

Vermont Building Energy Codes Update

December 11, 2019

<http://publicservice.vermont.gov/content/building-energy-standards-update>

» Residential

Major Changes for 2020 vs 2015

- ▶ Some definitions and other language clarified
- ▶ Insulation and fenestration criteria (Base & Stretch)
 - Base Code
 - Prescriptive packages plus required points from list of options based on house size
 - Stretch Code
 - Same approach with more stringent prescriptive packages and more points
- ▶ Air Leakage Testing
 - Required blower door testing by certified testers in Base
- ▶ Electric resistance heating equipment
- ▶ Electric vehicle charging (Base & Stretch)
- ▶ HERS (ERI) rating values (Base & Stretch)
- ▶ Solar Ready (Stretch)

2015 Stretch Code Requirements – Residential

Prescriptive Requirements

Stretch Code ~ Single-Family and Multi-Family Homes

Component	Package 1	Package 2	Package 3	Package 4	Package 5
1. Ceiling R-Value	R-60 attic/ R-49 slope	R-49 attic/ R-49 slope	R-60 attic/ R-49 slope	R-28 cont.	R-60 attic/ R-49 slope
2. Above-Grade Wall R-value	R-13+10	R-25 cav.	R-20 cav.	R-21 cont.	R-20+11.25
3. Floor R-value	R-30	R-38	R-38	R-30	R-30
4. Basement/Crawl Space Wall R-value	R-20 cont./ R-13+10	R-20 cont./ R-13+10	R-20 cont./ R-13+10	R-20 cont./ R-13+10	R-15 cont./ R-20 cav.
5. Slab Edge R-value	R-15, 4ft.	R-15, 4ft.	R-15, 4ft	R-15, 4 ft	R-15, 4 ft
6. Heated Slab R-value (Edge and Under)	R-15	R-15	R-15	R-15	R-15
7. Window and Door U-value	U-0.28	U-0.28	U-0.28	U-0.30	U-0.30
8. Skylight U-value	0.55	0.55	0.55	0.55	0.55
9. Maximum Air Leakage	< 3 ACH50				
10. Maximum Duct Leakage	4 CFM25/ 100 CFA	Inside thermal boundary	Inside thermal boundary	Inside thermal boundary	Inside thermal boundary
11. Heating System AFUE	ENERGY STAR (85% Blr/95% Fur)	ENERGY STAR (85% Blr/95% Fur)	ENERGY STAR (85% Blr/95% Fur)	NAECA (82% Blr/78% Fur)	ENERGY STAR (85% Blr/95% Fur)
12. Cooling System SEER	ENERGY STAR (14.5 SEER)	ENERGY STAR (14.5 SEER)	ENERGY STAR (14.5 SEER)	NAECA (13 SEER)	ENERGY STAR (14.5 SEER)



DEPARTMENT OF PUBLIC SERVICE

2020 Base Code Requirements – Residential

Component ^a		Package 1 “Standard”	Package 2 “SIPS”	Package 3 “Thick Wall”	Package 4 “Cavity Only”
Envelope	Ceiling R-Value	R-49 ^g	R-28 cont.	R-49 ^g	R-60 ^h attic / R-49 ^g slope
	Wood Frame Wall R-Value	R-20+5 ^f OR 13+10 ^f	R-21 cont.	R-20+12 ^f	R-20 cavity
	Floor R-Value	R-30 ^e	R-30 ^e	R-30 ^e	R-38 ^e
	Basement/Crawl Space Wall ^c R-Value	R-15 (continuous) OR 20 (cavity)	R-15 (continuous) OR 20 (cavity)	R-20 (continuous) OR R-13+10 ^f	R-20 (continuous) OR R-13+10 ^f
	Slab Edge ^d R-Value	R-15, 4ft	R-15, 4 ft	R-10, 4ft	R-15, 4 ft
	Heated Slab R-Value (Edge and Under)	R-15	R-15	R-15	R-15
	Fenestration ^b (Window and Door) max. U-Value	U-0.30	U-0.30	U-0.30	U-0.27
	Skylight ^b max. U-Value	U-0.55	U-0.55	U-0.55	U-0.55
Air Leakage and Ventilation	Air Leakage ⁱ	≤3.0 ACH50 tested	≤3.0 ACH50 tested	≤3.0 ACH50 tested	≤3.0 ACH50 tested
	Ventilation	EOV ^j 64 cfm; 24 hr/d; ≤50 w (ASHRAE 62.2–2013)	EOV ^j 64 cfm; 24 hr/d; ≤50 w (ASHRAE 62.2–2013)	EOV ^j 64 cfm; 24 hr/d; ≤50 w (ASHRAE 62.2–2013)	EOV ^j 64 cfm; 24 hr/d; ≤50 w (ASHRAE 62.2–2013)
Mechanicals	Duct Leakage	Inside thermal boundary	Inside thermal boundary	4 CFM25 per 100 sq. ft. of CFA ^k	Inside thermal boundary
Lighting	Percent High Efficacy Lamps ^l	90% High Efficacy Lamps	90% High Efficacy Lamps	90% High Efficacy Lamps	100% High Efficacy Lamps

2020 Stretch Code Requirements

Component ^a		Package 1	Package 2	Package 3
		“Standard”	“SIPS”	“Thick Wall”
Envelope	Ceiling R-Value	R-60 ^h attic / R-49 ^g slope	R-36 cont.	R-49 ^g
	Wood Frame Wall R-Value	R-20+5 ^f OR 13+10 ^f	R-21 cont.	R-20+12 ^f
	Floor R-Value	R-30 ^e	R-30 ^e	R-30 ^e
	Basement/Crawl Space Wall ^c R-Value	R-20 (continuous) OR R-13+10 ^f	R-20 (continuous) OR R-13+10 ^f	R-20 (continuous) OR R-13+10 ^f
	Slab Edge ^d R-Value	R-15, 4ft	R-15, 4 ft	R-15, 4ft
	Heated Slab R-Value (Edge and Under)	R-15	R-15	R-15
	Fenestration ^b (Window and Door) max. U-Value	U-0.27	U-0.27	U-0.30
	Skylight ^b max. U-Value	U-0.55	U-0.55	U-0.55
Air Leakage and Ventilation	Air Leakage ⁱ	≤3.0 ACH50 tested	≤3.0 ACH50 tested	≤3.0 ACH50 tested
	Ventilation	Balanced; min. SRE 70	Balanced; min. SRE 70	Balanced; min. SRE 70
Mechanicals	Duct Leakage	Inside thermal boundary	Inside thermal boundary	Inside thermal boundary
Lighting	Percent High Efficacy Lamps ^j	90% High Efficacy Lamps	90% High Efficacy Lamps	90% High Efficacy Lamps

Additional Points Required

REQUIRED POINTS BY BUILDING SIZE - BASE

Building Size	Required Points
Multifamily < 2000 square feet	4 points
<2000 square feet	5 points
2000 to 4000 square feet	7 points
>4000 square feet	10 points

REQUIRED POINTS BY BUILDING SIZE - STRETCH

Building Size	Required Points
Multifamily < 2000 square feet average unit size	6 points
<2000 square feet	7 points
2000 to 4000 square feet	9 points
>4000 square feet	12 points

TABLE R402.1.2.3

POINTS BY COMPONENT

Component		Description	Points
Envelope	Slab	R-10 below entire slab	1
	Walls - Upgraded	AG walls R-20+12 (or U-factor maximum 0.033 wall assembly) (Exception: not available for base package 3) OR ^b	2
	Walls - High-R	AG walls \geq R-40 (U-factor 0.025)	3
	Windows	Average U-factor \leq 0.27 OR ^b	1
		Average U-factor \leq 0.22	2
Air Leakage and Ventilation	Pre-Drywall	ACH50 is tested with blower door before drywall installed OR ^b	1
	Tight	ACH50 \leq 2.0 and balanced H/ERV ^c with \leq 70% SRE ^d and ECM ^e fans OR ^b	3
	Very Tight	ACH50 \leq 1.0 and balanced H/ERV ^c with \leq 80% SRE ^d and ECM ^e fans	4
Heating and Cooling ^a	Basic	ENERGY STAR basic: (1) Gas/propane furnace \geq 95 AFUE, Oil furnace \geq 85 AFUE, (2) Gas/Propane Boiler \geq 90 AFUE, Oil Boiler \geq 87 AFUE, (3) Heat pump HSPF \geq 9.0; PLUS any AC is SEER \geq 14.5 OR ^b	1
	Advanced	Advanced: Whole building heat/cool is (1) NEEP-listed heat pump combination, (2) GSHP, closed loop and COP \geq 3.3, (3) ATWHP ^f COP \geq 2.5 and 120F design temp, (4) Advanced wood heating system	3

TABLE R402.1.2.3 - POINTS CON'T

Component		Description	Points
Water	Advanced	ENERGY STAR advanced: Electric [EF or UEF ≥ 2.00 for ≤ 55 gal; EF ≥ 2.20 for > 55 gal]	2
	Low Flow	All showerheads ≤ 1.75 gpm ^g , all lav. faucets ≤ 1.0 gpm ^g , and all toilets ≤ 1.28 gpf ^h (for new construction only) OR ^b	1
	Certified	Certified water efficient design per WERS, WaterSense, or RESNETH2O (for new construction only)	2
	Drain Heat Recovery	Drain water heat recovery system on primary showers and tubs	1
	On-Demand	Controlled on-demand hot water recirculation system for furthest bathroom	1
Solar	Solar Ready	Home is Solar Ready per R407.5	1
	Solar PV	Solar Photovoltaic (PV), 1 point per 1.5 kW per housing unit of renewable generation on site	1 per 1.5 kW, max. 4
	Solar Hot Water	Solar hot water system designed to meet at least 50% of annual hot water load	2
Other Measures	Monitoring	Install whole-building energy monitoring system, min. 5 circuits and homeowner access to data	1
	EV Ready	Level 2 electric vehicle charger-ready per 407.3	1
	Battery	Min. 6 kWh grid-connected dispatchable demand-response-enabled battery backup	1

Air Leakage Testing for Base Code

- ▶ R402.4.1.2 Air Leakage Testing.
 - ...Testing and verification shall be conducted by an applicable Building Performance Institutes (BPI) Professional, a Home Energy Rating System (HERS) Energy Rater, HERS Field Inspector, or a Vermont Public Service Department approved air leakage tester
 - Optional reporting in Base, required in Stretch:
 - Report cubic feet per minute at 50 Pascals (CFM50) per square foot of building thermal shell area.
 - Building thermal shell area shall include all six (6) sides of the building.
 - For consistency with CBES and to prepare the market to move to this better metric

HERS Rating

- ▶ R406.4 ERI-based compliance
 - Standards:
 - Base – HERS (“Energy Rating Index” or “ERI”) of 61
 - Stretch – HERS (ERI) of 54
 - Based on current HERS software
 - “Up to 5 ERI points can be earned with renewables.”

Electric Vehicle Charging

- ▶ R404.3 Electric vehicle charging.
- ▶ Language from 2015 Stretch is now in Base
 - For multifamily developments of 10 or more dwelling units, 4% of parking spaces (rounded up to the nearest whole number) shall have a socket capable of providing either a level 1 or level 2 charge (see below) within 5 feet of the centerline of the parking space (“EV Charging Parking Space”).
- ▶ R407.4 Stretch
 - For multifamily developments of 10 or more dwelling units, at least 10% of parking spaces (rounded up to the nearest whole number) shall have either Level 2 charging installed or be Level 2 “ready”...

Solar Ready for Stretch

- ▶ **R407.5 Solar Ready Zone for Stretch Code**
 - Construction documents need to show
 - Roof area or ground mount minimum areas
 - Roof load documentation
 - Interconnection pathway
 - Electrical service reserved space

» Commercial

Building Envelope – *Table C402.1*

Component	2015 CBES	Proposed July	Final
Roof – Above Deck	R-30ci	R-35ci	R-40ci
Roof – Metal Building	R-25 + R11 LS	R-30 + R11 LS	R-25 + R-11 + R11 LS
Roof – Attic and Other	R-49	R-49	R-49

Building Envelope – *Table C402.1 – Walls Above Grade*

Component	2015 CBES	Proposed July	Final
Mass	R-13.3 ci	R-15.2ci	R-19ci
Metal Building	R-13 + R-13ci or R19.5ci	R-13 + R-13ci or R19.5ci	R-13 + R-17ci or R22.1ci
Metal Framed	R-13 + R-7.5ci or R-13ci	R-13 + R12.5ci or R-18ci	R-13 + R-15ci or R-20ci
Wood Framed and others	R-13 + R-7.5ci or R-20 + R3.8ci or R-23 or R-15ci	R-13 + R-7.5ci or R-20 + R3.8ci or R-23 or R-15ci	R-13 + R-12ci or R-19 + R8ci or R-20ci

Building Envelope – *Table C402.1 Floors*

Component	2015 CBES	Proposed July	Final
Mass	12.5ci	R-15ci	R-16.7ci
Joist/Framing – Metal	R-38	R-38	R-38
Joist/Framing – Wood and Other	R-30	R-30	R-30
Unheated Slabs	R-10 for 48”	R-10 for 48”	R-10 entire slab
Heated Slabs	R-10 entire slab	R-10 entire slab	R-20 entire slab

Efficiency Package Options – 6 Points Required

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	<u>2</u>	<u>2</u>	<u>5</u>	<u>2</u>	<u>6</u>	<u>3</u>
2.1 Reduced lighting power: Option 1	<u>1</u>	<u>1</u>	<u>3</u>	<u>3</u>	<u>3</u>	<u>2</u>
2.2 Reduced lighting power: Option 2	<u>2</u>	<u>2</u>	<u>5</u>	<u>5</u>	<u>5</u>	<u>4</u>
3. Enhanced lighting controls	<u>N/A</u>	<u>N/A</u>	<u>2</u>	<u>1</u>	<u>2</u>	<u>1</u>
4. On-site supply of renewable energy	<u>3</u>	<u>2</u>	<u>2</u>	<u>3</u>	<u>3</u>	<u>3</u>
5. Dedicated outdoor air system	<u>3</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>3</u>
6.1 High-efficiency service water heating	<u>5</u>	<u>6</u>	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>	<u>3</u> (Group I only)
6.2 High-efficiency service water heating equipment	<u>3</u>	<u>3</u>	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>	<u>2</u> (Group I only)
6.3. Heat pump water heating	<u>5</u>	<u>5</u>	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>	<u>2</u> (Group I only)
7. Enhanced envelope performance	<u>3</u>	<u>4</u>	<u>2</u>	<u>2</u>	<u>2</u>	<u>3</u>
8. Reduced air infiltration	<u>3</u>	<u>5</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>3</u>
9. Efficient kitchen appliances	<u>5</u>	<u>5</u>	<u>5</u>	<u>5</u>	<u>5</u>	<u>5</u> (Group A-2 only)
10. Controlled Receptacles	<u>N/A</u>	<u>N/A</u>	<u>6</u>	<u>2</u>	<u>N/A</u>	<u>N/A</u>
1. This option is only available to building equipped with operable commercial kitchens serving a minimum of 5 meals per week. See C406.10						

Electric Vehicle Charging Stations

Parking spots shall have a socket capable of providing the required level 1 or level 2 charge (see Table C405.11) within 5 feet of the centerline.

50% of the parking spaces, rounded up to the nearest whole number, shall have Electric Vehicle Supply Equipment (EVSE). The remainder shall be pre-wire to allow for installations at such time as they are needed.

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

Any Questions Contact

Barry Murphy

Barry.Murphy@Vermont.gov

802 – 828 – 3183

