

# COMPROMISE /OMNIBUS PROPOSAL

*List of proposal used to generate the omnibus:*

RECPI-6 / RECPI-7      REPI-33      REPI-64      REPI-68      REPI-93      REPI-111  
REPI-7      REPI-20      REPI-70      REPI-115      REPI-122

## 2021 International Energy Conservation Code

### CHAPTER 2 [RE] DEFINITIONS

#### SECTION R202 GENERAL DEFINITIONS

Add new definitions as follows :

**AUTOMOBILE PARKING SPACE.** A space within a building or private or public parking lot, exclusive of driveways, ramps, columns, office and work areas, for the parking of an automobile.

**ELECTRIC VEHICLE (EV).** An automotive-type vehicle for on-road use, such as passenger automobiles, buses, trucks, vans, neighborhood electric vehicles, and electric motorcycles, primarily powered by an electric motor that draws current from a building electrical service, *EVSE*, a rechargeable storage battery, a fuel cell, a photovoltaic array, or another source of electric current.

**ELECTRIC VEHICLE SUPPLY EQUIPMENT (EVSE).** Equipment for plug-in power transfer including the ungrounded, grounded and equipment grounding conductors, and the *electric vehicle* connectors, attached plugs, personal protection system and all other fittings, devices, power outlets or apparatus installed specifically for the purpose of transferring energy between the premises wiring and the *electric vehicle*.

**ELECTRIC VEHICLE SUPPLY EQUIPMENT INSTALLED SPACE (EVSE space).** An *automobile parking space* that is provided with a dedicated *EVSE* connection

**ELECTRIC VEHICLE CAPABLE SPACE (EV CAPABLE SPACE).** A designated *automobile parking space* that is provided with electrical infrastructure, such as, but not limited to, raceways, cables, electrical capacity, and panelboard or other electrical distribution equipment space, necessary for the future installation of an *EVSE*.

**ELECTRIC VEHICLE READY SPACE (EV READY SPACE).** An *automobile parking space* that is provided with a branch circuit and either an outlet, junction box or receptacle, that will support an installed *EVSE*.

**DEMAND RESPONSE SIGNAL.** A signal that indicates a price or a request to modify electricity consumption for a limited time period.

**DEMAND RESPONSIVE CONTROL.** A control capable of receiving and automatically responding to a *demand response signal*.

**LOW-SLOPED ROOF.** A roof slope less than 2 units vertical in 12 units horizontal (17 percent slope).

**STEEP-SLOPED ROOF.** A roof slope 2 units vertical in 12 units horizontal (17 percent slope) or greater.

**GRADE PLANE.** A reference plane representing the average of the finished ground level adjoining the building at all exterior walls. Where the finished ground level slopes away from the exterior wall, the reference plane shall be established by the lowest points within the area between the building and the lot line or, where the lot line is more than 6 feet (1829 mm) from the building between the structure and a point 6 feet (1829 mm) from the building.

**LIVING SPACE.** Space within a dwelling unit utilized for living, sleeping, eating, cooking, bathing, washing and sanitation purposes.

**SOLAR-READY ZONE.** A section or sections of the roof or building overhang designated and reserved for the future installation of a solar photovoltaic or solar thermal system.

Add new as follows (REPI-7):

## CHAPTER 1 [RE] SCOPE AND ADMINISTRATION

### SECTION R103 CONSTRUCTION DOCUMENTS

**R103.2.2 Solar-ready system.** The construction documents shall provide details for dedicated roof area, structural design for roof dead and live load, and routing of conduit or pre-wiring from *solar-ready zone* to electrical service panel or plumbing from *solar-ready zone* to *service water heating system*.

Revise as follows:

**R105.2.3 Plumbing rough-in inspection.** Inspections at plumbing rough-in shall verify compliance as required by the code and *approved* plans and specifications as to types of insulation and corresponding *R*-values and protection, and required controls. Where required, inspections shall verify pathways for routing of plumbing from *solar-ready zone* to *service water heating system*.

Add new text as follows:

**R105.2.5 Electrical rough-in inspection.** Inspections at electrical rough-in shall verify compliance as required by the code and the *approved* plans and specifications as to the locations, distribution, and capacity of the electrical system. Where the *solar-ready zone* is installed for electricity generation, inspections shall verify conduit or pre-wiring from *solar-ready zone* to electrical panel.

Revise as follows:

**R105.2.5 R105.2.6 Final inspection.** The *building* shall have a final inspection and shall not be occupied until *approved*. The final inspection shall include verification of the installation of all required building systems, equipment and controls and their proper operation and the required number of high-efficacy lamps and fixtures.

## CHAPTER 4 [RE] RESIDENTIAL ENERGY EFFICIENCY

### SECTION R401 GENERAL

**R401.3 (N1101.14) Certificate.** A permanent certificate shall be completed by the builder or other approved party and posted on a wall in the space where the furnace is located, a utility room or an approved location inside the building. Where located on an electrical panel, the certificate shall not cover or obstruct the visibility of the circuit directory label, service disconnect label or other required labels. The certificate shall indicate the following:

1. The predominant R-values of insulation installed in or on ceilings, roofs, walls, foundation components such as slabs, *basement walls*, *crawl space walls* and floors and ducts outside *conditioned spaces*.
2. U-factors of fenestration and the *solar heat gain coefficient* (SHGC) of fenestration. Where there is more than one value for any component of the building envelope, the certificate shall indicate both the value covering the largest area and the area weighted average value if available.
3. The results from any required duct system and building envelope air leakage testing performed on the building.
4. The types, sizes and efficiencies of heating, cooling and service water-heating equipment. Where a gas-fired unvented room heater, electric furnace or baseboard electric heater is installed in the residence, the certificate shall indicate “gas-fired unvented room heater,” “electric furnace” or “baseboard electric heater,” as appropriate. An efficiency shall not be indicated for gas-fired unvented room heaters, electric furnaces and electric baseboard heaters.
5. Where on-site *photovoltaic panel* systems have been installed, the array capacity, inverter efficiency, panel tilt and orientation shall be noted on the certificate.
6. For buildings where an Energy Rating Index score is determined in accordance with Section R406, the Energy Rating Index score, both with and without any on-site generation, shall be listed on the certificate.
7. The code edition under which the structure was permitted and the compliance path used.
8. Where a *solar-ready zone* is provided, the certificate shall indicate the location, and dimensions.

Revise as follows (REPI-33):

**SECTION R402 BUILDING THERMAL ENVELOPE****TABLE R402.1.2 (TABLE R1102.1.2) MAXIMUM ASSEMBLY U-FACTORS<sup>a</sup> AND FENESTRATION REQUIREMENTS**

	FENESTRATION U-FACTOR <sup>f</sup>	SKYLIGHT U-FACTOR	GLAZED FENESTRATION SHGC <sup>d,e</sup>	CEILING U-FACTOR	WOOD FRAME WALL U-FACTOR	MASS WALL U-FACTOR <sup>b</sup>	FLOOR U-FACTOR	BASEMENT WALL U-FACTOR	CRAWL SPACE WALL U-FACTOR
0	0.50	0.75	0.25	0.035	0.084	0.197	0.064	0.360	0.477
1	0.50	0.75	0.25	0.035	0.084	0.197	0.064	0.360	0.477
2	0.40	0.65	0.25	0.026 <u>30</u>	0.084	0.165	0.064	0.360	0.477
3	0.30	0.55	0.25	0.026 <u>30</u>	0.060	0.098	0.047	0.091 <sup>c</sup>	0.136
4 except Marine	0.30	0.55	0.40	0.024 <u>26</u>	0.045	0.098	0.047	0.059	0.065
5 and Marine 4	0.30	0.55	0.40	0.024 <u>26</u>	0.045	0.082	0.033	0.050	0.055
6	0.30	0.55	NR	0.024 <u>26</u>	0.045	0.060	0.033	0.050	0.055
7 and 8	0.30	0.55	NR	0.024 <u>26</u>	0.045	0.057	0.028	0.050	0.055

**TABLE R402.1.3 (TABLE N1102.1.3) INSULATION MINIMUM R-VALUES AND FENESTRATION REQUIREMENTS BY COMPONENT<sup>a</sup>**

	FENESTRATION U-FACTOR <sup>b,i</sup>	SKYLIGHT U-FACTOR	GLAZED FENESTRATION SHGC <sup>b,e</sup>	CEILING R-VALUE	WOOD FRAME WALL R-VALUE <sup>g</sup>	MAS S WALL R-VALUE <sup>h</sup>	FLOOR R-VALUE	BASEMENT <sup>c,g</sup> WALL R-VALUE	SLAB <sup>d</sup> R-VALUE & DEPTH	CRAWL SPACE <sup>e,g</sup> WALL R-VALUE
0	NR	0.75	0.25	30	13 or 0 & 10ci	3/4	13	0	0	0
1	NR	0.75	0.25	30	13 or 0 & 10ci	3/4	13	0	0	0
2	0.40	0.65	0.25	49 <u>38</u>	13 or 0 & 10ci	4/6	13	0	0	0
3	.30	0.55	0.25	49 <u>38</u>		8/13	19	5ci or 13 <sup>f</sup>	10ci, 2 ft	5ci or 13 <sup>f</sup>

4 except Marine	.30	0.55	0.40	<del>6049</del>	30 or 20 & 5ci <sup>h</sup> or 13 & 10ci <sup>h</sup> or 0 & 20ci <sup>h</sup>	8/13	19	10ci or 13	10ci, 4 ft	10ci or 13
5 and Marine 4	0.30 <sup>i</sup>	0.55	0.40	<del>6049</del>	30 or 20 & 5ci <sup>h</sup> or 13 & 10ci <sup>h</sup> or 0 & 20ci <sup>h</sup>	13/17	30	15ci or 19 or 13 & 5ci	10ci, 4 ft	15ci or 19 or 13 & 5ci
6	0.30 <sup>i</sup>	0.55	NR	<del>6049</del>	30 or 20 & 5ci <sup>h</sup> or 13 & 10ci <sup>h</sup> or 0 & 20ci <sup>h</sup>	15/20	30	15ci or 19 or 13 & 5ci	10ci, 4 ft	15ci or 19 or 13 & 5ci
7 and 8	0.30 <sup>i</sup>	0.55	NR	<del>6049</del>	30 or 20 & 5ci <sup>h</sup> or 13 & 10ci <sup>h</sup> or 0 & 20ci <sup>h</sup>	19/21	38	15ci or 19 or 13 & 5ci	10ci, 4 ft	15ci or 19 or 13 & 5ci

Revise as follows (REPI-64):

**SECTION R402 BUILDING THERMAL ENVELOPE**

**R402.4.1.3 (N1102.4.1.3) Prescriptive air leakage ~~Leakage rate~~.**

When complying with Section R401.2.1, the building or dwelling unit shall have an air leakage rate not exceeding 5.0 air changes per hour in Climate Zones 0, 1 and 2, 3.0 air changes per hour in Climate Zones 3 through 5, and ~~3.0~~ 2.0 ~~2.5~~ air changes per hour in Climate Zones ~~3~~ through 8, when tested in accordance with Section R402.4.1.2.

**TABLE R405.4.2(1) (TABLE N1105.4.2(1)) SPECIFICATIONS FOR THE STANDARD REFERENCE AND PROPOSED DESIGNS**

Portions of table not shown remain unchanged.

BUILDING COMPONENT	STANDARD REFERENCE DESIGN	PROPOSED DESIGN
Air exchange rate	The air leakage rate at a pressure of 0.2 inch w.g. (50 Pa) shall be  Climate Zones 0 through 2: 5.0 air changes per hour.  <u>Climate Zone 3, 4, and 5: 3.0 air changes per hour.</u>  Climate Zones <del>3</del> through 8: <del>3.0</del> <u>2.5</u> air changes per hour.	The measured air exchange rate. <sup>a</sup>
	The mechanical ventilation rate shall be in addition to the air leakage rate and shall be the same as in the proposed design, but not greater than $0.01 \times \text{CFA} + 7.5 \times (\text{N} + 1)$  where:  CFA = conditioned floor area, ft <sup>2</sup> .  N = number of bedrooms.  The mechanical ventilation system type shall be the same as in the proposed design. Energy recovery shall not be assumed for mechanical ventilation.	The mechanical ventilation rate <sup>b</sup> shall be in addition to the air leakage rate and shall be as proposed.

Revise as follows (REPI-93):

## SECTION R403 SYSTEMS

### R403.6.1 Heat or energy recovery ventilation.

*Dwelling units* shall be provided with a heat recovery or energy recovery ventilation system in Climate Zones 6, 7, and 8. The system shall be balanced with a minimum sensible heat recovery efficiency of 65 percent at 32°F (0°C) at a flow greater than or equal to the design airflow.

~~— **Exceptions:**~~

~~— 1. *Dwelling units* in single and two-family dwellings and townhouses in Climate Zones 0-4.~~

~~— 2. *Dwelling units* in Group R occupancies that comply with Section C403.7.4.1.~~

Add new text as follows (REPI-111):

## SECTION R404 ELECTRICAL POWER AND LIGHTING SYSTEMS

**R404.4 (N1104.4) Electric readiness.** Systems using fossil fuel: water heaters, household clothes dryers, conventional cooking tops or conventional ovens shall comply with the requirements of Sections R404.4.1 through R404.4.4. ~~All water heating systems shall comply with the space requirements of Section R404.4.5.~~

**R404.4.1 (N1104.4.1) Cooking products.** An individual branch circuit outlet with a rating not less than 250-volts, 40-amperes shall be installed, and terminate within three feet of conventional cooking tops, conventional ovens or cooking products combining both.

**Exception:** Cooking products not installed in an individual *dwelling unit*.

**R404.4.2 (N1104.4.2) Household Clothes Dryers .**

An individual branch circuit outlet with a rating not less than 240-volts, 30-amperes shall be installed, and terminate within three feet (304 mm) of each household clothes dryer.

**Exception:** Clothes dryers that serve more than one *dwelling unit* and are located outside of a *dwelling unit*.

**R404.4.3 (N1104.4.3) Water heaters.**

An individual branch circuit outlet with a rating not less than either 240-volts, 30-amperes or 120V, 20-amperes shall be installed, and terminate within three feet (304 mm) of each fossil fuel water heater.

**Exception:** Water heaters in a centralized water heating system serving multiple dwelling units in a R-2 occupancy.

**R404.4.4 (N1104.4.4) Electrification-ready circuits.**

The unused conductors required by Sections R404.4.1 through R404.4.3 shall be labeled with the word "spare." Space shall be reserved in the electrical panel in which the branch circuit originates for the installation of an overcurrent device. Capacity for the circuits required by Sections R404.4.1 through R404.4.3 shall be included in the load calculations of the original installation.

~~**R404.4.5 (N1104.4.5) Water heater space.**~~

~~An indoor space that is at least 3 feet (304 mm) by 3 feet (304 mm) wide by 7 feet (2133 mm) high shall be available surrounding or within 3 feet (304 mm) of the installed water heater.~~

~~**Exceptions:**~~

~~1. Installed heat pump, electric tankless, or fossil fuel tankless water heaters.~~

~~2. Water heaters in a centralized water heating system serving multiple *dwelling units* in a R-2 occupancy.~~



Add new text as follows (REPI-7):

**R404.4 (N1104.4) Renewable energy infrastructure.** The building shall comply with the requirements of R404.4.1 or R404.4.2.

**R404.4.1 (N1104.4.1) One- and two- family dwellings and townhouses.** One- and two-family dwellings and townhouses shall comply with Sections R404.4.1.1 through R404.4.1.4.

Exceptions:

1. A *dwelling unit* with a permanently installed on-site renewable energy system.
2. A *dwelling unit* with a solar-ready zone area that is less than 500 square feet (46 m<sup>2</sup>) of roof area oriented between 110 degrees and 270 degrees of true north.
3. A *dwelling unit* with less than 500 square feet (46m<sup>2</sup>) of roof area oriented between 110 degrees and 270 degrees of true north.
4. ~~A *dwelling unit* with a solar-ready zone area that is shaded for more than 70 percent of daylight hours annually.~~ Dwelling units where 50 percent of the solar-ready area is shaded from direct-beam sunlight by natural objects or by structures that are not part of the building for more than 2500 annual hours between 8:00 a.m. and 4:00 p.m.
5. A *dwelling unit* that complies with Appendix RC.
6. A *dwelling unit* with a renewable energy power purchase agreement with a duration of not less than 15 years from a utility or a community renewable energy facility and for not less than 80 percent of the estimated whole-building electric use on an annual basis.
7. A *dwelling unit* less than or equal to 1,500 square feet of *living space* floor area located above *grade plane*.

**R404.4.1.1 (N1104.4.1.1) Solar-ready zone area.** The total area of the *solar-ready zone* shall not be less than 250 square feet (23.2 m<sup>2</sup>) and shall be composed of areas not less than 5.5 feet (1676 mm) in ~~ibe~~ **one** direction and not less than 80 square feet (7.4 m<sup>2</sup>) exclusive of access or set back areas as required by the *International Residential Code*.

**Exception:** Dwelling units in townhouses three stories or less in height above *grade plane* and with a total floor area less than or equal to 2,000 square feet (186 m<sup>2</sup>) per dwelling shall be permitted to have a *solar-ready zone* area of not less than 150 square feet (14 m<sup>2</sup>).

**R404.4.1.2 (N1104.4.1.2) Obstructions.** Solar-ready zones shall be free from obstructions, including but not limited to vents, chimneys, and roof-mounted equipment.

**R404.4.1.3 (N1104.4.1.3) Electrical service reserved space.** The main electrical service panel shall have a reserved space for a dual pole circuit breaker and shall be labeled "For Future Solar Electric." The reserved space shall be at the opposite (load) end of the busbar from the primary energy source.

**R404.4.1.4 (N1104.4.1.4) Electrical interconnection.** An electrical junction box shall be installed within 24 inches (610 mm) of the main electrical service panel and shall be connected to a capped roof penetration sleeve or a location in the attic that is within 3 feet (914 mm) of the *solar-ready zone* by a minimum 1 inch (25 mm) nonflexible metallic conduit or permanently installed wire as approved by the code official. Where the interconnection terminates in the attic, location shall be no less than 12 inches (35 mm) above ceiling insulation. Both ends of the interconnection shall be labeled "For Future Solar Electric".

**R404.4.2 (N1104.4.2) Group R occupancies.** Buildings in Group R-2, R-3 and R-4 shall comply with Section C405.13.

Revise as follows:

**SECTION 405 TOTAL BUILDING PERFORMANCE**

**TABLE R405.2 REQUIREMENTS FOR TOTAL BUILDING PERFORMANCE**

SECTION <sup>a</sup>	TITLE
<b>Electrical Power and Lighting Systems</b>	
R404.1	Lighting equipment
R404.2	Interior lighting controls
<u>R404.4</u>	<u>Renewable energy infrastructure</u>
<u>R404.4</u>	<u>Electric readiness</u>
<u>R404.4</u>	<u>Electric Vehicle Power Transfer Infrastructure</u>

**SECTION R406 ENERGY RATING INDEX COMPLIANCE ALTERNATIVE**

Revise as follows:

**TABLE R406.2 REQUIREMENTS FOR ENERGY RATING INDEX**

<b>Electrical Power and Lighting Systems</b>	
R404.1	Lighting equipment
R404.2	Interior lighting controls
<u>R404.4</u>	<u>Renewable energy infrastructure</u>
<u>R404.4</u>	<u>Electric readiness</u>
<u>R404.4</u>	<u>Electric Vehicle Power Transfer Infrastructure</u>

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

Add new text as follows (RECPI-6 & 7):

**R404.4 Electric Vehicle Power Transfer Infrastructure.** New automobile parking spaces for one- and two-family dwellings and townhouses shall be provided in accordance with Sections R404.4.1 through R404.4.5. New residential automobile parking spaces for R-2 occupancies shall be provided with electric vehicle power transfer infrastructure in accordance with Sections R404.4.1 through R404.4.5.

**R404.4.1 Quantity.** New one- and two-family dwellings and townhouses with a designated attached or detached garage or other onsite private parking provided adjacent to the dwelling unit shall be provided with one *EV-capable, EV-ready, or EVSE installed space* per dwelling unit. R-2 occupancies or allocated parking for R-2 occupancies in mixed-use buildings shall be provided with an EV capable space, EV ready space, or EVSE space for ~~75%~~ **40%** of each dwelling units or automobile parking spaces, whichever is less.

**R404.4.2 EV Capable Spaces.** Each *EV capable space* used to meet the requirements of Section R404.4.1 shall comply with all of the following:

1. A continuous raceway or cable assembly shall be installed between an enclosure or outlet located within 3 feet (914 mm) of the *EV capable space* and a suitable panelboard or other onsite electrical distribution equipment.
2. Installed raceway or cable assembly shall be sized and rated to supply a minimum circuit capacity in accordance with R404.4.4
3. The electrical distribution equipment to which the raceway or cable assembly connects shall have sufficient dedicated space and spare electrical capacity for a 2-pole circuit breaker or set of fuses.
4. The electrical enclosure or outlet and the electrical distribution equipment directory shall be marked: "For future *electric vehicle supply equipment (EVSE)*."

**R404.4.3 EV Ready Spaces.** Each branch circuit serving *EV ready spaces* shall comply with all of the following:

1. Terminate at an outlet or enclosure, located within 3 feet (914 mm) of each *EV ready space* it serves.
2. Have a minimum circuit capacity in accordance with R404.4.4.
3. The panelboard or other electrical distribution equipment directory shall designate the branch circuit as "For electric vehicle supply equipment (EVSE)" and the outlet or enclosure shall be marked "For electric vehicle supply equipment (EVSE)."

**R404.4.4 Circuit Capacity.** For one- and two-family dwellings and townhouses, the capacity of electrical infrastructure serving each *EV capable space, EV ready space* and *EVSE space* shall have a rated capacity not less than 8.3 kVA (or 40A at 208/240V) for each *EV capable space, EV ready space* or *EVSE space* it serves. Where a circuit is shared or managed it shall be in accordance with NFPA 70. For **R-2 occupancies**, the capacity of electrical infrastructure serving each *EV capable space, EV ready space* and *EVSE space* shall comply with one of the following:

1. A branch circuit shall have a rated capacity not less than 8.3kVA (or 40A at 208/240V) for each EV capable space, EV ready space or EVSE space it serves. Where a circuit is shared or managed it shall be in accordance with NFPA 70.

2. The requirements of R404.4.4.1.

**Exceptions:**

1. Where the local electric distribution entity has certified in writing that it is not able to provide 100% of the necessary distribution capacity within 2 years after the estimated date of the certificate of occupancy. The required EV charging infrastructure shall be reduced based on the available existing electric distribution capacity.

2. ~~For R-2 occupancies, w~~Where substantiation has been approved that meeting the requirements of Section R404.4.4.1 will alter the local utility infrastructure design requirements on the utility side of the meter so as to increase the utility side cost to the builder or developer by more than \$400.00 per dwelling unit.

**R404.4.4.1 Circuit capacity management.** The capacity of each branch circuit serving multiple EVSE spaces, EV ready space or EV capable spaces designed to be controlled by an energy management system providing load management in accordance with NFPA 70, shall have a capacity of not less than 2.7 kVA per space.

**R404.4.5 EVSE installation.** For one- and two-family dwellings and townhouses, EVSE shall be installed in accordance with NFPA 70 and shall be listed and labeled in accordance with UL 2202 or UL 2594. For R-2 occupancies, EVSE shall be installed in accordance with NFPA 70 and Section R404.4.5.1 and shall be listed and labeled in accordance with UL 2202 and UL 2594.

**R404.4.5.1 EVSE minimum charging rate.**

Each installed EVSE shall comply with one of the following:

1. Be capable of charging at a rate of not less than 6.2 kVA (or 30A at 208/240V).
2. Where serving EVSE spaces allowed to have a circuit capacity of not less than 2.7 kVA in accordance with R404.4.4.1 and controlled by an energy management system providing load management, be capable of simultaneously charging each EVSE space at a rate of not less than 2.1 kVA.

## CHAPTER 6 [RE] REFERENCED STANDARDS

Add new standard(s) as follows:

UL	UL LLC 333 Pfingsten Road Northbrook IL 60062
UL 2202-2009	Electric Vehicle (EV) Charging System - with revisions through February 2018
UL	UL LLC 333 Pfingsten Road Northbrook IL 60062
UL 2594-2016	Standard for Electric Vehicle Supply Equipment

9-19-2022

Revise as follows (REPI-68 correlating with REPI-18)

## SECTION R408 ADDITIONAL EFFICIENCY PACKAGE OPTIONS

**R408.2.1. Enhanced envelope performance options.** The total building thermal envelope UA, the sum of U-factor times assembly area, shall be less than or equal to 95 percent of the total UA resulting from multiplying the U-factors in Table R402.1.2 by the same assembly area as in the proposed building. The UA calculation shall be performed in accordance with Section R402.1.5. The area-weighted average SHGC of all glazed fenestration shall be less than or equal to 95 percent of the maximum glazed fenestration SHGC in Table R402.1.2. The building thermal envelope shall meet the requirements of the following:

1. Section R408.2.1.1 or R408.2.1.2.
2. Section R408.2.1.3.

**Section R408.2.1.3 Roof reflectance.** Roofs in Climate Zones 0 through 23 shall comply with one or more of the options in Table R408.2.1.3.

**Exceptions:**

1. Roofs with a radiant barrier with an emittance of 0.05 or less.
2. Portions of the roof that include or are covered by one or more of the following:
  - 2.1. On-site renewable energy systems or components
  - 2.2. Solar air or water heating systems or components
  - 2.3. Vegetative roofs or landscaped roofs
  - 2.4. Above roof decks or walkways
  - 2.5. Skylights
  - 2.6. HVAC systems and components, and other opaque objects mounted above the roof
3. Portions of roof shaded during the peak sun angle of the summer solstice by permanent features of the building or by permanent features of adjacent buildings.
4. Portions of roofs that are ballasted with a minimum stone ballast of 17 pounds per square foot (74 kg/m<sup>2</sup>) or 23 psf (117 kg/m<sup>2</sup>) pavers.
5. Roofs where portions exempted by exceptions 2, 3, and 4 make up not less than 75 percent of the total roof area.

**TABLE R408.2.1.3 MINIMUM ROOF REFLECTANCE<sup>a</sup>**

Roof Slope	Three-year aged solar reflectance index <sup>b</sup>
<i>Low-slope</i>	75 <sup>b,c</sup>
<i>Steep-slope</i>	16

a. The use of area-weighted averages to comply with these requirements shall be permitted. Materials lacking 3-year-aged tested values for solar reflectance shall be assigned a 3-year-aged solar reflectance in accordance with Section R408.2.1.3.1.

b. Aged solar reflectance tested in accordance with ASTM C1549, ASTM E903 or ASTM E1918 or CRRC-S100.

c. Solar reflectance index (SRI) shall be determined in accordance with ASTM E1980 using a convection coefficient of 2.1 Btu/h × ft<sup>2</sup> × °F (12 W/m<sup>2</sup> × K). Calculation of aged SRI shall be based on aged tested values of solar reflectance and thermal emittance.

**R408.2.1.3.1 Aged solar reflectance.** Where an aged solar reflectance required by Section R402.6 is not available, it shall be determined in accordance with Equation 4-X.

$$R_{aged} = [0.2 + 0.7(R_{initial} - 0.2)] \quad \text{(Equation 4-X)}$$

where:

$R_{aged}$  = The aged solar reflectance

$R_{initial}$  = The initial solar reflectance determined in accordance with CRRC-S100

Measure Numberber	Measure Description	Credit Value								
		CZ 0 & 1	CZ 2	CZ 3	CZ 4	CZ 4C	CZ 5	CZ 6	CZ 7	CZ 8
R408.2.1.3	Cool Roof	TBD	TBD	TBD	TBD	TBD	0	0	0	0

## CHAPTER 6 [RE] REFERENCED STANDARDS

Add new standard(s) as follows:

ASTM	ASTM International 100 Barr Harbor Drive, P.O. Box C700 West Conshohocken PA 19428-2959
ASTM C1549-2016	<u>Standard Test Method for Determination of Solar Reflectance Near Ambient Temperature Using a Portable Solar Reflectometer</u>
ASTM	ASTM International 100 Barr Harbor Drive, P.O. Box C700 West Conshohocken PA 19428-2959
ASTM E903-2012	<u>Standard Test Method for Solar Absorptance, Reflectance and Transmittance of Materials Using Integrating Spheres (Withdrawn 2005)</u>
ASTM	ASTM International 100 Barr Harbor Drive, P.O. Box C700 West Conshohocken PA 19428-2959
ASTM E1918-06(2016)	<u>Standard Test Method for Measuring Solar Reflectance of Horizontal or Low-sloped Surfaces in the Field</u>

ASTM	ASTM International 100 Barr Harbor Drive, P.O. Box C700 West Conshohocken PA 19428-2959
<u>ASTM E1980- 11</u>	<u>Standard Practice for Calculating Solar Reflectance of Horizontal and Low-sloped Opaque Surfaces</u>
CRRC	Cool Roof Rating Council 2435 North Lombard Street Portland OR 97217
<u>ANSI/CRRC-S100-2021</u>	<u>Standard Test Methods for Determining Radiative Properties of Materials</u>



Revise as follows (REPI-33 and REPI-20, and correlation with REPI-18)

**R408.2 (N1108.2) Additional energy efficiency credit requirements package options.**

Two additional ~~efficiency~~ package options for compliance with Section R401.2.1 are set forth in Sections ~~Table R408.2.1 through R408.2.5.~~ measures shall be selected from Table R408.2 that ~~are cumulatively equal to or greater than~~ meet or exceed a total of ten. Five additional credits shall be selected for dwelling units with greater than 5,000 square feet (465 m<sup>2</sup>) of conditioned living space floor area located above grade plane. Each measure selected shall meet the relevant subsections of Section R408 and receive credit as specified in Table 408.2 for the specific Climate Zone. Interpolation of credits between measures shall not be permitted.

Add new text as follows:

**R408.2.11 Opaque walls option.**

For *buildings* in climate zones 4 and 5, the maximum U-factor of 0.060 shall be permitted to be used for wood frame walls for compliance with Table R402.1.2 where complying with one or more of the following:

1. ~~A heat pump is installed for~~ Primary space heating is provided by a heat pump that meets one of the efficiencies in R408.2.3.
2. All installed water heaters are heat pumps that meet one of the efficiencies in R408.2.4~~have a UEF equal to or greater than 2.0 or a COP of greater than 1.0.~~
3. In addition to the number of credits required by Section R408.2, three additional credits are achieved.
4. Renewable energy resources are installed to meet the requirements of R408.2.8.

Add new text as follows (REPI-70)

**TABLE R408.2**  
**CREDITS FOR ADDITIONAL ENERGY EFFICIENCY**

Measure Number	Measure Description	Credit Value								
		CZ 0 & 1	CZ 2	CZ 3	CZ 4	CZ 4C	CZ 5	CZ 6	CZ 7	CZ 8
R408.2.10	Demand Responsive Thermostat	<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>

**R408.2.10 Demand Response**

The thermostat controlling the primary heating or cooling system of each dwelling unit shall be provided with a demand responsive control capable of communicating with the Virtual End Node (VEN) using a wired or wireless bi-directional communication pathway that provides the occupant the ability to voluntarily participate in utility demand response programs, where available. The thermostat shall be capable of executing the following actions in response to a demand response signal:

1. Automatically increasing the zone operating cooling set point by the following values: 1°F (0.5°C), 2°F (1°C), 3°F (1.5°C), and 4°F (2°C).
2. Automatically decreasing the zone operating heating set point by the following values: 1°F (0.5°C), 2°F (1°C), 3°F (1.5°C), and 4°F (2°C).

Thermostats controlling single stage HVAC systems shall comply with Section R408.2.10.1. Thermostats controlling variable capacity systems shall comply with Section R408.2.10.2. Thermostats controlling multi-stage HVAC systems shall comply with either Section R408.2.10.1 or R408.2.10.2.

Where a *demand response signal* is not available the thermostat shall be capable of performing all other functions.

**R408.2.10.1 Single stage HVAC system controls.** Thermostats controlling single stage HVAC systems shall be provided with a *demand responsive control* that complies with one of the following:

1. Certified OpenADR 2.0a VEN, as specified under Clause 11, Conformance
2. Certified OpenADR 2.0b VEN, as specified under Clause 11, Conformance
3. 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
4. IEC 62746-10-1
5. The communication protocol required by a controlling entity, such as a utility or service provider, to participate in an automated demand response program
6. The physical configuration and communication protocol of CTA 2045-A or CTA-2045-B

**R408.2.10.2 Variable capacity and two stage HVAC system controls.** Thermostats controlling variable capacity and two stage HVAC systems shall be provided with a *demand responsive control* that complies with the communication and performance requirements of AHRI 1380.

## CHAPTER 6 [RE] REFERENCED STANDARDS

**Add new standard(s) as follows:**

### **CTA**

Consumer Technology Association Technology & Standards Department  
1919 S Eads Street  
Arlington, VA 22202

CTA Consumer Technology Association Technology & Standards Department. 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 IEC Regional Centre for North America. 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

9-19-2022

San Ramon, CA 94583

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

**AHRI**

Air-Conditioning, Heating, & Refrigeration Institute

2111 Wilson Blvd, Suite 500

Arlington, VA 22201

AHRI 1380-2019 Demand Response through Variable Capacity HVAC Systems in Residential and Small Commercial

Applications

**Add new text as follows:**

CTA Consumer Technology Association Technology & Standards Department ANSI/CTA-2045-A – 2018.:  
Modular Communications

Interface for Energy Management

Revise as follows (REPI-122):

**R102.1.1 Above code programs.** The *code official* or other authority having jurisdiction shall be permitted to deem a national, state or local energy-efficiency program to exceed the energy efficiency required by this code. *Buildings approved* in writing by such an energy-efficiency program shall be considered to be in compliance with this code where such buildings also meet the requirements identified in Table R405.2 and the proposed total building thermal envelope UA, which is the sum of U-factor times assembly area, shall be less is greater than or equal to the building thermal envelope UA using the prescriptive U-factors from Table R402.1.2 multiplied by ~~1.15~~ 1.08 in Climate Zones 0, 1, and 2, and by 1.15 in Climates Zones 3 through 8, in accordance with Equation 4-1. The area-weighted maximum fenestration SHGC permitted in Climate Zones 0 through 3 shall be 0.30. levels of efficiency and solar heat gain coefficients in Tables 402.1.1 and 402.1.3 of the 2009 *International Energy Conservation Code*.

$$\text{For Climate Zones 0-2: } UA_{\text{Proposed design}} \leq 1.08 \times UA_{\text{Prescriptive reference design}} \quad (\text{Equation 4-1})$$

$$\text{For Climate Zones 3-8: } UA_{\text{Proposed design}} \leq 1.15 \times UA_{\text{Prescriptive reference design}}$$

Revise as follows:

**R401.2.5 Additional energy efficiency.**

This section establishes additional requirements applicable to all compliance approaches to achieve additional energy efficiency.

1. For buildings complying with Section R401.2.1, one of the additional efficiency package options shall be installed according to Section R408.2.
2. For buildings complying under with Section R401.2.2 , the building shall meet one of the following:
  - 2.1. One of the additional efficiency package Options in Section R408.2 shall be installed without including such measures in the proposed design under Section R405; or
  - 2.2. The proposed design of the building under Section R405.3 shall have an annual energy cost that is less than or equal to 95 percent of the annual energy cost of the standard reference design.
- ~~23. For buildings complying with the Energy Rating Index alternative Section R401.2.3, the Energy Rating Index value shall be at least 5 percent less than the Energy Rating Index target specified in Table R406.5.~~

The option selected for compliance shall be identified in the certificate required by Section R401.3.

**R405.2 (N1105.2) Performance-based compliance.**

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

1. The requirements of the sections indicated within Table R405.2.
2. The proposed total building thermal envelope UA, which is the sum of the U-factor times assembly area, shall be less greater than or equal to the building thermal envelope UA using the prescriptive U-factors from Table R402.1.2 multiplied by ~~1.15~~ 1.08 in Climate Zones 0, 1 and 2, and 1.15 in Climates Zones 3 through 8, in accordance with Equation 4-1. levels of efficiency and solar heat gain coefficients in

Table R402.1.1 or R402.1.3 of the 2009 *International Energy Conservation Code*. The area-weighted maximum fenestration SHGC permitted in Climate Zones 0 through 3 shall be 0.30.

~~Equation 4-1:  $UA_{\text{proposed design}} \leq 1.15 \times UA_{\text{prescriptive reference design}}$~~

~~For Climate Zones 0-2:  $UA_{\text{Proposed design}} \leq 1.08 \times UA_{\text{Prescriptive reference design}}$  (Equation 4-1)~~

~~For Climate Zones 3-8:  $UA_{\text{Proposed design}} \leq 1.15 \times UA_{\text{Prescriptive reference design}}$~~

3. For buildings without a fuel burning appliance for space heating or water heating, ~~At~~ the annual energy cost of the *proposed design* that is less than or equal to 85 percent of the annual energy cost of the *standard reference design* ~~or the additional efficiency credits as required in Section R408.2 shall be installed without including such measures in the proposed design under Section R405.~~ For buildings with a fuel burning appliance for space heating or water heating, the annual energy cost of the *proposed design* that is less than or equal to 80 percent of the annual energy cost of the *standard reference design*. For *dwelling units* with greater than 5,000 square feet (465 m<sup>2</sup>) of *conditioned living space* floor area *located above grade plane*, the annual energy cost of the proposed design shall be reduced by an additional 5 percent of annual energy cost of the standard reference design.

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.

**TABLE R405.4.2(1) (TABLE N1105.4.2(1)) SPECIFICATIONS FOR THE STANDARD REFERENCE AND PROPOSED DESIGNS**

BUILDING COMPONENT	STANDARD REFERENCE DESIGN	PROPOSED DESIGN		
Heating systems <sup>d, e, j, k</sup>		<u>As proposed</u>		
	Fuel Type/Capacity: Same as proposed design	<u>As proposed</u>		
	Product class: Same as proposed design	<u>As proposed</u>		
	Efficiencies:	<u>As proposed</u>		
	Heat pump: Complying with 10 CFR §430.32	<u>As proposed</u>		
	Non-electric furnaces: Complying with 10 CFR §430.32	<u>As proposed</u>		
	Non-electric boilers: Complying with 10 CFR §430.32	<u>As proposed</u>		
Cooling systems <sup>d, f, k</sup>		<u>As proposed</u>		
	Fuel Type: Electric	<u>As proposed</u>		
	Capacity: Same as proposed design			
	Efficiencies: Complying with 10 CFR §430.32	<u>As proposed</u>		

Service water heating <sup>d, g, k</sup>												
		<b>Compactness ratio<sup>i</sup> factor</b>		<b>HWD S</b>								
		1 story	2 or more stories									
		> 60%	> 30%	0								
		> 30% to ≤ 60%	> 15% to ≤ 30%	0.05								
		> 15% to ≤ 30%	> 7.5% to ≤ 15%	0.10								
		< 15%	< 7.5%	0.15								
	<u>Fuel Type: Same as proposed design</u>	<u>As proposed</u>										
	<u>Rated Storage Volume: Same as proposed design</u>	<u>As proposed</u>										
	<u>Draw Pattern: Same as proposed design</u>	<u>As proposed</u>										
	<u>Efficiencies: Uniform Energy Factor complying with 10 CFR §430.32</u>	<u>As proposed</u>										
	<u>Tank Temperature: 120° F (48.9° C)</u>	<u>Same as standard reference design</u>										
Thermal distribution systems	<p>Duct insulation: in accordance with Section R403.3.1.</p> <p>Duct location: <del>same as proposed design</del></p> <table border="1"> <thead> <tr> <th><u>Foundation Type</u></th> <th><u>Slab on grade</u></th> <th><u>Unconditioned crawlspace</u></th> <th><u>Basement or conditioned crawlspace</u></th> </tr> </thead> <tbody> <tr> <td><u>Duct location (supply and return)</u></td> <td><u>One-story building: 100% in unconditioned attic</u></td> <td><u>One-story building: 100% in unconditioned crawlspace</u></td> <td><u>50% inside conditioned space</u> -</td> </tr> </tbody> </table>	<u>Foundation Type</u>	<u>Slab on grade</u>	<u>Unconditioned crawlspace</u>	<u>Basement or conditioned crawlspace</u>	<u>Duct location (supply and return)</u>	<u>One-story building: 100% in unconditioned attic</u>	<u>One-story building: 100% in unconditioned crawlspace</u>	<u>50% inside conditioned space</u> -	<p>Duct insulation: as proposed.</p> <p>Duct location: as proposed.</p> <p>Duct System Leakage to Outside:</p> <p><u>The measured total duct</u></p>		
<u>Foundation Type</u>	<u>Slab on grade</u>	<u>Unconditioned crawlspace</u>	<u>Basement or conditioned crawlspace</u>									
<u>Duct location (supply and return)</u>	<u>One-story building: 100% in unconditioned attic</u>	<u>One-story building: 100% in unconditioned crawlspace</u>	<u>50% inside conditioned space</u> -									

		<p>- <u>All other: 75% in unconditioned attic and 25% inside conditioned space</u></p> <p>-</p>	<p>- <u>All other: 75% in unconditioned crawlspace and 25% inside conditioned space</u></p> <p>-</p>	<p><u>50% unconditioned attic</u></p> <p>-</p>	<p><u>system leakage rate shall be entered into the software as the duct system leakage to outside rate.</u></p> <p><b><u>Exceptions:</u></b></p> <p><u>1.. When duct system leakage to outside is tested in accordance ANSI/RESNET/ICC 380 or ASTM E1554, the measured value shall be permitted to be entered.</u></p> <p><u>2. When total duct system leakage is measured without the air handler installed, the simulation value shall be 4 cfm (113.3 L/min) per 100 ft<sup>2</sup> (9.29 m<sup>2</sup>) of conditioned floor area.</u></p>		
<p>Duct system leakage to outside:</p> <p><u>For duct systems serving &gt; 1,000ft<sup>2</sup> of conditioned floor area, the duct leakage to outside rate shall be 4 cfm (113.3 L/min) per 100 ft<sup>2</sup> (9.29 m<sup>2</sup>) of conditioned floor area.</u></p> <p><u>For duct systems serving ≤ 1,000ft<sup>2</sup> of conditioned floor area, the duct leakage to outside rate shall be 40 cfm (1132.7 L/min).</u></p>							
<p><del>For all systems other than tested duct systems. a For</del> <u>hydronic systems and ductless systems. a A thermal</u></p>					<p><del>As tested or,</del> <u>where not</u></p>		

	<p>distribution system efficiency (DSE) of 0.88 shall be applied to both the heating and cooling system efficiencies, <del>for all systems other than tested duct systems.</del></p> <p><del>Exception:</del> For nonducted heating and cooling systems that do not have a fan, the standard reference design thermal distribution system efficiency (DSE) shall be 1.</p> <p>For tested duct systems, the leakage rate shall be 4 cfm (113.3 L/min) per 100 ft<sup>2</sup> (9.29 m<sup>2</sup>) of <del>conditioned floor area</del> at a pressure of differential of 0.1 inch w.g. (25 Pa).</p>	<p><del>tested,</del> For <u>hydraulic</u> systems and <u>ductless</u> systems, DSE shall be as specified in Table R405.4.2(2).</p>	
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g. For a proposed design with a nonstorage type water heater, a 40-gallon storage type water heater having the prevailing federal minimum energy factor for the same fuel as the predominant heating fuel type shall be assumed. For a proposed design without a proposed water heater, a 40-gallon storage type water heater having the prevailing federal minimum efficiency for the same fuel as the predominant heating fuel type shall be assumed the following assumptions shall be made for both the proposed design and standard reference design.

Fuel Type: Same as the predominant heating fuel type

Rated Storage Volume: 40 Gallons

Draw Pattern: Medium

Efficiency: Uniform Energy Factor complying with 10 CFR §130.32

j. For a proposed design with electric resistance heating, a split system heat pump complying with 10 CFR §430.32 (2021) shall be assumed modeled in the standard reference design.

k. For heating systems, cooling systems, or water heating systems not included in Table R405.4.2(1), the standard reference design shall be the same as proposed design.

**TABLE R405.4.2(2) DEFAULT DISTRIBUTION SYSTEM EFFICIENCIES FOR PROPOSED DESIGNS<sup>a</sup>**

Distribution system components located in unconditioned space	<u>NA</u>	0.95
<del>Untested distribution</del> <u>Distribution system</u> systems components entirely located in conditioned space <sup>c</sup>	<del>0.88</del> <u>NA</u>	1
Ductless systems <sup>d</sup>	1	<u>NA</u>

a. Default values in this table are for untested distribution systems, which must still meet minimum requirements for duct system insulation.

b. Hydronic systems shall mean those systems that distribute heating and cooling energy directly to individual spaces using liquids pumped through closed-loop piping and that do not depend on ducted, forced airflow to maintain space temperatures.

c. Entire system in conditioned space shall mean that no component of the distribution system, including the air-handler unit, is located outside of the conditioned space.

d. Ductless systems shall be allowed to have forced airflow across a coil but shall not have any ducted airflow external to the manufacturer’s air-handler enclosure.



Add new standard(s) as follows:

DOE	US Department of Energy c/o Superintendent of Documents 1000 Independence Avenue SW Washington DC 20585
<u>10 CFR, Part 430-2021</u>	<u>Energy Conservation Program for Consumer Products: Energy and Water Conservation Standards and their compliance dates.</u>

**R406.3 Building thermal envelope.** ~~Building and portions thereof shall comply with Section R406.3.1 or R406.3.2.~~

**R406.3.1 On-site renewables are not included.** ~~Where on-site renewable energy is not included for compliance using the ERI analysis of Section R406.4,~~ The proposed total building thermal envelope UA, which is sum of U-factor times assembly area, shall be less than or equal to the building thermal envelope UA using the prescriptive U-factors from Table R402.1.2 multiplied by ~~1.15~~ **1.08 in Climate Zones 0, 1, and 2, and by 1.15 in Climates Zones 3 through 8,** in accordance with Equation 4-1. The area-weighted maximum fenestration SHGC permitted in Climate Zones 0 through 3 shall be 0.30.

~~$UA_{\text{Proposed design}} \leq 1.15 \times UA_{\text{Prescriptive reference design}}$  (Equation 4-1)~~

**For Climate Zones 0-2:**  $UA_{\text{Proposed design}} \leq 1.08 \times UA_{\text{Prescriptive reference design}}$  (Equation 4-1)

**For Climate Zones 3-8:**  $UA_{\text{Proposed design}} \leq 1.15 \times UA_{\text{Prescriptive reference design}}$

**R406.3.2 On-site renewables are included.** ~~Where on-site renewable energy is included for compliance using the ERI analysis of Section R406.4, the building thermal envelope shall be greater than or equal to the levels of efficiency and SHGC in Table R402.1.2 or Table R402.1.4 of the 2015 *International Energy Conservation Code*.~~

(REPI-115)

## **APPENDIX XX** **ELECTRIC ENERGY STORAGE PROVISIONS**

The provisions contained in this appendix are not mandatory unless specifically referenced in the adopting ordinance.

### **SECTION XX101** **SCOPE**

**XX101.1 General.** These provisions shall be applicable for new construction where solar-ready measures or an onsite solar PV system are required.

### **SECTION XX102** **GENERAL DEFINITION**

**ENERGY STORAGE SYSTEM (ESS).** One or more devices, assembled together, capable of storing energy in order to supply electrical energy at a future time.

### **SECTION XX103** **Electrical Energy Storage**

One- and two-family dwellings, townhouse units, and Group R-3 occupancies shall either comply with RB103.1 or RB103.2. Buildings with Group R-2 and R-4 occupancies shall comply with RB103.3.

**XX103.1 Electrical energy storage energy capacity.** Each building shall have a ESS with a minimum rated energy capacity of 5 kWh with a minimum of four ESS supplied branch circuits.

**XX103.2 Electrical energy storage system ready.** Each building shall be energy storage ready in accordance with Sections RB103.2.1 through RB103.2.4.

**XX103.2.1 Energy storage system space.** Interior or exterior space with dimensions and locations in accordance with Section R328 of the *International Residential Code* and Section 110.26 of NFPA 70 shall be reserved to allow for the future installation of an *energy storage system*.

**XX103.2.2 System Isolation Equipment Space.** Space shall be reserved to allow for the future installation of a transfer switch within 3 feet (305mm) of the main panelboard. Raceways shall be installed between the panelboard and the transfer switch location to allow the connection of an ESS.

**XX103.2.3 Panelboard with backed-up load circuits.** A dedicated raceway from the main service to a panelboard that supplies the branch circuits served by the ESS. All branch circuits are permitted to be supplied by the main service panel prior to the installation of an ESS. The trade size of the raceway shall be not less than one inch. The panelboard that supplies the branch circuits shall be labeled "Subpanel reserved for future battery energy storage system to supply essential loads."

**XX103.2.4 Branch circuits served by ESS.** A minimum of four branch circuits shall be identified and have their source of supply collocated at a single panelboard supplied by the ESS. The following end uses shall be served by the branch circuits:

1. A refrigerator.
2. One lighting circuit near the primary egress.
3. A sleeping room receptacle outlet.

**XX103.3 Electrical energy storage system.** Buildings with Group R-2 and R-4 occupancies shall comply with C405.15.