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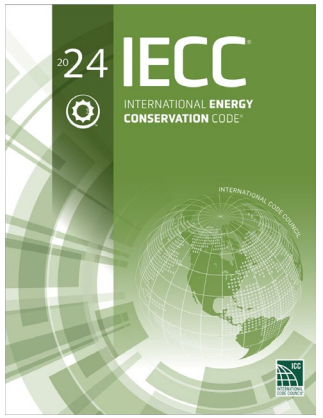
2024 International Energy Code

Opportunity….or burden?



Learning Objectives

After participating in this presentation, attendees will:

- Understand a number of the main electrical changes to the code and how this affects building design
- Understand the metering requirements for new buildings
- Have knowledge of the requirements for Photovoltaic (PV) Systems on all new projects
- Understand the cost, durability, indoor and roof/canopy space requirements for PV systems
- Have familiarity with the additional energy efficiency requirements and why this matters
- Have familiarity with the additional demand response and renewable requirements
- Obtain a high level familiarity with the current ComCheck Online version for IECC 2024

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General Code Revisions

What are some of the major MEP changes?

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High Level MEP Revisions

- Climate Zones (some changed in 2021 IECC) – Affects Mechanical mainly
- HVAC – Additional Boiler Controls, Economizer requirement revisions, Demand Control Ventilation requirement Sq. Ft. change, Air Cleaning as an option to mitigate Economizer and Demand Control requirements (i.e. CO2)
- Daylighting Zone Lighting Wattage Reduction
- Controlled Outlets (added in 2021 IECC)
- Electrical Metering (added in 2021 IECC, additional changes in 2024 IECC)
- Gas Equipment Metering
- Renewable Energy Systems Required

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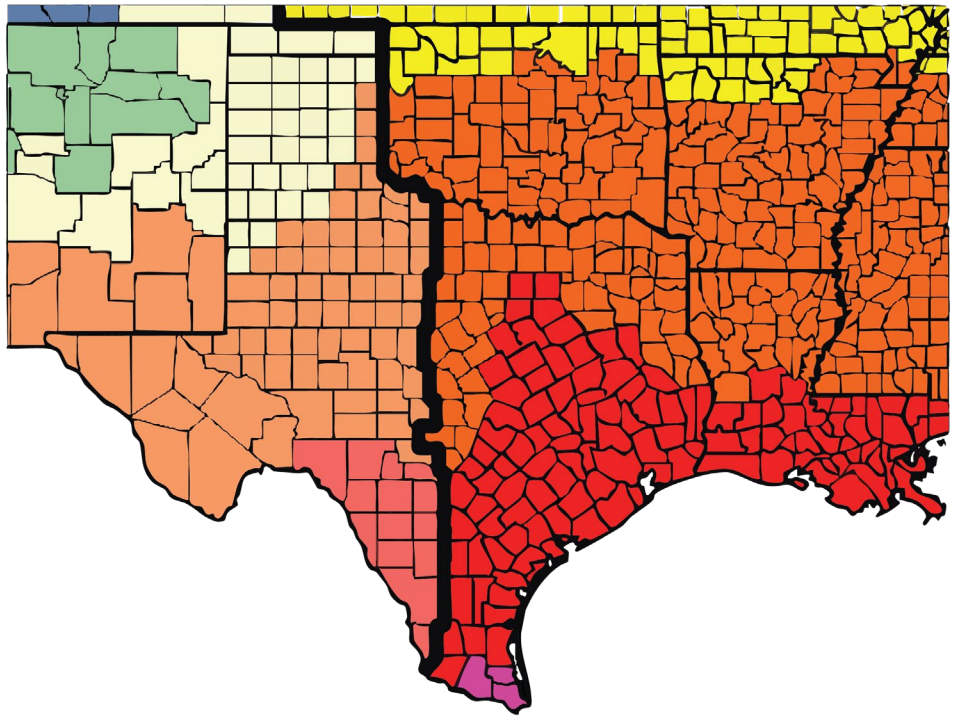
What Climate Zone are you in?



- Zone 0A Extremely Hot Humid
- Zone 0B Extremely Hot Dry
- Zone 1A Very Hot Humid
- Zone 1B Very Hot Dry
- Zone 2A Hot Humid
- Zone 2B Hot Dry
- Zone 3A Warm Humid
- Zone 3B Warm Dry
- Zone 3C Warm Marine
- Zone 4A Mixed Humid
- Zone 4B Mixed Dry
- Zone 4C Mixed Marine
- Zone 5A Cool Humid
- Zone 5B Cool Dry
- Zone 5C Cool Marine
- Zone 6A Cold Humid
- Zone 6B Cold Dry
- Zone 7 Very Cold
- Zone 8 Subarctic/Arctic

Travis County (Austin metro) is 2A
Burnet County (next county over) is 3A

Dallas/Tarrant County (DFW metro) is 2A
Collin/Denton County (upper DFW metro) is 3A

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Daylight Zone Revisions

Opportunities for more energy savings ahead!

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What the code says:

C405.2.4 Daylight responsive controls.

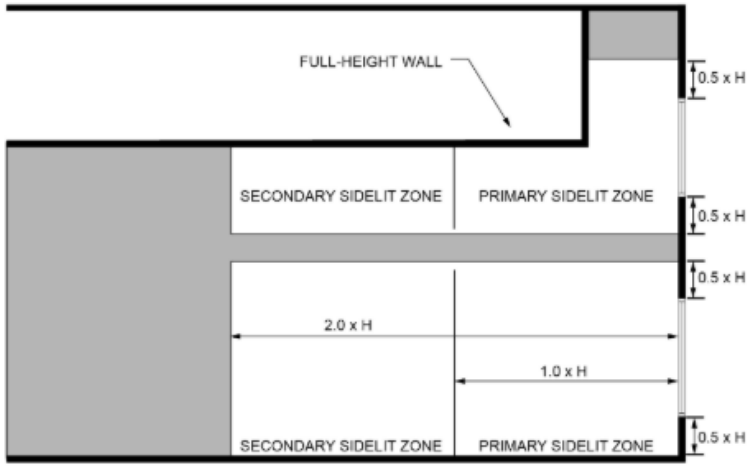
Daylight responsive controls complying with Section C405.2.4.1 shall be provided to control the *general lighting* within *daylight zones* in the following spaces:

1. Spaces with a total of more than 75 watts of *general lighting* within primary sidelit *daylight zones* complying with Section C405.2.4.2.
2. Spaces with a total of more than 150 watts of *general lighting* within sidelit *daylight zones* complying with Section C405.2.4.2.
3. Spaces with a total of more than 75 watts of *general lighting* within toplit *daylight zones* complying with Section C405.2.4.3.

Exceptions: *Daylight responsive controls* are not required for the following:

1. Spaces in health care facilities where patient care is directly provided.
2. Sidelit *daylight zones* on the first floor above grade in Group A-2 and Group M occupancies.
3. Enclosed office spaces less than 250 square feet (23.2 m^2).

(a) Section view



(b) Plan view

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Summary

- The lighting wattage in the Primary Daylight Zone (i.e. closest to the window) was reduced by ½ to 75 Watts
- The lighting wattage in the Secondary Daylight Zone was also reduced by ½. Total was 300 Watts previously and now 150 Watts
- Daylight sensors will likely be required at most exterior windows – will definitely be required in classrooms with typical large exterior windows

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Controlled Outlets

Energy Savings or Distracting Work Orders?

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What the code says

C405.11 Automatic receptacle control.

The following shall have automatic receptacle control complying with Section C405.11.1:

1. At least 50% of all 125V, 15-and 20-amp receptacles installed in **enclosed offices**, **conference rooms**, room used primarily for copy or print functions, breakrooms, **classrooms**, and individual workstations, including those installed in modular partitions and module office workstation systems.

2. At least 25% of branch circuit feeders installed for modular furniture not shown on the construction documents.

C405.11 Automatic receptacle control.

Automatic receptacle controls shall comply with the following:

1. Either split controlled receptacles shall be provided with top receptacle controlled, or a controlled receptacle shall be located within 12 inches (304.8 mm) of each uncontrolled receptacle.

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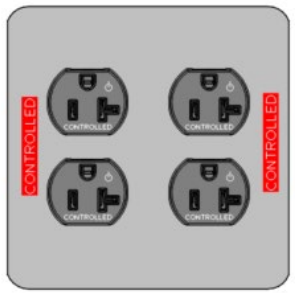
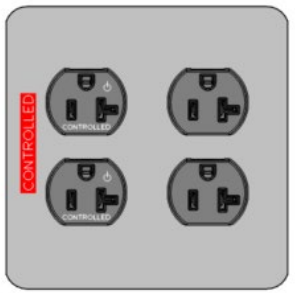
Summary

- Became a requirement in the 2021 version of the IECC
- Controlled outlets required in all classrooms
- ½ the outlets have to turn on/off with the occupancy sensor control in the space
- Double the outlet's locations or top one works and bottom one is off

SYMBOL: Φ^{C}



SYMBOL: Φ^{C}



SYMBOL: Φ^{PC}

CONTROLLED RECEPTACLE NOTES

1. PROVIDE RECEPTACLE CONFIGURATION AS NOTED BY SYMBOL.
2. PROVIDE STAINLESS STEEL FACEPLATE. PROVIDE ENGRAVED LABEL WITH WHITE LETTERS ON RED BACKGROUND. LETTERING SHALL BE MINIMUM 12 POINT TYPE IN BASIC BLOCK FONT.
3. PROVIDE LEVITON 5362-S2G OR APPROVED EQUAL TO COMPLY WITH ASHRAE 90.1.
4. PROVIDE LOW VOLTAGE CONTROLS TO CONTROLLED RECEPTACLE FROM PLUG LOAD CONTROL DEVICE ABOVE CEILING, ACTIVATED TO TO TURN OFF BY OCCUPANCY SENSOR AFTER 20 MINUTES OF INACTIVITY TO COMPLY WITH ASHRAE 90.1.
5. SUBMIT SAMPLE TO ARCHITECT PRIOR TO APPROVAL.

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Electric Power Metering

For all of you who want more real-time data on your building…

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What the code says

TABLE C405.13.2ELECTRICAL ENERGY USE CATEGORIES

LOAD CATEGORY	DESCRIPTION OF ENERGY USE
Total HVAC system	Heating, cooling and ventilation, including but not limited to fans, pumps, boilers, chillers and water heating. Energy used by 120-volt equipment, or by 208/120-volt equipment that is located in a building where the main service is 480/277-volt power, is permitted to be excluded from total HVAC system energy use.
Interior lighting	Lighting systems located within the building.
Exterior lighting	Lighting systems located on the building site but not within the building.
Plug loads	Devices, appliances and equipment connected to convenience receptacle outlets.
Process load	Any single load that is not included in an HVAC, lighting or plug load category and that exceeds 5 percent of the peak connected load of the whole building, including but not limited to data centers, manufacturing equipment and commercial kitchens.
Building operations and other miscellaneous loads	The remaining loads not included elsewhere in this table, including but not limited to vertical transportation systems, automatic doors, motorized shading systems, ornamental fountains, fireplaces, swimming pools, spas and snow-melt systems.
Electric hot water heating for uses other than space conditioning	Electricity used to generate hot water. **Exception:** Electric water heating with design capacity that is less than 10 percent of the building service rating.

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Summary

- Metering was added in 2021 version of IECC
- Required for buildings over 10,000 SF
- Required to meter the 7 different categories and add up total loads per category
- Typically results in 1 main meter and multiple sub-meters
- Typically results in additional electrical panels to more easily combine and meter entire panel versus individual loads on electrical panels
- New in 2024 IECC – required to meter renewable energy (i.e., PV panels)

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Other Energy Metering

In 2024 other utilities are also required to be metered….

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What the code says

TABLE C405.13.8NONELECTRICAL ENERGY USE CATEGORIES

END USE CATEGORY	DESCRIPTION OF END USE
Total HVAC system	Heating and cooling systems, including but not limited to boilers, chillers and furnaces. District heating and cooling energy entering the building's distribution system shall be monitored at the point of entry to the building distribution system.
Process loads	Any single load that is not included in the HVAC or service water heating categories where the rated fuel gas or fuel oil input of the load and that is not less than 5 percent of the sum of the rated fuel gas or fuel oil input of all monitored equipment, including but not limited to manufacturing equipment, process equipment, commercial kitchens, and commercial laundry equipment.
Other miscellaneous loads	The remaining loads not included elsewhere in this table, including but not limited to fireplaces, swimming pools, spas, gas lighting, and snow-melt systems.
Service water heating	Fuel used to heat potable water. **Exception:** Water heating with design capacity that is less than 10 percent of the sum of the rated fuel gas or fuel oil input of all monitored equipment.

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Summary

- Will require main gas meter
- Sub-meter gas water heaters
- Sub-meter kitchen gas loads
- Sub-meter gas to science labs (each lab or one main tap off main to multiple labs)
- More cost, more controls, likely more gas piping
- If you have building on a campus with a separate central plant – metering of chilled and heating water required

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Renewable Energy Requirements C405.15

Plan for PV on ALL projects

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What the code says

C405.15 Renewable energy systems.

Buildings in Climate Zones 0 through 7 shall comply with Sections C405.15.1 through C405.15.4.

C405.15.1 On-site renewable energy systems.

Buildings shall be provided with on-site renewable electricity generation systems with a direct current (DC) nameplate power rating of not less than 0.75 watts per square foot (8.1 W/m^2) multiplied by the sum of the gross *conditioned floor area* of all floors, not to exceed the combined gross *conditioned floor area* of the three largest floors.

Exceptions: The following *buildings* or building sites shall comply with Section C405.15.2:

1. A *building site* located where an unshaded flat plate collector oriented toward the equator and tilted at an angle from horizontal equal to the latitude receives an annual daily average incident solar radiation less than 1.1 $kBtu/ft^2$ per day (3.5 $kWh/m^2/day$).
2. A *building* where more than 80 percent of the roof area is covered by any combination of permanent obstructions such as, but not limited to, mechanical equipment, vegetated space, access pathways or occupied roof terrace.
3. Any *building* where more than 50 percent of the roof area is shaded from direct-beam sunlight by natural objects or by structures that are not part of the *building* for more than 2,500 annual hours between 8:00 a.m. and 4:00 p.m.
4. A *building* with gross *conditioned floor area* less than 5,000 square feet (465 m^2).

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What the code says

C405.15.2 Off-site renewable energy.

Buildings that qualify for one or more of the exceptions to Section C405.15.1 or do not meet the requirements of Section C405.15.1 with an on-site renewable energy system shall procure off-site renewable electrical energy, in accordance with Sections C405.15.2.1 and C405.15.2.2, that shall be not less than the total off-site renewable electrical energy determined in accordance with Equation 4-11.

$$TRE_{off} = (REN_{off} \times 0.75\ \text{W/ft}^2 \times \text{FLRA} - IRE_{on}) \times 15$$ Equation 4-11

where:

TRE_{off} = Total off-site renewable electrical energy in kilowatt-hours (kWh) to be procured in accordance with Table C405.15.2.

REN_{off} = Annual off-site renewable electrical energy from Table C405.15.2, in units of kilowatt-hours per watt of array capacity.

FLRA = The sum of the gross conditioned floor area of all floors not to exceed the combined floor area of the three largest floors.

IRE_{on} = Annual on-site renewable electrical energy generation of a new on-site renewable energy system, to be installed as part of the building project, whose rated capacity is less than the rated capacity required in Section C405.15.1.

TABLE C405.15.2ANNUAL OFF-SITE RENEWABLE ENERGY REQUIREMENTS

CLIMATE ZONE	ANNUAL OFF-SITE RENEWABLE ELECTRICAL ENERGY (kWh/W)
1A, 2B, 3B, 3C, 4B and 5B	1.75
0A, 0B, 1B, 2A, 3A and 6B	1.55
4A, 4C, 5A, 5C, 6A and 7	1.35

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What the code says

- Building Additions (greater than 5,000 Sq. Ft.)
  - C502.3.8 Renewable energy systems.
  - Additions shall comply with Section C405.15 for the addition alone.
- Alternations
  - Not referenced or noted so NO requirement for PV for renovation ONLY

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What it means

- A 100,000 Sq. Ft. Elementary school requires a 75 kW PV array
  - Approx. 10,000 Sq. Ft. depending on roof mounted equipment
- A 250,000 Sq. Ft. Middle school requires a 190 kW PV array
  - Approx. 22,000 Sq. Ft. depending on roof mounted equipment
- A 400,000 Sq. Ft. High school requires a 300 kW PV array
  - Approx. 35,000 Sq. Ft. depending on roof mounted equipment
- Any new building or addition over 5,000 Sq. Ft. that is air conditioned requires PV (wind seems to also be an option)
- Typical monocrystalline panels are approx. 15-20% efficient
- Typical module size is approx. 98”x45” or 31 Sq. Ft. and can produce approx. 585 W / module

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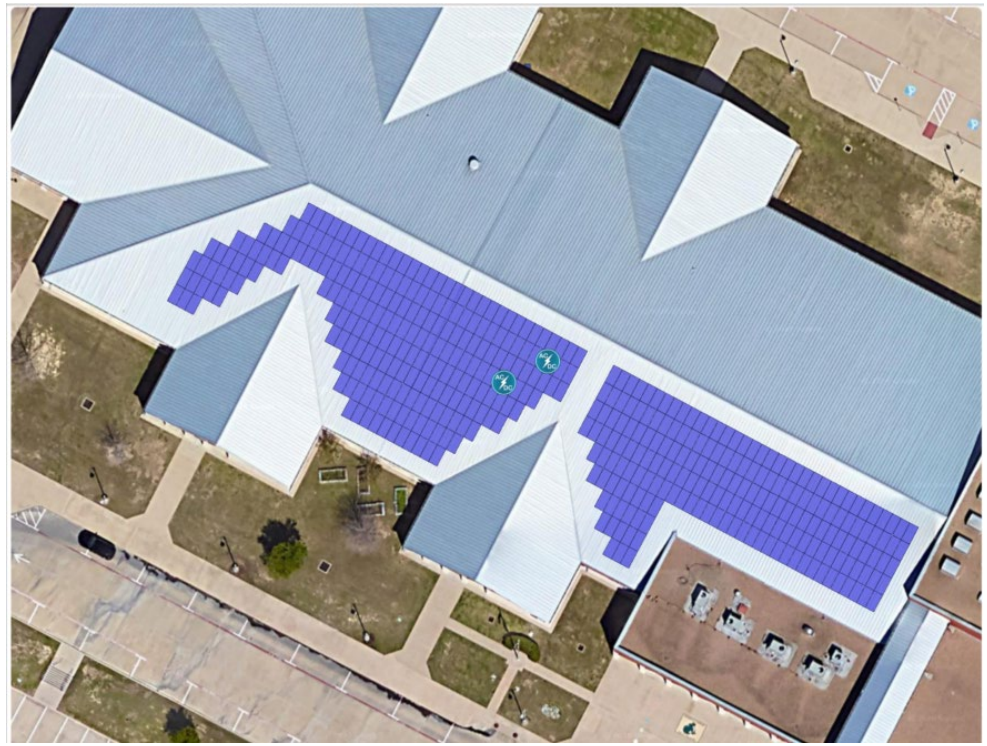
Example:

- An 80,000 Sq. Ft. Elementary school with a 240 kW PV array (slightly larger than code minimum for a middle school)



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Generation and Payback

- Average electrical energy usage for a K-12 facility is 7-14 kWh/SF/Yr (10.5 kWh/SF/Yr)
- A 100,000 Sq. Ft. Elementary School will use approx. 1,050,000 kWh/Yr.
- At 75 kW (DC) PV array will generate approx. 125,000 kWh annually
- Code minimum PV array may generate approx. 10-15% of annual facility electricity usage
- Current PV install cost is approx. $3-$4/DC Watt
- 100,000 Sq. Ft. Elementary install cost = $300K+
- Average cost/kWh Commercial in Texas is approx. $0.08 to $0.09/kWh
- This equates to a 30 year payback without any incentives

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Durability

- Typical monocrystalline PV panels are rated to withstand up to 1” Dia. hail at 50 MPH
- Most hail storms are 1 – 1 3/4” and fall at 25 to 40 MPH
- In Texas we get storms with larger hail that fall at faster speeds
- Many PV arrays on K-12 facilities in North Texas have been damaged beyond use

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Lots of Opportunities for Energy Savings!

But wait….There's More!!

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Additional Efficiency, Renewable and Load Management Requirements C406

What does that mean?

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How it used to be

- Back in the good ole days of the 2021 Energy Code…

What the 2021 code says

C406.1 Additional energy efficiency credit requirements.

New buildings shall achieve a total of 10 credits from Tables C406.1(1) through C406.1(5) where the table is selected based on the use group of the building and from credit calculations as specified in relevant subsections of Section C406. Where a building contains multiple-use groups, credits from each use group shall be weighted by floor area of each group to determine the weighted average building credit. Credits from the tables or calculation shall be achieved where a building complies with one or more of the following:

1. More efficient HVAC performance in accordance with Section C406.2.
2. Reduced lighting power in accordance with Section C406.3.
3. Enhanced lighting controls in accordance with Section C406.4.
4. On-site supply of renewable energy in accordance with Section C406.5.
5. Provision of a dedicated outdoor air system for certain HVAC equipment in accordance with Section C406.6.
6. High-efficiency service water heating in accordance with Section C406.7.
7. Enhanced envelope performance in accordance with Section C406.8.
8. Reduced air infiltration in accordance with Section C406.9
9. Where not required by Section C405.12, include an energy monitoring system in accordance with Section C406.10.
10. Where not required by Section C403.2.3, include a fault detection and diagnostics (FDD) system in accordance with Section C406.11.
11. Efficient kitchen equipment in accordance with Section C406.12.

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What the 2021 code says

TABLE C406.1(3)

ADDITIONAL ENERGY EFFICIENCY CREDITS FOR GROUP E OCCUPANCIES

SECTION	CLIMATE ZONE																
	0A & 1A	0B & 1B	2A	2B	3A	3B	3C	4A	4B	4C	5A	5B	5C	6A	6B	7	8
C406.2.1: 5% heating efficiency improvement	NA	NA	NA	NA	1	1	1	1	1	2	1	2	1	2	2	3	4
C406.2.2: 5% cooling efficiency improvement	4	4	3	3	2	2	2	2	1	1	1	1	NA	1	1	1	NA
C406.2.3: 10% heating efficiency improvement	NA	NA	NA	1	1	1	1	2	3	4	3	4	3	4	3	5	7
C406.2.4: 10% cooling efficiency improvement	7	8	7	6	5	4	3	4	3	1	2	2	1	2	2	2	1
C406.3: Reduced lighting power	8	8	8	9	8	9	9	8	9	9	8	9	8	7	8	7	7
C406.4: Enhanced digital lighting controls	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1
C406.5: On-site renewable energy	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	5	5
C406.6: Dedicatedoutdoor air system	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
C406.7.2: Recoveredor renewable water heating[a]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
C406.7.3: Efficient fossil fuel water heater[a]	NA	1	1	1	1	1	1	2	2	3	2	3	2	3	3	3	5
C406.7.4: Heat pump water heater[a]	NA	NA	NA	NA	NA	NA	NA	1	NA	NA	1	1	NA	1	1	1	1
C406.8: Enhanced envelope performance	3	7	3	4	2	4	1	1	3	1	2	3	NA	4	3	6	9
C406.9: Reduced air infiltration	1	1	1	2	NA	NA	NA	NA	NA	NA	1	NA	NA	4	1	4	3
C406.10: Energy monitoring	3	3	3	3	3	3	3	3	3	2	2	3	2	2	2	2	2
C406.11: Fault detection and diagnostics system	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2

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2021 C406 Summary

- Use HVAC equipment that is a little more efficient that you might be using anyway
- Add a few additional controls to lighting or use a little less lighting wattage (We were already doing that in most areas)
- Maybe have to increase insulation a little on the roof or walls
- Check! Good to go, what's the next project?

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How it is now

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What the 2024 code says

C406.1 Compliance.

Buildings shall comply as follows:

1. *Buildings* with greater than 2,000 square feet (186 m^2) of *conditioned floor area* shall comply with Section C406.1.1.
2. *Buildings* with greater than 5,000 square feet (465 m^2) of *conditioned floor area* shall comply with Sections C406.1.1 and C406.1.2.
3. Build-out construction greater than 1,000 square feet (93 m^2) of *conditioned floor area* that does not have final lighting or final HVAC systems installed under a prior building permit shall comply with Section C406.1.1.2.

Exceptions: Core and shell buildings where not 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 5,000 square feet (465 m^2) 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 C406.1.1.2.
3. Portions of the *building* where the *net floor area* has final lighting and final HVAC systems shall comply with Section C406.1.1.

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Additional Energy Efficiency

C406.1.1 Additional energy efficiency credit requirements

Buildings shall comply with measures from Section C406.2 to achieve not less than the number of required efficiency credits from Table C406.1.1(1) based on building occupancy group and *climate zone*. Where a project contains multiple occupancies, the total required energy credits from each building occupancy shall be weighted by the gross *conditioned floor area* to determine the weighted-average project energy credits required. Accessory occupancies shall be included with the primary occupancy group for the purposes of Section C406.

Exceptions:

1. Portions of *buildings* devoted to manufacturing or industrial use.
2. Where a *building* achieves more renewable and load management credits in Section C406.3 than are required in Section C406.1.2, surplus credits shall be permitted to reduce the required energy efficiency credits as follows:

$$EEC_{red} = EEC_{tbl} - \{\text{the lesser of: } [SRLM_{lim}, SLRM_{adj} \times (RLM_{ach} - RLM_{req})]\} \quad \text{(Equation 4-12)}$$

where:

EEC_{red} = Reduced required energy efficiency credits.
EEC_{tbl} = Required energy efficiency credits from Table C406.1.1(1).
$SRLM_{lim}$ = Surplus renewable and load management credit limit from Table C406.1.1(2).
$SRLM_{adj}$ = 1.0 for all-electric or all-renewable buildings (excluding emergency generation); 0.7 for buildings with fossil fuel equipment (excluding emergency generation).
RLM_{ach} = Achieved renewable and load management credits from Section C406.3.
RLM_{req} = Required renewable and load management credits from Section C406.1.2.

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What the code says

TABLE C406.1.1(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	70	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

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So…What does that mean?

- If my building is greater than 2,000 SF I have to comply with this section
- If my building is greater than 5,000 SF I have to comply with this section and the additional Demand Response credits also (we will talk about this in a minute)
- We have to achieve 55-66 credits versus the previous 10 credits!
- If you have multiple occupancies in a building (i.e., E and A) and they are classified as this then you have to proportion the credits required for all occupancies so overall required credits for the building may vary

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So…What does that mean?

- There are many credits that only allow a % of the credit to be taken for only the SF of the building that has that particular system (i.e. point of use water heaters)
- There is an option to reduce the number of credits required if the design achieves extra credits in the Renewable and Demand Response section
- For % improvements, those are beyond that required in the rest of the code (i.e. if HVAC equipment is 10% more efficient and that was required to get out of economizer in main portion of code, would need to be 5-10% more efficient beyond that so 15-20% more efficient than baseline code to get credits)
- There are options on some credits to achieve MORE than the listed credits (i.e. PV array, if 0.3 W/SF additional then can achieve ALL of the demand response credits required, based on 2024 ComCheck)

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What the code says (Additions)

C502.3.7 Additional energy efficiency credit requirements.

Additions shall comply with sufficient measures from Sections C406.2 and C406.3 to achieve not less than 50 percent of the number of required efficiency credits from Table C406.1.1(1) based on building occupancy group and *climate zone*. Where a project contains multiple occupancies, credits from Table C406.1.1(1) for each building occupancy shall be weighted by the gross floor area to determine the project weighted average energy credits required. Accessory occupancies shall be included with the primary occupancy group for purposes of this section. *Alterations* to the existing building that are not part of the *addition*, but are permitted with an *addition*, shall be permitted to be used to achieve the required credits.

Exceptions:

1. Buildings in Group U (Utility and Miscellaneous), Group S (Storage), Group F (Factory), Group H (High-Hazard).
2. *Additions* less than 1,000 square feet (93 m^2) and less than 50 percent of existing floor area.
3. *Additions* that do not include the *addition* or replacement of equipment covered by Tables C403.3.2(1) through C403.3.2(16) or Section C404.2.
4. *Additions* that do not increase*conditioned space*.
5. Where the *addition* alone or the existing building and *addition* together comply with Section C407.

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What the code says (Alterations)

C503.6 Additional energy efficiency credit requirements for alterations.

Alterations that are *substantial improvements* shall comply with measures from Sections C406.2, C406.3 or both to earn the number of required credits specified in Table C406.1.1(1) based on building occupancy group and *climate zone*. Where a project contains multiple occupancies, credits specified in Table C406.1.1(1) for each building occupancy shall be weighted by the gross *conditioned floor area* to determine the weighted average credits required. Accessory occupancies, other than Group F or H, shall be included with the primary occupancy group for the purposes of this section.

Exceptions:

1. *Alterations* that do not contain *conditioned space*.
2. Portions of *buildings* devoted to manufacturing or industrial use.
3. *Alterations* to *buildings* where the *building* after the *alteration* complies with Section C407.
4. *Alterations* that are permitted with an *addition* complying with Section C502.3.7.

Energy Model

SUBSTANTIAL IMPROVEMENT. Any *repair*, reconstruction, rehabilitation, *alteration*, *addition* or other improvement of a *building* or structure, the cost of which equals or is more than 50 percent of the market value of the structure before the improvement. Where the structure has sustained substantial damage, as defined in the *International Building Code*, any *repairs* are considered *substantial improvement* regardless of the actual *repair* work performed. *Substantial improvement* does not include the following:

1. Improvement of a *building* ordered by the code official to correct health, sanitary or safety code violations.
2. *Alteration* of a historic building where the *alteration* will not affect the designation as a historic building.

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So…what for the additions/renovations?

- You only have to comply with ½ of the required credits for an Addition.
- You have to comply with ALL of the required credits for a Renovation…IF it is over 50% of the current market cost of the facility (you're a realtor now….congrats!)
- IF you permit a renovation with an Addition then….you can ALSO ONLY comply with ½ of the required credits, if not then full credits required. (May mean discussing with municipality on best path for renovation).
- This means only 29-30 credits required for Addition or Renovation permitted with addition!

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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	8	18	7	19	12	13	20	17	11	24	20	17	33	32	29	40	38	46	44
E03	Reduced air leakage	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	C406.2.5.6	6	7	7	7	8	8	8	8	10	7	8	7	6	7	8	5	6	4	2
Q01	Efficient elevator	C406.2.6.1	3	4	4	4	4	5	5	5	5	5	5	5	5	5	5	4	5	4	3
Q02	Commercial kitchen equip.	C406.2.6.2	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Q03	Residential kitchen equip.	C406.2.6.3	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Q04	Fault detection	C406.2.6.4	4	4	4	4	3	3	3	3	2	3	3	3	3	3	2	4	3	4	4

DOAS = Dedicated Outside Air System; HVAC = Heating, Ventilation and Air Conditioning; SHW = Service Hot Water; UA = U-Factor × Area.
a. "x" indicates measure is not available in that climate zone for that measure.

Need 55-66 Credits

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Envelope (E0X) Credits

- E01 – Improved envelope performance: Requires a basic energy model to compare a baseline vs proposed
- E02 – Component performance envelope reduction: 15% better or more all building thermal envelope components
- E03 – Reduced air leakage: by 10% or more over base
- E04 – Added Roof Insulation: Up to R10 of additional, can achieve ½ points for R5 increase
- E05 – Added Wal Insulation: Up to R5 of additional, can achieve ½ points for R2.5 increase
- E06 – Improve Fenestration – Better U, SHGC based on climate zone, code has a table that notes this.

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HVAC (H0X) Credits

- H01 – HVAC Total System Performance: Essentially requires full building energy modeling using a “base code minimum building” versus “design building” to achieve points (Think LEED)
- H02 – More efficient HVAC equipment heating performance: 5% or more efficiency increase
- H03 – More efficient HVAC cooling equipment and fan performance: 5% or more efficiency increase
- H05 – Dedicated Outdoor Air System (DOAS): Conditions OA through a single unit versus through RTUs, AHUs, HPs, or FCUs

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Water Heating (W0X) Credits

- W01 – Recovered or renewable water heating: Waste heat off chillers, boilers, processes; a heat pump water heater; solar water heating
- W02 – Heat pump water heater: Air-source heat pump water heater
- W03 - Efficiency fossil fuel water heater: Gas-fired condensing water heater
- W04 – Service hot water piping insulation increase: Increase hot water piping insulation by 1.5X (1” = 1.5”)
- W05 – Point of Use Water Heaters
- W10 – Shower drain heat recovery: Taking the sanitary waste line off the shower drain through a heat exchanger and pre-heating the cold water to the shower

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Energy Monitoring (P01) Credits

- P01 – Energy Monitoring: Where energy monitoring is NOT required by the code in the base energy code it can be added to the facility

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Lighting (L0X) Credits

- L02 – High-end trim lighting controls: Requires all dimmable lighting controls to be set for 85% of full brightness
- L03 – Increase Occupancy Sensor: Additional occupancy sensors where not required in base code
- L04 – Increased daylight area: Increasing the daylighting control area by 5% on either side of the daylight zone
- L06 – Reduced lighting power: Reduce the overall lighting power of the building by 5%

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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	8	18	7	19	12	13	20	17	11	24	20	17	33	32	29	40	38	46	44
E03	Reduced air leakage	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	C406.2.5.6	6	7	7	7	8	8	8	8	10	7	8	7	6	7	8	5	6	4	2
Q01	Efficient elevator	C406.2.6.1	3	4	4	4	4	5	5	5	5	5	5	5	5	5	5	4	5	4	3
Q02	Commercial kitchen equip.	C406.2.6.2	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Q03	Residential kitchen equip.	C406.2.6.3	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Q04	Fault detection	C406.2.6.4	4	4	4	4	3	3	3	3	2	3	3	3	3	3	2	4	3	4	4

DOAS = Dedicated Outside Air System; HVAC = Heating, Ventilation and Air Conditioning; SHW = Service Hot Water; UA = U-Factor × Area.
a. "x" indicates measure is not available in that climate zone for that measure.

Need 55-66 Credits

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How did you achieve credits?

- How did you get to the required credits in your climate zone?
- Did you pick both HVAC credits for Energy Modeling and DOAS (H01 and H05)?
- Did you pick Credit E02 with any other E0X credits? If so which ones?
- Did you pick any service water heating credits (W0X)?
- Which lighting credits (L0X) did you pick?

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Only Certain Credits Allowed

C406.2.1 More efficient building thermal envelope.

A project shall achieve credits for improved envelope performance by complying with 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 E02 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.

These are most restrictive but other restrictions exist in lighting and service water heating

C406.2.2 More efficient HVAC equipment performance.

permitted to achieve HVAC energy credits by meeting the requirements of one of the following:

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.

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Only Certain Credits Allowed

C406.2.3 Reduced energy use in service water heating.

For 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 one of the following:

1. Section C406.2.3.1 by selecting one allowed measure W01, W02, W03 or a combination in accordance with Section C406.2.3.1.4.
2. Section C406.2.3.2 W04.
3. Section C406.2.3.3 by selecting one allowed measure: W05, W06 or W07.
4. Section C406.2.3.4 W08.
5. Section C406.2.3.5 W09.
6. Section C406.2.3.6 W10.
7. Any combination of measures in Sections C406.2.3.1 through C406.2.3.6 as long as not more than one allowed measure from Sections C406.2.3.1 and C406.2.3.3 are selected.

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 one of the following:

1. Section C406.2.5.2 L02.
2. Section C406.2.5.3 L03.
3. Section C406.2.5.4 L04.
4. Section C406.2.5.5 L05.
5. Section C406.2.5.6 L06.
6. Any combination of L03, L04, L05 and L06.
7. Any combination of L02, L03 and L04.

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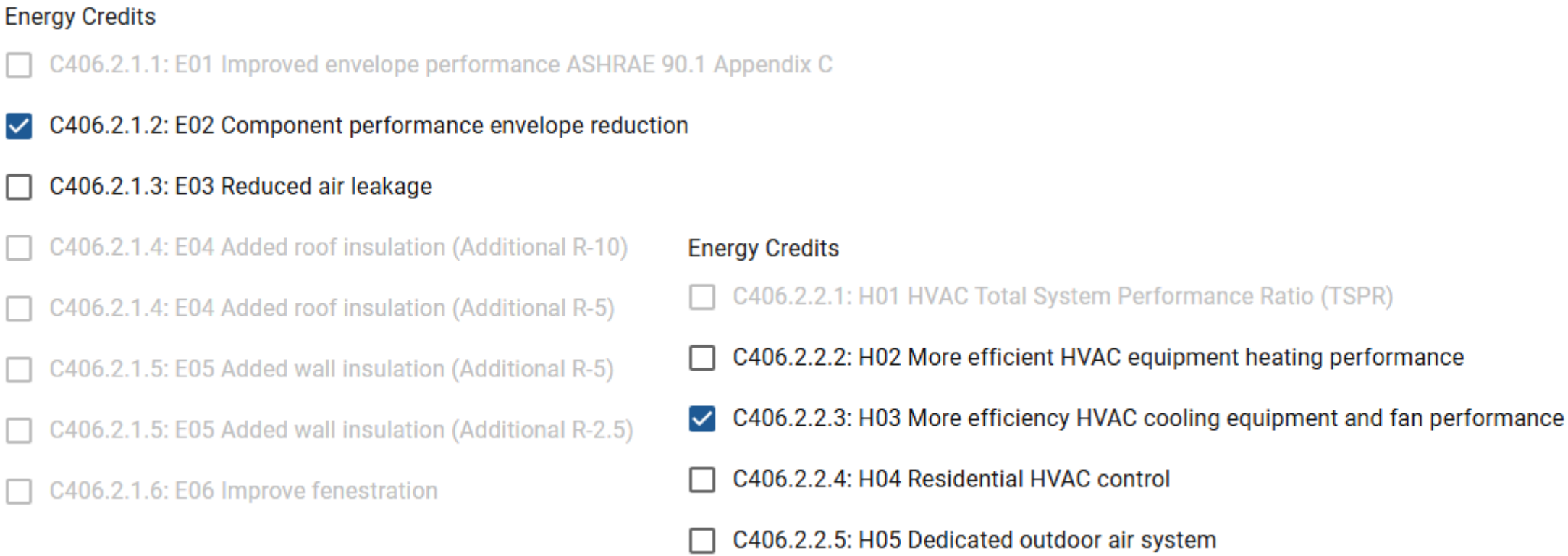
How do I keep track of that?

- The 2024 version of ComCheck has this built-in:



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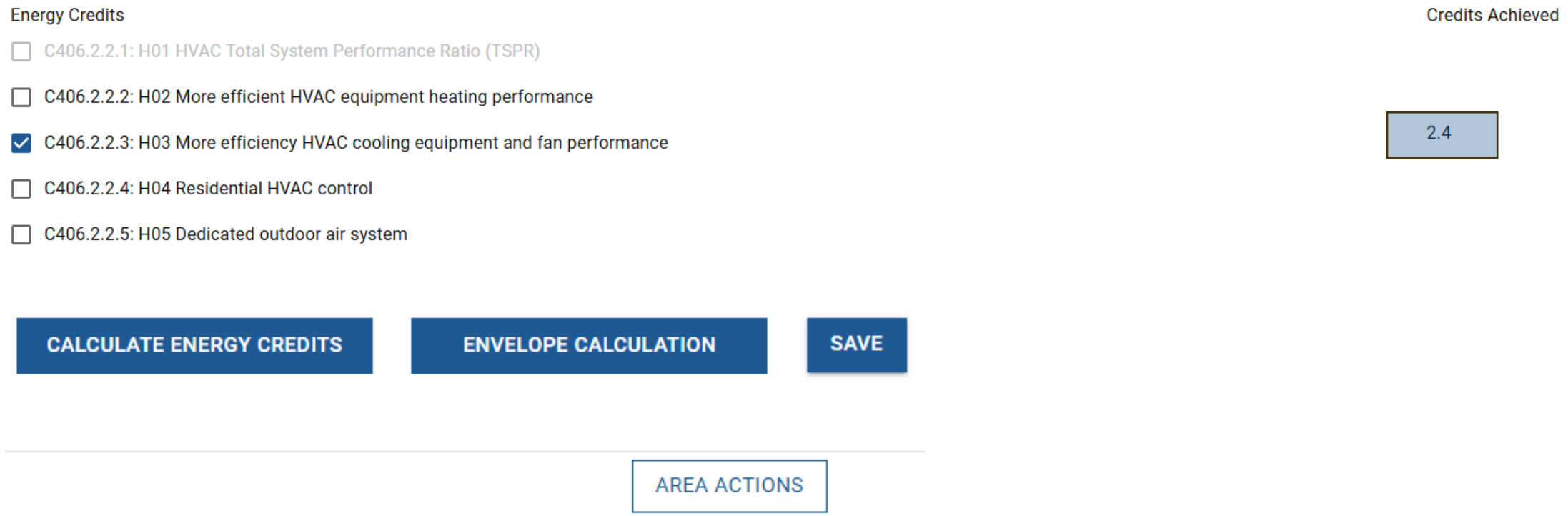
How do I keep track of that?

- The 2024 version of ComCheck also Calculates Credits as you go:



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That’s it right?

- Great Job!
- You’re ½ way done with the additional required credits!!

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Additional Renewable/Load Management

C406.1.2 Additional renewable and load management credit requirements.

Buildings shall comply with measures from Section 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 the purposes of Section C406.

Exception: Where a *building* achieves more energy efficiency credits in Section C406.2 than are required in Section C406.1.1, the renewable and load management credits required in Table C406.1.2 shall be permitted to be reduced by the amount of surplus energy efficiency credits.

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What the code says

C406.3 Renewable and load management credits achieved.

Renewable energy and load management measures shall achieve credits as follows:

1. General measure requirements. Credits are achieved for measures installed in the *building* that comply with Sections C406.3.1 through C406.3.8.
2. Achieved credits are determined as follows:
   - 2.1. Measure credits achieved shall be determined in one of two ways, depending on the measure:
     - 2.1.1. The measure credit shall be the base credit listed by occupancy group and *climate zone* for the measure in Tables C406.3(1) through C406.3(9) where no adjustment factor or formula is shown in the description of the measure in Section C406.3.
     - 2.1.2. 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.
   - 2.2. 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.
   - 2.3. 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.
3. Load management control requirements. 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. Where 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 one of the following:

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What the code says

3.1. 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.

3.2. 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.

3.3. The physical configuration and communication protocol of ANSI/CTA-2045-A or ANSI/CTA-2045-B.

3.4. For air conditioners and heat pumps with two or more stages of control and cooling capacity of less than 65,000 Btu/h (19 kW), *thermostats* with a *demand responsive control* that complies with the communication and performance requirements of AHRI 1380.

3.5. A device that complies with IEC 62746-10-1, an international standard for the open automated demand response system interface between the appliance, system, or energy management system and the controlling entity.

3.6. An interface that complies with the communication protocol required by a controlling entity to participate in an automated demand response program.

3.7. Where the controlling entity does not have a *demand response signal* available for the *building* type and size, local load management control shall be provided based on either:

3.7.1. Building demand management controls that monitor building electrical demand and initiate controls to minimize monthly or peak time period demand charges.

3.7.2. A local building schedule that reflects the electric rate peak period dates and times where buildings are less than 25,000 gross square feet (2322 m^2).

In this case, a binary input to the control system shall be provided that activates the demand response sequence.

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What the code says

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	34	37	31	46	48	56	49	56	38	31	42	32	26	33	34	23	27	25	25
I-2	23	24	25	25	25	28	26	30	22	25	32	24	25	28	29	26	28	22	20
R-1	30	28	35	30	34	36	34	37	41	32	37	27	28	33	32	25	29	22	18
B	38	39	45	42	45	49	47	56	57	44	55	42	38	47	46	38	45	38	31
A-2	8	8	9	9	8	9	9	11	13	8	11	9	8	10	9	8	9	8	3
M	32	32	42	37	39	47	44	58	57	42	54	46	38	48	5	42	45	38	34
E	27	34	38	37	39	47	44	58	57	42	54	46	38	48	50	42	45	38	34
S-1 and S-2	89	90	90	90	90	90	90	90	90	90	90	90	70	90	90	84	86	71	54
All other	35	39	46	42	46	52	49	56	56	40	52	42	37	44	44	36	39	32	28

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So…that means

- Yep…go achieve another 38-58 credits for even more stuff
- Similar to Energy Efficiency you only get a % of credits for where the measure is applied
- You can't double dip, you can't count your required PV array for renewable, but….you can make it bigger or…….contract for renewable energy in addition!

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What is Demand Response?

- Monitoring the electrical grid load profile
- Specific interface software is required, and this has to be done digitally through a control system interface
- As the amount of electricity being used starts increasing the “grid” sends a signal and the selected building systems start responding and using less electricity

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DR and Renewable Calculations

- Ready to jump back in?

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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

HVAC = Heating, Ventilation and Air Conditioning; SHW = Service Hot Water.

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

RENEWABLE AND LOAD MANAGEMENT CREDIT REQUIREMENTS FOR TYPE E BUILDING OCCUPANY (2024 IECC, Table C406.1.2)																			
Building Occupancy Group	CLIMATE ZONE																		
	0A	0B	1A	1B	2A	2B	3A	3B	3C	4A	4B	4C	5A	5B	5C	6A	6B	7	8
E	27	34	38	37	39	47	44	58	57	42	54	46	38	48	50	42	45	38	34

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How did you achieve credits?

- Did you pick R01 Renewable Energy?
  - Can increase the PV array you already installed…or
  - Allows the owner to purchase off-site renewable energy (i.e. wind or PV)
- Did you G01 Lighting Load Management?
  - If didn't pick Energy Efficiency L02 for Dimming and Tuning, then reduce lighting by 20%
  - If picked L02 which already reduced lighting to 85% of max, then reduce by another 20% so down to 65% lighting level of full brightness of fixture

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How did you achieve credits?

- Did you pick G02 HVAC Load Management?
  - Increase cooling setpoint by 3 Deg F or lower heating setpoint by 3 Deg F over 3 hours.
  - Increase OA before shift and decrease OA by 30% during shift
- Did you pick G03 Automated shading load management?
  - Need at least 20% of wall area for W, E, S exposure to have windows
  - Shading shall reduce solar gain by 50% when closed (i.e. NOT blackout)

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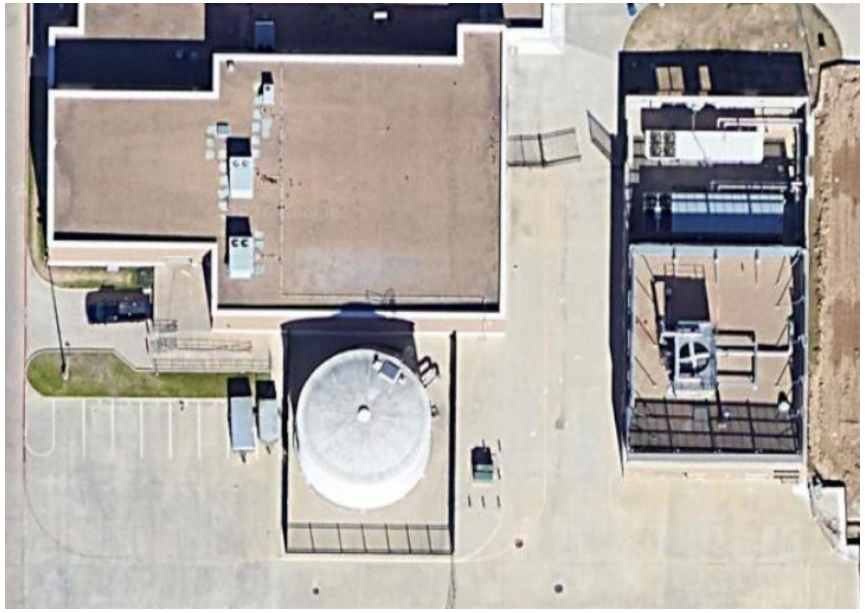
How did you achieve credits?

- Did you pick G04 Electric Energy Storage?
  - Battery Storage, 1.5Wh of storage per Gross SF, so for ES = 150kWh of storage (approx. 5 ft x 5 ft x 5 ft)
- Did you pick G05 Cooling Energy Storage?
  - Chilled Water System with large tank or multiple small ice tanks



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How did you achieve credits?

- Did you pick G06 Service hot water energy storage?
  - Only allowed for electric water heaters
  - Essentially requires an additional storage tank or water heater
- Did you pick G07 thermal mass?
  - Does not integrate with Demand Response Controls
  - Larger thermal mass (i.e. concrete) that is cooled at night by “flushing” building with cold air at night and allowing the building to radiate the cooling during the warmer day and then have the HVAC equipment operate at a lower level

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Is that it?

- If you have achieved minimum credits in both sections: Congratulations!
- If you can’t achieve minimum credits or want to do certain credits….It’s time to Make a Deal!

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Remember this…

C406.1.2 Additional renewable and load management credit requirements.

Buildings shall comply with measures from Section 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 the purposes of Section C406.

> **Exception:** Where a *building* achieves more energy efficiency credits in Section C406.2 than are required in Section C406.1.1, the renewable and load management credits required in Table C406.1.2 shall be permitted to be reduced by the amount of surplus energy efficiency credits.

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Remember this…

C406.1.1 Additional energy efficiency credit requirements.

Buildings shall comply with measures from Section C406.2 to achieve not less than the number of required efficiency credits from Table C406.1.1(1) based on building occupancy group and *climate zone*. Where a project contains multiple occupancies, the total required energy credits from each building occupancy shall be weighted by the gross *conditioned floor area* to determine the weighted-average project energy credits required. Accessory occupancies shall be included with the primary occupancy group for the purposes of Section C406.

Exceptions:

1. Portions of *buildings* devoted to manufacturing or industrial use.
2. Where a *building* achieves more renewable and load management credits in Section C406.3 than are required in Section C406.1.2, surplus credits shall be permitted to reduce the required energy efficiency credits as follows:

$$EEC_{red} = EEC_{tbl} - \{\text{the lesser of: } [SRLM_{lim}, SLRM_{adj} \times (RLM_{ach} - RLM_{req})]\} \quad \text{(Equation 4-12)}$$

where:

EEC_{red} = Reduced required energy efficiency credits.

EEC_{tbl} = Required energy efficiency credits from Table C406.1.1(1).

$SRLM_{lim}$ = Surplus renewable and load management credit limit from Table C406.1.1(2).

$SRLM_{adj}$ = 1.0 for all-electric or all-renewable buildings (excluding emergency generation); 0.7 for buildings with fossil fuel equipment (excluding emergency generation).

RLM_{ach} = Achieved renewable and load management credits from Section C406.3.

RLM_{req} = Required renewable and load management credits from Section C406.1.2.

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There's also a chart for that

TABLE C406.1.1(2)

LIMIT TO ENERGY EFFICIENCY CREDIT CARRYOVER FROM RENEWABLE AND LOAD MANAGEMENT CREDITS

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	5	5	5	5	5	5	5	24	19	5	22	18	5	5	19	5	5	5	5
I-2	16	14	11	8	6	5	5	10	6	8	14	10	17	26	29	21	21	22	39
R-1	7	5	8	5	19	5	32	40	41	24	41	42	17	37	41	5	24	15	22
B	7	5	5	8	6	6	14	26	31	23	39	34	19	35	45	5	19	17	27
A-2	18	16	14	15	13	9	11	23	32	5	23	23	5	5	26	5	5	5	5
M	5	5	5	5	5	5	5	5	20	5	5	5	5	5	5	5	5	5	5
E	13	13	18	16	17	14	21	35	40	25	43	29	23	32	27	11	17	25	5
S-1 and S-2	5	5	5	5	5	5	5	5	13	5	17	20	5	35	23	5	5	11	40
All other	5	5	5	5	5	5	5	7	17	5	10	7	5	6	11	5	5	5	5

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So…what did all that mean?

- If you achieve more Energy Efficiency Credits than minimum required then….you can take a 1 for 1 reduction on the number of Demand Response and Renewable Credits required.
- If you achieve more Demand Response Credits than minimum requires then….you can reduce the amount of Energy Efficiency Credits….but:
  - Only up to the maximum amount noted on the chart, 14-43 depending on the climate zone
  - Also…if you have gas fired equipment (i.e. RTUs, Boilers, etc.) you can ONLY take 70% of the extra credits achieved

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Summary

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Overall Summary of 2024 IECC

- Changes for Economizers and Carbon Dioxide Sensor requirements
- The more lighting controls the better
- Meter as much as you can
- Plan on a PV array on every new facility
- Additional planning and meetings with AE team and owner required to determine how to approach all the required credits – think LEED or CHPS design buildings for every building

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Overall Summary Owners

- May want to talk to cities and try to amend or not adopt the 2024 IECC
- Lots of additional maintenance items
- Lots of additional lighting controls
- Need for additional end user training for additional systems and understanding of temperatures, lighting, shades all changing on their own
- Need for additional internal staff training
- Owners may have to have mechanical systems they are not familiar with

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How to Address

- Additional Demand Response and Renewable: PV seems to be the easiest way to achieve more credits.
- Ground Source Heat Pumps (Geothermal) Systems can apply for IRA Tax Credits for non-taxed entities up to 30-40% of total construction cost of system (through 2032)
  - Can be $1.5-2M credit for elementary and up to $10M for high schools
- Utility Rebates for buildings can provide some minimal help:
  - Can earn up to $30-$50K for HVAC equipment for Elementary
- Utility Demand Response Programs have some minimal help.
  - Allows owners to shift kW load as required and get in range of $30/kW shifted with minimum shift of 100 kW
  - If shift 1,000 kW then $30,000 payment from Oncor
- Thermal Storage can get additional rebates, a large high school could achieve up to $180K of Utility Rebates

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Thank you!

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