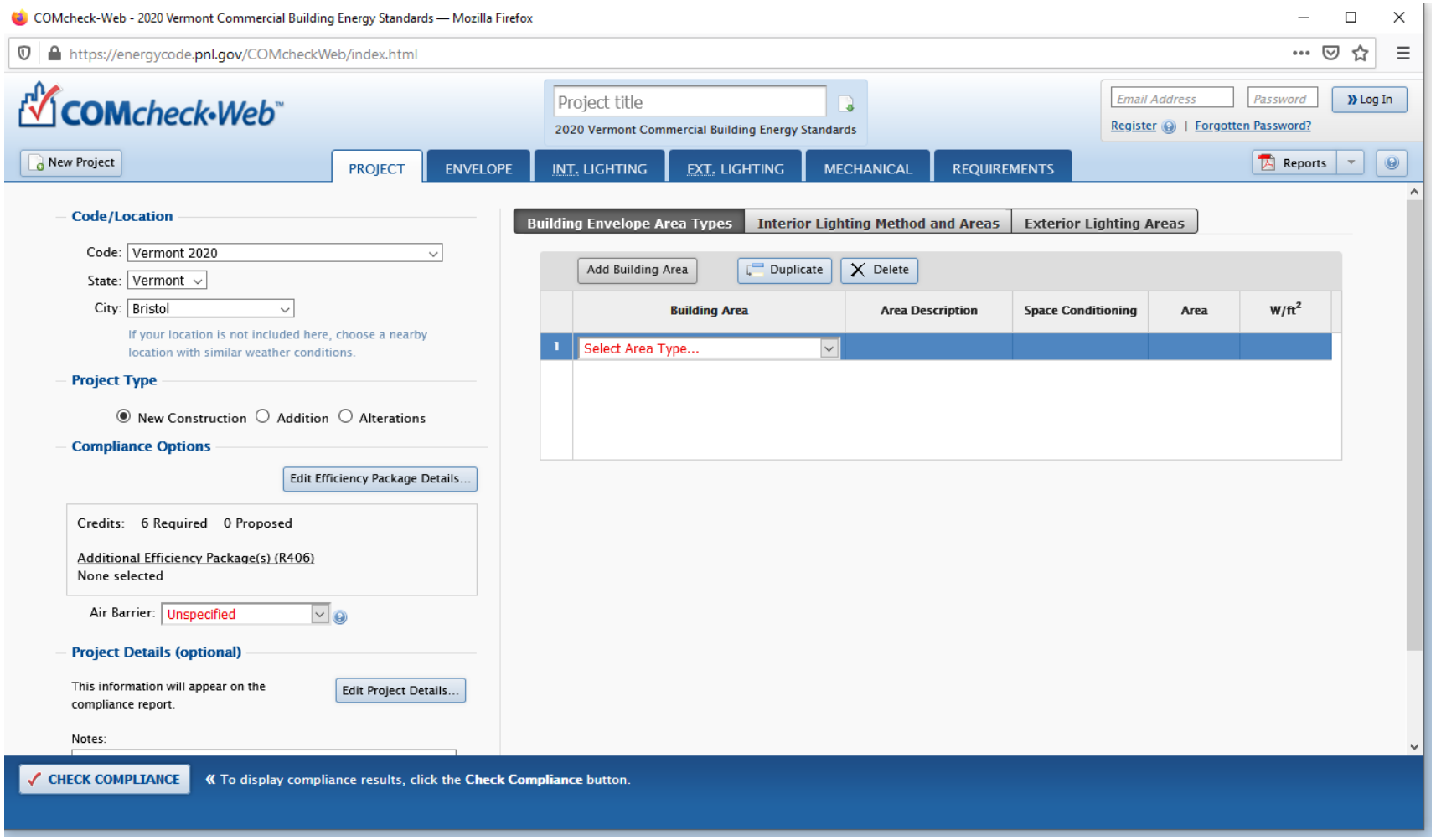
Documentation: COMcheck

Generates Compliance Reports

Software with inputs for:

- Envelope
- Mechanical
- Electrical
- Additional Efficiency Points

Documentation: COMcheck



Chapter 2
Definitions

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Mixed Use Occupancy Buildings

3 Stories or Less in Height

- Residential building requirements (RBES)
  - Living spaces
  - Hallways, Laundry, Community Rooms, Storage Rooms, Foyers
- Commercial building requirements (CBES)
  - Areas served by BOTH Residential and Commercial uses

4 Stories or MORE in Height

- CBES applied to all areas

On-Site Renewable Energy

Energy Generation can include:

- Solar radiation
- Wind
- Landfill gas
- Biogas
- Biomass
- Geothermal

Semi-Conditioned Space

Space that is heated or cooled by systems with:

- Heating output ≤ 14 Btu/h/SqFt of floor area
- Cooling sensible output < 3.4 Btu/h/SqFt of floor area
    - Lower R-Value insulation requirements

Section C402 Building Envelope Requirements

Efficiency Vermont

Overview of Changes

- Updated U-factor & R-value tables
- Window & Skylights
- Air leakage
  - Increased performance
  - Air barrier commissioning
  - Tests in dwelling units

Roof Insulation

- Insulation levels a closer match for all framing types

Component	Example R-VALUES
	Conditioned Space
Insulation Above Deck	R-40ci
Metal Building	R-25 + R-11* + R-11 LS
Attic	R-49

ci = Continuous Insulation
LS = Liner System

Wall Insulation-Above Grade

- Insulation levels a closer match for all framing types

Component	Example R-VALUES
	Conditioned Space
Mass	R-19ci
Metal Building	R-13 + R-17ci or R-22ci
Metal framed	R-13 + R-15ci or R-20ci
Wood-Framed & Other	R-13 + R-12ci or R-19 + R-8ci or R-20ci

ci = Continuous Insulation

Below-Grade Wall Insulation

Component	Example R-VALUES
	Conditioned Space
Bellow-Grade Wall	R-15ci

ci = Continuous Insulation

Floor Insulation

Component	Example R-VALUES
	Conditioned Space
Mass	R-16.7ci
Joist/Framing- Metal	R-38
Joins/Framing- Wood & Other	R-30
Unheated Slabs	R-10 entire slab & around perimeter
Heated Slabs	R-20 entire slab & around perimeter

ci = Continuous Insulation

Windows & Skylights

Windows		
U-Factor		R-Value
Fixed Window	0.33	R-3.0
Operable Window	0.37	R-2.7
Entrance Doors	0.68	R-1.5
Skylights		
U-Factor	0.48	R-2.0

Air Barrier Requirements

Comply with Either

1. Testing Performance
   - Blower Door Testing
   - Hit a Specific Number
   - Easiest & cheapest way to show compliance

2. Air Barrier Commissioning
   - No value to pass, but many steps to follow
   - Checklist in Code Book

Air Barrier Performance Testing

- Meet or exceed 0.30 CFM75/SqFt
  - Previous was 0.50 cfm50/SqFt
- Six-Sided envelope
  - Slab and Below-grade walls now included
- 75 Pa testing pressure
  - Previous was 50 Pa

Exceptions:

- 50,000 SqFt buildings can test portion or area

Dwelling Unit Air Infiltration

Each unit must meet 0.35 cfm75/SqFt

- Six-sided surface area

A random sampling of units shall be tested

- 10% of units in each building
- Construction contractor will not choose units to be tested

Each unit must be tested and pass

- Unit re-tested until unit passes

Section C403 Building Mechanical Systems

Efficiency Vermont

Ventilation

Follow Requirements in ASHRAE Standard 62.1-2016

Ventilation for Acceptable Indoor Air Quality

- Mechanical Ventilation is now required on new buildings
  - Natural ventilation is no longer allowed

Electric Resistance Heating Allowance

Electric resistance heating is still prohibited

New Exceptions

1. Multifamily buildings: Meeting Heat load requirements*
   - 6.0 Btu/Hr/SqFt or less at Design Temperature

2. Cold Climate Heat Pumps*
   - Full heating load met with HP at 5 Degrees F
     - Controlled cut-off of electric heat
   - Air Tested envelope to 0.20 CFM75/SqFt
     - 75 Pa and 6-sided

**Burlington projects need added BED approval*

HVAC Equipment Performance

Tables listing minimum Heating & Cooling efficiencies for:

- AC & Condensing Units
- Heat Pumps
- Water Chilling Packages
- VRF
- Furnaces & Boilers

EQUIPMENT TYPE[a]	SUBCATEGORY OR RATING CONDITION	SIZE CATEGORY (INPUT)	MINIMUM EFFICIENCY[d, e]
Boilers, hot water	Gas-fired	< 300,000 Btu/h[f, g]	82% AFUE
		≥ 300,000 Btu/h and ≤ 2,500,000 Btu/h[b]	80% E_t
		> 2,500,000 Btu/h[a]	82% E_c
	Oil-fired[c]	< 300,000 Btu/h[g]	84% AFUE
		≥ 300,000 Btu/h and ≤ 2,500,000 Btu/h[b]	82% E_t
		> 2,500,000 Btu/h[a]	84% E_c

Section C404 Service Water Heating

Efficiency Vermont

Electric Water Heaters

Max Size Increased to 7.5 kW

Hybrid Heat Pumps, with supplemental electric

- No kW limit if meets all:
  - At least 60% hot water demand from HP alone
  - Shower heads ≤ 2.0 GPM
  - Dishwashing equipment must be Energy Star rated

Section C405 Electrical Power and Lighting Systems

Efficiency Vermont

Occupancy Controls

Required in these spaces:

- Classrooms & Conference Rooms
- Copy Rooms
- Breakrooms
- Enclosed Offices
- Open Offices
- Restrooms & Locker rooms
- Storage Rooms
- Warehouse Storage
- Spaces 300 SqFt or less

Must turn lights OFF after 20 minutes unoccupied

Daylight Controls

Spaces with > 150 watts in daylight zones (top or sidelight)

Exceptions:

1. Health Care facilities w/ patient care
2. First floor of Group A-2 (restaurants) or M (shopping) occupancies
3. If LPD is < 35% Max allowed Watts/SqFt

Interior Lighting Power Density (LPD) Allowances

Building Area Method

Building Type	2015 CBES	2020 CBES	% Reduction
Office	0.82	0.64	22%
Retail	1.26	0.92	27%
Warehouse	0.6	0.43	28%
Hotel/Motel	0.87	0.65	25%
Health care clinic	0.9	0.69	23%
Dining: bar lounge/leisure	1.01	0.76	25%
Manufacturing facility	1.17	0.82	30%

Interior Lighting power Density (LPD) Allowances

Space-By-Space Method

Space Type	2015 CBES	2020 CBES	%Reduction
Office: Open	0.98	0.71	28%
Office: Enclosed	1.11	0.81	27%
Warehouse: Large Items	0.58	0.35	40%
Conference/ Multipurpose room	1.23	0.92	25%
Corridor	0.66	0.66	0%
Electrical/mechanical room	0.95	0.43	55%
Manufacturing: High-Bay	1.23	0.75	39%
Restroom	0.98	0.73	26%
Lobby	0.9	0.76	16%

Exterior Lighting Zones

Zone 3 = Our VT Downtowns

Zone 2 = Most Common

- Mixed residential & light commercial

Zone 1 = Rural & State Forests

LIGHTING ZONE	DESCRIPTION
1	Developed areas of national parks, state parks, forest land, and rural areas
2	Areas predominantly consisting of residential zoning, neighborhood business districts, light industrial with limited nighttime use and residential mixed-use areas
3	All other areas not classified as lighting zone 1 or 2

Exterior Lighting Power Density (LPD) Allowances

Base site allowance

Areas measured by W/SqFt or W/Linear Ft

New Areas

- Dining
- Landscape
- Loading Docks

	LIGHTING ZONES		
	Zone 1	**Zone 2**	**Zone 3**
Base Site Allowance	250 W	300 W	375 W
Uncovered Parking Areas			
Parking areas and drives	0.02 W/ft2	0.03 W/ft2	0.05 W/ft2
Building Grounds			
Walkways less than 10 feet wide	0.35 W/linear foot	0.35 W/linear foot	0.40 W/linear foot
Walkways 10 feet wide or greater, plaza areas special feature areas	0.07 W/ft2	0.07 W/ft2	0.08 W/ft2
Dining areas	0.50 W/ft2	0.50 W/ft2	0.60 W/ft2
Stairways	0.40 W/ft2	0.50 W/ft2	0.50 W/ft2
Pedestrian tunnels	0.08 W/ft2	0.08 W/ft2	0.10 W/ft2
Landscaping	0.02 W/ft2	0.03 Wft2	0.03 W/ft2
Building Entrances and Exits			
Pedestrian and vehicular entrances and exits	10 W/linear foot of door width	10 W/linear foot of door width	15 W/linear foot of door width
Entry canopies	0.10 W/ft2	0.12 W/ft2	0.20 W/ft2
Loading Docks	0.25 W/ft2	0.25 W/ft2	0.25 W/ft2

Electric Vehicle Charging Stations

EVSE = Electric Vehicle Supply Equipment

Install EVSE in 50% of required spaces

- Round up to whole #
- Pre-wire remaining spaces

Label parking spots as

- "For EV Use Only"

Level 1, 2 and DC Fast Charge Requirements

- If only installing Level 2 and/or DC Fast chargers
  - Combine Level 1 and Level 2 req's

Electric Vehicle Charging Stations

Commercial Building Occupancy[a]	**Minimum Number of EVSE and EVSE-ready Parking Spaces[b]** Whole numbers represent actual number of required spaces. Fractional percentages shall be rounded up to nearest whole number.					
	<25 Parking Spaces in Lot		≥25 Parking Spaces in Lot Option A		≥25 Parking Spaces in Lot Option B	
	Level 1	Level 2 or DC Fast Charge	Level 1	Level 2 or DC Fast Charge	Level 1	Level 2 or DC Fast Charge
Groups A & M[c]	0	0	0%	4%	0%	10
Groups B, E, F, & H	1	1	3%	3%	2%	5
Groups I-1, I-2, I-3, & R-4	1	1	2%	4%	1%	10
Group R-1	0	1	0%	2%	1%	10
Group R-2	1	0	8%	0%	3%	5

Example: Hotel (group R-1) with 100 parking spaces

- Option A: 2% Level 2 = 2 parking spots
  - Install 1 at construction. Pre-wire other 1
- Option B: 1% Level 1 (1 parking spot) + 10 Level 2 parking spots
  - Install 1 Level 1 and 5 Level 2. Pre-wire remining 5 spots

Section C406 Additional Efficiency Package Options

Efficiency Vermont

Additional Energy Efficiency Credits

6 Credits required for each new building

- Existing Buildings exempt

- Tenant Spaces
  - Only 3 Credits Required

Available credits vary for each building occupancy type

Additional Energy Efficiency Credits

CODE SECTION	COMMERCIAL BUILDING OCCUPANCY					
	Group R-1	Group R-2	Group B	Group E	Group M	All Other Groups
	Additional Efficiency Credits					
1. More efficient HVAC performance in accordance with Section C406.2.	2	2	5	2	6	3
2.1. Reduced lighting power: Option 1 in accordance with Section C406.3.1.	1	1	3	3	3	2
2.2. Reduced lighting power: Option 2 in accordance with Section C406.3.2.	2	2	5	5	5	4
3. Enhanced lighting controls in accordance with C406.4.	N/A	N/A	2	1	2	1
4. On-site supply of renewable energy in accordance with C406.5.	3	2	2	3	3	3
5. Dedicated outdoor air system in accordance with C406.6.[a]	3	1	2	3	4	3
6.1. High-efficiency service water heating in accordance with Sections C406.7.1 and C406.7.2.	5	6	N/A	N/A	N/A	3 (Group I only)
6.2. High-efficiency service water heating equipment in accordance with Sections C406.7.1 and C406.7.3.	3	3	N/A	N/A	N/A	2 (Group I only)
6.3. Heat pump water heating equipment in accordance with Sections C406.7.1 and C406.7.4.	5	5	N/A	N/A	N/A	2 (Group I only)
7. Enhanced envelope performance in accordance with Section C406.8.	3	4	2	2	2	3
8. Reduced air infiltration in accordance with Section C406.9.	3	5	2	3	4	3
9. Efficient kitchen appliances in accordance with Section C406.10.2	5	5	5	5	5	5 (Group A-2 only)
10. Controlled Receptacles in accordance with Section C406.11	N/A	N/A	6	2	N/A	N/A

Credit 4: On-Site Renewable Energy

Commercial Building Occupancy Group					
R-1	R-2	B	E	M	All Other
Additional Efficiency Credits					
3	2	2	3	3	3

System size based on conditioned floor area

ON-SITE RENEWABLE ENERGY SYSTEM RATING (PER SQUARE FOOT) Building Area Type	kBTU per year	kWh per year
Assembly	1.8	0.53
Dining	10.7	3.14
Hospital	3.6	1.06
Hotel/Motel	2.0	0.59
Multi-family residential	0.50	0.15
Office	0.82	0.24
Other	2.02	0.59
Retail	1.31	0.38
School/University	1.17	0.34
Supermarket	5.0	1.47
Warehouse	0.43	0.13

Energy sources include:

- Solar Radiation
- Wind
- Landfill Gas or Biogas
- Biomass (Wood)
- Geothermal Heat

Credit 6: High Efficiency Service Water Heating

Option 1: Load Fraction

- 60% hot water provided by:
  - Waste heat recovery
  - Renewable energy heating system

Commercial Building Occupancy Group					
R-1	R-2	B	E	M	I-2, A-2, F, A-3
Additional Efficiency Credits					
5	6	N/A	N/A	N/A	3

Option 2: High Performance Equipment

- 95% Efficiency for all

Commercial Building Occupancy Group					
R-1	R-2	B	E	M	I-2, A-2, F, A-3
Additional Efficiency Credits					
3	3	N/A	N/A	N/A	2

Option 3: Heat Pump Equipment

- 3.0 COP
- Cannot draw conditioned indoor air

Commercial Building Occupancy Group					
R-1	R-2	B	E	M	I-2, A-2, F, A-3
Additional Efficiency Credits					
5	5	N/A	N/A	N/A	2

Section C407 Maintenance Information and System Commissioning

Efficiency Vermont

What Buildings to Commission?

No longer a size requirement for Commissioning

- System Size Requirements for 2020

What sized systems require Cx?

- Cooling systems:
  - 140.7 kW (40 tons) or >
- Space Heating and Service Water (combined capacity):
  - 175.8 kW (50 tons) or >

Chapter 5
Existing Buildings

Efficiency Vermont

Additions

Additions ONLY will meet all Code requirements:

- Envelope
- Windows
- HVAC
- Hot Water
- Lighting

Alterations

Existing building cannot be LESS conforming to code after alteration

Items that must meet the Code:

1. New envelope assemblies
2. New HVAC systems
3. New Hot Water systems
4. New Lighting systems

Alterations (continued)

Alterations NOT needing to bring up to code:

1. Storm Windows
2. Single-pane window film (reducing solar heat gain)
3. Exposed cavities (ceiling, wall, floor)
   - If filled with insulation
4. Existing cavity that's not exposed
5. Replacement of existing electric resistance unit
6. Roof recover
   1. Installing an additional roof covering over existing
   2. Do not remove existing covering
7. Air Barrier for roof recover/replacement
   - If remainder of envelope not touched

Repairs

These repairs DO NOT need to meet code:

1. Glass-only replacement
   - Existing frame remains
2. Roof Repair
   1. Maintenance of any portion
3. Air Barrier for roof repair
   - If remainder of envelope not touched
4. Vestibule on existing door
   - Don’t remove an existing vestibule if present
5. Bulb & ballast replacements
   - If No increase in LPD

Change of Occupancy or Use

If change results in increased demand (fuel and/or electric)

- Must meet CBES requirements

Lighting: LPD shall match new occupancy type

Historic Building Exemption

Alteration, repair and change of occupancy provisions exempt if:

- Demonstrate that compliance with certain aspects of the Commercial Energy Code may adversely affect historic resources
  - Threaten, degrade, or destroy the historic form, fabric, or function

- Email form to the Vermont Division for Historic Preservation
  - AKA State Historic Preservation Office or SHPO at ACCD.projectreview@vermont.gov.
  - Must be approved to be exempt from Code provisions.

Disclaimer

Efficiency Vermont

Questions?

Energy Code Assistance Center

1-855-887-0673

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