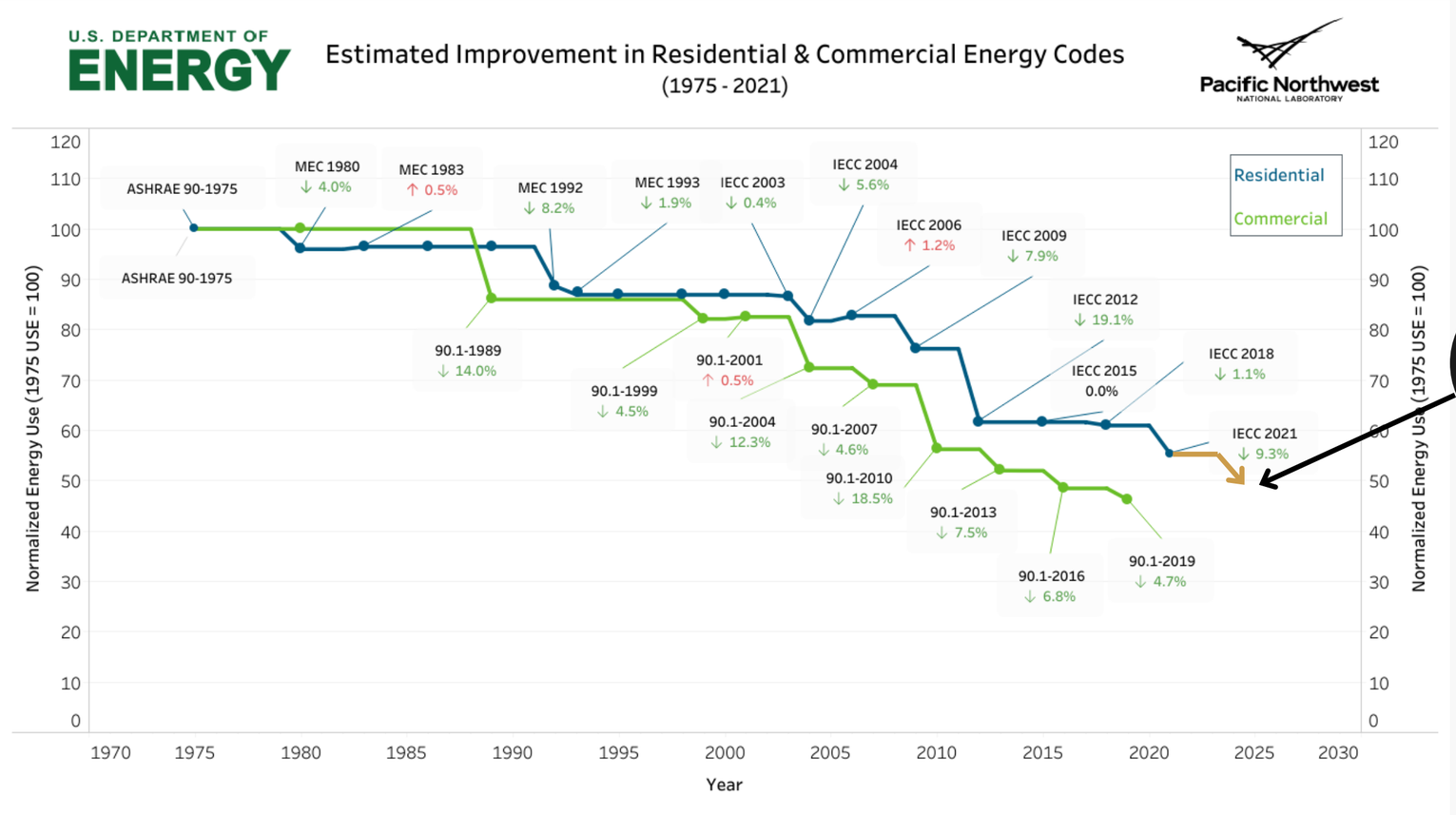
EMA Engineering & Consulting, Inc.

2024 IECC OVERVIEW

ESTIMATED IMPROVEMENT IN RESIDENTIAL & COMMERCIAL ENERGY CODES (19752022)



IECC 2024 ~6-8%

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AGENDA

01

Compliance Paths

02

Additional Efficiency Credit Requirements

03

MEP Changes

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COMPLIANCE PATHS

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PRESCRIPTIVE COMPLIANCE

Requires compliance with all prescriptive & mandatory requirements.

Mandatory Requirements		UA Calculation & Lighting Tradeoffs		C406 Additional Efficiency Requirements Points
Section C402 - C406 and C408 (Cx)	+	2024 COMCheck is now available!	+	New: Renewable and Load Management Requirements

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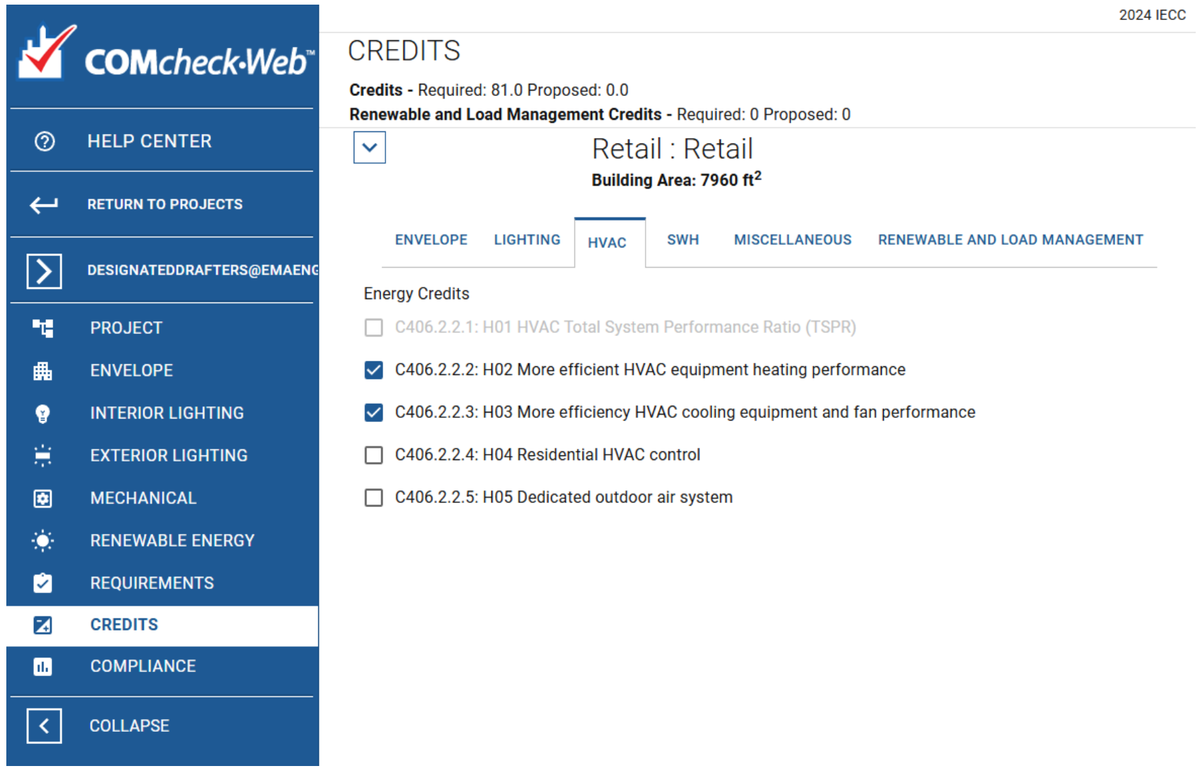
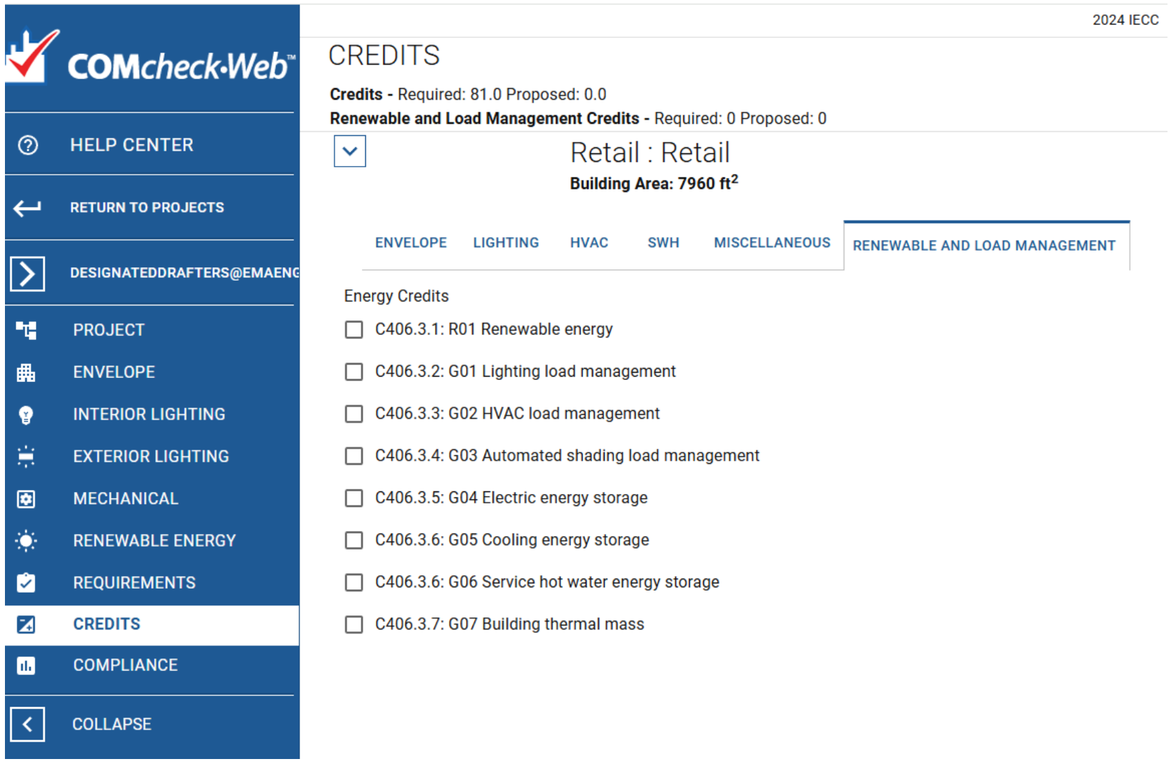
2024 COMCheck





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SIMULATED PERFORMANCE PATH

C407 requires compliance with all mandatory requirements

Mandatory Requirements

+ Sections referred in Table C407.2 (1)

+ Trade-offs among the various energy-using systems of the building

Energy Model Required in Permit Submittal

+ Proposed design % savings requirement ranges from 21% to 25.6%

+ Need to be calculated based on energy efficiency points required in C406

Renewable & Load Management Credits

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TABLE C407.2(1) - REQUIREMENTS FOR SIMULATED BUILDING PERFORMANCE

TABLE C407.2(1)—REQUIREMENTS FOR SIMULATED BUILDING PERFORMANCE

SECTION[a]	TITLE
Envelope	
C401.3	*Building thermal envelope* certificate
C402.2.1.1	Joints staggered
C402.2.1.2	Skylight curbs
C402.2.6	Insulation of radiant heating system panels
C402.6	Air leakage—*building 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
C403.4.1	Thermostatic controls
C403.4.2	Off-hour controls
C403.4.7	Heating and cooling system controls for operable openings to the outdoors
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
C403.12, except C403.12.3	Refrigeration equipment performance
C403.13	Construction of HVAC system elements
C403.14	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.

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PERFORMANCE PATH

C407 requires compliance with all mandatory requirements

+ Proposed design savings requirements range from 21% to 25.6%

+ NEW! Additional on-site renewables can be counted towards Annual Energy Costs Savings
  + (IECC 2021 is limited to 5% of Standard Ref Design's Annual Energy Cost Savings)

+ Must use c407 or ASHRAE 90.1 if window-to-wall area > 40%

+ Trade off between envelope, lighting, and HVAC

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EFFICIENCY CREDIT REQUIREMENTS

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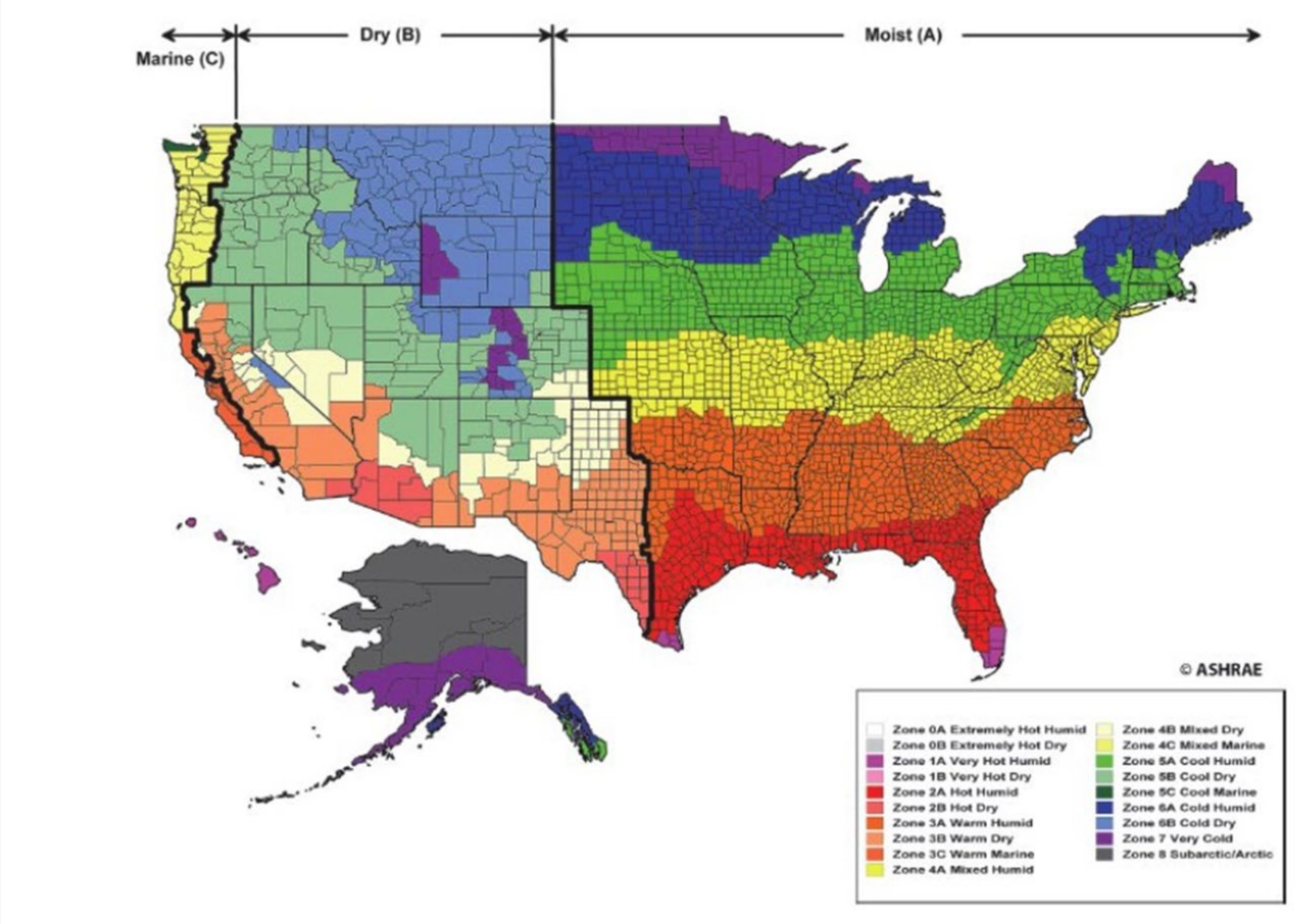
ADDITIONAL EFFICIENCY REQUIREMENTS

+ Determined by Occupancy Group and Climate Zone.

+ Comparison (e.g., Group B Occupancy in 2A Climate Zone)
  + Total Energy Credits Under 2021 IECC: 10
  + Total Energy Credits Under 2024 IECC: 111



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ADDITIONAL EFFICIENCY REQUIREMENTS POINTS
Snapshot

+ > 2,000 SF Conditioned Floor Area
  + C406.1.1 → Additional energy efficiency credit requirements

+ > 5,000 SF Conditioned Floor Area
  + C406.1.1
  + C406.1.2 → Additional energy efficiency credit + Additional renewable & load management credit

+ Build Out Construction > SF Conditioned Floor Area
  + C406.1.1.2

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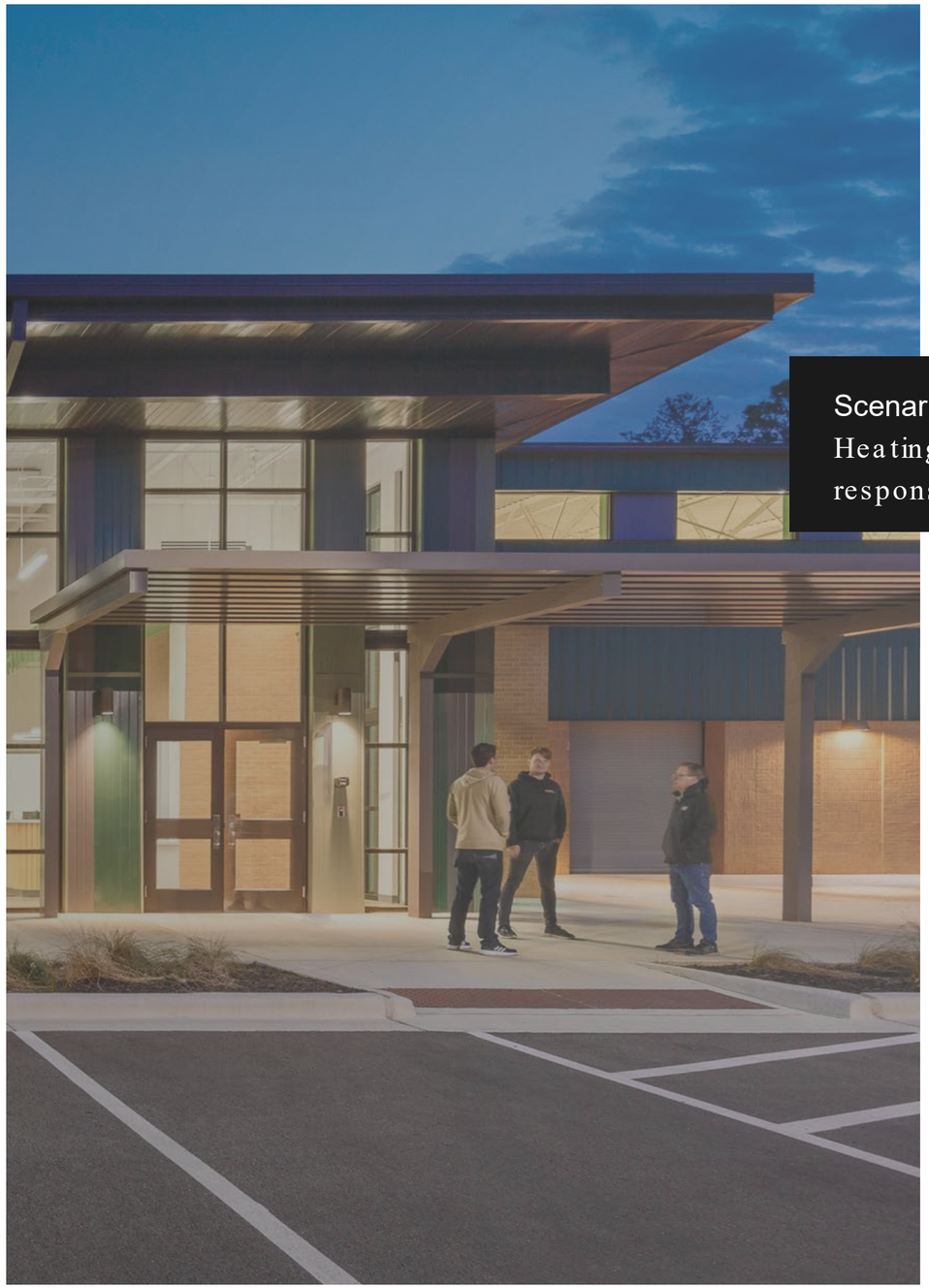

HOW MANY ADDITIONAL EFFICIENCY CREDITS DOES MY PROJECT NEED?

Scenario: Prescriptive path, School in San Antonio, 100,000 sq. ft. conditioned area, Natural Gas Heating, On-site Solar of 500kW, Lighting Load Management in 80% of building area with demand responsive lighting controls.

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

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	8	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	3	28

*Required: Renewable and Load Management Credits

$$54 \leftarrow EEC_{red} = \underbrace{EEC_{tbl}}_{58} - \{\text{the lesser of: } [\overbrace{SLRM_{lim}}^{17}, \underbrace{SRLM_{adj}}_{0.7\text{ (for fossi fuels)}} \times (\overbrace{RLM_{ach}}^{45} - \underbrace{RLM_{req}}_{39})]\}$$

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TOTAL BASE ENERGY CREDITS: 173

MEP-related Energy Credits:

+ Mechanical (64)
  + 5 options
+ Electrical (3)
  + 1 options
+ Lighting (26)
  + 10 options

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

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BUILDING ENVELOPE

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2024 Focused Items

+ Mechanical Penetration

+ Fenestration Allowance

+ Thermal Bridging

+ Envelope Testing

- Only for Prescriptive Path
- Calculation required for through wall penetrations (louvers, refrigerant lines, conduits, etc).
- If more than 1% of opaque above grade wall; Must be broken out as a separate wall assembly and meet envelope U -factor (default 0.5)
- Area weighted method or component performance alternative method

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2024 Focused Items

+ Mechanical Penetration

+ Fenestration Allowance

+ Thermal Bridging

+ Envelope Testing

- Vertical fenestration <30% : Prescriptive path or Performance path
- Vertical fenestration >30% & up to 40%: Need improved SHGC, U -factor + daylight responsive controls, component performance alternative
  - Still stays in prescriptive
  - *2021 required either performance path or ASHRAE 90.1*
- Vertical fenestration >40%:
  - Simulated performance path OR
  - ASHRAE 90.1

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2024 Focused Items

+ Mechanical Penetration

+ Fenestration Allowance

+ Thermal Bridging

+ Envelope Testing

- 2021 IECC: Did not address thermal bridging at the intersection of assemblies & components
- 2024 IECC: Added thermal bridging identification for:
  - **Balconies:** approved thermal break device, Penetration area within the area-weighted U-factor of above-grade wall, component alternative or performance path approach
  - **Cladding Supports:** offset from structure to allow for continuous insulation to pass behind cladding except at the support point
  - **Beams & Columns:** covered with R -5 for at least 2 ft
  - **Vertical fenestrations:** non-metal thermal break in the frame, R -3 for or wood buck at least 1.5 inches, accounted in U -factor calculation
  - **Parapets:** continuous insulation on both sides of parapet walls, cavity insulation

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2024 Focused Items

+ Mechanical Penetration

+ Fenestration Allowance

+ Thermal Bridging

+ Envelope Testing →

- Buildings < 25,000 sq ft on CZ0 -4: exempt from air leakage testing
- Reduced leakage allowance: 0.35 CFM/sq ft
- Leakage allowance up to 0.45 CFM/sq ft, but requires corrective action
- Building Envelope Performance Verification (Cx) Requirement (same as 2021 IECC)

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MEP CHANGES

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MECHANICAL

+ Sections C403.4.6 - C403.3.8, C403.7.8, C403.8.6.2, added.

+ HVAC Efficiency table has been adjusted to match with ASHRAE 90.1 -2022

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C403.4.6 - C403.4.8

+ Door interlock requirement: expanded to 40 sf doors between conditioned space and outdoors must interlock with HVAC controls (i.e., disable heating or cooling when open), not just large operable openings.

+ Humidity limits: imposes upper and lower relative humidity caps for spaces actively controlled for humidity, intended to limit excessive energy use.

+ Prohibits sub-cooling of air for reducing humidity below the lower of 55F dew point or RH of 60% in the coldest zone. (DOAS, DX with Hot-gas Reheat, ECM fan, multi-stage compressors)

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C403.7.8

+ Requires “occupied standby” controls in certain spaces: when zones aren’t occupied, HVAC systems must be able to set back cooling/heating setpoints, reduce supply air, and cut ventilation airflow to save energy.
    + 3 Setpoint Modes
    + Occ. Sensors, CO2
    + Excludes gyms, cafeterias

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C403.8.6.2

+ Requires that exhaust fans in bathrooms and toilet rooms must have intermittent control methods.

+ The automatic control requirement is waived if the bathroom or toilet room is part of the outdoor air ventilation system for Group R-2, R-3, or R-4 occupancies. In those cases, only a manual “on” override is required.

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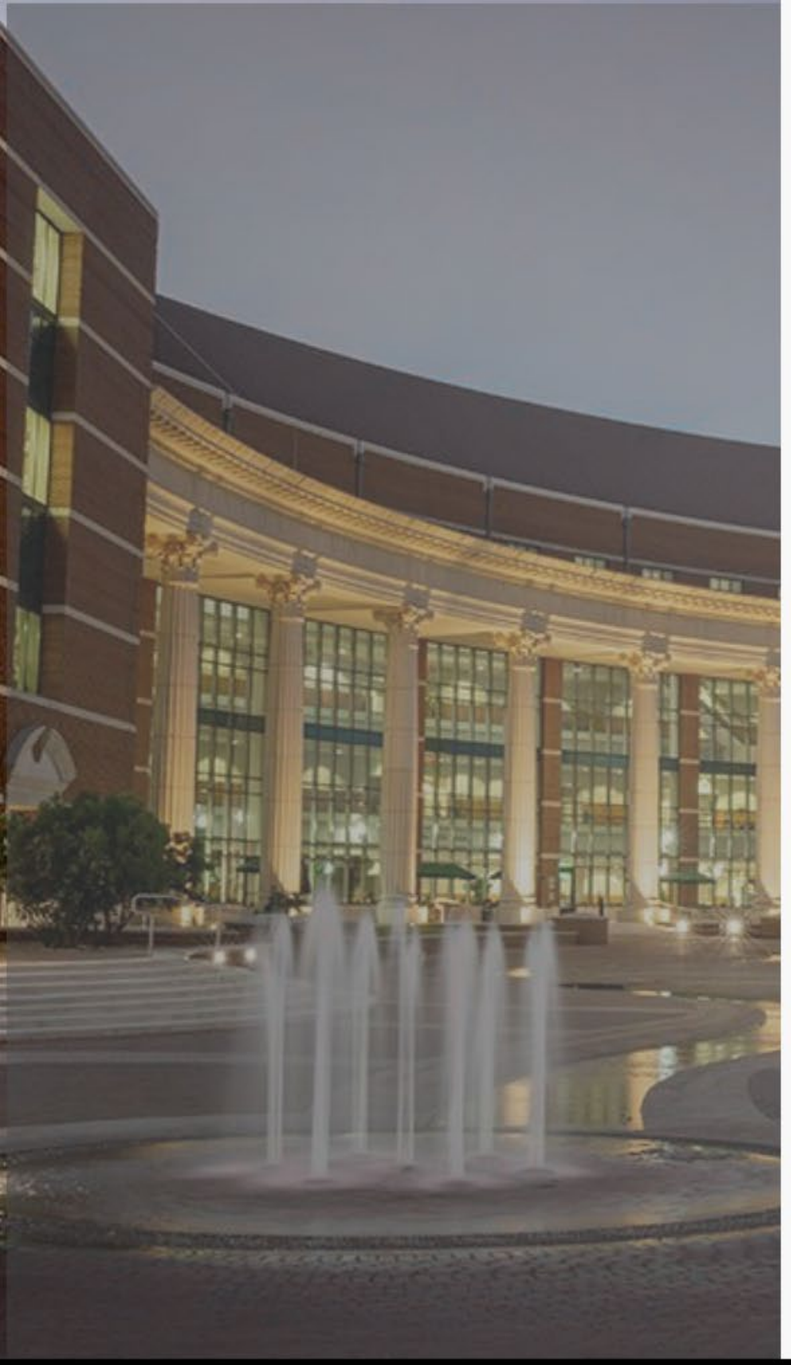

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PLUMBING

+ UEF is determined by simulating the water heater in different scenarios

+ Insulation thickness
  + All pipe sizes 1 ½” require 1" thick insulation (stayed the same)
  + All pipe size 1 ½” or larger require 1 ½” thick insulation (stayed the same)

+ Heatpump Water Heaters
  + Operate similar to a heatpump HVAC unit
  + Come in a “packaged” system or “split system”
  + Require electric back up

+ Shower Drain Heat Recovery
  + Install in shower drainpipe
  + Limited installation
  + Partial credits on all occupancy groups except I-2, I-4, R-1, R-2

LIGHTING

Occupancy Sensors

+ Occupancy sensors required in a few new areas.
  + Computer rooms, data centers, laundry rooms, medical supply rooms, telemedicine rooms.

+ Mandatory Continuous Dimming Controls added.

Allowable Wattage

+ Allowable wattage for general lighting within daylight zones has been reduced by half

150W to 75W in a single primary zone.

Sleeping & Dwelling Units

+ Sleeping units and dwelling units to have lighting controls and switched receptacles

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ELECTRICAL

UTILITY METERING

Now applies to commercial buildings ≥ 10,000 sq. ft. (was 25,000 sq. ft.).

Includes non-electrical utilities (natural gas, propane, fuel oil, etc.) must be metered by load category (C405.13.8).

ONSITE RENEWABLE ENERGY

New buildings (including additions) are required to generate renewable energy in the amount of 0.75 Watts for every sq. ft. of conditioned floor area, not to exceed the conditioned floor area for the three largest floors (C405.15.1)

ENERGY CREDITS

The number of required Energy Efficiency Credits have increased in the 2024 code (C406.1.1).

Newly added Renewable and Load Management (RLM) credit requirements (C406.3).

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ELECTRICAL

ON-SITE RENEWABLE ENERGY SYSTEMS

On-Site Renewable Energy Requirements

New commercial buildings ≥ 5,000 sq. ft. must incorporate an on-site renewable energy generation system with a minimum DC generating capacity of:

DC size = Conditioned Floor Area×0.75W

Exceptions to On-Site Renewable Energy Installation

An on-site renewable energy system is not required if the building or site meets one of the following four exceptions:

ON-SITE RENEWABLE ENERGY SYSTEM – FOUR EXCEPTIONS

- **Low Solar Radiation**

The site receives an annual daily average incident solar radiation of < 3.5 kWh/m²/day.
Typically applies to northernmost states; Texas and surrounding states exceed 4 kWh/m²/day.

- **Roof Obstructions Covering ≥ 80% of Roof Area**

Includes mechanical equipment, vents, drains, skylights, and access pathways.
This is an exception where the design can influence its application.

- **Shading from External Objects for > 2,500 Hours/Year**

More than 50% of the roof area is shaded by trees or neighboring structures between 8 AM and 4 PM.
Might apply for short buildings near tall trees/structures; requires a shading analysis to qualify.

- **Small Building Size**

Buildings < 5,000 sq. ft. of conditioned floor area

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ELECTRICAL

Off-Site Renewable Energy Procurement Requirements

If the building does qualify for an exception, the owner must procure off-site renewable energy per C405.15.2:

- **Option 1:** A 10-year minimum energy contract (C405.15.2.2).
- **Option 2:** If a contract is not available, the owner must purchase renewable electricity products equal to 5 times the required off-site renewable energy amount before the certificate of occupancy is issued (C405.15.4).

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ELECTRICAL

Demand Responsive (DR) Controls:

New requirements were added for **Demand Responsive (DR) lighting controls**, which must be capable of automatically reducing lighting output to 80% or less upon receiving a demand response signal.

DRLC systems function by communicating with the utility grid to receive a signal—the demand response signal—that indicates a period of high grid stress, a high wholesale price for electricity, or another request to temporarily reduce power usage.

Receipt of DR Signal:

The building's control system (often a Building Management System or a dedicated lighting controller) receives the OpenADR (Open Automated Demand Response) signal, which is a standardized communication protocol.

Automated Curtailment:

Upon receiving the signal, the DRLC system automatically reduces the power consumption of the controlled lighting. This is typically done through **continuous dimming** rather than switching lights off completely in occupied spaces, to minimize disruption to occupants.

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ELECTRICAL

2030 Glide Path

+ Not required, but recommendations are available for cities to adopt.

+ Increases the requirements for renewable energy.

+ Assumed that by 2030, all new construction will operate at a zero net energy usage by year 2030.

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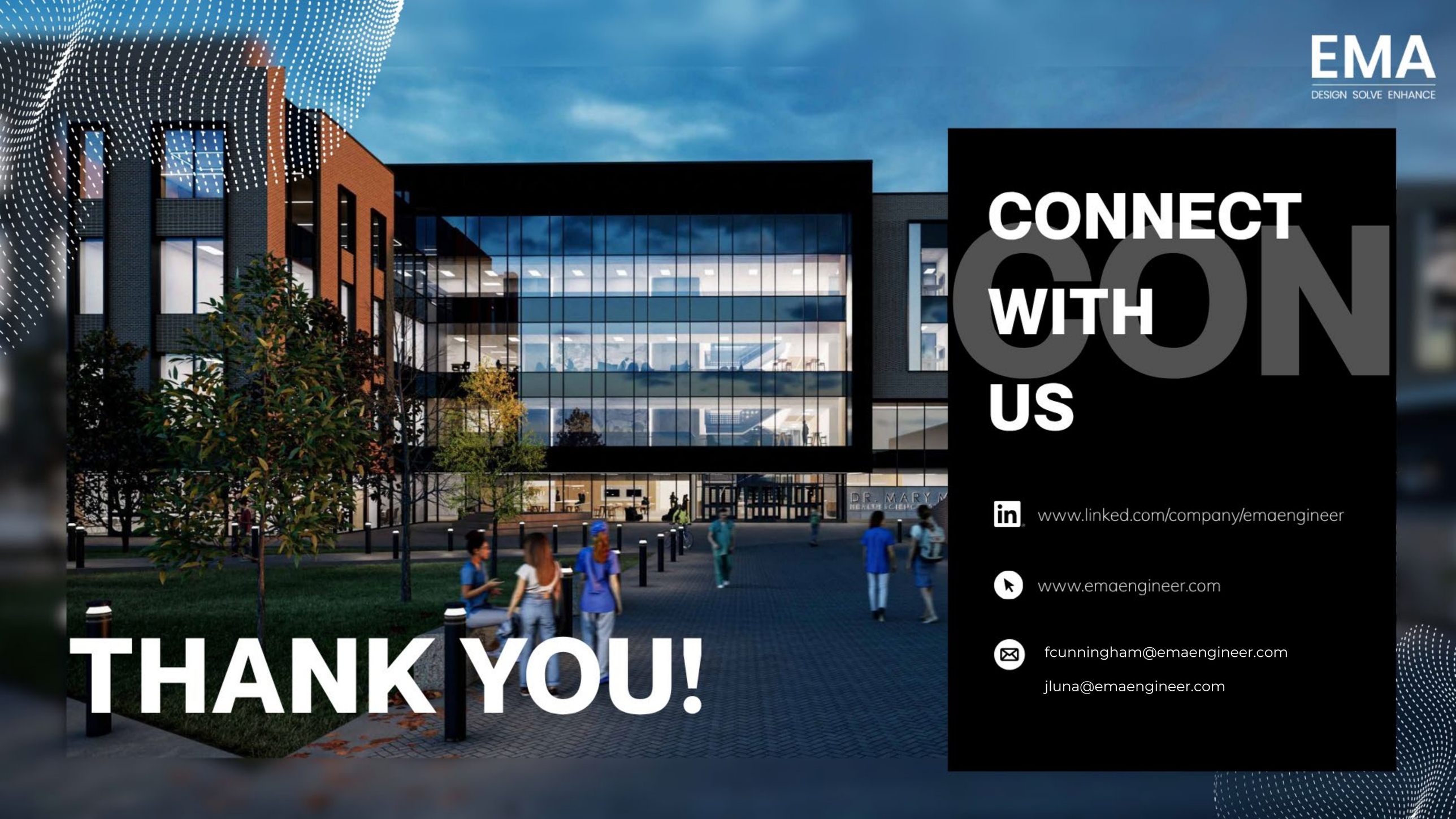

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