**As Modified**

*Revised items noted in “As Modified Reason Statement”*

*Note: some new equations and tables not shown underlined for clarity throughout*

**CEPI-193-21**

IECC®: SECTION C406, SECTION 406 (New), C406.1 (New), C406.1.1 (New), Table C406.1.1 (New), C406.1.1.1 (New), C406.1.2 (New), Table C406.1.2 (New), C406.1.3 (New), C406.2 (New), Table C406.2(1) (New), Table C406.2(2) (New), Table

C406.2(3) (New), Table C406.2(4) (New), Table C406.2(5) (New), Table C406.2(6) (New), Table C406.2(7) (New), Table

C406.2(8) (New), Table C406.2(9) (New), C406.2 (New), C406.2.1 (New), C406.2.1.1 (New), C406.2.1.2 (New), C406.2.1.3 (New),

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C406.2.3.4 (New), C406.2.3.5 (New), Table C406.2.3.5 (New), C406.2.3.6 (New), C406.2.4 (New), C406.2.5 (New), C406.2.5.1 (New),

C406.2.5.2 (New), C406.2.5.3 (New), C406.2.5.4 (New), TABLE C406.2.5.4 (New), C406.2.5.5 (New), C406.2.5.6 (New), C406.2.7

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Table C406.2.7.2(4) (New), C406.2.7.3 (New), C406.2.7.4 (New), C406.3 (New), Table C406.3(1) (New), Table C406.3(2) (New),

Table C406.3(3) (New), Table C406.3(4) (New), Table C406.3(5) (New), Table C403.6(6) (New), Table C406.3(7) (New), Table C406.3(8) (New), Table C406.3(9) (New), C406.3.1 (New), Table 406.3.1 (New), Table C406.3.1 (New), C406.3.2 (New), G406.3.3

(New), C406.3.4 (New), C406.3.5 (New), C403.6.6 (New), G406.3.7 (New), C406.3.8 (New), C407.2, TABLE C407.2, APPENDIX CD (New), CD101 (New), CD101.1 (New), CD101.2 (New), CD102 (New), CD102.1 (New), Table CD102.1 (New), ANSI Chapter 06

(New), IEC (New), IEC (New), OpenADR (New) Proponents:

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2021 International Energy Conservation Code

*Add the following definition:*

**SENSIBLE ENERGY RECOVERY RATIO***:* change in the dry-bulb temperature of the outdoor airsupply

divided by the difference between the outdoor airand entering exhaust air dry-bulb temperatures,

expressed as a percentage.

Delete without substitution:

~~SECTION C406 ADDITIONAL EFFICIENCY REQUIREMENTS~~

Add new text as follows:

# SECTION 406 ADDITIONAL EFFICIENCY, RENEWABLE, and LOAD MANAGEMENT REQUIREMENTS

# C406.1 Compliance.

*Buildings* shall comply as follows:

1. *Buildings* with greater than 2000 square feet (190 m2) of floor area shall comply with Section C406.1.1.
2. *Buildings* with greater than 5000 square feet (465 m2) *of conditioned floor area* shall comply with Sections C406.1.1 and C406.1.2.
3. Build-out construction greater than 1000 square feet (93 m2) of *conditioned floor area* that does not have final lighting or final HVAC systems installed under a prior building permit shall comply with Section C406.1.3.

Exception: Core and shell *buildings* where no less than 20 percent of the *net floor area* is without final lighting or final HVAC that comply with all of the following:

1. *Buildings* with greater than 5000 square feet (465 m2) of *conditioned floor area* shall comply with Section C406.1.2
2. Portions of the *building* where the *net floor area* is without final lighting or final HVAC shall comply with Section C406.1.3
3. Portions of the building where the *net floor area* has final lighting and final HVAC systems shall comply with C406.1.1.

# C406.1.1 Additional energy efficiency credit requirements.

*Buildings* shall comply with measures from C406.2 to achieve not less than the number of required efficiency credits from Table C406.1.1 based on building occupancy group and climate zone.

Where a project contains multiple occupancies, credits in Table C406.1.1 from each building occupancy shall be weighted by the gross floor area to determine the weighted average project energy credits required. Accessory occupancies shall be included with the primary occupancy group for purposes of Section C406.

Exceptions:

1. Unconditioned parking garages that achieve 50% of the credits required for use groups S-1 and S-2 in Table C406.1.1.
2. Portions of *buildings* devoted to manufacturing or industrial use.

Table C406.1.1 Energy Credit Requirements by Building Occupancy Group

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Building Occupancy Group** | **Climate Zone** | | | | | | | | | | | | | | | | | | |
| **0A** | **0B** | **1A** | **1B** | **2A** | **2B** | **3A** | **3B** | **3C** | **4A** | **4B** | **4C** | **5A** | **5B** | **5C** | **6A** | **6B** | **7** | **8** |
| R-2, R-4, and I-1 | 65 | 66 | 67 | 77 | 80 | 86 | 80 | 81 | 90 | 86 | 90 | 90 | 86 | 90 | 90 | 79 | 89 | 80 | 78 |
| I-2 | 43 | 42 | 38 | 37 | 36 | 38 | 32 | 32 | 30 | 36 | 36 | 35 | 43 | 43 | 44 | 46 | 47 | 50 | 53 |
| R-1 | 63 | 62 | 66 | 65 | 70 | 71 | 77 | 80 | 84 | 81 | 83 | 88 | 85 | 86 | 90 | 83 | 87 | 87 | 85 |
| B | 62 | 62 | 64 | 66 | 66 | 65 | 64 | 64 | 68 | 70 | 72 | 74 | 71 | 73 | 77 | 71 | 74 | 74 | 71 |
| A-2 | 70 | 70 | 72 | 72 | 75 | 75 | 70 | 73 | 82 | 69 | 74 | 78 | 67 | 72 | 78 | 60 | 67 | 57 | 51 |
| M | 80 | 79 | 83 | 79 | 81 | 84 | 67 | 74 | 87 | 80 | 66 | 65 | 79 | 62 | 50 | 75 | 67 | 75 | 58 |
| E | 56 | 57 | 55 | 58 | 58 | 57 | 59 | 62 | 59 | 61 | 66 | 62 | 64 | 67 | 67 | 65 | 67 | 63 | 58 |
| S-1 and S-2 | 61 | 60 | 61 | 60 | 58 | 57 | 44 | 54 | 62 | 85 | 68 | 75 | 90 | 82 | 72 | 90 | 89 | 90 | 90 |
| All Other | 31 | 31 | 31 | 32 | 32 | 33 | 30 | 32 | 36 | 35 | 35 | 35 | 37 | 36 | 36 | 36 | 37 | 36 | 34 |

# C406.1.2 Additional renewable and load management credit requirements.

Buildings shall comply with measures from C406.3 to achieve not less than the number of required renewable and load management credits from Table C406.1.2 based on building occupancy group and climate zone. Where a project contains multiple occupancies, credits in Table C406.1.2 from each building occupancy shall be weighted by the gross floor area to determine the weighted average project energy credits required. Accessory occupancies shall be included with the primary occupancy group for purposes of Section C406.

Table C406.1.2 Renewable and Load Management Credit Requirements by Building Occupancy Group

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Building Occupancy Group | Climate Zone | | | | | | | | | | | | | | | | | | |
| 0A | 0B | 1A | 1B | 2A | 2B | 3A | 3B | 3C | 4A | 4B | 4C | 5A | 5B | 5C | 6A | 6B | 7 | 8 |
| R-2, R-4, and I-1 | 64 | 59 | 70 | 69 | 73 | 89 | 72 | 90 | 90 | 63 | 90 | 70 | 51 | 75 | 66 | 48 | 58 | 50 | 42 |
| I-2 | 31 | 32 | 33 | 32 | 33 | 36 | 31 | 40 | 34 | 32 | 43 | 32 | 29 | 37 | 33 | 34 | 33 | 27 | 23 |
| R-1 | 41 | 40 | 48 | 44 | 48 | 58 | 54 | 61 | 63 | 50 | 61 | 47 | 42 | 55 | 50 | 41 | 51 | 40 | 32 |
| B | 63 | 64 | 74 | 75 | 78 | 89 | 83 | 90 | 90 | 77 | 90 | 86 | 68 | 90 | 83 | 72 | 81 | 68 | 58 |
| A-2 | 12 | 12 | 13 | 13 | 12 | 17 | 13 | 17 | 17 | 12 | 17 | 13 | 12 | 12 | 12 | 12 | 12 | 8 | 7 |
| M | 71 | 70 | 84 | 84 | 90 | 90 | 90 | 90 | 90 | 81 | 90 | 90 | 77 | 90 | 90 | 76 | 84 | 71 | 58 |
| E | 49 | 55 | 64 | 61 | 69 | 83 | 73 | 90 | 90 | 67 | 90 | 75 | 61 | 86 | 74 | 66 | 76 | 60 | 47 |
| S-1 and S-2 | 90 | 90 | 90 | 90 | 90 | 90 | 90 | 90 | 90 | 90 | 90 | 90 | 70 | 90 | 90 | 61 | 85 | 61 | 53 |
| All Other | 56 | 55 | 66 | 63 | 69 | 80 | 69 | 87 | 88 | 59 | 86 | 68 | 51 | 72 | 66 | 51 | 60 | 48 | 40 |

## 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. 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.
   2. Alternatively, the project shall achieve not less than 33 percent of the energy credits required in Table C406.1.1.
2. For core and shell *buildings* or portions of *buildings* the energy credits achieved shall be subject to the following adjustments:
   1. Lighting measure credits shall be determined only for areas with final lighting installed.
   2. WhereHVAC or service water heating systems are designed to serve the entire building, full HVAC or service water heating measure credits shall be achieved
   3. WhereHVAC 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:
   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 build-out project are not less than 33 percent of the credits required in Table C406.1.1
   2. Where heating and cooling generation are provided by an HVAC system installed in the build out, the energy credits achieved in accordance with Section C406.2 under the build-out project are not less than 50 percent of the credits required in Table C406.1.1
   3. Where the core and shell building was *approved* in accordance with C407 under 2021 IECC or later.

# C406.2 Additional Energy Efficiency Credits Achieved.

Each energy efficiency credit measure used to meet credit requirements for the project shall have efficiency that is greater than the requirements in Sections C402 through C405. Measures installed in the project that meet the requirements in Sections C406.2.1 through C406.2.7 shall achieve the base credits listed for the measure and occupancy type in Tables C406.2(1) through C406.2(9) or, where calculations required by Sections C406.2.1 through C406.2.7 create or modify the table credits, the credits achieved shall be based upon the calculations. Energy credits achieved for measures shall be determined by one of the following, as applicable:

1. The measure’s energy credit shall be the base energy credit for the measure where no adjustment factor or calculation is included in the description of the measure in Section C406.2.
2. The measure’s energy credit shall be the base energy credit for the measure adjusted by a factor or equation as stated in the description of the measure in Section C406.2. Where adjustments are applied, each measure’s energy credit shall be rounded to the nearest whole number.
3. The measure’s energy credit shall be by calculation as stated in the measure’s description in Section C406.2, where each individual measure credit shall be rounded to the nearest whole number.

Energy credits achieved for the project shall be the sum of the individual measure’s energy credits*.* Credits are available for the measures listed in this Section. Where a project contains multiple building occupancy groups:

1. Credits achieved for each occupancy group shall be summed and then weighted by the floor area of each occupancy group to determine the weighted average project energy credits achieved.
2. Credits for improved envelope efficiency and lighting reduction (L06) shall be determined for the *building* or permitted floor area as a whole. Credits for other measures shall be taken from applicable tables or calculations weighted by the building occupancy group floor area.

Table C406.2(1) Base Energy Credits for Group R-2, R-4, and I-1 Occupancies a

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ID | Energy Credit Measure | Section | Climate Zone | | | | | | | | | | | | | | | | | | |
|  | 0A | 0B | 1A | 1B | 2A | 2B | 3A | 3B | 3C | 4A | 4B | 4C | 5A | 5B | 5C | 6A | 6B | 7 | 8 |
| E01 | Envelope Performance | C406.2.1.1 | Determined in accordance with Section C406.2.1.1 | | | | | | | | | | | | | | | | | | |
| E02 | UA reduction (15%) | C406.2.1.2 | 8 | 13 | 7 | 11 | 6 | 8 | 9 | 6 | 1 | 24 | 8 | 9 | 30 | 15 | 5 | 32 | 28 | 31 | 36 |
| E03 | Envelope leakage reduction | C406.2.1.3 | 15 | 10 | 12 | 8 | 6 | 16 | 13 | 5 | 1 | 47 | 7 | 9 | 65 | 16 | 1 | 73 | 43 | 52 | 26 |
| E04 | Add Roof Insulation | C406.2.1.4 | 1 | 1 | 1 | 1 | 1 | 1 | 4 | 3 | 1 | 5 | 3 | 4 | 6 | 5 | 1 | 7 | 7 | 6 | 8 |
| E05 | Add Wall Insulation | C406.2.1.5 | 10 | 10 | 6 | 8 | 5 | 6 | 8 | 4 | 1 | 8 | 3 | 4 | 11 | 7 | 1 | 14 | 12 | 13 | 13 |
| E06 | Improve Fenestration | C406.2.1.6 | 7 | 7 | 4 | 6 | 9 | 11 | 13 | 3 | 1 | 22 | 5 | 10 | 27 | 18 | 7 | 41 | 33 | 22 | 21 |
| H01 | HVAC Performance | C406.2.2.1 | 20 | 19 | 16 | 17 | 14 | 13 | 11 | 11 | 5 | 13 | 10 | 8 | 15 | 12 | 7 | 18 | 14 | 17 | 19 |
| H02 | Heating efficiency | C406.2.2.2 | x | x | x | x | x | x | 3 | 1 | 1 | 6 | 2 | 3 | 10 | 5 | 2 | 14 | 10 | 13 | 16 |
| H03 | Cooling efficiency | C406.2.2.3 | 7 | 6 | 4 | 4 | 3 | 3 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | x | x | x | x | x |
| H04 | Residential HVAC control | C406.2.2.4 | 9 | 10 | 8 | 22 | 20 | 25 | 16 | 17 | 32 | 21 | 24 | 17 | 23 | 27 | 16 | 21 | 24 | 18 | 18 |
| H05 | DOAS/fan control | C406.2.2.5 | 32 | 31 | 27 | 28 | 23 | 23 | 28 | 21 | 12 | 42 | 24 | 24 | 56 | 36 | 19 | 73 | 54 | 70 | 79 |
| W01 | SHW preheat recovery | C406.2.3.1 a | 61 | 63 | 74 | 74 | 85 | 88 | 101 | 100 | 121 | 103 | 109 | 122 | 102 | 111 | 130 | 93 | 106 | 99 | 96 |
| W02 | Heat pump water heater | C406.2.3.1 b | 50 | 52 | 62 | 61 | 72 | 74 | 86 | 85 | 104 | 88 | 94 | 106 | 88 | 96 | 112 | 81 | 92 | 87 | 84 |
| W03 | Efficient gas water heater | C406.2.3.1 c | 38 | 39 | 46 | 46 | 53 | 55 | 63 | 62 | 76 | 64 | 68 | 76 | 64 | 69 | 81 | 58 | 66 | 62 | 60 |
| W04 | SHW pipe insulation | C406.2.3.2 | 7 | 7 | 8 | 7 | 8 | 8 | 8 | 9 | 10 | 8 | 9 | 9 | 7 | 8 | 9 | 6 | 7 | 6 | 6 |
| W05 | Point of use water heaters | C406.2.3.3 a | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| W06 | Thermostatic bal. valves | C406.2.3.3 b | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 4 | 3 | 3 | 4 | 3 | 3 | 4 | 3 | 3 | 3 | 2 |
| W07 | SHW heat trace system | C406.2.3.3 c | 12 | 12 | 13 | 13 | 14 | 15 | 15 | 15 | 18 | 14 | 15 | 16 | 13 | 14 | 16 | 11 | 13 | 11 | 10 |
| W08 | SHW submeters | C406.2.3.4 | 11 | 11 | 13 | 13 | 15 | 16 | 18 | 18 | 22 | 19 | 20 | 22 | 19 | 20 | 24 | 17 | 20 | 18 | 18 |
| W09 | SHW flow reduction | C406.2.3.5 | 45 | 46 | 55 | 54 | 63 | 65 | 74 | 73 | 89 | 75 | 80 | 89 | 74 | 81 | 95 | 68 | 77 | 72 | 70 |
| W10 | Shower heat recovery | C406.2.3.6 | 15 | 16 | 19 | 19 | 22 | 23 | 26 | 26 | 32 | 27 | 29 | 32 | 27 | 29 | 34 | 25 | 28 | 27 | 26 |
| P01 | Energy monitoring | C406.2.4 | 3 | 3 | 2 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 2 | 2 | 3 |
| L01 | Lighting Performance | C406.2.5.1 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| L02 | Lighting dimming & tuning | C406.2.5.2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| L03 | Increase occp. sensor | C406.2.5.3 | 3 | 3 | 4 | 4 | 4 | 4 | 3 | 4 | 3 | 2 | 3 | 2 | 1 | 2 | 2 | 1 | 1 | 1 | 1 |
| L04 | Increase daylight area | C406.2.5.4 | 5 | 5 | 5 | 5 | 5 | 5 | 4 | 4 | 4 | 4 | 4 | 3 | 3 | 4 | 3 | 2 | 3 | 3 | 2 |
| L05 | Residential light control | C406.2.5.5 | 8 | 8 | 9 | 9 | 9 | 9 | 8 | 8 | 10 | 6 | 8 | 7 | 4 | 6 | 8 | 3 | 5 | 4 | 3 |
| L06 | Light power reduction | C406.2.5.7 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Q01 | Efficient elevator | C406.2.7.1 | 4 | 4 | 4 | 4 | 5 | 5 | 5 | 5 | 5 | 4 | 5 | 5 | 4 | 4 | 5 | 4 | 4 | 4 | 3 |
| Q02 | Commercial kitchen equip. | C406.2.7.2 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| Q03 | Residential kitchen equip. | C406.2.7.3 | 15 | 15 | 17 | 16 | 17 | 18 | 17 | 18 | 20 | 16 | 17 | 18 | 15 | 16 | 18 | 13 | 15 | 13 | 12 |
| Q04 | Fault detection | C406.2.7.4 | 3 | 3 | 2 | 3 | 2 | 2 | 2 | 2 | 1 | 2 | 2 | 1 | 2 | 2 | 1 | 3 | 2 | 3 | 3 |

1. “x” indicates credit is not available for that measure

Table C406.2(2) Base Energy Credits for Group I-2 Occupancies a

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ID | Energy Credit  Measure | Section | Climate Zone | | | | | | | | | | | | | | | | | | |
|  | 0A | 0B | 1A | 1B | 2A | 2B | 3A | 3B | 3C | 4A | 4B | 4C | 5A | 5B | 5C | 6A | 6B | 7 | 8 |
| E01 | Envelope Performance | C406.2.1.1 | Determined in accordance with Section C406.2.1.1 | | | | | | | | | | | | | | | | | | |
| E02 | UA reduction (15%) | C406.2.1.2 | 6 | 11 | 6 | 11 | 7 | 9 | 6 | 6 | 2 | 3 | 3 | 3 | 4 | 3 | 7 | 5 | 5 | 17 | 3 |
| E03 | Envelope leakage reduction | C406.2.1.3 | 5 | 3 | 4 | 3 | 5 | 8 | 8 | 3 | 2 | 6 | 2 | 2 | 7 | 3 | 1 | 9 | 7 | 19 | 5 |
| E04 | Add Roof Insulation | C406.2.1.4 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 1 | 2 | 1 | 2 | 3 |
| E05 | Add Wall Insulation | C406.2.1.5 | 1 | 3 | 1 | 3 | 2 | 2 | 9 | 4 | 1 | 4 | 1 | 1 | 3 | 1 | 1 | 3 | 3 | 3 | 3 |
| E06 | Improve Fenestration | C406.2.1.6 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 4 | 3 | 5 | 5 | 1 | 1 | 5 | 5 | 2 | 2 |
| H01 | HVAC Performance | C406.2.2.1 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| H02 | Heating efficiency | C406.2.2.2 | x | x | x | x | 2 | 3 | 4 | 3 | 7 | 6 | 4 | 6 | 8 | 6 | 10 | 11 | 12 | 15 | 19 |
| H03 | Cooling efficiency | C406.2.2.3 | 6 | 6 | 4 | 4 | 3 | 3 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | x | x | x | x |
| H04 | Residential HVAC control | C406.2.2.4 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| H05 | DOAS/fan control | C406.2.2.5 | 41 | 41 | 40 | 40 | 42 | 36 | 42 | 37 | 39 | 49 | 40 | 46 | 56 | 46 | 61 | 65 | 68 | 82 | 93 |
| W01 | SHW preheat recovery | C406.2.3.1 a | 4 | 4 | 4 | 4 | 5 | 5 | 5 | 5 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 5 | 5 | 5 |
| W02 | Heat pump water heater | C406.2.3.1 b | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| W03 | Efficient gas water heater | C406.2.3.1 c | 2 | 2 | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| W04 | SHW pipe insulation | C406.2.3.2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| W05 | Point of use water heaters | C406.2.3.3 a | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| W06 | Thermostatic bal. valves | C406.2.3.3 b | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| W07 | SHW heat trace system | C406.2.3.3 c | 1 | 1 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 1 | 1 | 1 | 1 |
| W08 | SHW submeters | C406.2.3.4 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| W09 | SHW flow reduction | C406.2.3.5 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| W10 | Shower heat recovery | C406.2.3.6 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| P01 | Energy monitoring | C406.2.4 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| L01 | Lighting Performance | C406.2.5.1 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| L02 | Lighting dimming & tuning | C406.2.5.2 | 5 | 5 | 5 | 5 | 5 | 6 | 5 | 6 | 6 | 5 | 6 | 6 | 5 | 5 | 5 | 4 | 4 | 3 | 2 |
| L03 | Increase occp. sensor | C406.2.5.3 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 6 | 5 | 5 | 6 | 5 | 5 | 5 | 4 | 4 | 3 | 2 |
| L04 | Increase daylight area | C406.2.5.4 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 8 | 6 | 6 | 6 | 6 | 6 | 5 | 5 | 5 | 5 | 4 |
| L05 | Residential light control | C406.2.5.5 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| L06 | Light power reduction | C406.2.5.7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 9 | 7 | 7 | 8 | 6 | 7 | 7 | 5 | 5 | 4 | 3 |
| Q01 | Efficient elevator | C406.2.7.1 | 1 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 1 | 1 |
| Q02 | Commercial kitchen equip. | C406.2.7.2 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| Q03 | Residential kitchen equip. | C406.2.7.3 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| Q04 | Fault detection | C406.2.7.4 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 2 | 3 | 3 | 3 | 3 | 3 | 4 | 4 |

a.”x” indicates credit is not available for that measure

Table C406.2(3) Base Energy Credits for Group R-1 Occupancies a

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ID | Energy Credit  Measure | Section | Climate Zone | | | | | | | | | | | | | | | | | | |
|  | 0A | 0B | 1A | 1B | 2A | 2B | 3A | 3B | 3C | 4A | 4B | 4C | 5A | 5B | 5C | 6A | 6B | 7 | 8 |
| E01 | Envelope Performance | C406.2.1.1 | Determined in accordance with Section C406.2.1.1 | | | | | | | | | | | | | | | | | | |
| E02 | UA reduction (15%) | C406.2.1.2 | 8 | 12 | 7 | 12 | 6 | 8 | 6 | 7 | 13 | 8 | 5 | 3 | 9 | 7 | 3 | 13 | 12 | 18 | 26 |
| E03 | Envelope leakage reduction | C406.2.1.3 | 15 | 9 | 12 | 8 | 6 | 16 | 7 | 5 | 10 | 14 | 3 | 1 | 19 | 5 | 1 | 28 | 16 | 28 | 18 |
| E04 | Add Roof Insulation | C406.2.1.4 | 1 | 1 | 1 | 2 | 2 | 1 | 2 | 1 | 1 | 2 | 1 | 2 | 2 | 1 | 2 | 3 | 2 | 2 | 3 |
| E05 | Add Wall Insulation | C406.2.1.5 | 18 | 26 | 11 | 25 | 3 | 4 | 5 | 3 | 1 | 6 | 2 | 4 | 7 | 4 | 4 | 8 | 6 | 8 | 5 |
| E06 | Improve Fenestration | C406.2.1.6 | 2 | 2 | 1 | 2 | 2 | 3 | 5 | 3 | 1 | 6 | 3 | 4 | 9 | 7 | 6 | 13 | 8 | 6 | 6 |
| H01 | HVAC Performance | C406.2.2.1 | 21 | 20 | 17 | 18 | 16 | 13 | 12 | 12 | 11 | 11 | 11 | 8 | 11 | 11 | 8 | 13 | 11 | 14 | 16 |
| H02 | Heating efficiency | C406.2.2.2 | x | x | x | x | x | x | 1 | 1 | 6 | 2 | 1 | 1 | 3 | 2 | 2 | 6 | 4 | 8 | 11 |
| H03 | Cooling efficiency | C406.2.2.3 | 7 | 6 | 4 | 4 | 3 | 2 | 1 | 2 | 1 | 1 | 2 | 1 | 1 | 1 | 1 | x | x | x | x |
| H04 | Residential HVAC control | C406.2.2.4 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| H05 | DOAS/fan control | C406.2.2.5 | 32 | 30 | 26 | 28 | 25 | 23 | 24 | 22 | 28 | 26 | 22 | 20 | 30 | 26 | 19 | 41 | 34 | 48 | 62 |
| W01 | SHW preheat recovery | C406.2.3.1 a | 18 | 19 | 22 | 22 | 25 | 27 | 31 | 31 | 32 | 34 | 34 | 38 | 37 | 36 | 40 | 36 | 37 | 36 | 35 |
| W02 | Heat pump water heater | C406.2.3.1 b | 14 | 15 | 18 | 17 | 20 | 22 | 25 | 25 | 27 | 29 | 29 | 32 | 31 | 31 | 34 | 30 | 32 | 31 | 30 |
| W03 | Efficient gas water heater | C406.2.3.1 c | 11 | 12 | 14 | 14 | 16 | 17 | 19 | 19 | 20 | 21 | 21 | 24 | 23 | 23 | 25 | 22 | 23 | 23 | 22 |
| W04 | SHW pipe insulation | C406.2.3.2 | 3 | 3 | 4 | 3 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 3 |
| W05 | Point of use water heaters | C406.2.3.3 a | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| W06 | Thermostatic bal. valves | C406.2.3.3 b | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 1 | 1 |
| W07 | SHW heat trace system | C406.2.3.3 c | 5 | 6 | 6 | 6 | 6 | 7 | 7 | 7 | 7 | 7 | 7 | 8 | 7 | 7 | 8 | 7 | 7 | 6 | 6 |
| W08 | SHW submeters | C406.2.3.4 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| W09 | SHW flow reduction | C406.2.3.5 | 13 | 14 | 16 | 16 | 18 | 20 | 22 | 22 | 23 | 25 | 25 | 28 | 27 | 26 | 29 | 26 | 27 | 26 | 25 |
| W10 | Shower heat recovery | C406.2.3.6 | 4 | 5 | 5 | 5 | 6 | 7 | 8 | 8 | 8 | 9 | 9 | 10 | 10 | 9 | 10 | 9 | 10 | 10 | 9 |
| P01 | Energy monitoring | C406.2.4 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| L01 | Lighting Performance | C406.2.5.1 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| L02 | Lighting dimming & tuning | C406.2.5.2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| L03 | Increase occp. sensor | C406.2.5.3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 4 | 2 | 3 | 3 | 2 | 2 | 3 | 2 | 2 | 1 | 1 |
| L04 | Increase daylight area | C406.2.5.4 | 4 | 5 | 5 | 4 | 5 | 5 | 4 | 4 | 5 | 4 | 4 | 4 | 3 | 4 | 3 | 3 | 3 | 3 | 2 |
| L05 | Residential light control | C406.2.5.5 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| L06 | Light power reduction | C406.2.5.7 | 1 | 1 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 1 | 2 | 2 | 1 | 1 | 2 | 1 | 1 | 1 | 1 |
| Q01 | Efficient elevator | C406.2.7.1 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 2 | 2 |
| Q02 | Commercial kitchen equip. | C406.2.7.2 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| Q03 | Residential kitchen equip. | C406.2.7.3 | 9 | 9 | 10 | 10 | 10 | 11 | 11 | 11 | 11 | 11 | 11 | 12 | 11 | 11 | 12 | 10 | 11 | 10 | 9 |
| Q04 | Fault detection | C406.2.7.4 | 3 | 3 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 1 | 2 | 2 | 1 | 2 | 2 | 2 | 2 |

a “x” indicates credit is not available for that measure

**Table C406.2(4) Base Energy Credits for Group B Occupancies a**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ID | Energy Credit  Measure | Section | Climate Zone | | | | | | | | | | | | | | | | | | |
|  | 0A | 0B | 1A | 1B | 2A | 2B | 3A | 3B | 3C | 4A | 4B | 4C | 5A | 5B | 5C | 6A | 6B | 7 | 8 |
| E01 | Envelope Performance | C406.2.1.1 | Determined in accordance with Section C406.2.1.1 | | | | | | | | | | | | | | | | | | |
| E02 | UA reduction (15%) | C406.2.1.2 | 4 | 7 | 4 | 7 | 3 | 4 | 7 | 2 | 1 | 7 | 2 | 3 | 10 | 6 | 4 | 12 | 9 | 19 | 11 |
| E03 | Envelope leakage reduction | C406.2.1.3 | 5 | 3 | 4 | 2 | 2 | 2 | 5 | 1 | 1 | 8 | 1 | 2 | 13 | 4 | 1 | 18 | 9 | 18 | 7 |
| E04 | Add Roof Insulation | C406.2.1.4 | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 2 | 1 | 3 | 1 | 2 | 3 | 2 | 2 | 3 | 3 | 2 | 3 |
| E05 | Add Wall Insulation | C406.2.1.5 | 13 | 14 | 8 | 11 | 4 | 4 | 7 | 4 | 1 | 5 | 2 | 4 | 6 | 4 | 3 | 9 | 7 | 10 | 8 |
| E06 | Improve Fenestration | C406.2.1.6 | 5 | 5 | 4 | 5 | 7 | 7 | 8 | 2 | 1 | 8 | 2 | 4 | 10 | 5 | 1 | 21 | 17 | 10 | 9 |
| H01 | HVAC Performance | C406.2.2.1 | 22 | 22 | 19 | 20 | 17 | 17 | 15 | 15 | 11 | 15 | 15 | 11 | 16 | 15 | 11 | 19 | 17 | 18 | 20 |
| H02 | Heating efficiency | C406.2.2.2 | x | x | x | x | x | x | 1 | 1 | 1 | 3 | 2 | 2 | 5 | 4 | 3 | 9 | 7 | 8 | 12 |
| H03 | Cooling efficiency | C406.2.2.3 | 7 | 6 | 4 | 5 | 3 | 3 | 1 | 2 | 1 | 1 | 2 | 1 | 1 | 1 | 1 | x | x | x | x |
| H04 | Residential HVAC control | C406.2.2.4 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| H05 | DOAS/fan control | C406.2.2.5 | 31 | 31 | 27 | 29 | 25 | 25 | 28 | 26 | 18 | 35 | 28 | 28 | 47 | 38 | 29 | 64 | 53 | 58 | 74 |
| W01 | SHW preheat recovery | C406.2.3.1 a | 8 | 9 | 10 | 9 | 11 | 11 | 12 | 12 | 14 | 13 | 13 | 14 | 13 | 13 | 15 | 12 | 13 | 14 | 14 |
| W02 | Heat pump water heater | C406.2.3.1 b | 3 | 3 | 3 | 3 | 4 | 4 | 5 | 4 | 5 | 5 | 5 | 6 | 5 | 5 | 6 | 5 | 5 | 6 | 6 |
| W03 | Efficient gas water heater | C406.2.3.1 c | 5 | 5 | 6 | 6 | 7 | 7 | 8 | 7 | 8 | 8 | 8 | 9 | 8 | 8 | 9 | 8 | 8 | 9 | 8 |
| W04 | SHW pipe insulation | C406.2.3.2 | 3 | 3 | 4 | 4 | 4 | 4 | 4 | 4 | 5 | 4 | 4 | 5 | 4 | 4 | 5 | 4 | 4 | 4 | 4 |
| W05 | Point of use water heaters | C406.2.3.3 a | 12 | 15 | 17 | 16 | 18 | 18 | 19 | 19 | 22 | 20 | 20 | 22 | 20 | 20 | 22 | 18 | 19 | 20 | 19 |
| W06 | Thermostatic bal. valves | C406.2.3.3 b | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| W07 | SHW heat trace system | C406.2.3.3 c | 4 | 4 | 4 | 4 | 5 | 5 | 5 | 5 | 6 | 5 | 5 | 6 | 5 | 5 | 6 | 5 | 5 | 5 | 5 |
| W08 | SHW submeters | C406.2.3.4 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| W09 | SHW flow reduction | C406.2.3.5 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| W10 | Shower heat recovery | C406.2.3.6 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| P01 | Energy monitoring | C406.2.4 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| L01 | Lighting Performance | C406.2.5.1 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| L02 | Lighting dimming & tuning | C406.2.5.2 | 5 | 5 | 6 | 6 | 6 | 6 | 6 | 6 | 7 | 6 | 6 | 6 | 5 | 5 | 6 | 4 | 5 | 3 | 2 |
| L03 | Increase occp. sensor | C406.2.5.3 | 5 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 8 | 6 | 6 | 6 | 5 | 5 | 6 | 4 | 5 | 4 | 3 |
| L04 | Increase daylight area | C406.2.5.4 | 7 | 7 | 8 | 8 | 8 | 8 | 8 | 8 | 9 | 6 | 7 | 7 | 6 | 6 | 6 | 6 | 6 | 7 | 5 |
| L05 | Residential light control | C406.2.5.5 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| L06 | Light power reduction | C406.2.5.7 | 7 | 7 | 8 | 8 | 8 | 8 | 8 | 8 | 9 | 7 | 8 | 8 | 6 | 7 | 8 | 5 | 6 | 5 | 3 |
| Q01 | Efficient elevator | C406.2.7.1 | 4 | 4 | 4 | 4 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 4 | 5 | 4 | 4 |
| Q02 | Commercial kitchen equip. | C406.2.7.2 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| Q03 | Residential kitchen equip. | C406.2.7.3 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| Q04 | Fault detection | C406.2.7.4 | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 3 | 3 | 3 |

a**. “**x” indicates credit is not available for that measure building occupancy in that climate zone

Table C406.2(5) Base Energy Credits for Group A-2 Occupancies a

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ID | Energy Credit  Measure | Section | Climate Zone | | | | | | | | | | | | | | | | | | |
|  | 0A | 0B | 1A | 1B | 2A | 2B | 3A | 3B | 3C | 4A | 4B | 4C | 5A | 5B | 5C | 6A | 6B | 7 | 8 |
| E01 | Envelope Performance | C406.2.1.1 | Determined in accordance with Section C406.2.1.1 | | | | | | | | | | | | | | | | | | |
| E02 | UA reduction (15%) | C406.2.1.2 | 1 | 1 | 1 | 1 | 2 | 2 | 9 | 2 | 1 | 19 | 4 | 5 | 26 | 7 | 3 | 33 | 23 | 29 | 13 |
| E03 | Envelope leakage reduction | C406.2.1.3 | 2 | 1 | 1 | 1 | 2 | 3 | 11 | 2 | 1 | 24 | 4 | 6 | 33 | 9 | 3 | 42 | 29 | 36 | 16 |
| E04 | Add Roof Insulation | C406.2.1.4 | 1 | 1 | 0 | 1 | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 1 | 2 | 2 | 1 | 2 |
| E05 | Add Wall Insulation | C406.2.1.5 | 1 | 1 | 0 | 1 | 1 | 2 | 3 | 3 | 1 | 2 | 1 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| E06 | Improve Fenestration | C406.2.1.6 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 1 | 1 | 2 | 2 | 3 | 2 | 1 | 4 | 4 | 1 | 1 |
| H01 | HVAC Performance | C406.2.2.1 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| H02 | Heating efficiency | C406.2.2.2 | x | x | x | x | 1 | 1 | 6 | 3 | 3 | 10 | 6 | 8 | 15 | 11 | 10 | 19 | 15 | 23 | 28 |
| H03 | Cooling efficiency | C406.2.2.3 | 6 | 5 | 3 | 4 | 3 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | x | x | x | x |
| H04 | Residential HVAC control | C406.2.2.4 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| H05 | DOAS/fan control | C406.2.2.5 | 29 | 27 | 20 | 25 | 24 | 21 | 36 | 27 | 15 | 51 | 35 | 38 | 67 | 53 | 45 | 84 | 70 | 97 | 115 |
| W01 | SHW preheat recovery | C406.2.3.1 a | 24 | 26 | 31 | 29 | 33 | 35 | 37 | 38 | 45 | 38 | 41 | 44 | 37 | 40 | 44 | 34 | 38 | 33 | 30 |
| W02 | Heat pump water heater | C406.2.3.1 b | 15 | 16 | 19 | 18 | 21 | 23 | 25 | 25 | 29 | 26 | 28 | 30 | 26 | 28 | 31 | 25 | 27 | 24 | 22 |
| W03 | Efficient gas water heater | C406.2.3.1 c | 15 | 16 | 19 | 18 | 21 | 22 | 23 | 24 | 28 | 24 | 25 | 27 | 23 | 25 | 27 | 21 | 24 | 21 | 18 |
| W04 | SHW pipe insulation | C406.2.3.2 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 2 | 2 | 2 | 2 |
| W05 | Point of use water heaters | C406.2.3.3 a | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| W06 | Thermostatic bal. valves | C406.2.3.3 b | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| W07 | SHW heat trace system | C406.2.3.3 c | 3 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 3 | 4 | 4 | 3 | 3 | 3 | 3 |
| W08 | SHW submeters | C406.2.3.4 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| W09 | SHW flow reduction | C406.2.3.5 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| W10 | Shower heat recovery | C406.2.3.6 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| P01 | Energy monitoring | C406.2.4 | 2 | 2 | 2 | 2 | 2 | 1 | 2 | 1 | 1 | 2 | 1 | 1 | 2 | 2 | 1 | 2 | 2 | 2 | 3 |
| L01 | Lighting Performance | C406.2.5.1 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| L02 | Lighting dimming & tuning | C406.2.5.2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 1 | 2 | 1 | 1 | 1 | 1 | 0 |
| L03 | Increase occp. sensor | C406.2.5.3 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 |
| L04 | Increase daylight area | C406.2.5.4 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 1 | 2 | 1 | 1 | 1 | 1 | 1 |
| L05 | Residential light control | C406.2.5.5 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| L06 | Light power reduction | C406.2.5.7 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 1 | 2 | 1 | 1 |
| Q01 | Efficient elevator | C406.2.7.1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Q02 | Commercial kitchen equip. | C406.2.7.2 | 24 | 26 | 28 | 27 | 28 | 29 | 27 | 29 | 32 | 26 | 28 | 29 | 24 | 26 | 28 | 21 | 23 | 19 | 17 |
| Q03 | Residential kitchen equip. | C406.2.7.3 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| Q04 | Fault detection | C406.2.7.4 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 1 | 2 | 2 | 1 | 2 | 2 | 2 | 3 | 2 | 3 | 4 |

a “x” indicates credit is not available for that measure

Table C406.2(6) Base Energy Credits for Group M Occupancies a

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ID | Energy Credit  Measure | Section | Climate Zone | | | | | | | | | | | | | | | | | | |  |
|  |  |  | 0A | 0B | 1A | 1B | 2A | 2B | 3A | 3B | 3C | 4A | 4B | 4C | 5A | 5B | 5C | 6A | 6B | 7 | 8 |
| E01 | Envelope Performance | C406.2.1.1 | Determined in accordance with Section C406.2.1.1 | | | | | | | | | | | | | | | | | | |
| E02 | UA reduction (15%) | C406.2.1.2 | 2 | 2 | 2 | 2 | 2 | 3 | 15 | 2 | 1 | 36 | 5 | 9 | 45 | 11 | 5 | 51 | 36 | 35 | 15 |
| E03 | Envelope leakage reduction | C406.2.1.3 | 3 | 3 | 2 | 2 | 3 | 3 | 19 | 3 | 1 | 44 | 6 | 11 | 56 | 13 | 6 | 64 | 44 | 43 | 19 |
| E04 | Add Roof Insulation | C406.2.1.4 | 8 | 6 | 5 | 7 | 7 | 7 | 18 | 16 | 4 | 19 | 18 | 20 | 21 | 22 | 23 | 24 | 26 | 24 | 30 |
| E05 | Add Wall Insulation | C406.2.1.5 | 64 | 65 | 48 | 62 | 13 | 15 | 23 | 18 | 4 | 27 | 21 | 27 | 25 | 24 | 25 | 23 | 24 | 24 | 16 |
| E06 | Improve Fenestration | C406.2.1.6 | 4 | 3 | 3 | 3 | 4 | 4 | 6 | 5 | 2 | 7 | 5 | 7 | 7 | 5 | 7 | 10 | 10 | 3 | 3 |
| H01 | HVAC Performance | C406.2.2.1 | 31 | 30 | 26 | 28 | 23 | 21 | 23 | 20 | 14 | 27 | 21 | 22 | 29 | 25 | 23 | 32 | 28 | 30 | 33 |
| H02 | Heating efficiency | C406.2.2.2 | x | x | x | x | x | x | 10 | 3 | 1 | 19 | 8 | 15 | 26 | 17 | 18 | 29 | 24 | 27 | 31 |
| H03 | Cooling efficiency | C406.2.2.3 | 10 | 9 | 7 | 7 | 5 | 4 | 2 | 2 | 1 | 1 | 2 | 1 | 1 | 1 | 1 | x | x | x | x |
| H04 | Residential HVAC control | C406.2.2.4 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| H05 | DOAS/fan control | C406.2.2.5 | 48 | 48 | 42 | 47 | 40 | 38 | 66 | 46 | 31 | 98 | 61 | 82 | 120 | 91 | 90 | 134 | 115 | 125 | 141 |
| W01 | SHW preheat recovery | C406.2.3.1 a | 12 | 13 | 16 | 15 | 18 | 20 | 19 | 21 | 26 | 17 | 21 | 21 | 16 | 19 | 21 | 13 | 16 | 15 | 13 |
| W02 | Heat pump water heater | C406.2.3.1 b | 3 | 3 | 4 | 3 | 4 | 5 | 5 | 5 | 7 | 5 | 6 | 6 | 4 | 5 | 6 | 4 | 4 | 4 | 4 |
| W03 | Efficient gas water heater | C406.2.3.1 c | 6 | 7 | 8 | 8 | 10 | 10 | 10 | 11 | 14 | 9 | 11 | 11 | 8 | 10 | 11 | 7 | 8 | 8 | 7 |
| W04 | SHW pipe insulation | C406.2.3.2 | 3 | 3 | 4 | 4 | 4 | 4 | 4 | 4 | 5 | 4 | 4 | 5 | 4 | 4 | 5 | 4 | 4 | 4 | 4 |
| W05 | Point of use water heaters | C406.2.3.3 a | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| W06 | Thermostatic bal. valves | C406.2.3.3 b | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| W07 | SHW heat trace system | C406.2.3.3 c | 4 | 4 | 4 | 4 | 5 | 5 | 5 | 5 | 6 | 5 | 5 | 6 | 5 | 5 | 6 | 5 | 5 | 5 | 5 |
| W08 | SHW submeters | C406.2.3.4 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| W09 | SHW flow reduction | C406.2.3.5 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| W10 | Shower heat recovery | C406.2.3.6 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| P01 | Energy monitoring | C406.2.4 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| L01 | Lighting Performance | C406.2.5.1 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| L02 | Lighting dimming & tuning | C406.2.5.2 | 9 | 9 | 11 | 10 | 12 | 13 | 11 | 13 | 15 | 9 | 12 | 11 | 7 | 9 | 10 | 5 | 7 | 5 | 3 |
| L03 | Increase occp. sensor | C406.2.5.3 | 9 | 9 | 11 | 10 | 12 | 13 | 12 | 13 | 15 | 10 | 12 | 11 | 7 | 10 | 11 | 6 | 8 | 5 | 4 |
| L04 | Increase daylight area | C406.2.5.4 | 12 | 13 | 15 | 14 | 16 | 17 | 15 | 16 | 20 | 11 | 14 | 13 | 9 | 12 | 11 | 8 | 10 | 10 | 8 |
| L05 | Residential light control | C406.2.5.5 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| L06 | Light power reduction | C406.2.5.7 | 12 | 12 | 14 | 14 | 15 | 16 | 12 | 15 | 19 | 8 | 12 | 9 | 6 | 10 | 7 | 6 | 7 | 6 | 5 |
| Q01 | Efficient elevator | C406.2.7.1 | 3 | 3 | 4 | 3 | 4 | 4 | 4 | 4 | 5 | 3 | 4 | 4 | 3 | 4 | 4 | 3 | 3 | 3 | 2 |
| Q02 | Commercial kitchen equip. | C406.2.7.2 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| Q03 | Residential kitchen equip. | C406.2.7.3 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| Q04 | Fault detection | C406.2.7.4 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 1 | 2 | 2 | 1 | 2 | 2 | 2 | 3 | 2 | 3 | 4 |

1. “x” indicates credit is not available for that measure

Table C406.2(7) Base Energy Credits for Group E Occupancies a

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ID | Energy Credit  Measure | Section | Climate Zone | | | | | | | | | | | | | | | | | | |
|  | 0A | 0B | 1A | 1B | 2A | 2B | 3A | 3B | 3C | 4A | 4B | 4C | 5A | 5B | 5C | 6A | 6B | 7 | 8 |
| E01 | Envelope Performance | C406.2.1.1 | Determined in accordance with Section C406.2.1.1 | | | | | | | | | | | | | | | | | | |
| E02 | UA reduction (15%) | C406.2.1.2 | 9 | 22 | 8 | 20 | 9 | 12 | 5 | 11 | 3 | 4 | 9 | 2 | 3 | 6 | 0 | 4 | 3 | 4 | 3 |
| E03 | Envelope leakage reduction | C406.2.1.3 | 4 | 3 | 3 | 3 | 2 | 5 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 1 | 1 |
| E04 | Add Roof Insulation | C406.2.1.4 | 8 | 8 | 4 | 9 | 5 | 7 | 16 | 7 | 1 | 14 | 7 | 10 | 18 | 13 | 13 | 23 | 25 | 22 | 28 |
| E05 | Add Wall Insulation | C406.2.1.5 | 5 | 7 | 4 | 8 | 3 | 6 | 8 | 6 | 2 | 6 | 3 | 6 | 5 | 5 | 6 | 7 | 6 | 7 | 8 |
| E06 | Improve Fenestration | C406.2.1.6 | 8 | 10 | 6 | 9 | 11 | 11 | 15 | 9 | 1 | 16 | 8 | 15 | 22 | 18 | 19 | 33 | 29 | 19 | 18 |
| H01 | HVAC Performance | C406.2.2.1 | 30 | 28 | 25 | 26 | 23 | 21 | 20 | 18 | 15 | 19 | 18 | 17 | 19 | 20 | 15 | 23 | 20 | 25 | 29 |
| H02 | Heating efficiency | C406.2.2.2 | x | x | x | x | x | x | 4 | 3 | 3 | 5 | 5 | 10 | 9 | 11 | 6 | 15 | 11 | 18 | 26 |
| H03 | Cooling efficiency | C406.2.2.3 | 9 | 8 | 6 | 7 | 5 | 4 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | x | x | x | x |
| H04 | Residential HVAC control | C406.2.2.4 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| H05 | DOAS/fan control | C406.2.2.5 | 45 | 42 | 37 | 41 | 36 | 34 | 41 | 39 | 30 | 43 | 46 | 58 | 57 | 65 | 40 | 79 | 63 | 88 | 117 |
| W01 | SHW preheat recovery | C406.2.3.1 a | 7 | 7 | 9 | 8 | 10 | 11 | 13 | 13 | 15 | 14 | 15 | 15 | 15 | 14 | 17 | 13 | 15 | 14 | 12 |
| W02 | Heat pump water heater | C406.2.3.1 b | 4 | 4 | 6 | 5 | 7 | 7 | 9 | 9 | 10 | 10 | 10 | 11 | 11 | 10 | 12 | 10 | 11 | 10 | 9 |
| W03 | Efficient gas water heater | C406.2.3.1 c | 4 | 4 | 6 | 5 | 6 | 7 | 8 | 8 | 9 | 9 | 9 | 10 | 9 | 9 | 11 | 8 | 10 | 9 | 7 |
| W04 | SHW pipe insulation | C406.2.3.2 | 3 | 3 | 4 | 4 | 4 | 4 | 4 | 5 | 6 | 5 | 5 | 6 | 5 | 5 | 7 | 4 | 5 | 4 | 4 |
| W05 | Point of use water heaters | C406.2.3.3 a | 3 | 4 | 4 | 4 | 4 | 5 | 5 | 5 | 6 | 5 | 5 | 5 | 5 | 5 | 6 | 4 | 5 | 4 | 3 |
| W06 | Thermostatic bal. valves | C406.2.3.3 b | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 1 | 2 | 1 | 1 |
| W07 | SHW heat trace system | C406.2.3.3 c | 4 | 4 | 4 | 4 | 5 | 5 | 5 | 6 | 7 | 6 | 6 | 7 | 6 | 6 | 8 | 5 | 7 | 5 | 5 |
| W08 | SHW submeters | C406.2.3.4 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| W09 | SHW flow reduction | C406.2.3.5 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| W10 | Shower heat recovery | C406.2.3.6 | 2 | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 4 | 3 | 3 | 4 | 3 | 3 | 4 | 3 | 3 | 3 | 3 |
| P01 | Energy monitoring | C406.2.4 | 4 | 4 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 4 |
| L01 | Lighting Performance | C406.2.5.1 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| L02 | Lighting dimming & tuning | C406.2.5.2 | 5 | 5 | 5 | 6 | 6 | 6 | 5 | 6 | 7 | 6 | 6 | 6 | 5 | 5 | 6 | 4 | 4 | 3 | 2 |
| L03 | Increase occp. sensor | C406.2.5.3 | 4 | 4 | 5 | 5 | 5 | 6 | 6 | 6 | 7 | 6 | 6 | 5 | 4 | 4 | 5 | 3 | 4 | 3 | 2 |
| L04 | Increase daylight area | C406.2.5.4 | 6 | 6 | 7 | 7 | 7 | 7 | 7 | 7 | 8 | 6 | 6 | 6 | 5 | 5 | 6 | 5 | 5 | 5 | 4 |
| L05 | Residential light control | C406.2.5.5 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| L06 | Light power reduction | C406.2.5.7 | 6 | 7 | 7 | 7 | 8 | 8 | 8 | 8 | 10 | 7 | 8 | 7 | 6 | 7 | 8 | 5 | 6 | 4 | 2 |
| Q01 | Efficient elevator | C406.2.7.1 | 3 | 4 | 4 | 4 | 4 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 4 | 5 | 4 | 3 |
| Q02 | Commercial kitchen equip. | C406.2.7.2 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| Q03 | Residential kitchen equip. | C406.2.7.3 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| Q04 | Fault detection | C406.2.7.4 | 4 | 4 | 4 | 4 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 3 | 3 | 2 | 4 | 3 | 4 | 4 |

a. “x” indicates credit is not available for that measure

Table C406.2(8) Base Energy Credits for Group S-1 and S-2 Occupancies a

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ID | Energy Credit  Measure | Section | Climate Zone | | | | | | | | | | | | | | | | | | |
|  | 0A | 0B | 1A | 1B | 2A | 2B | 3A | 3B | 3C | 4A | 4B | 4C | 5A | 5B | 5C | 6A | 6B | 7 | 8 |
| E01 | Envelope Performance | C406.2.1.1 | Determined in accordance with Section C406.2.1.1 | | | | | | | | | | | | | | | | | | |
| E02 | UA reduction (15%) | C406.2.1.2 | 1 | 2 | 1 | 1 | 1 | 2 | 25 | 2 | 1 | 62 | 11 | 14 | 74 | 21 | 6 | 75 | 57 | 56 | 21 |
| E03 | Envelope leakage reduction | C406.2.1.3 | 2 | 2 | 1 | 2 | 1 | 3 | 31 | 3 | 1 | 77 | 14 | 17 | 92 | 25 | 8 | 95 | 71 | 69 | 26 |
| E04 | Add Roof Insulation | C406.2.1.4 | 13 | 12 | 10 | 11 | 10 | 11 | 18 | 17 | 7 | 14 | 19 | 18 | 14 | 20 | 22 | 10 | 14 | 12 | 19 |
| E05 | Add Wall Insulation | C406.2.1.5 | 19 | 23 | 13 | 21 | 7 | 10 | 15 | 12 | 3 | 10 | 12 | 13 | 9 | 12 | 12 | 7 | 9 | 9 | 8 |
| E06 | Improve Fenestration | C406.2.1.6 | 7 | 5 | 8 | 7 | 6 | 6 | 2 | 4 | 2 | 4 | 1 | 6 | 5 | 1 | 7 | 3 | 4 | 4 | 7 |
| H01 | HVAC Performance | C406.2.2.1 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| H02 | Heating efficiency | C406.2.2.2 | x | x | x | x | x | x | 16 | 3 | 1 | 33 | 17 | 22 | 41 | 31 | 21 | 44 | 38 | 43 | 43 |
| H03 | Cooling efficiency | C406.2.2.3 | 7 | 7 | 4 | 5 | 3 | 3 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | x | x | x | x |
| H04 | Residential HVAC control | C406.2.2.4 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| H05 | DOAS/fan control | C406.2.2.5 | 35 | 37 | 26 | 33 | 24 | 27 | 77 | 35 | 14 | 141 | 83 | 96 | 168 | 132 | 90 | 180 | 157 | 177 | 178 |
| W01 | SHW preheat recovery | C406.2.3.1 a | 8 | 7 | 9 | 8 | 10 | 10 | 8 | 10 | 12 | 5 | 8 | 8 | 4 | 6 | 9 | 3 | 4 | 3 | 3 |
| W02 | Heat pump water heater | C406.2.3.1 b | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 1 | 2 | 2 | 1 | 2 | 2 | 1 | 1 | 1 | 1 |
| W03 | Efficient gas water heater | C406.2.3.1 c | 4 | 4 | 5 | 4 | 5 | 5 | 4 | 5 | 6 | 3 | 4 | 4 | 2 | 3 | 5 | 2 | 2 | 2 | 2 |
| W04 | SHW pipe insulation | C406.2.3.2 | 3 | 3 | 4 | 3 | 3 | 3 | 2 | 3 | 4 | 2 | 2 | 3 | 1 | 2 | 3 | 1 | 1 | 1 | 1 |
| W05 | Point of use water heaters | C406.2.3.3 a | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| W06 | Thermostatic bal. valves | C406.2.3.3 b | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| W07 | SHW heat trace system | C406.2.3.3 c | 4 | 4 | 4 | 3 | 4 | 4 | 3 | 4 | 5 | 2 | 3 | 3 | 2 | 2 | 4 | 2 | 2 | 2 | 2 |
| W08 | SHW submeters | C406.2.3.4 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| W09 | SHW flow reduction | C406.2.3.5 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| W10 | Shower heat recovery | C406.2.3.6 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| P01 | Energy monitoring | C406.2.4 | 5 | 5 | 6 | 6 | 6 | 6 | 5 | 6 | 6 | 5 | 5 | 5 | 5 | 5 | 6 | 5 | 5 | 5 | 5 |
| L01 | Lighting Performance | C406.2.5.1 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| L02 | Lighting dimming & tuning | C406.2.5.2 | 10 | 10 | 12 | 11 | 12 | 14 | 9 | 12 | 14 | 6 | 9 | 9 | 3 | 6 | 9 | 3 | 5 | 3 | 2 |
| L03 | Increase occp. sensor | C406.2.5.3 | 12 | 12 | 14 | 13 | 15 | 14 | 12 | 14 | 17 | 7 | 11 | 11 | 5 | 7 | 11 | 4 | 6 | 3 | 3 |
| L04 | Increase daylight area | C406.2.5.4 | 15 | 14 | 18 | 16 | 18 | 17 | 13 | 16 | 21 | 7 | 12 | 11 | 5 | 8 | 10 | 4 | 6 | 6 | 5 |
| L05 | Residential light control | C406.2.5.5 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| L06 | Light power reduction | C406.2.5.7 | 14 | 14 | 17 | 16 | 17 | 17 | 13 | 17 | 19 | 8 | 13 | 12 | 5 | 8 | 12 | 4 | 6 | 4 | 2 |
| Q01 | Efficient elevator | C406.2.7.1 | 15 | 14 | 18 | 16 | 18 | 18 | 15 | 18 | 21 | 9 | 14 | 14 | 7 | 10 | 14 | 5 | 7 | 5 | 5 |
| Q02 | Commercial kitchen equip. | C406.2.7.2 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| Q03 | Residential kitchen equip. | C406.2.7.3 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| Q04 | Fault detection | C406.2.7.4 | 3 | 3 | 2 | 3 | 2 | 2 | 3 | 2 | 1 | 5 | 3 | 3 | 5 | 4 | 3 | 6 | 5 | 6 | 6 |

a. “x” indicates measure credit is not available for that measure building occupancy in that climate zone

Table C406.2(9) Base Energy Credits for Other Occupancies a, b

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ID | Energy Credit  Measure | Section | Climate Zone | | | | | | | | | | | | | | | | | | |
|  | 0A | 0B | 1A | 1B | 2A | 2B | 3A | 3B | 3C | 4A | 4B | 4C | 5A | 5B | 5C | 6A | 6B | 7 | 8 |
| E01 | Envelope Performance | C406.2.1.1 | Determined in accordance with Section C406.2.1.1 | | | | | | | | | | | | | | | | | | |
| E02 | UA reduction (15%) | C406.2.1.2 | 5 | 9 | 5 | 8 | 5 | 6 | 10 | 5 | 2 | 20 | 6 | 6 | 25 | 10 | 4 | 28 | 22 | 26 | 16 |
| E03 | Envelope leakage reduction | C406.2.1.3 | 6 | 4 | 5 | 4 | 3 | 7 | 12 | 3 | 2 | 28 | 5 | 6 | 36 | 9 | 3 | 41 | 27 | 33 | 15 |
| E04 | Add Roof Insulation | C406.2.1.4 | 4 | 4 | 3 | 4 | 4 | 4 | 8 | 6 | 2 | 7 | 6 | 7 | 9 | 8 | 9 | 9 | 10 | 9 | 12 |
| E05 | Add Wall Insulation | C406.2.1.5 | 16 | 19 | 11 | 17 | 5 | 6 | 10 | 7 | 2 | 9 | 6 | 8 | 9 | 7 | 7 | 9 | 9 | 10 | 8 |
| E06 | Improve Fenestration | C406.2.1.6 | 4 | 4 | 3 | 4 | 5 | 6 | 6 | 4 | 1 | 9 | 4 | 7 | 11 | 7 | 6 | 16 | 14 | 8 | 8 |
| H01 | HVAC Performance | C406.2.2.1 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| H02 | Heating efficiency | C406.2.2.2 | x | x | x | x | x | x | 6 | 2 | 3 | 11 | 6 | 8 | 15 | 11 | 9 | 18 | 15 | 19 | 23 |
| H03 | Cooling efficiency | C406.2.2.3 | 7 | 7 | 5 | 5 | 4 | 3 | 1 | 2 | 1 | x | x | x | x | x | x | x | x | x | x |
| H04 | Residential HVAC control | C406.2.2.4 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| H05 | DOAS/fan control | C406.2.2.5 | 37 | 36 | 31 | 34 | 30 | 28 | 43 | 32 | 23 | 61 | 42 | 49 | 75 | 61 | 49 | 90 | 77 | 93 | 90 |
| W01 | SHW preheat recovery | C406.2.3.1 a | 18 | 19 | 22 | 21 | 25 | 26 | 28 | 29 | 34 | 29 | 31 | 34 | 29 | 31 | 35 | 26 | 29 | 27 | 26 |
| W02 | Heat pump water heater | C406.2.3.1 b | 12 | 12 | 15 | 14 | 17 | 17 | 20 | 20 | 24 | 21 | 22 | 25 | 21 | 23 | 26 | 20 | 22 | 21 | 20 |
| W03 | Efficient gas water heater | C406.2.3.1 c | 11 | 11 | 13 | 13 | 15 | 16 | 17 | 17 | 21 | 18 | 19 | 21 | 18 | 19 | 22 | 16 | 18 | 17 | 16 |
| W04 | SHW pipe insulation | C406.2.3.2 | 3 | 3 | 4 | 4 | 4 | 4 | 4 | 4 | 5 | 4 | 4 | 5 | 4 | 4 | 5 | 3 | 4 | 3 | 3 |
| W05 | Point of use water heaters | C406.2.3.3 a | 8 | 10 | 11 | 10 | 11 | 12 | 12 | 12 | 14 | 13 | 13 | 14 | 13 | 13 | 14 | 11 | 12 | 12 | 11 |
| W06 | Thermostatic bal. valves | C406.2.3.3 b | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 1 | 2 | 1 | 1 | 2 | 1 | 1 | 1 | 1 |
| W07 | SHW heat trace system | C406.2.3.3 c | 5 | 5 | 5 | 5 | 6 | 6 | 6 | 6 | 7 | 6 | 6 | 7 | 5 | 6 | 7 | 5 | 5 | 5 | 5 |
| W08 | SHW submeters | C406.2.3.4 | 11 | 11 | 13 | 13 | 15 | 16 | 18 | 18 | 22 | 19 | 20 | 22 | 19 | 20 | 24 | 17 | 20 | 18 | 18 |
| W09 | SHW flow reduction | C406.2.3.5 | 29 | 30 | 36 | 35 | 41 | 43 | 48 | 48 | 56 | 50 | 53 | 59 | 51 | 54 | 62 | 47 | 52 | 49 | 48 |
| W10 | Shower heat recovery | C406.2.3.6 | 6 | 6 | 7 | 7 | 8 | 9 | 10 | 10 | 11 | 10 | 11 | 12 | 10 | 11 | 12 | 10 | 11 | 10 | 10 |
| P01 | Energy monitoring | C406.2.4 | 4 | 4 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 4 |
| L01 | Lighting Performance | C406.2.5.1 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| L02 | Lighting dimming & tuning | C406.2.5.2 | 5 | 5 | 5 | 5 | 6 | 6 | 5 | 6 | 7 | 5 | 5 | 5 | 4 | 4 | 5 | 3 | 4 | 3 | 2 |
| L03 | Increase occp. sensor | C406.2.5.3 | 5 | 6 | 6 | 6 | 7 | 7 | 6 | 7 | 8 | 5 | 6 | 6 | 4 | 5 | 6 | 3 | 4 | 3 | 2 |
| L04 | Increase daylight area | C406.2.5.4 | 7 | 8 | 9 | 8 | 9 | 9 | 8 | 8 | 10 | 6 | 7 | 7 | 5 | 6 | 6 | 4 | 5 | 5 | 4 |
| L05 | Residential light control | C406.2.5.5 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| L06 | Light power reduction | C406.2.5.7 | 7 | 7 | 8 | 7 | 8 | 8 | 7 | 8 | 9 | 5 | 7 | 6 | 4 | 5 | 6 | 4 | 4 | 3 | 2 |
| Q01 | Efficient elevator | C406.2.7.1 | 4 | 4 | 5 | 4 | 5 | 5 | 5 | 5 | 6 | 4 | 5 | 5 | 4 | 4 | 5 | 3 | 4 | 3 | 3 |
| Q02 | Commercial kitchen equip. | C406.2.7.2 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| Q03 | Residential kitchen equip. | C406.2.7.3 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| Q04 | Fault detection | C406.2.7.4 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 2 | 2 | 3 | 3 | 2 | 3 | 3 | 2 | 4 | 3 | 4 | 4 |

a. “x” indicates credit is not available for that measure

b. Other occupancy groups include all Groups except for Groups A-2, B, E, I, M, and R.

# C406.2.1 More Efficient Building Envelope.

A project shall achieve credits for improved envelope performance by complying with of one of the following measures:

1. Section C406.2.1.1: E01
2. Section C406.2.1.2: E02
3. Section C406.2.1.3: E03
4. Both EO2 and E03
5. Any combination of

5.1 Section C406.2.1.3: E03

5.2 Section C406.2.1.4: E04

5.3 Section C406.2.1.5: E05

5.4 Section C406.2.1.6: E06

## C406.2.1.1 EO1 Improved envelope performance 90.1 Appendix C.

*Building* envelope measures shall be installed to improve the energy performance of the project. The achieved energy credits shall be determined using Equation 4-13.

ECenv = 1000 X (EPFB - EPFP)/EPFB (Equation 4-13)

where:

ECENV = E01 energy credits

EPFB= base envelope performance factor calculated in accordance with ASHRAE 90.1Appendix C.

EPFP = proposed envelope performance factor calculated in accordance with ASHRAE 90.1~~-~~Appendix C.

## C406.2.1.2 E02 Total UA envelope reduction.

Energy credits shall be achieved where the total UA of the *building* *thermal envelope* as designed is not less than 15 percent below the total UA of the *building* thermal envelope in accordance with Section C402.1.5.

## C406.2.1.3 E03 Reduced air leakage.

*[Special note to consensus committee and language coordination staff: The language below replaces and is coordinated with changes to Section C406 voted AM by the Envelope committee for proposals CEPI-58 and CEPI-71. The stringency level is the same, although this section allows a gradation of credits rather than just one level of results.]*

Energy credits shall be achieved where tested *building* air leakageis not less than 10 percent less than the maximum leakage permitted by Section C402.5.2 provided the *building* is tested in accordance with the applicable method in Section C402.5.2. Energy credits achieved for measure E03 shall be determined as follows:

ECE03 = ECB x ECadj  (Equation 4-14)

where:

ECE03 = energy efficiency credits achieved for envelope leakage reduction

ECB = C406.2.1.3 credits from Tables C406.2(1) through C406.2(9)

ECadj = Ls / ECa

Ls = Leakage savings fraction: the lessor of [(Lr – Lm) / Lr] or 0.8

Lr = maximum leakage permitted for tested *buildings,* by occupancy group, in accordance with Section C402.5.2

Lm = Measured leakage in accordance with Section C402.5.2.1 or C402.5.2.2

ECa = Energy Credit alignment factor:

0.37 for whole *building* tests in accordance with Section C402.5.2.1 or

0.25 for dwelling and sleeping unit enclosure tests in accordance with Section C402.5.2.2

## C406.2.1.4 E04 Add Roof Insulation.

Energy credits shall be achieved for insulation that is in addition to the required insulation in Table C402.1.3.

All roof areas in the project shall have additional R-10 continuous insulation included in the roof assembly. For attics this is permitted to be achieved with fill or batt insulation rated at R-10 that is continuous and not interrupted by ceiling or roof joists. Where interrupted by joists, the added insulation shall be not less than R-13. Alternatively, one-half of the base credits shall be achieved where the added R-value is one-half of the additional R-value required by this section.

## C406.2.1.5 E05 Added Wall Insulation.

Energy credits shall be achieved for insulation applied to not less than 90 percent of all opaque wall area in the project that is in addition to the required insulation in Table C402.1.3.

Opaque walls shall have additional R-5 continuous insulation included in the wall assembly. Alternatively, one-half of the base credits shall be achieved where the added R-value is R-2.5.

## C406.2.1.6 E06 Improve fenestration

Energy credits for one selected fenestration energy credit ID shall be achieved for improved energy characteristics of all vertical fenestration in the project meeting the requirements in one of the rows of Table C406.2.1.6. The area-weighted average U-factor and SHGC of all vertical fenestration shall be equal to or less than the value shown in the selected table row. The area-weighted average visible transmittance (VT) of all vertical fenestration shall be equal to or greater than the value shown in the selected table row.

Table C406.2.1.6 Vertical Fenestration Requirements for Energy Credit E06

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Applicable Climate Zones | Maximum U-Factor | | Maximum SHGC | Minimum VT |
| Fixed | Operable |
| 0-2 | 0.45 | 0.52 | 0.21 | 0.28 |
| 3 | 0.33 | 0.44 | 0.23 | 0.30 |
| 4-5 | 0.31 | 0.38 | 0.34 | 0.41 |
| 6-7 | 0.26 | 0.32 | 0.38 | 0.44 |
| 8 | 0.24 | 0.28 | 0.38 | 0.44 |

# C406.2.2 More Efficient HVAC Equipment Performance.

All heating and cooling systems shall meet the minimum requirements of Section C403 and efficiency improvements shall be referenced to minimum efficiencies listed in Tables referenced by Section C403.3.2. Where multiple efficiency requirements are listed, equipment shall meet the seasonal or part-load efficiencies including SEER, EER/integrated energy efficiency ratio (IEER), integrated part load value (IPLV), or AFUE. Equipment that is larger than the maximum capacity range indicated in Tables referenced by Section C403.3.2 shall utilize the values listed for the largest capacity equipment for the associated equipment type shown in the table. Where multiple individual heating or cooling systems serve the project, the improvement shall be the weighted average improvement based on individual system capacity.

Systems are permitted to achieve HVAC energy credits by meeting the requirements of either:

1. C406.2.2.1 H01
2. C406.2.2.2 H02
3. C406.2.2.3 H03
4. C406.2.2.4 H04
5. C406.2.2.5 H05
6. Any combination of H02, H03, H04 and H05
7. The combination of H01 and H04

*[Special note to consensus committee and staff language coordination: The H01 modifications adapt TSPR, passed AM in CEPI-76 to align with revision of energy credits in CEPI-193. The updates include tabular values for H01 that have been adjusted to the new credit values. They match the intent of C406 provisions in CEPI-76 and supersede the C406 language in CEPI-76]*

## C406.2.2.1 H01 HVAC Performance (TSPR).

H01 energy credits shall be achieved for systems allowed to use Section C403.1.3, HVAC total system performance ratio, where the proposed TSPR exceeds the minimum TSPR requirement by 5 percent. If improvement is greater, base energy credits from Table C406.2(1) through C406.2(9) are permitted to be prorated up to a 20 percent improvement using Equation 4-15. Energy credits for H01 may not be combined with energy credits from HVAC measures H02, H03 and H05.

H01 energy credit = H01 base energy credit x TSPRs / 0.05 (Equation 4-15)

where:

TSPRs = the lessor of 0.20 and ( 1 – ( TSPRp / TSPRt ))

where:

TSPRt = TSPRr / MPF

TSPRp = HVAC TSPR of the proposed design calculated in accordance with Sections C409.4, C409.5 and C409.6.

TSPRr = HVAC TSPR of the reference building design calculated in accordance with Sections C409.4, C409.5 and C409.6.

MPF = Mechanical Performance Factor from Table C409.4 based on climate zone and building use type

Where a *building* has multiple building use types, MPF shall be area weighted in accordance with Section C409.4

## C406.2.2.2 H02 More efficient HVAC equipment heating performance.

No less than 90 percent of the total HVAC capacity serving the total *conditioned floor area* of the entire *building*, or tenant space in accordance with Section C406.1.1, shall comply with the requirements of this Section.

1. Equipment installed shall be types that are listed in Tables referenced by Section C403.3.2. Electric resistance heating capacity shall be limited to 20 percent of system capacity, with the exception of heat pump supplemental heating.
2. Equipment shall exceed the minimum heating efficiency requirements listed in Tables referenced by Section C403.3.2 by at least 5 percent. Where equipment exceeds the minimum annual heating efficiency requirements by more than 5 percent, energy efficiency credits for heating shall be determined using Equation 4-16 rounded to the nearest whole number.

EECHEH = EECH5 x (HEI / 0.05) (Equation 4-16)

where:

EECHEH = energy efficiency credits for heating efficiency improvement

EECH5 = C406.2.2.2 credits from Tables C406.2(1) through C406.2(9)

HEI = the lesser of: the improvement (as a fraction) above minimum heating efficiency requirements, or 20 percent(0.20). Where heating equipment with different minimum efficiencies are included in the *building*, a heating capacity weighted average improvement shall be used. Where electric resistance primary heating or reheat is included in the *building* it shall be included in the weighted average improvement with an HEI of 0. Supplemental gas and electric heat for heat pump systems shall be excluded from the weighted HEI. For heat pumps rated at multiple ambient temperatures, the efficiency at 47°F (8.3°C) shall be used.

For metrics that increase as efficiency increases, HEI shall be calculated as follows:

Where:

HMDES = Design heating efficiency metric, part-load or annualized where available

HMMIN = Minimum required heating efficiency metric, part-load or annualized where available from Section C403.3.2

Exception: In low energy spaces complying with Section C402.1.1, where no less than 90 percent of the installed heating capacity is provided by electric infrared or gas-fired radiant heating equipment for localized heating applications. Such spaces shall only achieve energy credits for EEC5.

## C406.2.2.3 H03 More efficient HVAC cooling equipment and fan performance.

No less than 90 percent of the total HVAC cooling capacity serving the total *conditioned floor area* of the entire *building* or tenant space in accordance with Section C406.1.1, shall comply with all of the requirements of this section.

1. Equipment installed shall be types that are listed in Tables referenced by Section C403.3.2.
2. Equipment shall exceed the minimum cooling efficiency requirements listed in Tables referenced by Section C403.3.2 by at least 5 percent. For water-cooled chiller plants, heat rejection equipment *efficiency* shall also be increased by at least the chiller efficiency improvement. Where equipment exceeds the minimum annual cooling efficiency and heat rejection efficiency requirements by more than 5 percent, energy efficiency credits for cooling shall be determined using Equation 4-17, rounded to the nearest whole number.
3. Where fan energy is not included in packaged equipment rating or it is and the fan size has been increased from the as-rated equipment condition, fan power or horsepower shall be less than 95 percent of the allowed fan power in Section C403.8.1.

EECHEC = EEC5 x (CEI / 0.05) (Equation 4-17)

where:

EECHEC = energy efficiency credits for cooling efficiency improvement

EEC5 = C406.2.2.3 base energy credits from Tables C406.2(1) through C406.2(9)

CEI = the lesser of: the improvement above minimum cooling and heat rejection efficiency requirementsexpressed as a fraction, or 0.20 (20 percent**)**. Where cooling equipment with different minimum efficiencies are included in the *building*, a cooling capacity weighted average improvement shall be used. Where multiple cooling performance requirements are provided, the *equipment* shall exceed the annualized energy or part-load requirement. Meeting both part-load and full-load efficiencies is not required.

For metrics that increase as efficiency increases, CEI shall be calculated as follows:

For metrics that decrease as efficiency increases, CEI shall be calculated as follows:

Where:

CMDES = Design cooling efficiency metric, part-load or annualized where available

CMMIN = Minimum required cooling efficiency metric, part-load or annualized where available from Section C403.3.2

For Data Centers using Standard 90.4, CEI shall be calculated as follows:

Where:

AMLCDES = As-Designed Annualized Mechanical Load Component calculated in accordance with Standard 90.4, Section 6.5

AMLCMAX = Maximum Annualized Mechanical Load Component from Standard 90.4, Table 6.5

## C406.2.2.4 H04 Residential HVAC control.

HVAC systems serving *dwelling units* or *sleeping units* shall be controlled to automatically activate a setback at least 5°F (3°C) for both heating and cooling. The temperature controller shall be configured to provide setback during occupied sleep periods. The unoccupied setback mode shall be configured to operate in conjunction with one of the following:

1. A manual main control device by each *dwelling unit* main entrance that initiates setback and non-ventilation mode for all HVAC units in the dwelling unit and is clearly identified as “Heating/Cooling Master Setback.”
2. Occupancy sensors in each room of the *dwelling unit* combined with a door switch to initiate setback and non-ventilation mode for all HVAC units in the dwelling within 20 minutes of all spaces being vacant immediately after a door switch operation. Where separate room HVAC units are used, an individual occupancy sensor on each unit that is configured to provide setback shall meet this requirement.
3. An advanced learning thermostat or controller that recognizes occupant presence and automatically creates a schedule for occupancy and provides a dynamic setback schedule based on when the spaces are generally unoccupied.
4. An automated control and sensing system that uses geographic fencing connected to the dwelling unit occupants’ cell phones and initiates the setback condition when all occupants are away from the *building*.

## C406.2.2.5 H05 Dedicated Outdoor Air System.

Credits for this measure are only allowed where single zone HVAC units are not required to have multi-speed or variable-speed fan control in accordance with Section C403.8.6.1. HVAC controls and *ventilation* systems shall include all of the following:

1. Zone controls shall cycle the heating/cooling unit fans off when not providing required heating and cooling or shall limit fan power to 0.12 watts/cfm of zone outdoor air.
2. Outdoor air shall be supplied by an independent ventilation system designed to provide no more than 110 percent of the minimum outdoor air to each individual occupied zone, as specified by the *International Mechanical Code.*
3. The ventilation system shall have energy recovery with an *enthalpy recovery ratio* of 65 percent or more at heating design conditions in climate zones 3 through 8 and an enthalpy recovery ratio of 65 percent or more at cooling design conditions in climate zones 0, 1, 2, 3A, 3B, 4A, 4B, 5A, and 6A. In “A” climate zones, energy recovery shall include latent recovery. Where no humidification is provided, heating energy recovery effectiveness is permitted to be based on *sensible energy recovery ratio*. Where energy recovery effectiveness is less than the 65 percent required for full credit, adjust the credits from Section C406.2 by the factors in Table C406.2.2.5.
4. Where the ventilation system serves multiple zones and the system is not in a latent recovery outside air dehumidification mode. partial economizer cooling through an outdoor air bypass or wheel speed control shall automatically do one of the following:
   1. Set the energy recovery leaving-air temperature 55°F (13°C) or 100 percent outdoor air bypass when a majority of zones require cooling and outdoor air temperature is below 70°F (21°C).
   2. The HVAC ventilation system shall include supply-air temperature controls that automatically reset the supply-air temperature in response to representative *building* loads, or to outdoor air temperatures. The controls shall reset the supply-air temperature not less than 25 percent of the difference between the design supply-air temperature and the design room-air temperature.
5. Ventilation systems providing mechanical dehumidification shall use recovered energy for reheat within the limits of item 4. This shall not limit the use of latent energy recovery for dehumidification.

Where only a portion of the *building* is permitted to be served by constant air volume units or the *enthalpy recovery ratio* or *sensible energy recovery ratio* is less than 65 percent, the base energy credits shown in Section C406.2 shall be prorated as follows:

(Equation 4-18)

where:

ECDOAS  = Energy credits achievedfor H06

ECbase  = H06 base energy credits in Section C406.2

FloorCAV = Fraction of whole project *gross conditioned floor area* not required to have variable speed or multi-speed fan airflow control in accordance with Section C403.8.6.

EREadj = The energy recovery adjustment from Table C406.2.2.5 based on the lower of actual cooling or heating *enthalpy recovery ratio* or *sensible energy recovery ratio* where required for the climate zone. Where recovery ratios vary, use a weighted average by supply airflow.

**Table C406.2.2.5 – DOAS Energy Recovery Adjustments**

|  |  |  |
| --- | --- | --- |
| EREadj based on lower of actual heating or cooling  energy recovery effectiveness where required | | |
| Cooling ERR  is ≥ | Heating *enthalpy recovery ratio* or *sensible energy recovery ratio* is ≥ | Energy Recovery Effectiveness Adjustment  (EREadj) |
| 65% | 65% | 1.00 |
| 60% | 60% | 0.67 |
| 55% | 55% a | 0.33 |
| 50% | 50% a | 0.25 |

aIn climate zones where heating recovery is required for this measure, for dwelling units a heating recovery effectiveness below 60 percent is not allowed.

# C406.2.3 Reduced Energy Use In-service Water Heating.

Projects with service water-heating equipment that serves the whole *building*, a *building* addition or a tenant space shall achieve credits through compliance with the requirements of this section. Systems are permitted to achieve energy credits by meeting the requirements of either:

1. C406.2.3.1 by selecting one allowed measure W01, W02 or W03
2. C406.2.3.2 W04
3. C406.2.3.3 by selecting one allowed measure of W05, W06, or W07
4. C406.2.3.4 W08
5. C406.2.3.5 W09
6. C406.2.3.6 W10
7. Any combination of measures in C402.2.3.1 through C402.2.3.6 as long no more than one allowed measure from C406.2.3.1 and C406.2.3.3 are selected.

## C406.2.3.1 Service water-heating system efficiency.

A project is allowed to achieve energy credits from only one of Sections C406.2.3.1.1 through C406.2.3.1.4.

C406.2.3.1.1 W01 Recovered or renewable water heating. The *building* service water-heating system shall have one or more of the following that are sized to provide not less than 30 percent of the *building’s* annual hot water requirements, or sized to provide not less than 70 percent of the *building’s* annual hot water requirements if the *building* is required to comply with Section C403.10.5:

1. Waste heat recovery from SHW, heat recovery chillers, *building* equipment, or process equipment.
2. A water-to-water heat pump that precools chilled water return for *building* cooling.
3. On-site renewable energy water-heating systems.

C406.2.3.1.2 W02 Heat pump water heater. Air-source heat pump *water heater*s shall be installed according to manufacturer’s instructions and at least 30 percent of design end use service water heating requirements shall be met using only heat pump heating at an ambient condition of 67.5°F, db without supplemental electric resistance or fossil fuel heating. For a heat pump water heater with supplemental electric resistance heating, the heat pump only capacity shall be deemed at 40 percent of first hour draw. Where the heat pump only capacity exceeds 50 percent of the design end use load excluding *recirculating* system losses, the credits from the Section C406.2 tables shall be prorated as follows:

(Equation 4-19)

where:

ECHPWH  = Energy credits achievedfor W02

ECbase  = W02 base energy credits Section 13.5.3

EndLoad = End use peak hot water load, excluding load for heat trace or recirculation, Btu/hr or kW

CapHPWH  = the heat pump only capacity at 50°F (10°C) entering air and 70°F (21°C) entering potable water without supplemental electric resistance or fossil fuel heat, Btu/hr or kW

The heat pump service water heating system shall comply with the following requirements:

1. For systemswith an installed total output capacity of more than 100,000 Btu/hr (30 kW) at an ambient condition of 67.5°F (19.7°C), db a preheat storage tank with greater than or equal 0.75 gallons per 1000 Btu/hr (≥9.7 L/kW) of design end use *service water heating* requirements shall be heated only with heat pump heating when the ambient temperature is greater than 45°F (7.2°C)
2. For systems with piping temperature maintenance, either a heat trace system or a separate *water heater* in series for recirculating systemand final heating shall be installed.
3. Heat pump *water heater* efficiency shall meet or exceed one of the following:
   1. Output-capacity-weighted-average UEF of 3.0 in accordance with 10 CFR 430 Appendix E.
   2. Output-capacity-weighted-average COP of not less than 4.0 tested at 50°F (10°C) entering air and 70°F (21°C) entering potable water in accordance with AHRI standard 1300.

Where the heat pump capacity at 50°F (10°C) entering air and 70°F (21°C) entering water exceeds 50 percent of the design end-use load excluding recirculating systemlosses, the base credits from Section C406.2 shall be prorated based on Equation 4-20.

W02 credit = base W02 table credit × (HPLF / 50%) (Equation 4-20)

where:

HPLF = Heat pump capacity as a fraction of the design end-use SHW requirements excluding recirculating system losses, not to exceed 80 percent.

C406.2.3.1.3 W03 Efficient fossil fuel water heater. The combined input-capacity-weighted-average equipment rating of all gas water-heating equipment in the *building* shall be not less than 95 percent Et or 0.93 UEF. This measure shall receive only thirty percent of the listed energy credits for *buildings* required to comply with C404.2.1. Projects where the installed *building* service water heating capacity is less than 200,000 Btu/hr (59 kW) and weighted UEF is not less than 0.82 shall achieve 25 percent of the base table W03 credit.

**C406.2.3.1.4** **Combination service water heating systems** shall achieve credits using one of the measure combinations as follows:

1. (W01 + W02) Where service water heating employs both energy recovery and heat pump water heating, W01 may be combined with W02 and receive the sum of both credits.

2. (W01 + W03) Where service water heating employs both energy recovery and efficient gas water heating, W01 may be combined with W03 and receive the sum of the W01 credit and the portion of the W03 credit based on item 4.

3. (W02 + W03) Where service water heating employs both heat pump water heating and efficient gas water heating, W02 may be combined with W03 and receive the sum of the W02 credit and the portion of the W03 credit based on item 4.

For items 2 and 3, the achieved W03 credit shall be the Section C406.2.3.1.3 W03 credit multiplied by the fractional share of total water heating installed capacity served by gas water heating that is not less than 95 percent Et or 0.93 UEF. In no case shall the achieved W03 credit exceed 60 percent of the W03 credit in Section C406.2 tables. In *Buildings* that have a service water heating design generating capacity greater than 900,000 Btu/h that proportioned W03 credit shall be further multiplied by 30 percent.

## C406.2.3.3 Water-heating distribution temperature maintenance.

A project is allowed to achieve energy credits from only one of the following SHW distribution temperature maintenance measures.

## W04: Service Hot Water Piping Insulation Increase. Where service hot water is provided by a central water heating system, the hot water pipe insulation thickness shall be at least 1.5 times the thickness required in Section C404.4. All service hot water piping shall be insulated from the hot water source to the fixture shutoff. Where no more than 50% of hot water piping does not have increased insulation due to installation in partitions, the credit shall be prorated as a percentage of lineal feet of piping with increased insulation.

W05 Point of use water heaters. Credits are available for Group B or E buildings larger than 10,000 ft2 (930 m2). Fixtures requiring hot water shall be supplied from a localized source of hot water with no recirculating system or heat trace piping. Supply piping from the water heater to the termination of the fixture supply pipe shall be insulated to the levels shown in Table C403.12.3 without exception. The volume from the water heater to the termination of the fixture supply pipe shall be limited as follows:

1. Non-residential lavatories: not more than 2 oz (60 mL)
2. All other plumbing fixtures or appliances: not more than 0.25 gallons (0.95 L)

Exception: Where all remotely located hot water uses meet the requirements for measure W05, separate water heaters serving commercial kitchens or showers in locker rooms shall be permitted to have a local recirculating system or heat trace piping.

W06 Thermostatic balancing valves. Credits are available where service water heating is provided centrally and distributed throughout the *building* and has a recirculating system. Each recirculating system branch return connection to the main SHW supply piping shall have an automatic thermostatic balancing valve set to a minimal return water flow when the branch return temperature is greater than 120°F (49°C).

W07 Heat trace system. Credits are available for projects with gross floor area greater than 10,000 square feet (930 m2) and a central water-heating system. The energy credits achieved shall be from Tables C406.2(1) through C406.2(9). This system shall include self-regulating electric heat cables, connection kits, and electronic controls. The cable shall be installed directly on the hot water supply pipes underneath the insulation to replace standby losses.

## C406.2.3.4 W08 Water-heating system submeters.

Each individual *dwelling unit* in a Group R-2 occupancy served by a central service water-heating system shall be provided with a service hot water meter connected to a reporting system that provides individual *dwelling unit* reporting of actual domestic hot water use. Preheated water serving the cold water inlet to showers need not be metered.

## C406.2.3.5 W09 Service hot water flow reduction.

Dwelling unit, sleeping unit, and guest room plumbing fixtures that are connected to the service water-heating system shall have a flow or consumption rating less than or equal to the values shown in Table C406.2.3.5.

Table C406.2.3.5

Maximum Flow Rating for Residential Plumbing Fixtures with Heated Water

|  |  |
| --- | --- |
| Plumbing Fixture | Maximum Flow Rate |
| Faucet for private lavatory,a hand sinks, or bar sinks | 1.50 gpm at 60 psi (0.095 L/s at 410 kPa) |
| Faucet for residential kitchen sink a,b, c | 1.8 gpm at 60 psi 0.11 L/s at 410 kPa) |
| Shower head (including hand-held shower spray) a, b, d | 2.0 gpm at 80 psi (0.13 L/s at 550 kPa) |

* 1. Showerheads, lavatory faucets and kitchen faucets are subject to U.S. Federal requirements listed in 10 CFR 430.32(o)- (p).
  2. Maximum flow allowed is less than required by flow rates listed in U.S. 10 CFR 430.32(o)-(p) for showerheads and kitchen faucets.
  3. Residential kitchen faucet may temporarily increase the flow above the maximum rate, but not above 2.2 gallons per minute at 60 psi (0.14 L/s at 410 kPa) and must default to the maximum flow rate listed.
  4. When a shower is served by multiple shower heads, the combined flow rate of all shower heads controlled by a single valve shall not exceed the maximum flow rate listed or the shower shall be designed to allow only one shower head to operate at a time.

## C406.2.3.6 W10 Shower drain heat recovery.

Cold water serving *building* showers shall be preheated by shower drain heat recovery units that comply with Section C404.7. The efficiency of drain heat recovery units shall be 54 percent or greater measured in accordance with CSA B55.1. Full credits are applicable to the following *building* uses: I-2, I-4, R-1, R-2 and also group E where there are more than eight showers. Partial credits are applicable to *buildings* where all but ground floor showers are served where the base energy credit from Section C406.2 is adjusted by Equation 4-21.

(Equation 4-21)

## C406.2.4 P01 Energy Monitoring.

A project not required to comply with C405.12 can achieve energy credits for installing an energy monitoring system that complies with all the requirements of C405.12.1 through C405.12.5.

# C406.2.5 Energy Savings in Lighting Systems.

Projects are permitted to achieve energy credits for increased lighting system performance by meeting the requirements of either:

1. C406.2.5.2 L02

2. C406.2.5.3 L03

3. C406.2.5.4 L04

4. C406.2.5.5 L05

5. C406.2.5.6 L06

1. Any combination of L03, L04, L05 and L06
2. Any combination of L02, L03 and L04

Where lighting energy credit measures include reductions in lighting power, the lighting shall achieve ANSI/IES recommended practice for minimum illuminance levels as referenced at “The Interactive Illuminance Selector,” which includes minimum recommended illuminance levels from various ANSI/IES RP-## standards.

## C406.2.5.1 L01 Lighting system performance (reserved).

*Reserved for future use*

## C406.2.5.2 L02 Enhanced digital lighting controls.

Measure credits shall be achieved where no less than 50 percent of the gross floor area within the project shall comply with the requirements of this section.

1. Lighting controls function. Interior general lighting shall be located, scheduled and operated in accordance with Section C405.2 and shall be configured with the following enhanced control functions:
   1. Luminaires shall be configured for continuous dimming.
   2. Each luminaire shall be individually addressed.

Exceptions:

1. Multiple luminaires mounted on no more than 12 linear feet of a single lighting track and addressed as a single luminaire.
2. Multiple linear luminaires that are ganged together to create the appearance of a single longer fixture and addressed as a single luminaire, where the total length of the combined luminaires is not more than 12 feet.
   1. No more than eight luminaires within a *daylight zone* are permitted to be controlled by a single *daylight responsive control*.
3. Luminaires shall be controlled by a digital control system configured with the following capabilities:
   1. Scheduling and illumination levels of individual luminaires and groups of luminaires are capable of being reconfigured through the system.
   2. Load shedding.
   3. Occupancy sensors and daylight responsive controls are capable of being reconfigured through the system.
4. Construction documents shall include submittal of a Sequence of Operations, including a specification outlining each of the functions required by this section.
5. High-end trim. Luminaires shall be initially configured with the following:
   1. High-end trim, setting the maximum light output of individual luminaires or groups of luminaires to support visual needs of a space or area, shall be implemented and construction documents shall state that maximum light output or power of controlled lighting shall be initially reduced by at least 15 percent from full output. The average maximum light output or power of the controlled lighting shall be documented without high-end trim and with high-end trim to verify reduction of light output or power by at least 15 percent when tuned.
   2. Where lumen maintenance control is used, controls shall be configured to limit the initial maximum lumen output or maximum lighting power to 85 percent or less of full light output or full power draw and lumen maintenance controls shall be limited to increasing lighting power by 1 percent per year.
   3. High-end trim and lumen maintenance controls shall be accessible only to authorized personnel.

Where *general lighting* in more than 50 percent of the *gross lighted floor area* receives *high-end trim*, the base credits from Section C406.2 shall be prorated as follows:

*[Tuned lighted floor area,%] × [Base energy credits for C406.2.5.2] / 50%*  (Equation 4-22)

## C406.2.5.3 L03 Increase occupancy sensor.

Lighting controls shall comply with C406.2.5.3.1, C406.2.5.3.2 and C406.2.5.3.3.

**C406.2.5.3.1 Occupant Sensor Controls.** *Occupant sensor controls* shall be installed to control lights in the following space types:

1. Courtroom
2. Electrical / mechanical room
3. Food preparation area
4. Laboratory
5. Elevator lobby
6. Pharmacy Area
7. Vehicular Maintenance Area
8. Workshop
9. Chapel in a facility for the visually impaired
10. Recreation room in a facility for the visually impaired
11. Exercise area in a fitness center
12. Playing area in a fitness center
13. Exam / treatment room in a healthcare facility
14. Imaging room in a healthcare facility
15. Physical therapy room in a healthcare facility
16. Library reading area
17. Library stacks
18. Detailed manufacturing area
19. Equipment room in a manufacturing facility
20. Low-bay area in a manufacturing facility
21. Post office sorting area
22. Religious fellowship hall
23. Religious worship / pulpit / choir area
24. Hair salon
25. Nail salon

*Note to staff coordinating proposal text: If the following areas are added to C405.2.1 with another proposal, they can be deleted here.*

1. Banking activity area
2. Computer room, data center
3. Laundry / washing area
4. Medical supply room in a healthcare facility
5. Telemedicine room in a healthcare facility
6. Museum restoration room

### C406.2.5.3.2 Occupant Sensor Control Function.

*Occupant sensor controls* shall automatically turn lights off within 10 minutes after all occupants have left the space. A manual control complying with C405.2.6 shall allow occupants to turn off lights. *Time-switch controls* are not required.

***Exception:*** In spaces where an automatic shutoff could endanger occupant safety or security *occupant sensor controls* shall uniformly reduce lighting power to not more than 20 percent of full power within 10 minutes after all occupants have left the space. *Time-switch controls* complying with C405.2.2.1 shall automatically turn lights off.

### C406.2.5.3.3 Occupant Sensor Time Function.

*Occupant sensor controls* installed in accordance with Sections C405.2.1.1, C405.2.1.2, C405.2.1.3, and C405.2.1.4 shall automatically turn lights off or reduce lighting power within 10 minutes after all occupants have left the space. Where lighting power is reduced, the unoccupied setpoint shall be 20 percent of full power or in egress areas to the power level required to meet egress light levels.

## C406.2.5.4 L04 Increase daylight area.

The total daylight area of the project (DLABLDG) with continuous daylight dimming meeting the requirements of C405.2.4 shall be at least 5 percent greater than the typical daylit area (DLATYP).

Credits for measure L04 shall be determined based on Equation 4-23:

ECDL = ECDL5 x 20 x[(DLABLDG/GLFA) - DLATYP] (Equation 4-23)

where:

ECDL = C406.2.5.4 L04 measure base energy credits

DLABLDG = The lesser of actual area of *daylight zones* in the *building* with continuous daylight dimming, ft2 or m2 and (GLFA x DLAmax ) see Table C406.2.5.4. *Daylight zones* shall meet the criteria in Sections C405.2.4.2 and C405.2.4.3 for primary sidelit *daylight zones*, secondary sidelit *daylight zones*, and toplit *daylight zones*.

GLFA = Project gross lighted floor area, ft2 or m2

DLATYP = Typical percentage of *building* area with daylight control (as a fraction) from Table C406.2.5.4:

ECDL5 = C406.2.5.4 L04 base energy credits from Section C406.2

TABLE C406.2.5.4

ADDED DAYLIGHTING PARAMETERS

|  |  |  |
| --- | --- | --- |
| Buildinguse type | DLATYP | DLAmax |
| Group B; Office ≤ 5000 ft2 (460 m2) | 10% | 20% |
| Group B; Office > 5000 ft2 (460 m2) | 21% | 31% |
| Group M; Retail with ≤ 1000 ft2 (900 m2) *roof* area | 0% | 20% |
| Group M; Retail with > 1000 ft2 (900 m2) *roof* area | 60% | 80% |
| Group E; Education | 42% | 52% |
| Groups S-1 and S-2; Warehouse | 50% | 70% |
| Group I-2, R, and other; Medical, hotel, multifamily, dormitory, and other | NA | NA |

## C406.2.5.5 L05 Residential light control.

In *buildings* with Group R-2 occupancy spaces, interior lighting systems shall comply with the following:

1. Common area Restrooms, laundry rooms, storage rooms, and utility rooms shall have automatic full OFF occupancy sensor controls that comply with the requirements of C405.2.1.1. Each additional control device shall control no more than 5,000 sq.ft.
2. Each *dwelling unit* shall have a main control by the main entrance that turns off all the lights and all switched receptacles in the *dwelling unit*. Two switched receptacles shall be provided in living and sleeping rooms or areas and clearly identified. All switched receptacles shall be located within 12 inches (30 cm) of an unswitched receptacle. The main control shall be permitted to have two controls, one for permanently wired lighting and one for switched receptacles. The main controls should be clearly identified as “lights master off” and “switched outlets master off.”

## C406.2.5.6 L06 Reduced lighting power.

Interior lighting within the whole building shall comply with all the requirements of this section.The net connected interior lighting power (LPn) shall be 95 percent or less than the net interior lighting power allowance (LPAn) determined in accordance with Section C405.3.2.2. In R-1 and R-2 occupancies the credit is calculated for all common areas other than dwelling units and sleeping units. No less than 95 percent of the permanently installed light fixtures in *dwelling units* and *sleeping units,* excluding kitchen appliance lighting, shall be provided by high efficacy lamps with a minimum efficacy of 90 lumens per watt or high efficacy luminaires that have a minimum efficacy of 55 lumens per watt. Energy credits shall not be greater than four times the L06 base credit from Section C406.2 and shall be determined using Equation 4-24:

ECLPA = EC5 x 20 x (LPAn - LPn)/LPAn (Equation 4-24)

where:

ECLPA = additional energy credit for lighting power reduction

LPn = net connected interior lighting power calculated in accordance with SectionC405.3.1, watts, excluding any additional lighting power allowed in Section C405.3.2.2.1

LPAn = interior lighting power allowance calculated in accordance with the requirements of Section C405.3.2.2, watts, less any additional interior lighting power allowed in Section C405.3.2.2.1

EC5 = L06 base credit from Section C406.2

# C406.2.7 Efficient Equipment Credits.

Projects are permitted to achieve energy credits using any combination of Efficient Equipment Credits Q01 through Q04.

## C406.2.7.1 Q01 Efficient Elevator Equipment.

Qualifying elevators in the *building* shall be Energy efficiency class A per ISO 25745-2, Table 7. Only *buildings* 3 or more floors above grade are permitted to use this credit. Credits shall be prorated based on Equation 4-25, rounded to the nearest whole credit. Projects with a compliance ratio below 0.5 do not qualify for this credit.

ECe = ECt x CRe (Equation 4-25)

where:

ECe = Elevator energy credit achieved for the *building*

ECt = C406.2.7.1 Table energy credit

CR*e* = Compliance Ratio = (FA / FB)

FA = Sum of floors served by class A elevators

FB = Sum of floors served by all *building* elevators and escalators

## C406.2.7.2 Q02 Efficient Commercial Kitchen Equipment.

For *buildings* and spaces designated as Group A-2, or facilities whose primary business type involves the use of a commercial kitchen where at least one gas or electric fryer is installed before the issuance of the Certificate of Occupancy all fryers, dishwashers, steam cookers and ovens installed before the issuance of the Certificate of Occupancy shall comply with all of the following:

1. Achieve performance levels in accordance with the equipment specifications listed in Tables C406.2.7.2 (1) through C406.2.7.2 (4) when rated in accordance with the applicable test procedure.
2. Have associated performance levels listed on the construction documents submitted for permitting.

Table C406.2.7.2(1)

Minimum Efficiency Requirements: Commercial Fryers

|  |  |  |  |
| --- | --- | --- | --- |
|  | Heavy-Load Cooking Energy Efficiency | Idle Energy Rate | Test Procedure |
| Standard Open Deep-Fat Gas Fryers | ≥ 50% | ≤ 9,000 Btu/hr  (≤ 2,600 watts) | ASTM F1361 |
| Standard Open Deep-Fat Electric Fryers | ≥ 83% | ≤ 800 watts |
| Large Vat Open Deep-Fat Gas Fryers | ≥ 50% | ≤ 12,000 Btu/hr  (≤ 3,500 watts) | ASTM F2144 |
| Large Vat Open Deep-Fat Electric Fryers | ≥ 80% | ≤ 1,100 watts |

Table C406.2.7.2(2)

Minimum Efficiency Requirements: Commercial Steam Cookers

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Fuel Type | Pan Capacity | Cooking Energy Efficiencya | Idle Energy Rate | Test Procedure |
| Electric Steam | 3-pan | 50% | 400 W | ASTM F1484 |
| 4-pan | 50% | 530 W |
| 5-pan | 50% | 670 W |
| 6-pan and larger | 50% | 800 W |
| Gas Steam | 3-pan | 38% | 6,250 Btu/h  1.83 kW |
| 4-pan | 38% | 8,350 Btu/h  2.45 kW |
| 5-pan | 38% | 10,400 Btu/h  3.05 kW |
| 6-pan and larger | 38% | 12,500 Btu/h  3.66 kW |

TABLE C406.2.7.2(3)

MINIMUM EFFICIENCY REQUIREMENTS: COMMERCIAL DISHWASHERS

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Machine Type** | **High Temperature Efficiency Requirements** | | | **Low Temperature Efficiency Requirements** | | | **Test Procedure** |
| **Idle Energy Ratea** | **Washing Energy** | **Water Consumptionb** | **Idle Energy Ratea** | **Washing Energy** | **Water Consumptionb** |
| Under Counter | ≤ 0.30 kW | ≤ 0.35 kWh/rack | ≤ 0.86 GPR  (≤ 3.3 LPR) | ≤ 0.25 kW | ≤ 0.15 kWh/rack | ≤ 1.19 GPR  ≤ 4.5 LPR |  |
| Stationary Single Tank Door | ≤ 0.55 kW | ≤ 0.35 kWh/rack | ≤ 0.89 GPR  (≤ 3.4 LPR) | ≤ 0.30 kW | ≤ 0.15 kWh/rack | ≤ 1.18 GPR  ≤ 4.47 LPR |  |
| Pot, Pan, and Utensil | ≤ 0.90 kW | kWh/rack ≤ 0.55 + 0.05 × SFrackc  (≤ 0.55 + 0.0046 × SMrackc) | ≤ 0.58 GPSF  (≤ 2.2 LPSM) | N/A | N/A | N/A | ASTM F1696 |
| Single Tank Conveyor | ≤ 1.20 kW | ≤ 0.36 kWh/rack | ≤ 0.70 GPR  (≤ 2.6 LPR\_ | ≤ 0.85 kW | ≤ 0.16 kWh/rack | ≤ 0.79 GPR  ≤ 3.0 LPR |
| Multiple Tank Conveyor | ≤ 1.85 kW | ≤ 0.36 kWh/rack | ≤ 0.54 GPR  (≤ 2.0 LPR) | ≤ 1.00 kW | ≤ 0.22 kWh/rack | ≤ 0.54 GPR  ≤ 2.0 LPR | ASTM F1920 |
| Single Tank Flight Type | Reported | Reported | GPH ≤ 2.975c + 55.0  (LPH ≤ 0.276d + 208) | N/A | N/A | N/A |  |
| Multiple Tank Flight Type | Reported | Reported | GPH ≤ 4.96c + 17.00  (LPH ≤ 0.461d + 787) | N/A |  | N/A |  |

* 1. Idle results should be measured with the door closed and represent the total idle energy consumed by the machine including all tank heaters and controls. The most energy consumptive configuration in the product family shall be selected to test the idle energy rate. Booster heater (internal or external) energy consumption shall be measured and reported separately, if possible, per ASTM F1696 and ASTM F1920 Sections 10.8 and 10.9, respectively. However, if booster energy cannot be measured separately it will be included in the idle energy rate measurements.
  2. GPR = gallons per rack, LPR = Liters per rack, GPSF = gallons per square foot of rack, LPSM = liters per square fmeter of rack, GPH = gallons per hour, c = [maximum conveyor belt speed (feet/minute)] × [conveyor belt width (feet)], LPH = liters per hour, d = [maximum conveyor belt speed (m/minute)] × [conveyor belt width (m)]
  3. PPU Washing Energy is still in format kWh/rack when evaluated; SFrack (SMrack) is Square Feet of rack area (square meters of rack area), same as in PPU water consumption metric.

Table C406.2.7.2(4)

Minimum Efficiency Requirements: Commercial Ovens

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Fuel Type** | **Classification** | **Idle Rate** | **Cooking Energy Efficiency, %** | **Test Procedure** |
| Convection Ovens | | | | |
| Gas | Full-Size | ≤ 12,000 Btu/h (3.5 kW) | ≥ 46 | ASTM F1496 |
| Electric | Half-Size | ≤ 1.0 kW | ≥ 71 |
| Full-Size | ≤ 1.60 kW |
| Combination Ovens | | | | |
| Gas | Steam Mode | ≤ 200 *P*a + 6,511 Btu/h  (≤ 0.059 *P*a + 1.9 kW) | ≥ 41 | ASTM F2861 |
| Convection Mode | ≤ 150 *P*a + 5,425 Btu/h  (≤ 0.044 *P*a + 1.6 kW) | ≥ 56 |
| Electric | Steam Mode | ≤ 0.133 *P*a + 0.6400 kW | ≥ 55 |
| Convection Mode | ≤ 0.080 *P*a + 0.4989 kW | ≥ 76 |
| Rack Ovens | | | | |
| Gas | Single | ≤ 25,000 Btu/h (7.3 kW) | ≥ 48 | ASTM F2093 |
| Double | ≤ 30,000 Btu/h (8.8 kW) | ≥ 52 |

*aP* = Pan Capacity: the number of steam table pans the combination oven is able to accommodate in accordance with ASTM F1495

## C406.2.7.3 Q03 Efficient Residential Kitchen Equipment.

For projects with Group R-1 and R-2 occupancies, energy credits shall be achieved where all dishwashers, refrigerators, and freezers comply with all of the following:

1. Achieve the Energy Star Most Efficient 2021 label in accordance with the specifications current as of:
   1. Refrigerators and freezers 5.0, 9/15/2014
   2. 1.2 Dishwashers 6.0, 1/29/2016
2. Be installed before the issuance of the certificate of occupancy.

For Group R-1 where only some guest rooms are equipped with both refrigerators and dishwashers, the table credits shall be prorated as follows:

(Equation 4-26)

## C406.2.7.4 Q04 Fault detection and diagnostics system.

A project not required to comply with C403.2.3 can achieve energy credits for installing a fault detection and diagnostics system to monitor the HVAC system's performance and automatically identify faults. The installed system shall comply with items 1 through 6 in Section C403.2.3.

# C406.3 Renewable and Load Management Credits Achieved.

Renewable energy and load management measures installed in the *building* that comply with Sections C406.3.1 through C406.3.8 shall achieve the credits listed for the occupancy group in Tables C406.3(1) through C406.3(9) or where calculations are required in Sections C406.3 to determine credits or modify the table credits, the credits achieved shall be based upon the Section C406.3 calculations. Measure credits achieved shall be determined in one of two ways, depending on the measure:

1. The measure credit shall be the base energy credit for the measure where no adjustment factor or formula is shown in the description of the measure in Section C406.3.
2. The measure credit shall be the base energy credit for the measure adjusted by a factor or formula as stated in the description of the measure in Section C406.3. Where adjustments are applied, each energy credit shall be rounded to the nearest whole number.

Load management and renewable credits achieved for the project shall be the sum of credits for individual measures included in the project*.* Credits are available for the measures listed in this Section. Where a project contains multiple building use groups credits achieved for each building use group shall be summed and then weighted by the gross floor area of each building use group to determine the weighted average project energy credits achieved.

The load management measures in Sections C406.3.2 (G01) through C406.3.7 (G06) require load management control sequences that are capable of and configured to automatically provide the load management operation specified based on indication of a peak period related to high short-term electric prices, grid condition, or peak *building* load. Such a peak period shall, where possible, be initiated by a demand response signal from the controlling entity, such as a utility or service operator. When communications are disabled or unavailable, all demand responsive controls shall continue backup demand response based on a local schedule or *building* demand monitoring. The local *building* schedule shall be adjustable without programming and reflect the electric rate peak period dates and times. The load management control sequences shall be activated for peak period control by either:

1. A certified OpenADR 2.0a or OpenADR 2.0b Virtual End Node (VEN), as specified under Clause 11, Conformance, in the applicable OpenADR 2.0 Specification, or
2. A device certified by the manufacturer as being capable of responding to a demand response signal from a certified OpenADR 2.0b VEN by automatically implementing the control functions requested by the VEN for the equipment it controls, or
3. A device that complies with IEC 62726-10-1, an international standard for the open automated demand response system interface between the appliance, system, or energy management system and the controlling entity, or
4. An interface that complies with the communication protocol required by a controlling entity, to participate in an automated demand response program, or
5. Where the controlling entity does not have a demand response program or protocol available, local demand response control shall be provided based on either:
   1. *building* demand management controls that monitor *building* electrical demand and initiate controls to minimize monthly or peak time period demand charges, or,
   2. where *buildings* are less than 25,000 gross square feet, a local *building* schedule that reflects the electric rate peak period dates and times. In this case a binary input to the control system shall be provided that activates the demand response sequence.

**Table C406.3(1) Renewable and Load Management Credits for Group R-2, R-4, and I-1 Occupancies**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **ID** | **Energy Credit Abbreviated Title** | **Section** | **Climate Zone** | | | | | | | | | | | | | | | | | | |
| **0A** | **0B** | **1A** | **1B** | **2A** | **2B** | **3A** | **3B** | **3C** | **4A** | **4B** | **4C** | **5A** | **5B** | **5C** | **6A** | **6B** | **7** | **8** |
| R01 | Renewable Energy | C406.3.1 | 9 | 15 | 11 | 17 | 18 | 20 | 19 | 21 | 13 | 10 | 13 | 9 | 9 | 11 | 10 | 9 | 10 | 9 | 7 |
| G01 | Lighting load management | C406.3.2 | 16 | 7 | 9 | 12 | 12 | 16 | 11 | 14 | 12 | 11 | 16 | 14 | 8 | 11 | 14 | 5 | 7 | 7 | 11 |
| G02 | HVAC load management | C406.3.3 | 42 | 41 | 21 | 35 | 23 | 37 | 30 | 28 | 28 | 17 | 33 | 24 | 20 | 22 | 23 | 10 | 13 | 15 | 17 |
| G03 | Automated shading | C406.3.4 | 11 | x | 7 | 18 | 10 | 13 | 5 | 13 | 12 | 2 | 14 | 7 | 10 | 13 | 11 | 1 | 8 | 8 | 16 |
| G04 | Electric energy storage | C406.3.5 | 10 | 10 | 10 | 11 | 10 | 13 | 13 | 14 | 17 | 16 | 13 | 17 | 14 | 13 | 17 | 14 | 14 | 14 | 15 |
| G05 | Cooling energy storage | C406.3.6 | 28 | 6 | 31 | 13 | 22 | 21 | 21 | 37 | 11 | 12 | 22 | 11 | 9 | 17 | 9 | 7 | 17 | 2 | 3 |
| G06 | SHW energy storage | C406.3.7 | 17 | 17 | 19 | 18 | 19 | 19 | 20 | 20 | 22 | 19 | 19 | 21 | 19 | 19 | 20 | 18 | 19 | 18 | 17 |
| G07 | *Building* thermal mass | C406.3.8 | 7 | 2 | 11 | 5 | 16 | 28 | 22 | 27 | 60 | 19 | 43 | 46 | 32 | 58 | 37 | 27 | 45 | 40 | 19 |

x = Credits excluded from this *building* use type and climate zone.

**Table C406.3(2) Renewable and Load Management Credits for Group I-2 Occupancies**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **ID** | **Energy Credit Abbreviated Title** | **Section** | **Climate Zone** | | | | | | | | | | | | | | | | | | |
| **0A** | **0B** | **1A** | **1B** | **2A** | **2B** | **3A** | **3B** | **3C** | **4A** | **4B** | **4C** | **5A** | **5B** | **5C** | **6A** | **6B** | **7** | **8** |
| R01 | Renewable Energy | C406.3.1 | 6 | 6 | 6 | 6 | 6 | 8 | 7 | 9 | 8 | 6 | 8 | 6 | 6 | 7 | 7 | 6 | 7 | 5 | 4 |
| G01 | Lighting load management | C406.3.2 | 11 | 12 | 13 | 13 | 13 | 12 | 12 | 12 | 6 | 13 | 16 | 12 | 13 | 14 | 15 | 14 | 14 | 12 | 12 |
| G02 | HVAC load management | C406.3.3 | 10 | 11 | 10 | 10 | 8 | 21 | 10 | 10 | 13 | 11 | 18 | 11 | 12 | 14 | 13 | 12 | 11 | 9 | 7 |
| G03 | Automated shading | C406.3.4 | 1 | 1 | 1 | 1 | x | x | x | 1 | x | x | 2 | x | x | 2 | x | x | 1 | 1 | x |
| G04 | Electric energy storage | C406.3.5 | 13 | 13 | 13 | 13 | 14 | 15 | 14 | 15 | 15 | 14 | 15 | 15 | 14 | 15 | 15 | 13 | 14 | 13 | 12 |
| G05 | Cooling energy storage | C406.3.6 | 25 | 6 | 33 | 14 | 25 | 19 | 27 | 37 | 27 | 16 | 22 | 19 | 14 | 18 | 11 | 11 | 20 | 2 | 3 |
| G06 | SHW energy storage | C406.3.7 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 5 | 4 | 4 | 4 | 4 | 4 | 4 | 4 |
| G07 | *Building* thermal mass | C406.3.8 | 6 | 2 | 10 | 4 | 15 | 25 | 20 | 24 | 57 | 18 | 39 | 44 | 31 | 53 | 33 | 26 | 40 | 34 | 14 |

x = Credits excluded from this *building* use type and climate zone.

**Table C406.3(3) Renewable and Load Management Credits for Group R-1 Occupancies**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **ID** | **Energy Credit Abbreviated Title** | **Section** | **Climate Zone** | | | | | | | | | | | | | | | | | | |
| **0A** | **0B** | **1A** | **1B** | **2A** | **2B** | **3A** | **3B** | **3C** | **4A** | **4B** | **4C** | **5A** | **5B** | **5C** | **6A** | **6B** | **7** | **8** |
| R01 | Renewable Energy | C406.3.1 | 9 | 8 | 12 | 9 | 11 | 11 | 10 | 12 | 13 | 9 | 12 | 8 | 9 | 11 | 9 | 8 | 9 | 7 | 5 |
| G01 | Lighting load management | C406.3.2 | 12 | 12 | 11 | 12 | 12 | 14 | 14 | 13 | 15 | 14 | 13 | 11 | 10 | 11 | 14 | 9 | 11 | 8 | 8 |
| G02 | HVAC load management | C406.3.3 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| G03 | Automated shading | C406.3.4 | 2 | 2 | 2 | 3 | 1 | 2 | 3 | 2 | 4 | 3 | 2 | 1 | 1 | 1 | 3 | 1 | 2 | 1 | 1 |
| G04 | Electric energy storage | C406.3.5 | 9 | 9 | 10 | 10 | 9 | 13 | 13 | 15 | 13 | 14 | 13 | 14 | 14 | 12 | 16 | 13 | 12 | 12 | 13 |
| G05 | Cooling energy storage | C406.3.6 | 31 | 7 | 38 | 17 | 29 | 24 | 31 | 44 | 26 | 18 | 26 | 16 | 15 | 21 | 11 | 12 | 24 | 2 | 4 |
| G06 | SHW energy storage | C406.3.7 | 25 | 25 | 28 | 26 | 28 | 29 | 29 | 30 | 31 | 29 | 30 | 31 | 28 | 29 | 31 | 26 | 28 | 25 | 24 |
| G07 | *Building* thermal mass | C406.3.8 | 6 | 1 | 10 | 4 | 14 | 24 | 19 | 23 | 53 | 17 | 38 | 41 | 30 | 52 | 33 | 26 | 42 | 37 | 17 |

x = Credits excluded from this *building* use type and climate zone.

**Table C406.3(4) Renewable and Load Management Credits for Group B Occupancies**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **ID** | **Energy Credit Abbreviated Title** | **Section** | **Climate Zone** | | | | | | | | | | | | | | | | | | |
| **0A** | **0B** | **1A** | **1B** | **2A** | **2B** | **3A** | **3B** | **3C** | **4A** | **4B** | **4C** | **5A** | **5B** | **5C** | **6A** | **6B** | **7** | **8** |
| R01 | Renewable Energy | C406.3.1 | 14 | 14 | 17 | 15 | 17 | 19 | 18 | 22 | 24 | 17 | 22 | 16 | 14 | 18 | 18 | 14 | 17 | 14 | 11 |
| G01 | Lighting load management | C406.3.2 | 10 | 11 | 11 | 12 | 11 | 11 | 11 | 12 | 9 | 10 | 11 | 10 | 10 | 11 | 10 | 10 | 11 | 10 | 9 |
| G02 | HVAC load management | C406.3.3 | x | 10 | 10 | 9 | 9 | 3 | 8 | 12 | 7 | 12 | 8 | 11 | 9 | 10 | 12 | 8 | 9 | 10 | 2 |
| G03 | Automated shading | C406.3.4 | 4 | 7 | 7 | 8 | 7 | 8 | 5 | 6 | 6 | 4 | 6 | 5 | 4 | 5 | 5 | 5 | 5 | 4 | 7 |
| G04 | Electric energy storage | C406.3.5 | 14 | 15 | 14 | 14 | 16 | 16 | 17 | 16 | 18 | 17 | 16 | 18 | 17 | 17 | 18 | 16 | 15 | 17 | 18 |
| G05 | Cooling energy storage | C406.3.6 | 28 | 7 | 36 | 16 | 27 | 24 | 28 | 45 | 27 | 17 | 27 | 15 | 15 | 20 | 9 | 12 | 25 | 2 | 4 |
| G06 | SHW energy storage | C406.3.7 | 5 | 5 | 6 | 6 | 6 | 6 | 7 | 7 | 8 | 7 | 7 | 7 | 7 | 7 | 8 | 6 | 7 | 6 | 6 |
| G07 | *Building* thermal mass | C406.3.8 | 3 | 1 | 5 | 2 | 6 | 9 | 6 | 7 | 14 | 4 | 11 | 8 | 9 | 15 | 5 | 8 | 12 | 15 | 7 |

x = Credits excluded from this *building* use type and climate zone.

**Table C406.3(5) Renewable and Load Management Credits for Group A-2 Occupancies**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **ID** | **Energy Credit Abbreviated Title** | **Section** | **Climate Zone** | | | | | | | | | | | | | | | | | | |
| **0A** | **0B** | **1A** | **1B** | **2A** | **2B** | **3A** | **3B** | **3C** | **4A** | **4B** | **4C** | **5A** | **5B** | **5C** | **6A** | **6B** | **7** | **8** |
| R01 | Renewable Energy | C406.3.1 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 4 | 2 | 3 | 2 | 2 | 3 | 2 | 2 | 2 | 2 | 1 |
| G01 | Lighting load management | C406.3.2 | 4 | 4 | 5 | 5 | 4 | 5 | 5 | 5 | 5 | 4 | 5 | 5 | 4 | 4 | 5 | 4 | 5 | 4 | 1 |
| G02 | HVAC load management | C406.3.3 | 32 | 26 | 37 | 28 | 31 | 26 | 27 | 22 | 23 | 20 | 17 | 14 | 19 | 14 | 10 | 16 | 14 | 14 | 1 |
| G03 | Automated shading | C406.3.4 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| G04 | Electric energy storage | C406.3.5 | 4 | 4 | 4 | 4 | 5 | 5 | 5 | 5 | 4 | 4 | 4 | 4 | 3 | 4 | 4 | 4 | 3 | 3 | 2 |
| G05 | Cooling energy storage | C406.3.6 | 15 | 4 | 17 | 8 | 12 | 10 | 10 | 16 | 6 | 5 | 7 | 3 | 3 | 4 | 1 | 2 | 4 | x | x |
| G06 | SHW energy storage | C406.3.7 | 13 | 13 | 15 | 14 | 15 | 16 | 16 | 17 | 19 | 16 | 17 | 19 | 16 | 17 | 18 | 15 | 16 | 14 | 13 |
| G07 | *Building* thermal mass | C406.3.8 | 3 | 1 | 5 | 2 | 7 | 12 | 8 | 10 | 21 | 6 | 15 | 14 | 8 | 18 | 10 | 6 | 12 | 8 | 3 |

x = Credits excluded from this *building* use type and climate zone.

**Table C406.3(6) Renewable and Load Management Credits for Group M Occupancies**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **ID** | **Energy Credit Abbreviated Title** | **Section** | **Climate Zone** | | | | | | | | | | | | | | | | | | |
| **0A** | **0B** | **1A** | **1B** | **2A** | **2B** | **3A** | **3B** | **3C** | **4A** | **4B** | **4C** | **5A** | **5B** | **5C** | **6A** | **6B** | **7** | **8** |
| R01 | Renewable Energy | C406.3.1 | 8 | 8 | 12 | 9 | 11 | 12 | 12 | 17 | 17 | 11 | 13 | 9 | 10 | 11 | 10 | 9 | 10 | 9 | 6 |
| G01 | Lighting load management | C406.3.2 | 16 | 16 | 18 | 19 | 17 | 19 | 19 | 21 | 17 | 18 | 21 | 21 | 18 | 21 | 22 | 18 | 22 | 18 | 16 |
| G02 | HVAC load management | C406.3.3 | x | 15 | 16 | 15 | 15 | 6 | 15 | 21 | 13 | 23 | 15 | 23 | 17 | 19 | 26 | 14 | 17 | 18 | 3 |
| G03 | Automated shading | C406.3.4 | 7 | 11 | 11 | 12 | 11 | 13 | 10 | 11 | 11 | 7 | 11 | 11 | 8 | 10 | 11 | 8 | 9 | 8 | 12 |
| G04 | Electric energy storage | C406.3.5 | 6 | 10 | 8 | 10 | 11 | 12 | 11 | 10 | 14 | 11 | 10 | 12 | 10 | 11 | 12 | 11 | 9 | 10 | 8 |
| G05 | Cooling energy storage | C406.3.6 | 40 | 9 | 51 | 22 | 35 | 31 | 34 | 53 | 21 | 17 | 28 | 10 | 11 | 19 | 4 | 9 | 18 | 2 | 2 |
| G06 | SHW energy storage | C406.3.7 | 3 | 3 | 4 | 3 | 4 | 4 | 4 | 4 | 5 | 4 | 4 | 5 | 4 | 4 | 5 | 4 | 4 | 4 | 3 |
| G07 | *Building* thermal mass | C406.3.8 | 5 | 1 | 6 | 3 | 8 | 12 | 10 | 10 | 20 | 7 | 17 | 15 | 14 | 24 | 10 | 13 | 20 | 24 | 12 |

x = Credits excluded from this *building* use type and climate zone.

**Table C406.3(7) Renewable and Load Management Credits for Group E Occupancies**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **ID** | **Energy Credit Abbreviated Title** | **Section** | **Climate Zone** | | | | | | | | | | | | | | | | | | |
| **0A** | **0B** | **1A** | **1B** | **2A** | **2B** | **3A** | **3B** | **3C** | **4A** | **4B** | **4C** | **5A** | **5B** | **5C** | **6A** | **6B** | **7** | **8** |
| R01 | Renewable Energy | C406.3.1 | 10 | 11 | 13 | 12 | 13 | 16 | 15 | 21 | 22 | 15 | 19 | 15 | 14 | 17 | 16 | 13 | 16 | 12 | 10 |
| G01 | Lighting load management | C406.3.2 | 7 | 12 | 12 | 13 | 13 | 15 | 14 | 16 | 13 | 12 | 16 | 16 | 10 | 14 | 18 | 16 | 13 | 14 | 14 |
| G02 | HVAC load management | C406.3.3 | 18 | 22 | 32 | 23 | 25 | 31 | 26 | 26 | 20 | 23 | 31 | 24 | 20 | 31 | 12 | 18 | 27 | 16 | 9 |
| G03 | Automated shading | C406.3.4 | 7 | 13 | 16 | 12 | 18 | 17 | 17 | 18 | 13 | 12 | 17 | 17 | 10 | 15 | 13 | 14 | 10 | 16 | 17 |
| G04 | Electric energy storage | C406.3.5 | 16 | 16 | 18 | 17 | 19 | 21 | 21 | 23 | 26 | 22 | 24 | 24 | 23 | 24 | 24 | 20 | 22 | 19 | 19 |
| G05 | Cooling energy storage | C406.3.6 | 36 | 9 | 46 | 21 | 36 | 32 | 39 | 62 | 39 | 24 | 37 | 22 | 20 | 28 | 13 | 16 | 31 | 3 | 4 |
| G06 | SHW energy storage | C406.3.7 | 5 | 5 | 6 | 5 | 6 | 6 | 7 | 7 | 8 | 7 | 7 | 8 | 7 | 7 | 8 | 7 | 7 | 7 | 6 |
| G07 | *Building* thermal mass | C406.3.8 | 7 | 2 | 11 | 5 | 17 | 28 | 23 | 27 | 63 | 21 | 44 | 48 | 37 | 60 | 38 | 31 | 50 | 47 | 21 |

x = Credits excluded from this *building* use type and climate zone.

**Table C406.3(8) Renewable and Load Management Credits for Group S-1 and S-2 Occupancies**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **ID** | **Energy Credit Abbreviated Title** | **Section** | **Climate Zone** | | | | | | | | | | | | | | | | | | |
| **0A** | **0B** | **1A** | **1B** | **2A** | **2B** | **3A** | **3B** | **3C** | **4A** | **4B** | **4C** | **5A** | **5B** | **5C** | **6A** | **6B** | **7** | **8** |
| R01 | Renewable Energy | C406.3.1 | 38 | 37 | 55 | 45 | 53 | 53 | 49 | 58 | 66 | 36 | 56 | 38 | 29 | 41 | 36 | 24 | 32 | 23 | 16 |
| G01 | Lighting load management | C406.3.2 | 13 | 26 | 32 | 28 | 32 | 35 | 36 | 33 | 36 | 31 | 27 | 37 | 32 | 23 | 28 | 36 | 22 | 25 | 22 |
| G02 | HVAC load management | C406.3.3 | 18 | 46 | 37 | 37 | 28 | 36 | 29 | 26 | 22 | 23 | 17 | 12 | 16 | 13 | 5 | 14 | 8 | 10 | 3 |
| G03 | Automated shading | C406.3.4 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| G04 | Electric energy storage | C406.3.5 | 40 | 40 | 47 | 41 | 47 | 44 | 40 | 44 | 42 | 30 | 38 | 31 | 21 | 31 | 26 | 24 | 29 | 23 | 21 |
| G05 | Cooling energy storage | C406.3.6 | 20 | 5 | 21 | 11 | 14 | 14 | 11 | 21 | 5 | 5 | 9 | 2 | 2 | 5 | 1 | 1 | 3 | x | x |
| G06 | SHW energy storage | C406.3.7 | 3 | 3 | 3 | 3 | 4 | 3 | 4 | 4 | 4 | 3 | 4 | 4 | 3 | 3 | 4 | 2 | 2 | 2 | 2 |
| G07 | *Building* thermal mass | C406.3.8 | 7 | 2 | 12 | 5 | 17 | 29 | 23 | 28 | 66 | 18 | 44 | 47 | 28 | 56 | 37 | 20 | 39 | 29 | 13 |

“x” indicates measure is not available for building occupancy in that climate zone

**Table C406.3(9) Renewable and Load Management Credits for Other**a **Occupancies**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **ID** | **Energy Credit Abbreviated Title** | **Section** | **Climate Zone** | | | | | | | | | | | | | | | | | | |
| **0A** | **0B** | **1A** | **1B** | **2A** | **2B** | **3A** | **3B** | **3C** | **4A** | **4B** | **4C** | **5A** | **5B** | **5C** | **6A** | **6B** | **7** | **8** |
| R01 | Renewable Energy | C406.3.1 | 12 | 13 | 16 | 14 | 16 | 18 | 17 | 20 | 21 | 13 | 18 | 13 | 12 | 15 | 14 | 11 | 13 | 10 | 8 |
| G01 | Lighting load management | C406.3.2 | 11 | 13 | 14 | 14 | 14 | 16 | 15 | 16 | 14 | 14 | 16 | 16 | 13 | 14 | 16 | 14 | 13 | 12 | 12 |
| G02 | HVAC load management | C406.3.3 | 24 | 24 | 23 | 22 | 20 | 23 | 21 | 21 | 18 | 18 | 20 | 17 | 16 | 18 | 14 | 13 | 14 | 13 | 6 |
| G03 | Automated shading | C406.3.4 | 5 | 6 | 7 | 9 | 8 | 9 | 7 | 9 | 8 | 5 | 9 | 7 | 5 | 8 | 7 | 5 | 6 | 6 | 9 |
| G04 | Electric energy storage | C406.3.5 | 14 | 15 | 16 | 15 | 16 | 17 | 17 | 18 | 19 | 16 | 17 | 17 | 15 | 16 | 17 | 14 | 15 | 14 | 14 |
| G05 | Cooling energy storage | C406.3.6 | 28 | 7 | 34 | 15 | 25 | 22 | 25 | 39 | 20 | 14 | 22 | 12 | 11 | 17 | 7 | 9 | 18 | 2 | 3 |
| G06 | SHW energy storage | C406.3.7 | 9 | 9 | 11 | 10 | 11 | 11 | 11 | 12 | 13 | 11 | 12 | 13 | 11 | 11 | 12 | 10 | 11 | 10 | 9 |
| G07 | *Building* thermal mass | C406.3.8 | 6 | 2 | 9 | 4 | 13 | 21 | 16 | 20 | 44 | 14 | 31 | 33 | 24 | 42 | 25 | 20 | 33 | 29 | 13 |

a Other occupancy groups include all Groups except for Groups A-2, B, E, I, M, and R.

## C406.3.1 R01 Renewable Energy.

*[Special note to consensus committee and staff language coordination: These modifications adapt renewable requirements, passed AM in CEPI-2 to align with revision of energy credits in CEPI-193. The updates match the intent of C406 provisions in CEPI-2 and supersede the C406 language in CEPI-2]*

Projects installing *on-site renewable energy* systems with a capacity of at least 0.1 watts per gross square foot (1.08 W/m2) of *building* area or securing off-site renewable energy shall achieve energy credits for this measure calculated as follows:

ECR = EC0.1 x ( Rt + Roff - Rex ) / ( 0.1 x PGFA ) (Equation 4-27)

where:

ECR = C406.3.1 R01 energy credits achieved for this project

Rt = actual total rating of on-site renewable energy systems (W)

PGFA = Project gross floor area, ft2

EC0.1 = C406.3.1 R01 base credits from Tables C406.3(1) through C406.3(9)

Roff = actual total equivalent rating of off-site renewable energy contracts (W), calculated as follows:

R**off** = TRE / ( REN × 20)

where:

TRE = Total off-site renewable electrical energy in kilowatt-hours (kWh) that is procured in accordance with Sections C405.13.2.1 through C405.13.4

REN = Annual off-site renewable electrical energy from Table C405.13.2, in units of kilowatt-hours per watt of array capacity

Rex *=* rating (W) of *renewable energy resources* capacity excluded from credit calculated as follows:

Rex = RRr + RRx + RRc

where:

RRr = rating of on-site renewable energy systems required by Section C405.13.1, without exception (W).

RRx = rating of *renewable energy resources* used to meet any exceptions of this code (W).

RRc = rating of *renewable energy resources* used to achieve other energy credits in Section C406 (W).

Where renewable requirements, exceptions, or credits are expressed in annual kWh or Btu rather than Watts of output capacity, they shall be converted as 3413 Btu = 1 kWh and converted to W equivalent capacity as follows:

RRw = actual total equivalent rating of renewable energy capacity (W), calculated as follows:

RR**w** = TREx / ( REN × PGFA )

where:

TREx = Total renewable energy in kilowatt-hours (kWh) that is excluded from R01 energy credits

## C406.3.2 G01 Lighting Load Management.

Luminaires shall have dimming capability and automatic load management controls that shall gradually reduce *general lighting* power during peak periods. The load management controls shall reduce lighting power in 75 percent of the *building* area by at least 20 percent with *continuous dimming* over a period no longer than 15 minutes. Where less than 75 percent, but at least 50 percent of the project *general lighting* is controlled, the credits from Tables C406.3 shall be prorated as follows:

[*building* area with lighting load management, %] x [table credits for C406.3.2] / 75% (Equation 4-28)

Exception: Warehouse or retail storage *building* areas shall be permitted to achieve this credit by switching off at least 25 percent of lighting power in 75 percent of the *building* area without dimming, or as adjusted by Equation 4-28.

## G406.3.3 G02 HVAC Load Management.

Automatic load management controls shall be configured:

1. Where electric cooling is in use to gradually increase the cooling setpoint by at least 3°F (1.7°C) over a minimum of three hours or reduce effective cooling capacity to 60% of installed capacity during the peak period.
2. Where electric heating is in use to gradually decrease the heating setpoint by at least 3°F (1.7°C) over a minimum of three hours or reduce effective heating capacity to 60% of installed capacity during the peak period.
3. Where HVAC systems are serving multiple zones and have less than 70 percent outdoor air required, include controls that provide excess outdoor airpreceding the peak period and reduce outdoor airby at least 30 percent during the peak period, in accordance with ASHRAE Standard 62.1 Section 6.2.5.2 Short Term Conditions or provisions for *approved* engineering analysis in the International Mechanical Code Section 403.3.1.1, Outdoor Airflow Rate.

## C406.3.4 G03 Automated Shading Load Management.

Where fenestration on east, south, and west exposures exceeds 20 percent of wall area, load management credits shall be achieved as follows:

1. Automatic exterior shading devices or dynamic glazing that are capable of reducing solar gain (SHGC) through sunlit fenestration by at least 50 percent when fully closed shall receive the full credits in Tables C406.3(1) through C406.3(9). The exterior shades shall have fully open and fully closed SHGC determined in accordance with AERC 1.
2. Automatic interior shading devices with a minimum solar reflectance of 0.50 for the surface facing the fenestration shall receive 40 percent of the credits in Tables C406.3(1) through C406.3(9).
3. All shading devices, dynamic glazing, or shading attachments shall:
   1. provide at least 90 percent coverage of the total fenestration on east, south, and west exposures in the *building*
   2. be automatically controlled and shall modulate in multiple steps or continuously the amount of solar gain and light transmitted into the space in response to peak periods and either daylight levels or solar intensity
   3. include a manual override located in the same enclosed space as the shaded vertical fenestration that shall override operation of automatic controls no longer than four hours. Such override shall be locked out during peak periods.

For this section, directional east, south, or west exposures shall exclude fenestration that is plus or minus 45 degrees of facing true north in the northern hemisphere. In the southern hemisphere, where the south exposure is referred to, it shall be replaced by the north exposure and the referenced south exposure shall be replaced by the north exposure.

## C406.3.5 G04 Electric Energy Storage.

Electric storage devices shall be charged and discharged by automatic load management controls to store energy during non-peak periods and use stored energy during peak periods to reduce *building* demand. Electric storage devices shall have a minimum capacity of 1.5 Wh/ft2 (87 Wh/m2) of gross *building* area. Base credits in Tables C406.3-1 through C406.3-8 are based on installed electric storage of 5 Wh/ft2 (54 Wh/m2) and shall be prorated for actual installed storage capacity between 1.5 and 15 Wh/ft2 (16 to 160 Wh/m2), as follows:

(Equation 4-29)

Larger energy storage shall be permitted; however, credits are limited to the range of 1.5 to 15 Wh/ft2 (16 to 160 Wh/m2).

## C403.6.6 G05 Cooling Energy Storage.

Automatic load management controls shall be capable of activating ice or chilled water storage *equipment* to reduce demand during summer peak periods. Storage tank standby loss shall be demonstrated through analysis to be no more than 2 percent of storage capacity over a 24 hour period for the cooling design day.

Base credits in Section C406.3 are based on storage capacity of the design peak hour cooling load with a 1.15 sizing factor. Credits shall be prorated for installed storage systems sized between 0.5 and 4.0 times the design day peak hour cooling load, rounded to the nearest whole credit. Larger storage shall be permitted but the associated credits are limited to the range above. Energy credits shall be determined as follows:

ECs = EC1.0 x (1.44 × SR + 0.71) / 2.15 (Equation 4-30)

where:

ECs = Cooling Storage credit achieved for Project

EC1.0 = G05 base energy credit for building use type and climate zone based on 1.0 ton-hours storage per design day ton (kWh/kW) of cooling load

SR = Storage ratio in Btu storage per peak design day Btu/hr cooling load (kWh/kW) where 0.5 ≤ SR ≤ 4.0

## G406.3.7 G06 SWH Energy Storage.

Where SHW is heated by electricity, automatic load management controls comply with ANSI/CTA-2045-B shall preheat stored SHW before the peak period and suspend electric water heating during the peak period. Storage capacity shall be provided by either:

1. Preheating water above 140°F (60°C) delivery temperature with at least 1.34 kWh of energy storage per kW of water-heating capacity. Tempering valves shall be provided at the water heater delivery location.
2. Providing additional heated water tank storage capacity above peak SHW demand with equivalent peak storage capacity to item 1. Where heat pump water heating is used, the credits achieved shall be 1/3 of the credits in Tables C406.3(1) through C406.3(9).

## C406.3.8 G07 Building Thermal Mass.

The project shall have additional passive interior mass and a night flush control of the HVAC system. The credit is available to projects that have at least 80 percent of gross floor area unoccupied between midnight and 6:00 a.m. The project shall meet the following requirements:

1. Interior to the *building envelope* insulation, provide 10 lb/ft2 (50 kg/m2) of project *conditioned floor area* of passive thermal mass in the *building* interior *wall*, the inside of the *exterior wall*, or interior *floor* *construction*. Mass *construction* shall have mass surfaces directly contacting the air in *conditioned spaces* with directly attached gypsum panels allowed. Mass with carpet or furred gypsum panels or *exterior wall* mass that is on the exterior of the insulation layer (e.g., the portion of CMU block on the exterior of insulation filled cell cavities) shall not be included toward the *building* mass required.
2. HVAC units for 80 percent or more of the supply airflow in the project shall be equipped with outdoor air economizers and fans that have variable or low speed capable of operating at 66 percent or lower airflow and be included in the night flush *control* sequence.
3. Night flush controls shall be configured with the following sequence or another night flush strategy shall be permitted where demonstrated to be effective, avoids added morning heating, and is approved by the *authority having jurisdiction*.
   1. Summer mode shall be activated when outdoor air temperature exceeds 70°F (21°C) and shall continue uninterrupted until deactivated when outdoor air temperature falls below 45°F (7°C). During summer mode, the occupied cooling *set point* shall be set 1°F (0.6°C) higher than normal and the occupied heating *set point* shall be *reset* 2°F (1.1°C) lower than normal.
   2. When all the following conditions exist, night flush shall be activated:
      1. Summer mode is active in accordance with item 3.1
      2. Outdoor air temperature is 5°F (2.8°C) or more below indoor average zone temperature
      3. Indoor average zone temperature is greater than morning occupied heating *set point*
      4. In climate zones 0A through 3A, outdoor dewpoint is below 50°F (10°C) or outdoor air enthalpy is less than indoor air enthalpy
      5. Local time is between 10:00 pm and 6:00 am.
   3. When night flush is active, *automatic* night flush controls shall operate outdoor air *economizers* at low fan speed not exceeding 66 percent during the unoccupied period with *mechanical cooling* and heating locked out.

4. The project shall demonstrate a contractual obligation for post-occupancy commissioning and control tuning in the spring or fall season to tune the summer mode activation setpoints and occupied heating setpoint or other algorithms to achieve minimal morning heating due to night flush activation while maintaining comfort conditions. Commissioning shall include monitoring of time series space temperature, heating, and cooling operation to demonstrate both night cooling and minimization of morning heating along with monitoring of post-tuning operation to verify tuned parameters. Operating manuals shall include recommendations for tuned parameters and narrative training for operating staff on night flush automated settings. Reporting shall be in compliance with C408.

*Revise as follows:*

C407.2 Mandatory requirements.

Compliance based on total *building* performance requires that a proposed design meet all of the following:

1. The requirements of the sections indicated within Table C407.2.
2. An annual energy cost that is less than or equal to ~~80~~ the percentage of the annual energy cost (PAEC) of the *standard reference design* calculated in Equation 4-31*.* Energy prices shall be taken from a source *approved* by the *code official*, such as the Department of Energy, Energy Information Administration’s *State Energy Data System Prices and Expenditures* reports. *Code officials* shall be permitted to require time-of-use pricing in energy cost calculations. The reduction in energy cost of the proposeddesign associated with *on-site renewable energy* shall be not more than 5 percent of the total energy cost. The amount of renewable energy purchased from off-site sources shall be the same in the *standard reference design* and the *proposed design*.

Exception: Jurisdictions that require site energy (1 kWh = 3413 Btu) rather than energy cost as the metric of comparison.

PAEC = 100 x (0.85 + 0.025 - ECr/1000) (Equation 4-31)

where:

*PAEC = Percentage of annual energy cost applied to standard reference design*

*ECr* = Energy efficiency credits required for the *building* in accordance with Section C406.1 (do not include load management and renewable credits)

TABLE C407.2 REQUIREMENTS FOR TOTAL BUILDING PERFORMANCE

SECTION a TITLE

Envelope

C402.5 Air leakage—thermal envelope

Mechanical

C403.1.1 Calculation of heating and cooling loads

C403.1.2 Data centers

C403.2 System design

C403.3 Heating and cooling equipment efficiencies C403.4, except C403.4.3, C403.4.4 and C403.4.5 Heating and cooling system controls C403.5.5 Economizer fault detection and diagnostics

C403.7, except C403.7.4.1 Ventilation and exhaust systems

C403.8, except C403.8.6 Fan and fan controls

C403.9 Large-diameter ceiling fans

C403.11, except C403.11.3 Refrigeration equipment performance

C403.12 Construction of HVAC system elements

C403.13 Mechanical systems located outside of the building thermal envelope

C404 Service water heating

C405, except C405.3 Electrical power and lighting systems

C406.1.2 Additional renewable and load management credit requirements

C408 Maintenance information and system commissioning

a. Reference to a code section includes all the relative subsections except as indicated in the table.

*Note, energy credits for Additions and Alterations have been removed from CEPI-193 for consideration under CEPI-217.*

*Add new text as follows:*

# APPENDIX CD ENERGY CREDITS

CD101 General CD101.1 Purpose.

This purpose of this Appendix is to supplement the *International Energy Conservation Code and* requires projects to comply with Advanced Energy Credit Package requirements.

CD101.2 Scope.

This Appendix applies to all *buildings*, in accordance with Section C406.1, required to comply with, either Section C406.1.1 or Section C406.1.3.

CD102 Advanced Energy Credit Package

CD102.1 Advanced Energy Credit Package requirements.

The requirements of this Section supercede the requirements of Section C406.1.1. Projects shall comply with measures from C406.2 to achieve the minimum number of required efficiency credits from Table CD102.1 based on building occupancy group and climate zone. Projects with multiple *occupancies*, unconditioned parking garages, alterations*,* and *buildings* with separate shell-and- core and build-out *construction* permits shall comply as follows:

Where a project contains multiple occupancies, credits in Table CD102.1 from each building occupancy shall be weighted by the gross floor area to determine the weighted average project energy credits required. Accessory occupancies shall be included with the primary occupancy group for purposes of Section C406 and Appendix CD.

Exceptions:

1. Unconditioned parking garages that achieve 50% of the credits required for use groups S-1 and S-2 in Table CD102.1.
2. Portions of *buildings* devoted to manufacturing or industrial use.

Table CD102.1

Energy Credit Requirements by Building Occupancy Group

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Building Occupancy Groups | Climate Zone | | | | | | | | | | | | | | | | | | |
| 0A | 0B | 1A | 1B | 2A | 2B | 3A | 3B | 3C | 4A | 4B | 4C | 5A | 5B | 5C | 6A | 6B | 7 | 8 |
| R-2, R-4, and I-1 | 179 | 174 | 188 | 197 | 200 | 200 | 200 | 200 | 200 | 200 | 200 | 200 | 193 | 200 | 200 | 200 | 200 | 200 | 200 |
| I-2 | 78 | 75 | 73 | 71 | 80 | 90 | 100 | 85 | 90 | 97 | 83 | 90 | 99 | 90 | 96 | 107 | 106 | 130 | 117 |
| R-1 | 106 | 100 | 110 | 105 | 109 | 122 | 123 | 125 | 131 | 137 | 129 | 136 | 157 | 139 | 147 | 171 | 158 | 180 | 176 |
| B | 114 | 110 | 112 | 115 | 108 | 107 | 116 | 111 | 114 | 126 | 118 | 123 | 135 | 125 | 125 | 152 | 142 | 153 | 141 |
| A-2 | 83 | 81 | 82 | 82 | 86 | 86 | 108 | 91 | 97 | 126 | 99 | 111 | 147 | 117 | 113 | 160 | 143 | 163 | 151 |
| M | 113 | 113 | 121 | 118 | 123 | 127 | 116 | 116 | 133 | 109 | 100 | 92 | 99 | 134 | 125 | 171 | 146 | 150 | 137 |
| E | 91 | 95 | 91 | 100 | 96 | 100 | 105 | 104 | 101 | 113 | 110 | 110 | 120 | 117 | 122 | 131 | 132 | 126 | 131 |
| S-1 and S-2 | 108 | 106 | 111 | 109 | 109 | 108 | 89 | 106 | 108 | 134 | 100 | 130 | 200 | 143 | 123 | 200 | 190 | 189 | 148 |
| All Other | 54 | 53 | 55 | 56 | 57 | 60 | 61 | 60 | 63 | 68 | 60 | 65 | 73 | 68 | 69 | 84 | 79 | 84 | 78 |

*Add new standard(s) as follows:*

AERC Attachments Energy Rating Council

355 Lexington Ave 15th Floor

New York, NY 10017

AERC 1-2017 Procedures for Determining Energy Performance Properties of Fenestration Attachments

ANSI American National Standards Institute 25 West 43rd Street, 4th Floor New York NY 10036

ANSI/CTA-2045-B – 2018 Modular Communications Interface for Energy Management

IEC IEC Regional Centre for North America 446 Main Street 16th Floor Worcester MA 01608 IEC International Electrotechnical Commission.

IEC 62746-10-1 - 2018 Systems interface between customer energy management system and the power management system - Part 10-1: Open automated demand response

OpenADR OpenADR Alliance 111 Deerwood Road Suite 200 San Roman CA 94583 OpenADR OpenADR Alliance.

OpenADR 2.0a and 2.0b – 2019: Profile Specification Distributed Energy Resources

IES Illuminating Engineering Society

120 Wall street, Floor 17

New York, NY 10005-4001

|  |  |
| --- | --- |
|  | “The Interactive Illuminance Selector,” *available at*  <https://www.ies.org/standards/lighting-library/the-interactive-illuminance-selector/> *which includes minimum recommended illuminance levels from the following standards:* |
| ANSI/IES RP-1-2020 | Recommended Practice: Lighting Office Spaces |
| ANSI/IES RP-2-2020 | Recommended Practice: Lighting Retail Spaces |
| ANSI/IES RP-3-2020 | Recommended Practice: Lighting Educational Facilities |
| ANSI/IES RP-4-2020 | Recommended Practice: Lighting Library Spaces |
| ANSI/IES RP-6-2020 | Recommended Practice: Lighting Sports and Recreational Areas |
| ANSI/IES RP-7-2020 | Recommended Practice: Lighting Industrial Facilities |
| ANSI/IES RP-8-2021 | Recommended Practice: Lighting Roadway and Parking Facilities |
| ANSI/IES RP-9-2020 | Recommended Practice: Lighting Hospitality Spaces |
| ANSI/IES RP-10-2020 | Recommended Practice: Lighting Common Applications |
| ANSI/IES RP-11-2020 | Recommended Practice: Lighting for Interior and Exterior Residential Environments |
| ANSI/IES RP-27-2020 | Recommended Practice: Photobiological Safety for Lighting Systems |
| ANSI/IES RP-29-2020 | Recommended Practice: Lighting Hospital and Healthcare Facilities |
| ANSI/IES RP-30-2020 | Recommended Practice: Lighting Museums |
| ANSI/IES RP-41-2020 | Recommended Practice: Lighting Theaters and Worship Spaces |

*Update Standards as follows:*

**ASTM** ASTM International

100 Barr Harbor Drive, P.O. Box C700

West Conshohocken, PA 19428-2959

F1696—~~2018~~ 2020 Standard Test Method for Energy Performance of Stationary-Rack, Door-Type Commercial Dishwashing Machines

F1920—~~2015~~ 2020 Standard Test Method for Performance of Rack Conveyor Commercial Dishwashing Machines

# Reason Statement for as modified:

Revision summary compared to original CEPI-193-21 proposal:

* Reduced requirements from original proposal to fit new IECC cost effectiveness criteria and limit LPD reduction for demonstration package to 10%
* Included updates from Standard 90.1 public review on a similar proposal
* Incorporate CEPI 198,199,200 verbatim related to commercial kitchen equipment (Q02)
* Combined fenestration, wall insulation, and roof insulation into fewer measures (E04, E05, E06)
* Increased VT requirement in E06 to avoid reduced daylighting and aligned U-factors/SHGC with 189.1.
* Remove requirements for additions and alterations and clarify core/shell & build out
* Revise residential piping configuration (W09) to just fixture flow reduction
* Air leakage coordinated with CEPI-3, CEPI-58 & CEPI-71
* Window shading (G03) coordinated with CEPI-195 & CEPI-196
* Removed residential control credits for H04 & L05 except for the R-2/R4/I-1 table
* Updated H01 TSPR HVAC based credit inputs after coordination with CEPI-76
* Revise L03 for more clarity on occupancy sensor function
* Revise L04 to simplify and remove tertiary daylight areas
* Revised renewable credit (R01) to match CEPI-2, including off-site and removing on-site cap
* Incorporate language updates from working group and other code officials
* Make references to peak periods more consistent, with clearer language about load management for jurisdictions without a demand response program

A track changes comparison document is available as a pdf.

The “achieved energy credits” moved to Section C406.2 with the following resulting requirements:

Table 1: Energy Credit building thresholds

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Project Type | HVAC Type | Building Size,  floor area | C406.1.1 Efficiency | C406.1.2 LM/ renewable |
| New & core/shell portion with final Light or HVAC | Any | >2000 sq. ft. | Yes | No |
| >5000 sq. ft. conditioned | Yes | Yes |
| Core/Shell portion without final Light & HVAC | Central HVAC | >2000 sq. ft. | 50% | See Above |
| Local HVAC | >2000 sq. ft. | 33% |
| Build out with initial Lighting or HVAC after separate core/shell permit | Central HVAC | >1000 sq. ft. build out area | 33% | NA |
| Local HVAC | 50% |
| Core/shell via C407\* | 0% |

\* For build out to be exempt, prior C407 performance must be 2021 IECC or later, indicating full credits were achieved in the core/shell building

In the 2021 IECC, energy credit measures were expanded from 8 alternate options to 15 measures that can be flexibly selected to achieve a 2.5% level of building energy cost savings. A similar package of measures has been proposed for ASHRAE Standard 90.1- 2022, with 32 energy efficiency, renewable energy, and load management measures available. Building-type-specific targets were developed with a goal of 5% total energy cost savings.

This proposal includes 31 energy efficiency measures and builds on the former energy credit approaches with a base goal of around 6-7% energy savings. The energy efficiency credits here are based on site energy use and each credit represents 1/10 of 1% building energy use.

Outline of changes in energy efficiency credit measures from the tech brief shown in Table 2.

Table 2: Energy Efficiency Credit Measures compared to 2021 IECC

| **ID** | **New C406** | **Measure Name** | **2021 IECC** | **Compare to 2021** |
| --- | --- | --- | --- | --- |
| E01 | C406.2.1.1 | Envelope performance  (90.1 Appendix C basis) |  | New |
| E02 | C406.2.1.2 | UA reduction (15%) | C406.8 | Same |
| E03 | C406.2.1.3 | Envelope leakage reduction | C406.9 | Same |
| E04 | C406.2.1.4 | Add Roof Insulation | C406.8 sim | New |
| E05 | C406.2.1.5 | Add Wall Insulation | C406.8 sim | New |
| E06 | C406.2.1.6 | Improve Fenestration | C406.8 sim | New |
| H01 | C406.2.2.1 | HVAC performance (TSPR) |  | New |
| H02 | C406.2.2.2 | Heating efficiency | C406.2.1 | Expanded |
|  | *in above* | 5-20% Heat efficiency by formula | C406.2.3 | in H02 |
| H03 | C406.2.2.3 | Cooling efficiency | C406.2.2 | Expanded |
|  | *in above* | 5-20% Cool efficiency by formula | C406.2.4 | in H03 |
| H04 | C406.2.2.4 | Residential HVAC control |  | New |
| H05 | C406.2.2.5 | DOAS/fan control | C406.6 | Modified |
| W01 | C406.2.3.1 a | SHW preheat recovery | C406.7.2 | Same |
| W02 | C406.2.3.1 b | Heat pump water heater | C406.7.4 | Modified |
| W03 | C406.2.3.1 c | Efficient gas water heater | C406.7.3 | Same |
| W04 | C406.2.3.2 | SHW pipe insulation |  | New |
| W05 | C406.2.3.3 a | Point of use water heaters |  | New |
| W06 | C406.2.3.3 b | Thermostatic balancing valves |  | New |
| W07 | C406.2.3.3 c | SHW heat trace system |  | New |
| W08 | C406.2.3.4 | SHW submeters |  | New |
| W09 | C406.2.3.5 | SHW distribution sizing |  | New |
| W10 | C406.2.3.6 | SHW shower drain heat recovery |  | New |
| P01 | C406.2.4 | Energy monitoring | C406.10 | Same |
| L01 | C406.2.5.1 | Lighting performance |  | *Future* |
| L02 | C406.2.5.2 | Lighting dimming & tuning | C406.4 | Expanded |
| L03 | C406.2.5.3 | Increase occupancy sensor |  | New |
| L04 | C406.2.5.4 | Increase daylight area |  | New |
| L05 | C406.2.5.5 | Residential light control |  | New |
| L06 | C406.2.5.6 | Lighting power reduction | C406.3.1 | Expanded |
|  | in above | *20% LPA reduction* | C406.3.2 | in L06 |
|  | in above | Residential lamp efficacy | C406.3.3 | in L06 |
| Q01 | C406.2.7.1 | Efficient elevators |  | New |
| Q02 | C406.2.7.2 | Efficient commercial kitchen equipment | C406.12 | Same |
| Q03 | C406.2.7.3 | Efficient residential kitchen equipment |  | New |
| Q04 | C406.2.7.4 | Fault detection and diagnosis (FDD) | C406.11 | Same |

Renewable and Load Management measures add cost savings based on grid cost impact represented by a time- of-use electric price structure. These measures are new, with the exception of renewable that was included in the 2021 IECC. The list of load management and renewable measures is as follows:

* R01: Renewable Energy (2021 IECC Section C406.5)
* G01: Lighting load management
* G02: HVAC load management
* G03: Automated shading
* G04: Electric energy storage
* G05: Cooling energy storage
* G06: SHW energy storage
* G07: Building thermal mass and night flush

Bibliography:

Hart, R, J. McNeil, M. Tillou, E. Franconi, C. Cejudo, C. Nambiar, H. Nagada, D. Maddox, J. Lerond, M. Rosenberg. 2021. Expanded Energy and Load Management Credits in Energy Codes. PNNL-32001, Pacific Northwest National Laboratory, Richland, WA. https://[www.energycodes.gov/sites/default/files/2021-07/TechBrief\_EnergyCredits\_July2021.pdf](http://www.energycodes.gov/sites/default/files/2021-07/TechBrief_EnergyCredits_July2021.pdf)

Cost Impact:

The code change proposal will increase the cost of construction.

While baseline prescriptive requirements usually undergo individual review for cost effectiveness, the approach to energy credit measures is different. Each measure can be selected for a particular building; however, not all measures are required, so the approach is to find at least one package of measures that are shown to be cost effective.

The energy credit requirements are justified based on a selection of a package of measures that meet the requirement and are cost effective for each building use type and climate zone. About one quarter of the measures were selected for inclusion in the cost effectiveness analysis, based on their general applicability and reliable savings. A requirement package was determined for evaluation of cost effectiveness:

* The energy package included standard efficiency measures with a cap of 9% energy savings for required credits to allow for measure selection flexibility.
* Table 3 provides an overview of measures selected for inclusion in the demonstration package. Measures are selected with the goal of 6-7% savings or 60-70 credits for this package. Some building types in some climate zones can accommodate more savings; however, the requirement is capped at 9%. Measure selection may be climate zone specific. For example, cooling efficiency only makes sense in warm climate zones. The climate zones (CZ) or application of measures is shown along with individual measure lives shown for determining cost effectiveness. These measure lives are based on well documented research and may vary from simplified measure lives.

Table 3: Energy Measures selected for cost effective demonstration package:



Based on this selection of measures, the scalar value or payback for each building type for the selected group of measures is given in Table 4. This uses energy prices with the more conservative assumption that there is no social cost of carbon. This represents the cost for all measures included in the package divided by the annual consumer energy cost savings. Based on the IECC adopted economic criteria, a scalar limit or threshold is developed for each combination of climate zone and building type based on the individual measure lives shown in Table 5, based on a measure life weighted by the measure cost savings. The measures included in the base package that help determine the credits required are adjusted so that all building types in all climate zones have a consumer payback that is less than the scalar limit, indicating cost effectiveness for the efficiency credit requirements. The threshold divided by the payback is shown in Table 6.

Table 4: Scalar Ratio (or simple payback) of selected demonstration measure package for each building use type and climate zone (no social cost of carbon included):



Table 5: Based on the 7% discount rate IECC cost effectiveness criteria, the following thresholds apply:



Table 6: Ratio of Threshold to Actual Scalar Ratio; Values greater than 1.0 meet criteria



The same selection of measures is also evaluated with societal evaluation criteria based on energy prices that include a social cost of carbon and a 3% discount rate.

* The payback or scalar ratio including cost of carbon is given in Table 7.
* The scalar limit or threshold using a 3% discount rate is shown in Table 8.
* The threshold divided by the payback is shown in Table 9.

Using these societal criteria, the paybacks (scalar ratios) are shorter, the thresholds are longer, and the ratio of the two are higher, indicating that all building types meet the adopted cost effectiveness criteria.

Table 7: Scalar Ratio (or simple payback) of selected demonstration measure package for each building use type and climate zone (with social cost of carbon included):



Table 8: Based on the 3% discount rate IECC cost effectiveness criteria, the following thresholds apply:



Table 9: Ratio of Threshold to Actual Scalar Ratio; Values greater than 1.0 meet criteria



Notes from original reason statement:

* 1. The Code Approach

Energy codes include mandatory requirements that all buildings must fulfill prescriptive requirements that can be used without following a performance path, or whole-building performance paths where equivalent energy performance to the prescriptive path is demonstrated. To fit into the existing code structure, additional energy credits constitute a new prescriptive requirement; however, instead of all measures being required, the building designer can select from various options to achieve a defined level of energy performance. To maintain equivalent energy impact, whole-building performance paths must be adjusted to reflect the impact of

the required energy credits.

* 1. Energy Credit Development Energy credits have been developed from typical measures used in green building programs, new construction utility incentive programs, and Advanced Energy Design Guidelines (ASHRAE 2019b). A detailed discussion of the methodology used to develop individual credits can be found in the published Energy Credit Tech Brief

at https://[www.energycodes.gov/stretch-codes](http://www.energycodes.gov/stretch-codes)

Referenced Standards.

ANSI/CTA-2045-B-2018 Modular Communications Interface for Energy Management: https://shop.cta.tech/products/modular- communications-interface-for-energy-management

ANSI/IES Various Recommend Practices regarding illuminance levels

OpenADR 2.0a and 2.0b – 2019: Profile Specification Distributed Energy Resources: https://[www.openadr.org/specification-download](http://www.openadr.org/specification-download)

The following notes should be included in the Commentary:

Section C406.2.3.5 *Note to adopting jurisdictions, consider including the following commentary to clarify the requirements of C406.2.3.5 Where low water supply pressures are anticipated, user satisfaction may be enhanced if flow restrictors are specified to provide ≥80% of the rated flow at 20 psi (140 kPa).Where the distribution sizing protocol is applied to other than multifamily residential buildings, a variance to the plumbing code may be needed.*

Section C406.3.1 *On-site renewable energy may include thermal service water heating or pool water heating in which case ratings in Btu/h can be converted to W where W = Btu/h / 3.413.*

Section C406.3.4 *This credit can be met by exterior roller, movable blind, or movable shutter shading devices; however fixed overhang, screen or shutter shading will not meet the requirement. Roller shades that reject solar gain but still allow a view are allowed as long as they provide an effective 50% reduction in net solar gain, e.g., have a shading coefficient of less than 0.5 for the shading material itself. Interior shading devices will not meet the requirement. Electrochromatic windows that achieve 50% of SHGC would qualify.*

Section C406.3.8 *The simplified night flush sequence described will operate in “Summer Mode” below the 70F OA trigger temperature down until OA of 45F is hit when the “Summer Mode” is deactivated until the OA rises above 70F again. These activation temperatures may need customization for the local climate. Other strategies may be implemented that include connection to weather prediction information or cool the space below the heating setpoint and adjust the morning heating setpoint to avoid morning reheating.*

Section C407.2 *The formula for PAEC in Section C407.2 allows adjustment for the current energy credits required in the IECC (2.5% or 0.025) and the new energy efficiency credit requirements that come from Section C406.1.1.*