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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





# Chapter 4

Additional Efficiency, Renewable and Load Management Requirements





## 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



## C406.1.1 Additional Energy Efficiency Credit Requirements

### How many points does my building need?

ENERGY	CREDIT RE			C406.1. BY BUI	-	OCCUP	ANCY G	ROUP	
			В	uilding (	Occupan	cy Group	•		
	R-2, R-4, and I-1	I-2	R-1	В	A-2	M	E	S-1 and S-2	All Other
Energy Credit	79	46	83	30	60	75	90	65	36

## What about mixed occupancy?

Requirements

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



## C406.1.3 Core and Shell Buildings and Build-Out Construction

#### C406.1.3 Core and Shell Buildings and Build-Out Construction.

Where separate permits are issued for core and shell buildings and build-out construction, compliance shall be in accordance with the following requirements.

- 1. Core and shell buildings or portions of buildings shall comply with one of the following:
  - 1.1. Where the permit includes a central HVAC system or service water heating system with chillers, heat pumps, boilers, service water heating equipment, or loop pumping systems with heat rejection, the project shall achieve not less than 50 percent of the energy credits required in Table C406.1.1 in accordance with Section C406.2.
  - 1.2. Alternatively, the project shall achieve not less than 33 percent of the energy credits required in Table C406.1.1.
- For core and shell buildings or portions of buildings the energy credits achieved shall be subject to the following adjustments:
  - 2.1. Lighting measure credits shall be determined only for areas with final lighting installed.
  - 2.2. Where HVAC or service water heating systems are designed to serve the entire building, full HVAC or service water heating measure credits shall be achieved
  - 2.3. Where HVAC or service water heating systems are designed to serve individual areas, HVAC or service water heating measure credits achieved shall be reduced in proportion to the floor area with final HVAC systems or final service water heating systems installed
- 3. Build-out construction shall be deemed to comply with Section C406.1 where either
  - 3.1. Where heating and cooling generation are provided by a previously installed central system, the energy credits achieved in accordance with Section C406.2 under the buildout project are not less than 33 percent of the credits required in Table C406.1.1



**Building Occupancy Group** 

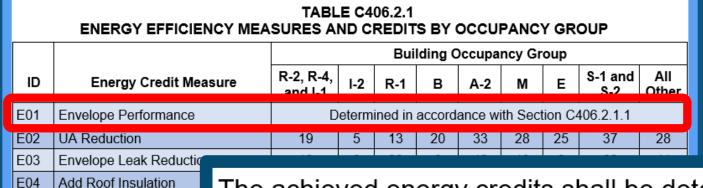
#### TABLE C406.2.1 ENERGY EFFICIENCY MEASURES AND CREDITS BY OCCUPANCY GROUP

			_
ID	Energy Credit Measure	R-2, R-4, and I-1	
E01	Envelope Performance	D	e
E02	UA Reduction	19	Ī
E03	Envelope Leak Reduction	13	
E04	Add Roof Insulation	7	Ī
E05	Add Wall Insulation	13	
E06	Improve Fenestration	42	Ī
H01	HVAC Performance	6	
H02	Heating Efficiency	14	
H03	Cooling Efficiency	3	
H04	Residential HVAC Control	21	
H05	Energy Recovery	46	
W01	Recovered/Renewable Water Heat	93	Ī
W02	Heat Pump Water Heater	81	Ī
W03	SWH Pipe Insulation	6	
W04	Point of Use Water Heaters		
W05	Thermostatic Balance Valves	3	

#### TABLE C406.2.1 ENERGY EFFICIENCY MEASURES AND CREDITS BY OCCUPANCY GROUP

					Bui	lding C	)ccupa	ncy Gr	oup		
	ID	Energy Credit Measure	R-2, R-4, and I-1	I-2	R-1	В	A-2	М	E	S-1 and S-2	All Other
	W06	SWH Heat Trace System	11	1	7	5	3	5	5	2	5
	W07	SWH Submeters	17								17
	W08	SWH Distribution Sizing	68		26						47
	W09	Shower Heat Recovery	25	1	9						10
	P01	Energy Monitoring	3	3	2	3	2	5	3	5	3
ı	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
ı	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





Improved Envelope Performance 90.1 Appendix C:

The achieved energy credits shall be determined using Equation 4-13

$$ECenv = 1000 x (EPF_B - EPF_P)/EPF_B$$

where:

 $EC_{ENV}$  = E01 energy credits

EPF<sub>B</sub> = base envelope performance factor calculated in accordance

with ASHRAE 90.1 Appendix C.

EPF<sub>P</sub> = proposed envelope performance factor calculated in

accordance with ASHRAE 90.1-Appendix C.



E05

E06

H01 H02

H03

H04

H05

W01

W02

W03

Add Wall Insulation

Improve Fenestration

HVAC Performance

Heating Efficiency

Cooling Efficiency

Energy Recovery

Residential HVAC Conti

Recovered/Renewable

Heat Pump Water Heate

Thermostatic Balance \

SWH Pipe Insulation
Point of Use Water Hea

#### TABLE C406.2.1 ENERGY EFFICIENCY MEASURES AND CREDITS BY OCCUPANCY GROUP

		Building Occupancy Group								
ID	Energy Credit Measure	R-2, R-4, and I-1	I-2	R-1	В	A-2	М	E	S-1 and S-2	All Other
E01	Envelope Performance	D	eterm	ined in	accord	ance w	ith Sect	tion C4	106.2.1.1	
E02	UA Reduction	19	5	13	20	33	28	25	37	28
E03	Envelope Leak Reduction	13	9	28	6	42	13	8	68	41
E04	Add Roof Insulation	7	2	3	3	2	24	23	10	9
E05	Add Wall Insulation	13	3	5	8	2	16	7	7	9
E06	Improve Fenestration	42	6	13	21	4	10	34	6	17
H01	HVAC Performance	6	6	6	6		9	8		8
H02	Heating Efficiency	14	11	6	9	19	29	15	44	18
H03	Cooling Efficiency	3			1		7	4		
H04	Residential HVAC Control	21								
H05	Energy Recovery	46	65	41	114	84	242	43	180	90
W01	Recovered/Renewable Water Heat	93	6	36	12	34	13	13	3	26
W02	Heat Pump Water Heater	81	3	30	5	25	4	10	1	20
W03	SWH Pipe Insulation	6	1	4	4	2	4	4	1	3
W04	Point of Use Water Heaters				18			4		11
W05	Thermostatic Balance Valves	3	0	2	1	1	1	1	1	1

# Total UA Envelope Reduction:

U-value of <u>entire</u> thermal envelope 15% better than C402.1.3 (prescriptive tables)



#### TABLE C406.2.1 ENERGY EFFICIENCY MEASURES AND CREDITS BY OCCUPANCY GROUP

				Bui	lding C	)ccupa	ncy Gr	oup		
ID	Energy Credit Measure	R-2, R-4, and I-1	I-2	R-1	В	A-2	М	E	S-1 and S-2	All Other
E01	Envelope Performance	D	eterm	ined in	accord	ance w	ith Sect	tion C4	106.2.1.1	
F02	LIA Reduction	10	5	13	20	33	28	25	37	28
E03	Envelope Leak Reduction	13	9	28	6	42	13	8	68	41
E04	Add Roof Insulation	7	2	3	3	2	24	23	10	9
E05	Add Wall Insulation	13	3	5	8	2	16	7	7	9
E06	Improve Fenestration	42	6	13	21	4	10	34	6	17
H01	HVAC Performance	6	6	6	6		9	8		8
H02	Heating Efficiency	14	11	6	9	19	29	15	44	18
H03	Cooling Efficiency	3			1		7	4		
H04	Residential HVAC Control	21								
H05	Energy Recovery	46	65	41	114	84	242	43	180	90
W01	Recovered/Renewable Water Heat	93	6	36	12	34	13	13	3	26
W02	Heat Pump Water Heater	81	3	30	5	25	4	10	1	20
W03	SWH Pipe Insulation	6	1	4	4	2	4	4	1	3
W04	Point of Use Water Heaters				18			4		11
W05	Thermostatic Balance Valves	3	0	2	1	1	1	1	1	1

### Reduced Air Leakage:

Tested air leakage is less than 0.15 cfm/sf

Does not differentiate between cfm50 or cfm75

- cfm50 = MF
- cfm75 = other commercial



#### TABLE C406.2.1 ENERGY EFFICIENCY MEASURES AND CREDITS BY OCCUPANCY GROUP

				Bui	lding C	Ссира	ncy Gr	oup		
ID	Energy Credit Measure	R-2, R-4, and I-1	I-2	R-1	В	A-2	М	E	S-1 and S-2	All Other
E01	Envelope Performance	D	eterm	ined in	accord	ance w	ith Sect	ion C	406.2.1.1	
E02	UA Reduction	19	5	13	20	33	28	25	37	28
F03	Envelope Leak Reduction	13	g	28	6	42	13	8	68	41
E04	Add Roof Insulation	7	2	3	3	2	24	23	10	9
E05	Add Wall Insulation	13	3	5	8	2	16	7	7	9
E06	Improve Fenestration	42	6	13	21	4	10	34	6	17
H01	HVAC Performance	6	6	6	6		9	8		8
H02	Heating Efficiency	14	11	6	9	19	29	15	44	18
H03	Cooling Efficiency	3			1		7	4		
H04	Residential HVAC Control	21								
H05	Energy Recovery	46	65	41	114	84	242	43	180	90
W01	Recovered/Renewable Water Heat	93	6	36	12	34	13	13	3	26
W02	Heat Pump Water Heater	81	3	30	5	25	4	10	1	20
W03	SWH Pipe Insulation	6	1	4	4	2	4	4	1	3
W04	Point of Use Water Heaters				18			4		11
W05	Thermostatic Balance Valves	3	0	2	1	1	1	1	1	1

#### Add Roof Insulation:

Flat roof: R-10 continuous

Attic: fill or batt rated at R-10 that is continuous

• Interrupted by joists?: R-13

1/2 of base credit achieved for installing 50% of R-value



#### TABLE C406.2.1 ENERGY EFFICIENCY MEASURES AND CREDITS BY OCCUPANCY GROUP

		Building Occupancy Group									
ID	Energy Credit Measure	R-2, R-4, and I-1	I-2	R-1	В	A-2	М	E	S-1 and S-2	All Other	
E01	Envelope Performance	D	eterm	ined in	accord	ance w	ith Sect	ion C4	406.2.1.1		
E02	UA Reduction	19	5	13	20	33	28	25	37	28	
E03	Envelope Leak Reduction	13	9	28	6	42	13	8	68	41	
F04	Add Roof Insulation	7	2	3	3	2	24	23	10	9	
E05	Add Wall Insulation	13	3	5	8	2	16	7	7	9	
E06	Improve Fenestration	42	6	13	21	4	10	34	6	17	
H01	HVAC Performance	6	6	6	6		9	8		8	
H02	Heating Efficiency	14	11	6	9	19	29	15	44	18	
H03	Cooling Efficiency	3			1		7	4			
H04	Residential HVAC Control	21									
H05	Energy Recovery	46	65	41	114	84	242	43	180	90	
W01	Recovered/Renewable Water Heat	93	6	36	12	34	13	13	3	26	
W02	Heat Pump Water Heater	81	3	30	5	25	4	10	1	20	
W03	SWH Pipe Insulation	6	1	4	4	2	4	4	1	3	
W04	Point of Use Water Heaters				18			4		11	
W05	Thermostatic Balance Valves	3	0	2	1	1	1	1	1	1	

#### Added Wall Insulation:

90% or more of opaque wall area addressed

Additional R-5 continuous

<sup>1</sup>/<sub>2</sub> of base credit achieved for installing R-2.5 continuous



#### TABLE C406.2.1 ENERGY EFFICIENCY MEASURES AND CREDITS BY OCCUPANCY GROUP

	ENERGY EFFICIENCY MEA					ccupa				
ID	Energy Credit Measure	R-2, R-4, and I-1	I-2	R-1	В	A-2	M	E	S-1 and S-2	All Other
E01	Envelope Performance	D	eterm	ined in	accord	ance w	th Sect	ion C	106.2.1.1	
E02	UA Reduction	19	5	13	20	33	28	25	37	28
E03	Envelope Leak Reduction	13	9	28	6	42	13	8	68	41
E04	Add Roof Insulation	7	2	3	3	2	24	23	10	9
F05	Add Wall Insulation	13	3	5	8	2	16	7	7	9
E06	Improve Fenestration	42	6	13	21	4	10	34	6	17
H01	HVAC Performance	6	6	6	6		9	8		8
H02	Heating Efficiency	14	11	6	9	19	29	15	44	18
H03	Cooling Efficiency	3			1		7	4		
H04	Residential HVAC Control	21								
H05	Energy Recovery	46	65	41	114	84	242	43	180	90
W01	Recovered/Renewable Water Heat	93	6	36	12	34	13	13	3	26
W02	Heat Pump Water Heater	81	3	30	5	25	4	10	1	20
W03	SWH Pipe Insulation	6	1	4	4	2	4	4	1	3
W04	Point of Use Water Heaters				18			4		11
W05	Thermostatic Balance Valves	3	0	2	1	1	1	1	1	1

### Improve Fenestration:

Area-weighted U-factor of all vertical fenestrations < U-0.22



#### TABLE C406.2.1 ENERGY EFFICIENCY MEASURES AND CREDITS BY OCCUPANCY GROUP

		Building Occupancy Group									
ID	Energy Credit Measure	R-2, R-4, and I-1	I-2	R-1	В	A-2	М	E	S-1 and S-2	All Other	
E01	Envelope Performance	D	eterm	ined in	accord	ance w	ith Sect	tion C4	406.2.1.1		
E02	UA Reduction	19	5	13	20	33	28	25	37	28	
E03	Envelope Leak Reduction	13	9	28	6	42	13	8	68	41	
E04	Add Roof Insulation	7	2	3	3	2	24	23	10	9	
E05	Add Wall Insulation	13	3	5	8	2	16	7	7	9	
F06	Improve Fenestration	42	6	13	21	4	10	34	6	17	
H01	HVAC Performance	6	6	6	6		9	8		8	
H02	Heating Efficiency	14	11	6	9	19	29	15	44	18	
H03	Cooling Efficiency	3			1		7	4			
H04	Residential HVAC Control	21									
H05	Energy Recovery	46	65	41	114	84	242	43	180	90	
W01	Recovered/Renewable Water Heat	93	6	36	12	34	13	13	3	26	
W02	Heat Pump Water Heater	81	3	30	5	25	4	10	1	20	
W03	SWH Pipe Insulation	6	1	4	4	2	4	4	1	3	
W04	Point of Use Water Heaters				18			4		11	
W05	Thermostatic Balance Valves	3	0	2	1	1	1	1	1	1	

# More Efficient HVAC Equipment Performance:

For systems using Total System Performance Ratio (TSPR)

TSPR exceeds minimum TSPR requirement by 5%



#### TABLE C406.2.1 ENERGY EFFICIENCY MEASURES AND CREDITS BY OCCUPANCY GROUP

		Building Occupancy Group									
ID	Energy Credit Measure	R-2, R-4, and I-1	I-2	R-1	В	A-2	М	E	S-1 and S-2	All Other	
E01	Envelope Performance	D	eterm	ined in	accord	ance w	ith Sect	tion C4	406.2.1.1		
E02	UA Reduction	19	5	13	20	33	28	25	37	28	
E03	Envelope Leak Reduction	13	9	28	6	42	13	8	68	41	
E04	Add Roof Insulation	7	2	3	3	2	24	23	10	9	
E05	Add Wall Insulation	13	3	5	8	2	16	7	7	9	
E06	Improve Fenestration	42	6	13	21	4	10	34	6	17	
H01	HVAC Performance	6	6	6	6		g	8		8	
H02	Heating Efficiency	14	11	6	9	19	29	15	44	18	
H03	Cooling Efficiency	3			1		7	4			
H04	Residential HVAC Control	21									
H05	Energy Recovery	46	65	41	114	84	242	43	180	90	
W01	Recovered/Renewable Water Heat	93	6	36	12	34	13	13	3	26	
W02	Heat Pump Water Heater	81	3	30	5	25	4	10	1	20	
W03	SWH Pipe Insulation	6	1	4	4	2	4	4	1	3	
W04	Point of Use Water Heaters				18			4		11	
W05	Thermostatic Balance Valves	3	0	2	1	1	1	1	1	1	

# More Efficient HVAC Equipment HEATING:

- Equipment shall be 5% more efficient than requirement
- Extra credit if  $\geq$  5%. Use formula to calculate
- Electric resistance heating capacity limited to 20% of system capacity (exception: HP supplemental heating)



#### TABLE C406.2.1 ENERGY EFFICIENCY MEASURES AND CREDITS BY OCCUPANCY GROUP

		Building Occupancy Group									
ID	Energy Credit Measure	R-2, R-4, and I-1	I-2	R-1	В	A-2	М	E	S-1 and S-2	All Other	
E01	Envelope Performance	D	eterm	ined in	accord	ance w	ith Sect	tion C4	406.2.1.1		
E02	UA Reduction	19	5	13	20	33	28	25	37	28	
E03	Envelope Leak Reduction	13	9	28	6	42	13	8	68	41	
E04	Add Roof Insulation	7	2	3	3	2	24	23	10	9	
E05	Add Wall Insulation	13	3	5	8	2	16	7	7	9	
E06	Improve Fenestration	42	6	13	21	4	10	34	6	17	
H01	HVAC Performance	6	6	6	6		9	8		8	
HUS	Heating Efficiency	1/1	11	6	a	10	20	15	11	12	
H03	Cooling Efficiency	3			1		7	4			
H04	Residential HVAC Control	21									
H05	Energy Recovery	46	65	41	114	84	242	43	180	90	
W01	Recovered/Renewable Water Heat	93	6	36	12	34	13	13	3	26	
W02	Heat Pump Water Heater	81	3	30	5	25	4	10	1	20	
W03	SWH Pipe Insulation	6	1	4	4	2	4	4	1	3	
W04	Point of Use Water Heaters				18			4		11	
W05	Thermostatic Balance Valves	3	0	2	1	1	1	1	1	1	

# More Efficient HVAC Equipment COOLING:

- Equipment shall be 5% more efficient than requirement
- Extra credit if ≥ 5%. Use formula to calculate
- Fan power shall be 95% of allowed fan power (if fan energy not included in packaged equipment rating



#### TABLE C406.2.1 ENERGY EFFICIENCY MEASURES AND CREDITS BY OCCUPANCY GROUP

		Building Occupancy Group									
ID	Energy Credit Measure	R-2, R-4, and I-1	I-2	R-1	В	A-2	М	E	S-1 and S-2	All Other	
E01	Envelope Performance	D	eterm	ined in	accord	ance w	ith Sect	tion C4	406.2.1.1		
E02	UA Reduction	19	5	13	20	33	28	25	37	28	
E03	Envelope Leak Reduction	13	9	28	6	42	13	8	68	41	
E04	Add Roof Insulation	7	2	3	3	2	24	23	10	9	
E05	Add Wall Insulation	13	3	5	8	2	16	7	7	9	
E06	Improve Fenestration	42	6	13	21	4	10	34	6	17	
H01	HVAC Performance	6	6	6	6		9	8		8	
H02	Heating Efficiency	14	11	6	9	19	29	15	44	18	
H03	Cooling Efficiency	3			1		7	4			
H04	Residential HVAC Control	21									
H05	Energy Recovery	46	65	41	114	84	242	43	180	90	
W01	Recovered/Renewable Water Heat	93	6	36	12	34	13	13	3	26	
W02	Heat Pump Water Heater	81	3	30	5	25	4	10	1	20	
W03	SWH Pipe Insulation	6	1	4	4	2	4	4	1	3	
W04	Point of Use Water Heaters				18			4		11	
W05	Thermostatic Balance Valves	3	0	2	1	1	1	1	1	1	

#### Residential HVAC Control:

Automatic setback of at least 5°F for heating and cooling for dwelling and sleeping units

Several control strategies to select from



#### TABLE C406.2.1 ENERGY EFFICIENCY MEASURES AND CREDITS BY OCCUPANCY GROUP

				Bui	lding C	)ccupa	ncy Gr	oup		
ID	Energy Credit Measure	R-2, R-4, and I-1	I-2	R-1	В	A-2	М	Е	S-1 and S-2	All Other
E01	Envelope Performance	D	eterm	ined in	accord	ance w	th Sect	ion C	106.2.1.1	
E02	UA Reduction	19	5	13	20	33	28	25	37	28
E03	Envelope Leak Reduction	13	9	28	6	42	13	8	68	41
E04	Add Roof Insulation	7	2	3	3	2	24	23	10	9
E05	Add Wall Insulation	13	3	5	8	2	16	7	7	9
E06	Improve Fenestration	42	6	13	21	4	10	34	6	17
H01	HVAC Performance	6	6	6	6		9	8		8
H02	Heating Efficiency	14	11	6	9	19	29	15	44	18
H03	Cooling Efficiency	3			1		7	4		
H04	Residential HVAC Control	21								
H05	Energy Recovery	46	65	41	114	84	242	43	180	90
W01	Recovered/Renewable Water Heat	93	6	36	12	34	13	13	3	26
W02	Heat Pump Water Heater	81	3	30	5	25	4	10	1	20
W03	SWH Pipe Insulation	6	1	4	4	2	4	4	1	3
W04	Point of Use Water Heaters				18			4		11
W05	Thermostatic Balance Valves	3	0	2	1	1	1	1	1	1



## **Energy Recovery:**

Only for areas where singlezone HVAC units are not required to have variable speed fan control. Shall include:

- 75% Enthalpy recovery (or 75% Sensible if no cooling)
- Auto economizing
- Systems providing mechanical dehumidification: Recovered energy used for reheat

#### **TABLE C406.2.1** ENERGY EFFICIENCY MEASURES AND CREDITS BY OCCUPANCY GROUP **Building Occupancy Group** R-2, R-4, S-1 and ΑII **Energy Credit Measure** 1-2 R-1 В A-2 Ε S-2 Other Recovered/Renewable Water Heat 26 W01 93 36 34 13 13 12 3 W02 30 25 Heat Pump Water Heater 81 5 10 20 W03 | SWH Pipe Insulation 3 W04 Point of Use Water Heaters 18 4 11 W05 Thermostatic Balance Valves 3 W06 SWH Heat Trace System 11 5 3 2 5 W07 SWH Submeters 17 17 SWH Distribution Sizing 68 26 47 Shower Heat Recovery 25 9 10

## Reduced Energy Use In-Service Water Heating:

Broken into 3 sections

System Efficiency



#### **TABLE C406.2.1** ENERGY EFFICIENCY MEASURES AND CREDITS BY OCCUPANCY GROUP **Building Occupancy Group** R-2, R-4, S-1 and ΑII **Energy Credit Measure** 1-2 R-1 ID A-2 Ε S-2 Other and I-1 Recovered/Renewable Water Heat 93 36 12 34 13 26 13 W02 Heat Pump Water Heater 81 30 25 20 W03 SWH Pipe Insulation 6 4 3 W04 Point of Use Water Heaters 18 4 W05 Thermostatic Balance Valves 3 W06 SWH Heat Trace System 11 5 3 5 5 W07 TSWH Submeters 1/ 26 SWH Distribution Sizing 68 47 Shower Heat Recovery 25 9 10

## Reduced Energy Use In-Service Water Heating:

#### Broken into 3 sections

- System Efficiency
- Distribution temperature maintenance



#### TABLE C406.2.1 ENERGY EFFICIENCY MEASURES AND CREDITS BY OCCUPANCY GROUP

		Building Occupancy Group										
ID	Energy Credit Measure	R-2, R-4, and I-1	I-2	R-1	В	A-2	М	E	S-1 and S-2	All Other		
W01	Recovered/Renewable Water Heat	93	6	36	12	34	13	13	3	26		
W02	Heat Pump Water Heater	81	3	30	5	25	4	10	1	20		
W03	SWH Pipe Insulation	6	1	4	4	2	4	4	1	3		
W04	Point of Use Water Heaters				18			4		11		
W05	Thermostatic Balance Valves	3	0	2	1	1	1	1	1	1		
W06	SWH Heat Trace System	11	1	7	5	3	5	5	2	5		
W07	SWH Submeters	17								17		
W08	SWH Distribution Sizing	68		26						47		
W09	Shower Heat Recovery	25	1	9						10		

## Reduced Energy Use In-Service Water Heating:

#### Broken into 3 sections

- System Efficiency
- Distribution temperature maintenance
- Other



#### TABLE C406.2.1 ENERGY EFFICIENCY MEASURES AND CREDITS BY OCCUPANCY GROUP

			Building Occupancy Group								
ID	Energy Credit Measure	R-2, R-4, and I-1	I-2	R-1	В	A-2	М	E	S-1 and S-2	All Other	
W01	Recovered/Renewable Water Heat	93	6	36	12	34	13	13	3	26	
W02	Heat Pump Water Heater	81	3	30	5	25	4	10	1	20	
W03	SWH Pipe Insulation	6	1	4	4	2	4	4	1	3	
W04	Point of Use Water Heaters				18			4		11	
W05	Thermostatic Balance Valves	3	0	2	1	1	1	1	1	1	
W06	SWH Heat Trace System	11	1	7	5	3	5	5	2	5	
W07	SWH Submeters	17								17	
W08	SWH Distribution Sizing	68		26						47	
W09	Shower Heat Recovery	25	1	9						10	

## Reduced Energy Use In-Service Water Heating:

Achieve points by selecting one of the following:

- 1) Pick W01 or W02
- 2) Pick W04, W05, or W06
- 3) Pick W03, W07, W08, or W09
  - Can be combined
  - Can be combined with either option 1 or 2 above



#### **TABLE C406.2.1** ENERGY EFFICIENCY MEASURES AND CREDITS BY OCCUPANCY GROUP **Building Occupancy Group** R-2, R-4, S-1 and ΑII **Energy Credit Measure** 1-2 R-1 A-2 Ε Other Recovered/Renewable Water Heat 93 34 13 26 36 12 13 Heat Pump Water Heater 81 30 25 20 W03 SWH Pipe Insulation 6 W04 Point of Use Water Heaters 18 4 11 W05 Thermostatic Balance Valves 3 2 SWH Heat Trace System 11 5 3 2 W07 SWH Submeters 17 17 26 SWH Distribution Sizing 68 47 Shower Heat Recovery 25 9 10

# Recovered or Renewable Water Heating:

Meet 30% of annual hot water requirements by one of the following means:

- Waste heat recovery (off of SHW, heat recovery chiller, etc.)
- Air-to-Water heat pump that precools chilled water return
- On-site renewables

Meet 70% of annual hot water requirements if required to comply with C403.10.5



#### **TABLE C406.2.1** ENERGY EFFICIENCY MEASURES AND CREDITS BY OCCUPANCY GROUP **Building Occupancy Group** R-2, R-4, S-1 and ΑII **Energy Credit Measure** 1-2 R-1 A-2 Ε S-2 Other and I-1 Decovered/Denowable Water Heat Heat Pump Water Heater 30 25 10 20 81 5 SWH Pipe Insulation W04 Point of Use Water Heaters 18 4 11 W05 Thermostatic Balance Valves 3 SWH Heat Trace System 11 5 3 2 SWH Submeters W07 17 17 SWH Distribution Sizing 68 26 47 Shower Heat Recovery 25 10 9

### **Heat Pump Water Heater:**

Meet 30% of demand without backup at ambient condition of 67.5°F

If supplemental electric resistance heating: Heat pump capacity = 40% of 1<sup>st</sup> hour draw



A host of other design-related conditions

#### **TABLE C406.2.1** ENERGY EFFICIENCY MEASURES AND CREDITS BY OCCUPANCY GROUP **Building Occupancy Group** R-2, R-4, S-1 and ΑII **Energy Credit Measure** 1-2 R-1 A-2 Ε S-2 Other and I-1 Decovered/Denowable Water Heat Heat Pump Water Heater 30 25 10 20 81 5 SWH Pipe Insulation W04 Point of Use Water Heaters 18 4 11 W05 Thermostatic Balance Valves 3 SWH Heat Trace System 11 5 3 2 SWH Submeters W07 17 17 SWH Distribution Sizing 68 26 47 Shower Heat Recovery 25 10 9

### **Heat Pump Water Heater:**

Meet 30% of demand without backup at ambient condition of 67.5°F

If supplemental electric resistance heating: Heat pump capacity = 40% of 1<sup>st</sup> hour draw



A host of other design-related conditions

#### TABLE C406.2.1 ENERGY EFFICIENCY MEASURES AND CREDITS BY OCCUPANCY GROUP

				Bui	lding C	)ccupa	ncy Gr	oup		
ID	Energy Credit Measure	R-2, R-4, and I-1	I-2	R-1	В	A-2	М	E	S-1 and S-2	All Other
W01	Recovered/Renewable Water Heat	93	6	36	12	34	13	13	3	26
W02	Heat Pump Water Heater	81	3	30	5	25	4	10	1	20
W03	SWH Pipe Insulation	6	1	4	4	2	4	4	1	3
W04	Point of Use Water Heaters				18			4		11
W05	Thermostatic Balance Valves	3	0	2	1	1	1	1	1	1
W06	SWH Heat Trace System	11	1	7	5	3	5	5	2	5
W07	SWH Submeters	17								17
80W	SWH Distribution Sizing	68		26						47
W09	Shower Heat Recovery	25	1	9						10

## Reduced Energy Use In-Service Water Heating:

Pick W01 or W02.....

Except C406.2.3.1.3

Combination Service Water

Heating Systems says:

"Where SWH employs both, W01 and W02 may be combined and receive the sum of both credits"



Building Occupancy Group

### TABLE C406.2.1 ENERGY EFFICIENCY MEASURES AND CREDITS BY OCCUPANCY GROUP

` 		l .	Building Occupancy Group								
ID	Energy Credit Measure	R-2, R-4, and I-1	I-2	R-1	В	A-2	М	E	S-1 and S-2	All Other	
W01	Recovered/Renewable Water Heat	93	6	36	12	34	13	13	3	26	
W02	Heat Pump Water Heater	81	3	30	5	25	4	10	1	20	
W03	SWH Pipe Insulation	6	1	4	4	2	4	4	1	3	
W04	Point of Use Water Heaters				18			4		11	
W05	Thermostatic Balance Valves	3	0	2	1	1	1	1	1	1	
W06	SWH Heat Trace System	11	1	7	5	3	5	5	2	5	
W07	SWH Submeters	17								17	
W08	SWH Distribution Sizing	68		26						47	
W09	Shower Heat Recovery	25	1	9						10	

## Pipe Insulation Increase:

Increase insulation thickness by 1.5x required

Insulation installed from source to fixture shutoff

Prorate credit if less than 50% of pipe insulation does not meet the 1.5x requirement



#### **TABLE C406.2.1** ENERGY EFFICIENCY MEASURES AND CREDITS BY OCCUPANCY GROUP **Building Occupancy Group** R-2, R-4, S-1 and ΑII **Energy Credit Measure** 1-2 R-1 ID A-2 Ε S-2 Other and I-1 34 Recovered/Renewable Water Heat 93 36 12 13 13 26 Heat Pump Water Heater 81 30 25 20 W03 SWH Pine Insulation 11 Point of Use Water Heaters Thermostatic Balance Valves SWH Heat Trace System 11 5 3 5 2 5 SWH Submeters W07 17 17 SWH Distribution Sizing 68 26 47 Shower Heat Recovery 25 9 10

#### Point of Use Water Heater:

- Building is > 10,000sf
- No recirc or heat trace piping
- 100% of base pipe insulation requirements met, from WH to fixture termination
- <0.25 gallons of water in pipe between WH and termination of fixture pipe
- Local recirc or heat trace piping allowed for separate WHs serving commercial kitchens or showers in locker rooms.



## TABLE C406.2.1 ENERGY EFFICIENCY MEASURES AND CREDITS BY OCCUPANCY GROUP

		Building Occupancy Group										
ID	Energy Credit Measure	R-2, R-4, and I-1	I-2	R-1	В	A-2	М	E	S-1 and S-2	All Other		
W01	Recovered/Renewable Water Heat	93	6	36	12	34	13	13	3	26		
W02	Heat Pump Water Heater	81	3	30	5	25	4	10	1	20		
W03	SWH Pipe Insulation	6	1	4	4	2	4	4	1	3		
WOA	Point of Use Water Heaters				18			1		11		
W05	Thermostatic Balance Valves	3	0	2	1	1	1	1	1	1		
W06	SWH Heat Trace System	11	1	7	5	3	5	5	2	5		
W07	SWH Submeters	17								17		
W08	SWH Distribution Sizing	68		26						47		
W09	Shower Heat Recovery	25	1	9						10		

# Thermostatic Balancing Valves (TBV):

Each recirc branch return shall have a TBV set to minimal return water flow when return temperature is > 120°F



Building Occupancy Group

#### TABLE C406.2.1 ENERGY EFFICIENCY MEASURES AND CREDITS BY OCCUPANCY GROUP

		Building Occupancy Group								
ID	Energy Credit Measure	R-2, R-4, and I-1	I-2	R-1	В	A-2	М	Е	S-1 and S-2	All Other
W01	Recovered/Renewable Water Heat	93	6	36	12	34	13	13	3	26
W02	Heat Pump Water Heater	81	3	30	5	25	4	10	1	20
W03	SWH Pipe Insulation	6	1	4	4	2	4	4	1	3
W04	Point of Use Water Heaters				18			4		11
W05	Thermostatic Balance Valves	3	0	2	1	1	1	1	1	1
W06	SWH Heat Trace System	11	1	7	5	3	5	5	2	5
W07	SWH Submeters	17								17
W08	SWH Distribution Sizing	68		26						47
W09	Shower Heat Recovery	25	1	9						10

### **Heat Trace System:**

- Building is > 10,000sf
- Central water system
- Self-regulating
  - Electric heat cables
  - Connection kits
  - Electronic controls
- Installed directly on hot water supply pipes underneath insulation



This replaces standby losses

Building Occupancy Group

### TABLE C406.2.1 ENERGY EFFICIENCY MEASURES AND CREDITS BY OCCUPANCY GROUP

		Building Occupancy Group								
ID	Energy Credit Measure	R-2, R-4, and I-1	I-2	R-1	В	A-2	М	E	S-1 and S-2	All Other
W01	Recovered/Renewable Water Heat	93	6	36	12	34	13	13	3	26
W02	Heat Pump Water Heater	81	3	30	5	25	4	10	1	20
W03	SWH Pipe Insulation	6	1	4	4	2	4	4	1	3
W04	Point of Use Water Heaters				18			4		11
W05	Thermostatic Balance Valves	3	0	2	1	1	1	1	1	1
W06	SWH Heat Trace System	11	1	7	5	3	5	5	2	5
W07	SWH Submeters	17								17
W08	SWH Distribution Sizing	68		26						47
W09	Shower Heat Recovery	25	1	9						10

# Water Heating System Submeters:

Central DHW systems

Dwelling units provided with hot water meter connected to reporting system

Reports actual DHW use



#### **TABLE C406.2.1** ENERGY EFFICIENCY MEASURES AND CREDITS BY OCCUPANCY GROUP **Building Occupancy Group** R-2, R-4, S-1 and ΑII **Energy Credit Measure** 1-2 R-1 ID A-2 Ε S-2 and I-1 Other 34 Recovered/Renewable Water Heat 93 36 12 13 13 3 W01 25 Heat Pump Water Heater 81 30 5 10 20 W03 SWH Pipe Insulation 6 4 W04 Point of Use Water Heaters 18 4 W05 Thermostatic Balance Valves 3 2 SWH Heat Trace System 11 3 W07 SWH Submeters

25

#### **SHW Flow Reduction:**

Flow or consumption rating less than the following:

- 1.2 gpm lavatory sinks
- 1.5 gpm kitchen sinks
- 1.5 gpm showerheads

47

10



SWH Distribution Sizing

W09 | Shower Heat Recovery

#### TABLE C406.2.1 ENERGY EFFICIENCY MEASURES AND CREDITS BY OCCUPANCY GROUP

			Building Occupancy Group									
	ID	Energy Credit Measure	R-2, R-4, and I-1	I-2	R-1	В	A-2	М	E	S-1 and S-2	All Other	
١	W01	Recovered/Renewable Water Heat	93	6	36	12	34	13	13	3	26	
١	W02	Heat Pump Water Heater	81	3	30	5	25	4	10	1	20	
١	W03	SWH Pipe Insulation	6	1	4	4	2	4	4	1	3	
١	W04	Point of Use Water Heaters				18			4		11	
١	W05	Thermostatic Balance Valves	3	0	2	1	1	1	1	1	1	
١	W06	SWH Heat Trace System	11	1	7	5	3	5	5	2	5	
١	W07	SWH Submeters	17								17	
١	N08	SWH Distribution Sizing	68		26						47	
١	W09	Shower Heat Recovery	25	1	9						10	

# Shower Drain Heat Recovery:

≥54% recovery efficiency

Group E if more than 8 showers

Partial credit for buildings where all but ground floor showers are served



#### **TABLE C406.2.1** ENERGY EFFICIENCY MEASURES AND CREDITS BY OCCUPANCY GROUP **Building Occupancy Group** R-2, R-4, S-1 and All **Energy Credit Measure** 1-2 A-2 В Other **Energy Monitoring** | Lighting Performance L02 **Enhanced Digital Lighting Controls** 5 4 L03 6 Increase Occupancy Sensors L04 Increase Daylight Area 2 8 L05 Residential Light Control L06 Reduced Lighting Power 6 Q01 Efficient Elevator Equipment 0 21 Q02 Commercial Kitchen Equipment Residential Kitchen Equipment Q03 13 10 Q04 Fault Detection

### **Energy Monitoring:**

Buildings required to install Energy Monitoring per C405.12 cannot achieve credits

To achieve points, comply with section C405.12



#### **TABLE C406.2.1** ENERGY EFFICIENCY MEASURES AND CREDITS BY OCCUPANCY GROUP **Building Occupancy Group** R-2, R-4, S-1 and ΑII **Energy Credit Measure** 1-2 A-2 and I-1 S-2 Other P01 Energy Monitoring Lighting Performance L01 L02 **Enhanced Digital Lighting Controls** 5 L03 Increase Occupancy Sensors 6 L04 Increase Daylight Area 2 8 L05 Residential Light Control L06 Reduced Lighting Power 6 | Efficient Elevator Equipment 21 Commercial Kitchen Equipment Q02 Q03 Residential Kitchen Equipment 13 10 Q04 Fault Detection

# **Energy Savings in Lighting Systems:**

#### Meet one of the following:

- Pick any measure ID
- Pick any combo of L03, L04, L05 and L06
- Pick any combo of L02, L03, and L04



#### **TABLE C406.2.1 ENERGY EFFICIENCY MEASURES AND CREDITS BY OCCUPANCY GROUP Building Occupancy Group** R-2, R-4, S-1 and ΑII **Energy Credit Measure** ID 1-2 A-2 Other and I-1 S-2 P01 Energy Monitoring Lighting Performance Enhanced Digital Lighting Controls L03 Increase Occupancy Sensors 6 4 L04 Increase Daylight Area 2 6 L05 Residential Light Control L06 Reduced Lighting Power 5 6 Q01 Efficient Elevator Equipment 4 0 21 Q02 Commercial Kitchen Equipment Q03 Residential Kitchen Equipment 13 10 Q04 Fault Detection

### **Lighting Performance:**

Reserved for future use



#### **TABLE C406.2.1** ENERGY EFFICIENCY MEASURES AND CREDITS BY OCCUPANCY GROUP **Building Occupancy Group** R-2, R-4 S-1 and ΑII **Energy Credit Measure** 1-2 A-2 R-1 and I-1 S-2 Other **Energy Monitoring** Lighting Performance **Enhanced Digital Lighting Controls** Increase Occupancy Sensors L04 Increase Daylight Area 2 5 3 6 8 L05 Residential Light Control L06 Reduced Lighting Power 6 Q01 Efficient Elevator Equipment 0 21 Q02 Commercial Kitchen Equipment Q03 Residential Kitchen Equipment 13 10 Q04 Fault Detection

# **Enhanced Digital Lighting Controls:**

- >50% of gross floor area complies
- Located, scheduled, and operated per C405.2
- Controlled by DDC
- Sequence of operations on construction drawings
- High-end Trim requirements
- Can be prorated



#### **TABLE C406.2.1 ENERGY EFFICIENCY MEASURES AND CREDITS BY OCCUPANCY GROUP Building Occupancy Group** R-2, R-4 ΑII S-1 and **Energy Credit Measure** ID 1-2 A-2 R-1 and I-1 S-2 Other P01 **Energy Monitoring** Lighting Performance L01 Enhanced Digital Lighting Controls L03 Increase Occupancy Sensors Increase Daylight Area L05 Residential Light Control L06 Reduced Lighting Power 6 Q01 Efficient Elevator Equipment 0 21 Q02 Commercial Kitchen Equipment Residential Kitchen Equipment Q03 13 10 Q04 Fault Detection

# Increase Occupancy Sensor:

### Must comply with all:

- List of required spaces
- 10-minute turn-off after occupants have left space
- If lighting power reduced, not turned off: 20% of full power



# TABLE C406.2.1 ENERGY EFFICIENCY MEASURES AND CREDITS BY OCCUPANCY GROUP

				Bui	Iding C	)ccupa	ncy Gr	oup		
ID	Energy Credit Measure	R-2, R-4, and I-1	I-2	R-1	В	A-2	М	E	S-1 and S-2	All Other
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
103	Increase Occupancy Sensors	1	Л	2	1	1	6	2	1	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

# Increase Daylight Area:

5% more area served than base code requirement



### TABLE C406.2.1 ENERGY EFFICIENCY MEASURES AND CREDITS BY OCCUPANCY GROUP

				Bui	lding C	Occupa	ncy Gr	oup		
ID	Energy Credit Measure	R-2, R-4, and I-1	I-2	R-1	В	A-2	М	E	S-1 and S-2	All Other
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
1.04	Increase Daylight Area	2	5	વ	6	1	8	5	1	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

### Residential Light Control:

Occ sensor, automatic full OFF for common restrooms, laundry rooms, storage & utility rooms

Dwelling units have main controls that turns off all lights and switched receptacles

Minimum 2 switched receptacles installed & ID'd



#### **TABLE C406.2.1** ENERGY EFFICIENCY MEASURES AND CREDITS BY OCCUPANCY GROUP **Building Occupancy Group** R-2, R-4, ΑII S-1 and **Energy Credit Measure** 1-2 A-2 R-1 and I-1 S-2 Other P01 **Energy Monitoring** L01 Lighting Performance L02 **Enhanced Digital Lighting Controls** 5 4 L03 Increase Occupancy Sensors Increase Daylight Area L04 8 Residential Light Control Reduced Lighting Power Q01 | Efficient Elevator Equipment 21 Q02 Commercial Kitchen Equipment Q03 Residential Kitchen Equipment 13 10

### Reduced Lighting Power:

LPD for interior spaces:

- 95% or less of required LPD
  - R-1 & R-2: common areas only

In unit requirements:

- Fixtures: ≥80 lumens per watt
- Lamps: ≥ 90 lumens per watt



Fault Detection

Q04

Formula to determine credits

### TABLE C406.2.1 ENERGY EFFICIENCY MEASURES AND CREDITS BY OCCUPANCY GROUP

				Bui	lding C	ccupa)	ncy Gr	oup		
ID	Energy Credit Measure	R-2, R-4, and I-1	I-2	R-1	В	A-2	М	E	S-1 and S-2	All Other
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

### Other:

Pick any combination



### TABLE C406.2.1 ENERGY EFFICIENCY MEASURES AND CREDITS BY OCCUPANCY GROUP

			Building Occupancy Group										
ID	Energy Credit Measure	R-2, R-4, and I-1	I-2	R-1	В	A-2	М	E	S-1 and S-2	All Other			
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			

# Efficient Elevator Equipment:

Buildings 3 or more stories

Elevators: Energy Efficiency class A per ISO 25745-2

Use formula to determine if equipment qualifies



### TABLE C406.2.1 ENERGY EFFICIENCY MEASURES AND CREDITS BY OCCUPANCY GROUP

			Building Occupancy Group										
ID	Energy Credit Measure	R-2, R-4, and I-1	I-2	R-1	В	A-2	М	E	S-1 and S-2	All Other			
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			

# Efficient Commercial Kitchen Equipment:

Comply with Vermont Appliance Efficiency Standards

Following equipment must exceed those standards: Fryers, Dishwashers, Ovens



Performance levels indicated on construction permit documents

### TABLE C406.2.1 ENERGY EFFICIENCY MEASURES AND CREDITS BY OCCUPANCY GROUP

				Bui	lding C	)ccupa	ncy Gr	oup		
ID	Energy Credit Measure	R-2, R-4, and I-1	I-2	R-1	В	A-2	М	E	S-1 and S-2	All Other
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
002	Commercial Kitchen Equipment					21				
Q03	Residential Kitchen Equipment	13		10						
Q04	Fault Detection	3	3	2	3	3	3	4	6	4

# Efficient Residential Kitchen Equipment:

All dishwashers, refrigerators and freezers achieve Energy Star Most Efficient 2021 status

Prorate credits in cases where only some units are equipped with both refrigerators and dishwashers



### TABLE C406.2.1 ENERGY EFFICIENCY MEASURES AND CREDITS BY OCCUPANCY GROUP

		Building Occupancy Group										
ID	Energy Credit Measure	R-2, R-4, and I-1	I-2	R-1	В	A-2	М	E	S-1 and S-2	All Other		
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		

#### **Fault Detection:**

Projects not required to comply with C403.2.3

Install fault detection and diagnostics system to monitor HVAC and comply with C403.2.3



### 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	В	A-2	М	E	S-1 and S-2	All Other					
Renewable and Load Management Credit Requirements	16	11	14	24	4	25	22	20	17					



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

				Buile	ding O	ccupa)	ncy G	roup		
ID	Renewable and Load Management Credit	R-2, R-4, and I-1	I-2	R-1	В	A-2	М	Е	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								

### Note:

Measures highlighted at left require controls to respond to:

- High, short-term electric prices; or
- Grid condition; or
- Peak building load



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

				Building Occupancy Group									
ID	Renewable and Load Management Credit	R-2, R-4, and I-1	I-2	R-1	В	A-2	М	Е	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											

# On-Site Renewable Energy:

### To qualify:

- 0.1 watts per gross square foot; or
- Secure off-site renewable energy

Use formula to determine total credits



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

				Building Occupancy Group								
	ID	Renewable and Load Management Credit	R-2, R-4, and I-1	I-2	R-1	В	A-2	М	Е	S-1 and S-2	All Other	
Ī	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	
(	305	Cooling Energy Storage	7	11	12	12	2	9	16	1	9	
(	306	SHW Energy Storage	18	4	26	6	15	4	7	2	10	
(	307	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	
E	E01	Additional Electric Infrastructure	16									

### **Lighting Load Mgmt:**

Luminaires have dimming ability and automatic load management tools:

- Reduce load in 75% of building
- Reduce load by 20% or more
- Period no longer than 15 minutes

Prorate credits based on formula for projects where 50-75% of fixtures are controlled



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

				Buile	ding O	ссира	Building Occupancy Group								
ID	Renewable and Load Management Credit	R-2, R-4, and I-1	I-2	R-1	В	A-2	М	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													

### **HVAC Load Management:**

### Cooling & Electric Heating:

- Gradually increase/decrease cooling setpoint by 3°F for minimum of 3 hours: OR
- Reduce capacity to 60% of installed capacity during peak event

HVAC serving multiple zones, with < 70% outdoor air:
Reduce outdoor air by 30% during peak event



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

				Build	ding C	)ccupa	ncy G	roup		
ID	Renewable and Load Management Credit	R-2, R-4, and I-1	I-2	R-1	В	A-2	М	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								



Exterior devices: Reduce solar heat gain by 50%

Interior devices: minimum solar reflectance of 0.50 receive 40% of the credits

#### Exterior & Interior devices:

- 90% coverage of E, S and W fenestration exposures
- Automatically controlled
- Manual override locked out during peak events



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

				Buile	ding C	ccupa)	ncy G	roup		
ID	Renewable and Load Management Credit	R-2, R-4, and I-1	I-2	R-1	В	A-2	М	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								

### **Electric Energy Storage:**

Automatically Charge during nonpeak periods, discharge during peak events

Minimum capacity of 1.5 Watt-hour/s.f. of gross building area. Credits shown based on 5 Wh/sf

Actual credits based on formula. Limited to 1.5-15 Wh/sf



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

				Buile	ding O	ccupa)	incy G	roup		
ID	Renewable and Load Management Credit	R-2, R-4, and I-1	I-2	R-1	В	A-2	М	Е	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		80	16	14	18	14	13
G03	Automated Shading	1		1	5		80	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								

### Cooling Energy Storage:

Automatically activate Ice or chilled water storage during summer peak periods

Actual credits based on formula



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

				Build	ding C	ссира)	ncy G	roup		
ID	Renewable and Load Management Credit	R-2, R-4, and I-1	I-2	R-1	В	A-2	М	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		80	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								

### **SWH Energy Storage:**

### **Electric Service Water Heating**

Suspend water heating during peak period. Either:

- Preheat water above 140°F
  - Install tempering valves at delivery location
- 2) Provide additional storage capacity
  - 1/3 credits available where Heat Pump water heating is used



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

					Build	ding O	ccupa)	ncy G	roup		
	ID	Renewable and Load Management Credit	R-2, R-4, and I-1	I-2	R-1	В	A-2	М	Е	S-1 and S-2	All Other
F	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		80	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
E	E01	Additional Electric Infrastructure	16								

### **Building Thermal Mass:**

Projects where ≥80% of floor area is unoccupied 12pm to 6am

- 10lb/sf thermal mass per sf of floor area (mass located on wall or floor)
- HVAC with economizer and variable/low speed fans
- Night flush controls
- Contractual obligation for postoccupancy commissioning and control tuning



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

			Building Occupancy Group									
ID	Renewable and Load Management Credit	R-2, R-4, and I-1	I-2	R-1	В	A-2	М	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										

# Insulation Embodied Carbon:

Calculate Global Warming Potential Intensity per s.f. of floor area

Includes foundation, wall and roof insulation materials

Credits determined by formular.

Material GWP table and formula

provided



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

			Building Occupancy Group									
ID	Renewable and Load Management Credit	R-2, R-4, and I-1	I-2	R-1	В	A-2	М	Е	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										

# Additional Electric Infrastructure:

Group R-2 only

Comply with requirements of Section C405.14 *Additional Electric Infrastructure* 



### **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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