

Draft Amendments for the Development of the 2024 IECC

IECC - Residential Provisions

SUMMARY

Code Change Title	Section Impacted	Summary
All-electric buildings	R402	Requires all new construction be all-electric.
Demand responsive water heating	R403	Requires grid-integrated controls on electric storage water heaters (37-120 gallons/ “residential style”).
Demand responsive thermostats	R403	Requires grid-integrated controls on space heating and cooling systems that adjust temperature within 4-degrees.
Solar Readiness	R404	Requires single- and two-family solar readiness. Requires multifamily to comply with a sister provision under commercial section of energy code.
Electric Vehicles	R404	Requires single- and two-family EV charging. Requires multifamily to comply with a sister provision under commercial section of energy code.
Energy Storage Readiness	R404	Requires single- and two-family energy storage readiness.

Note: All language is in draft form and may be revised within the current scope and intent of each measure based on partner coordination between now and the submission deadline of October 12, 2021.

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All-Electric Buildings

SECTION R202 GENERAL DEFINITIONS

Add new definitions as follows:

ALL-ELECTRIC BUILDING. *A building that contains no combustion equipment, or plumbing for combustion equipment, installed within the building, or building site.*

APPLIANCE. *A device or apparatus that is manufactured and designed to utilize energy and for which this code provides specific requirements.*

Definition for appliance is mirrored from 2021 IMC to be useful in defining combustion equipment.

COMBUSTION EQUIPMENT. *Any equipment or appliance used for space heating, service water heating, cooking, clothes drying, or lighting that uses fuel gas or fuel oil.*

EQUIPMENT. *Piping, ducts, vents, control devices and other components of systems other than appliances that are permanently installed and integrated to provide control of environmental conditions for buildings. This definition shall also include other systems specifically regulated in this code.*

Definition for equipment is mirrored from 2021 IMC to be useful in defining combustion equipment.

SECTION R401 GENERAL

Revise text as follows:

R401.2 Application. Residential buildings shall be all-electric buildings and shall comply with Section R401.2.5~~4~~ and either Sections R401.2.1, R401.2.2, or R401.2.3 ~~or R401.2.4~~.

The change in application requires that new construction be all-electric. Where a jurisdiction does not wish to require electrification of specific end uses but wants to advance electric buildings further than electric-readiness, exception language can be added. Where exception language is added, electric infrastructure language should be brought over from the mixed-fuel version of the overlay to ensure easy accessibility to future electric equipment installation. Recommended exception language is: Exception: The following combustion equipment is permitted as approved by the code official (list specific equipment types).

All-electric newly constructed homes typically use less energy when compared to newly constructed mixed-fuel homes. An Ecotope study¹ of the 2017 Oregon Residential code found that homes heated by electric heat pumps use 40 percent less energy than homes heated with gas (including water heating). This change seeks to encourage electrification and more evenly weigh the impact of the additional efficiency credits by requiring the mixed-fuel home to select a total of three packages from the options while the all-electric home is required to select one package. Of the three packages required for the mixed-fuel home, one must address the envelope (improved envelope or reduced infiltration plus better

¹ Oregon Residential Specialty Code: 2005 Baseline and Code Roadmap to Achieve the 2030 Goal; Ecotope (2020)

ventilation) while the remaining two impact HVAC (better equipment or more efficient ducts) and water-heating (better equipment) requirements.

Revise text as follows:

R401.3 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 certification shall indicate the following:

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.

Revisions to this section remove vestigial language around “gas-fired” equipment that will not be necessary in an all-electric code.

**SECTION R402
BUILDING THERMAL ENVELOPE**

Delete section without substitution:

~~R402.4.4 Rooms containing fuel burning appliances.~~

All electric buildings will not need language that relates to fossil fuel systems. This vestigial language has been removed to avoid confusion in implementation of this overlay.

**SECTION R404
ELECTRICAL POWER AND LIGHTING SYSTEMS**

(All-electric) Revise text as follows:

R404.1.1 Fuel gas lighting equipment. Fuel gas lighting systems shall not ~~have~~ continuously burning pilot lights be installed.

While the use of gas lighting is nearly extinct for both indoor and outdoor new construction uses, gas lamps remain a nostalgic feature in historic neighborhoods. Since the IRC Chapter 24 Fuel Gas does not prohibit the installation of fuel gas lighting, it is critical to ensure that the adoption of this overlay does prohibit these installations.

**SECTION R408
ADDITIONAL EFFICIENCY PACKAGE OPTIONS**

Revise text as follows:

R408.2.2 More efficient HVAC equipment. Heating and cooling *equipment* shall meet one of the following efficiencies:

- ~~1. Greater than or equal to 95 AFUE natural gas furnace and 16 SEER air conditioner.~~
21. Greater than or equal to 10 HSPF/16 SEER air source heat pump.
32. Greater than or equal to 3.5 COP ground source heat pump.

R408.2.3 Reduced energy use in service water-heating option. The hot water system shall meet one of the following efficiencies:

- ~~1. Greater than or equal to 82 EF fossil fuel service water heating system.~~
21. Greater than or equal to 2.0 EF electric service water-heating system.
32. Greater than or equal to 0.4 solar fraction solar water-heating system.

All electric buildings will not need language that relates to fossil fuel systems. This vestigial language has been removed to avoid confusion in implementation of this overlay and the sections have been renumbered.

Demand Responsive Thermostats

SECTION R202 GENERAL DEFINITIONS

Add new definitions as follows:

DEMAND RESPONSIVE CONTROL. An automatic control that can receive and automatically respond to demand response requests from a utility, electrical system operator, or third-party demand response program provider.

SECTION R403 SYSTEMS

Revise text as follows:

R403.1.1 ~~Thermostat~~ Programmable thermostat. The thermostat controlling the primary heating or cooling system of the dwelling unit shall be capable of controlling the heating and cooling system on a daily schedule to maintain different temperature setpoints at different times of the day. This thermostat shall include the capability to set back or temporarily operate the system to maintain zone temperatures of not less than 55°F (13°C) to not greater than 85°F (29°C). The thermostat shall be programmed initially by the manufacturer with a heating temperature setpoint of not greater than 70°F (21°C) and a cooling temperature setpoint of not less than 78°F (26°C). The thermostat shall be provided with a demand responsive control capable of increasing the cooling setpoint by no less than 4°F (2.2°C) and decreasing the heating setpoint by no less than 4°F (2.2°C) in response to a demand response request.

Demand responsive controls for thermostats are added based on language from California Title 24 and integrated into the current requirement for thermostats. Any thermostat listed as "Title 24 compliant" would meet this requirement, and are available directly through major retailers.

SECTION R407 TROPICAL CLIMATE REGION COMPLIANCE PATH

Revise text as follows:

R407.2 Tropical climate region. Compliance with this section requires the following:

1. Not more than one-half of the *occupied* space is air conditioned and is controlled by a thermostat in accordance with Section R403.1.1.

Modifications to the Tropical Climate Region Path are minimal. To ensure the inclusion of demand response controls additional requirements are added to the tropical compliance list under R407.2.

Demand Responsive Water Heating

SECTION R202 GENERAL DEFINITIONS

Add new definitions as follows:

DEMAND RESPONSIVE CONTROL. An automatic control that can receive and automatically respond to demand response requests from a utility, electrical system operator, or third-party demand response program provider.

SECTION R403 SYSTEMS

Add new text as follows:

R403.5.4 Demand responsive water heating. All electric storage water heaters with a storage tank capacity greater than 20 gallons (76 L) shall be provided with *demand responsive controls* that comply with ANSI/CTA-2045-B or another *approved demand responsive control*.

ANSI/CTA-2045-B standardizes the socket, and communications protocol, for heat pump water heaters so they can communicate with the grid, and with demand response signal providers. In addition, 2045-B adds control and communications requirements for mixing valves in HPWH to enable them to provide greater storage capacity to support increased load shifting. Versions of this standard are included in codes or other requirements in California, Oregon, and Washington.

SECTION R403 TOTAL BUILDING PERFORMANCE

Revise table as follows:

TABLE R405.2 REQUIREMENTS FOR TOTAL BUILDING PERFORMANCE

SECTION	TITLE
	Mechanical
<u>R403.5 except Section R403.5.2</u>	<u>Service hot water systems</u>
<u>R403.5.1</u>	<u>Heated water circulation and temperature maintenance systems</u>
<u>R403.5.3</u>	<u>Drain water heat recovery units</u>

The mandatory requirements table has been modified to include the new requirement for demand responsive hot water control. Based on the structure of the table currently, combining R403.5 and creating a single in line exception is the most straightforward approach to this revision.

SECTION R406 ENERGY RATING INDEX COMPLIANCE ALTERNATIVE

Revise table as follows:

TABLE R406.2 REQUIREMENTS FOR ENERGY RATING INDEX

SECTION	TITLE
Mechanical	
R403.5 except Section R403.5.2	Service hot water systems
R403.5.1	Heated water circulation and temperature maintenance systems
R403.5.3	Drain water heat recovery units

The ERI mandatory requirements table has been modified to include the new requirement for demand responsive hot water control. Based on the structure of the table currently, combining R403.5 and creating a single in line exception is the most straightforward approach to this revision.

**SECTION R407
TROPICAL CLIMATE REGION COMPLIANCE PATH**

Revise text as follows:

R407.2 Tropical climate region. Compliance with this section requires the following:

3. Solar, wind or other renewable energy source supplies not less than 80 percent of the energy for service water heating controlled in accordance with Section R403.5.4.

Modifications to the Tropical Climate Region Path are minimal. To ensure the inclusion of demand response controls additional requirements are added to the tropical compliance list under R407.2.

**CHAPTER 6
REFERENCED STANDARDS**

Add new standard as follows:

CTA

Consumer Technology Association
1919 S. Eads Street
Arlington, VA 22202

Standard reference number	Title	Referenced in code section number
<u>ANSI/CTA-2045-B</u>	<u>Modular Communications Interface for Energy Management</u>	<u>. R403.5.4</u>

Solar Readiness

SECTION R103 CONSTRUCTION DOCUMENTS

Add new text as follows:

R103.2.3 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.

Revisions to this section incorporate critical elements of solar readiness to be clearly identified on the construction documents to allow for easier code compliance review and inspections. This code language has been migrated and amended from the 2021 IECC Appendix RB Solar-Ready Provisions to the most appropriate place in the base code.

SECTION R105 INSPECTIONS

Revise text 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 the solar-ready zone is installed for solar water heating, inspections shall verify pathways for routing of plumbing from solar-ready zone to service water heating system.

Revisions to this section incorporate critical elements of solar readiness used for service water heating to allow for inspection enforcement of this provision. This code language is not in the current version of the 2021 IECC Appendix RB Solar-Ready Provisions but is derived from the that language to fully incorporate all aspects of that appendix throughout the base code for enforceability by adopting jurisdictions.

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.

Current 2021 IECC inspections do not require dedicated electrical inspections. Additional electrical inspection code language that is not in the current version of the 2021 IECC Appendix RB Solar-Ready Provisions but is derived from the that language to fully incorporate all aspects of that appendix throughout the base code for enforceability by adopting jurisdictions. Similar language has been added to account for inspections of energy storage ready infrastructure.

Revise numbering as follows:

~~R105.2.5~~ R105.2.6 Final inspection.

SECTION R202

GENERAL DEFINITIONS

Add new definitions as follows:

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.

Definition for solar-ready zone has been migrated from the 2021 IECC Appendix RB Solar-Ready Provisions to the base code.

SECTION R401 GENERAL

Add new text as follows:

R401.3 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 certification shall indicate the following:

- 8. Where a solar-ready zone is provided, the certificate shall indicate the location, dimensions, and capacity reserved on the electrical service panel.**

Revisions to this section incorporate critical elements of solar readiness to be clearly identified to the original homeowner/building owner and any subsequent owners to allow for easier installation of solar panels. This code language has been migrated from the 2021 IECC Appendix RB Solar-Ready Provisions to the most appropriate place in the base code. By including on the certificate, the information is more likely to remain in the building for future owners.

SECTION R404 ELECTRICAL POWER AND LIGHTING SYSTEMS

Add new text as follows:

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

This code language has been migrated from the 2021 IECC Appendix RB Solar-Ready Provisions to the most appropriate place in the base code. By ensuring solar-ready zones, all-electric buildings will have the potential for an even greater impact on building decarbonization by contributing to the continued cleaning of the electricity supply.

R404.4.1 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 building with a permanently installed on-site renewable energy system.**

2. A building with less than 600 square feet (55 m²) of roof area oriented between 110 degrees and 270 degrees of true north.

3. A building where all areas of the roof that would otherwise meet the requirements for a solar-ready zone are in full or partial shade for more than 70 percent of daylight hours annually.

R404.4.1.1 Solar-ready zone area. The total area of the solar-ready zone shall not be less than 300 square feet (28 m²) and shall be composed of areas not less than 5.5 feet (1676 mm) in width and not less than 80 square feet (7.4 m²) exclusive of access or set back areas as required by the International Fire Code.

Exception: 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 m²) per dwelling shall be permitted to have a solar-ready zone area of not less than 150 square feet (14 m²).

Language for size of solar ready zone has been updated based on stakeholder and industry feedback. Appendix RB uses 5' as the minimum dimension for the solar ready zone. Typical residential scale solar panels are most commonly 65". By increasing the solar ready zone from 5' to 5.5' the language now better accommodates the flat installation of panels on roofs in the future.

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

R404.4.1.3 Electrical service reserved space. The main electrical service panel shall have a reserved space to allow installation of a dual pole circuit breaker for future solar electric installation and shall be labeled "For Future Solar Electric." The reserved space shall be positioned at the opposite (load) end from the input feeder location or main circuit location.

R404.4.1.4 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 one of the following:

1. Minimum ¾-inch nonflexible conduit
2. Minimum #10 Metal copper 3-wire

Where the interconnection terminates in the attic, location shall be no less than 12" (35 mm) above ceiling insulation. Both ends of the interconnection shall be labeled "For Future Solar Electric".

As it is currently written, Appendix RB only requires that the construction documents indicate pathways for routing of conduit from the solar-ready zone to the service panel. This update requires the installation and verification of either conduit or wire from the roof or attic to the panel. This language has been adapted from the solar-ready language proposed for the residential Oregon Reach Code.

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

The 2021 IECC Appendix RB Solar-Ready Provisions address single and two-family dwellings only. Additional language is added to apply the approach for commercial buildings to multifamily residential construction.

**SECTION R405
TOTAL BUILDING PERFORMANCE**

Revise table as follows:

TABLE R405.2 REQUIREMENTS FOR TOTAL BUILDING PERFORMANCE

SECTION	TITLE
Electrical Power and Lighting Systems	
R404.1	Lighting equipment
R404.2	Interior lighting controls
<u>R404.4</u>	<u>Renewable energy infrastructure</u>

The mandatory requirements table has been modified to include the new requirements for renewable energy as mandatory elements of the code amendments.

**SECTION R406
ENERGY RATING INDEX COMPLIANCE ALTERNATIVE**

Revise table as follows:

TABLE R406.2 REQUIREMENTS FOR ENERGY RATING INDEX

SECTION	TITLE
Electrical Power and Lighting Systems	
R404.1	Lighting equipment
R404.2	Interior lighting controls
<u>R404.4</u>	<u>Renewable energy infrastructure</u>
R406.3	Building thermal envelope

The ERI mandatory requirements table has been modified to include the new requirements for renewable energy infrastructure as mandatory elements of the code amendments.

Electric Vehicles

SECTION R103 CONSTRUCTION DOCUMENTS

Add new text as follows:

R103.2.5 EV-ready system. The construction documents shall provide the location of pathways for routing of raceways or cable from the EV-ready location to the electrical service panel and the location and layout of a designated area for EV-ready parking.

Revisions to this section incorporate critical elements of EV readiness to be clearly identified on the construction documents to allow for easier code compliance review and inspections. This code language is similar to that used for solar readiness, applied to the necessary components of the EV system.

SECTION R105 INSPECTIONS

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. Where the energy storage system area is not in the same space as the electrical panel, inspections shall verify conduit or pre-wiring from the energy storage ready zone to the electrical panel.

Current 2021 IECC inspections do not require dedicated electrical inspections. Additional electrical inspection code language that is not in the current version of the 2021 IECC Appendix RB Solar-Ready Provisions but is derived from the that language to fully incorporate all aspects of that appendix throughout the base code for enforceability by adopting jurisdictions. Similar language has been added to account for inspections of energy storage ready infrastructure.

Revise numbering as follows:

~~R105.2.5~~ **R105.2.6 Final inspection.**

SECTION R202 GENERAL DEFINITIONS

Add new definitions as follows:

ELECTRIC VEHICLE (EV). An automotive-type vehicle for on-road use, such as passenger automobiles, buses, trucks, vans, neighborhood electric vehicles, electric motorcycles, and the like, primarily powered by an electric motor that draws current from a rechargeable storage battery, a fuel cell, a photovoltaic array, or another source of electric current. Plug-in hybrid electric vehicles are electric vehicles having a second source of motive power. Off-road, self-propelled electric mobile equipment, such as industrial trucks, hoists, lifts, transports, golf carts, airline ground support equipment, tractors, boats and the like, are not considered electric vehicles.

ELECTRIC VEHICLE SUPPLY EQUIPMENT (EVSE). The conductors, including the ungrounded, grounded, and equipment grounding conductors and the electric vehicle connectors, attachment plugs, 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.

Definitions for EV and EVSE are mirrored from NEC-2020 to be useful in defining requirements for electric vehicle infrastructure.

EV-READY SPACE. A parking space that is provided with an electrical circuit capable of supporting an installed EVSE.

The definitions of EV spaces have been updated to be descriptive rather than prescriptive to allow for consistent use of the definitions and deferring requirements to be set in the body of the text. This allows the requirements to match the specific requirements and needs of the adopting jurisdiction and for EV spaces to be tailored for different EV charging scenarios (charging at different building types, parking types, residential types, business types, times of day, etc.) as well as different levels of penetration of EV charging spaces in a parking facility. These definitions build off of the IBC proposal G66-21 as modified by public comment from the 2024 development cycle.

SECTION R404 ELECTRICAL POWER AND LIGHTING

Add new text as follows:

R404.5 Electric vehicle charging infrastructure. Electric infrastructure for the current and future charging of *electric vehicles* shall be installed in accordance with this section. *EV ready spaces* are permitted to be counted toward meeting minimum parking requirements.

R404.5.1 One- and two- family dwellings and townhouses. One- and two-family dwellings and townhouses with a dedicated attached or detached garage or on-site parking spaces and new detached garages shall be provided with one *EV-ready space* per *dwelling unit*. The branch circuit shall meet the following requirements:

1. A minimum capacity of 9.6 kVA
2. Terminates at a junction box or receptacle located within 3 feet (914 mm) of the parking space and labelled “For electric vehicle charging”, and
3. The electrical panel directory shall designate the branch circuit as “For electric vehicle charging”.

R404.5.2 Group R occupancies. Parking facilities serving Group R-2, R-3 and R-4 occupancies shall comply with Section C405.14.

Tailored requirements for single-family and multifamily housing have been included. Single-family homes, where the occupants will choose the specific EVSE that meets their EV charging needs, are required to have one parking space with an EV Ready space that is sized to accommodate the most common EVSE on the market. The required capacity for the branch circuit for the EV Ready space is the equivalent of a 240V, 40A circuit and is expressed in kVA as that is the standard metric for capacity or “apparent power” in electrical infrastructure. The wiring requirement ensures that the space can be upgraded to a load-managed Level 2 EVSE in the future.

The requirements for EV charging infrastructure for multifamily buildings are referenced to the commercial requirements as those are more appropriate for EV charging in parking lots.

**SECTION R405
TOTAL BUILDING PERFORMANCE**

Revise table as follows:

TABLE R405.2 REQUIREMENTS FOR TOTAL BUILDING PERFORMANCE

SECTION	TITLE
Electrical Power and Lighting Systems	
R404.1	Lighting equipment
R404.2	Interior lighting controls
<u>R404.5</u>	<u>Electric vehicle charging</u>

The mandatory requirements table has been modified to include the new requirements for electric vehicle charging as mandatory elements of the code amendments.

**SECTION R406
ENERGY RATING INDEX COMPLIANCE ALTERNATIVE**

Revise table as follows:

TABLE R406.2 REQUIREMENTS FOR ENERGY RATING INDEX

SECTION	TITLE
Electrical Power and Lighting Systems	
R404.1	Lighting equipment
R404.2	Interior lighting controls
<u>R404.5</u>	<u>Electric vehicle charging</u>
R406.3	Building thermal envelope

The ERI mandatory requirements table has been modified to include the new requirements for electric vehicle charging as mandatory elements of the code amendments.

**SECTION R407
TROPICAL CLIMATE REGION COMPLIANCE PATH**

Add text as follows:

R407.2 Tropical climate region. Compliance with this section requires the following:

12. Parking is in accordance with Section R404.6.

Modifications to the Tropical Climate Region Path are minimal. To ensure the inclusion of electric vehicles is addressed additional requirements are added to the tropical compliance list under R407.2.

Energy Storage Readiness

SECTION R103 CONSTRUCTION DOCUMENTS

Add new text as follows:

R103.2.4 Energy storage-ready system. The construction documents shall provide the location of pathways for routing of raceways or cable from the energy storage system area to the electrical service panel and the location and layout of a designated area for electrical energy storage system.

Revisions to this section incorporate critical elements of storage readiness to be clearly identified on the construction documents to allow for easier code compliance review and inspections. This code language is similar to that used for solar readiness, applied to the necessary components of the energy storage system.

SECTION R105 INSPECTIONS

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 energy storage system area is not in the same space as the electrical panel, inspections shall verify conduit or pre-wiring from the energy storage ready zone to the electrical panel.

Current 2021 IECC inspections do not require dedicated electrical inspections. Additional electrical inspection code language that is not in the current version of the 2021 IECC Appendix RB Solar-Ready Provisions but is derived from the that language to fully incorporate all aspects of that appendix throughout the base code for enforceability by adopting jurisdictions. Similar language has been added to account for inspections of energy storage ready infrastructure.

Revise numbering as follows:

~~R105.2.5~~ **R105.2.6 Final inspection.**

SECTION R404 ELECTRICAL POWER AND LIGHTING SYSTEMS

Add new text as follows:

R404.6 Energy storage infrastructure. Each *building site* shall have a dedicated location for the installation of future on-site energy storage in accordance with this section.

Exception: Where an onsite electrical energy system storage system is installed.

R404.6.1 One- and two- family dwellings and townhouses. One- and two-family dwellings and townhouses shall be provided with an energy storage ready area in accordance with the following:

1. Floor area not less than 2 feet (610 mm) in one dimension and 4 feet (1219 mm) in another dimension and located in accordance with Section 1207 of the International Fire Code and Section 110.26 of the NFPA 70.
2. The main electrical service panel shall have a reserved space to allow installation of a two-pole circuit breaker for future electrical energy storage system installation. This space shall be labeled “For Future Electric Storage.” The reserved spaces shall be positioned at the end of the panel that is opposite from the panel supply conductor connection.

R404.6.2 Group R occupancies. Buildings with Group R-2, R-3 and R-4 occupancies shall comply with Section C405.15.

Infrastructure for energy storage has been adapted from Appendix CB Solar-Ready Zone into the main body of the residential code. This language includes revisions from the 2019 Group B Public Comment that were not incorporated into the final text of the 2021 IECC but modified the language to ensure needed correlation with the IFC and NFPA. Single and two family dwellings are subject to a prescriptive based sizing requirement, while low-rise multifamily buildings will be asked to refer to commercial guidelines.

SECTION R405 TOTAL BUILDING PERFORMANCE

Revise table as follows:

TABLE R405.2 REQUIREMENTS FOR TOTAL BUILDING PERFORMANCE

SECTION	TITLE
Electrical Power and Lighting Systems	
R404.1	Lighting equipment
R404.2	Interior lighting controls
<u>R404.6</u>	<u>Energy storage infrastructure</u>

The mandatory requirements table has been modified to include the new requirements for energy storage infrastructure as mandatory elements of the code amendments.

SECTION R406 ENERGY RATING INDEX COMPLIANCE ALTERNATIVE

Revise table as follows:

TABLE R406.2 REQUIREMENTS FOR ENERGY RATING INDEX

SECTION	TITLE
Electrical Power and Lighting Systems	
R404.1	Lighting equipment
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<u>R404.6</u>	<u>Energy storage infrastructure</u>
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The ERI mandatory requirements table has been modified to include the new requirements for energy storage infrastructure as mandatory elements of the code amendments.

**SECTION R407
TROPICAL CLIMATE REGION COMPLIANCE PATH**

Add text as follows:

R407.2 Tropical climate region. Compliance with this section requires the following:

13. Energy storage infrastructure is in accordance with Section R404.6.

Modifications to the Tropical Climate Region Path are minimal. To ensure the inclusion of electric storage is addressed additional requirements are added to the tropical compliance list under R407.2.

Draft Amendments for the Development of the 2024 IECC

IECC - Commercial Provisions

SUMMARY

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Mandatory Onsite Renewable Energy	C405	Requires mandatory on-site renewable energy generation.
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ALL-ELECTRIC BUILDING. *A building that contains no combustion equipment, or plumbing for combustion equipment, installed within the building or building site.*

APPLIANCE. *A device or apparatus that is manufactured and designed to utilize energy and for which this code provides specific requirements.*

Definition of appliance is mirrored from 2021 IMC to be useful in defining combustion equipment.

COMBUSTION EQUIPMENT. *Any equipment or appliance used for space heating, service water heating, cooking, clothes drying and/or lighting that uses fuel gas or fuel oil.*

COMMERCIAL COOKING APPLIANCES. *Appliances used in a commercial food service establishment for heating or cooking food and which produce grease vapors, steam, fumes, smoke or odors that are required to be removed through a local exhaust ventilation system. Such appliances include deep fat fryers, upright broilers, griddles, broilers, steam-jacketed kettles, hot-top ranges, under-fired broilers (charbroilers), ovens, barbecues, rotisseries, and similar appliances. For the purpose of this definition, a food service establishment shall include any building or a portion thereof used for the preparation and serving of food.*

Definition of commercial cooking appliances is mirrored from the 2021 International Fire Code for use in defining requirements for additional electric infrastructure required for cooking under Section C405.14.3.

EQUIPMENT. *Piping, ducts, vents, control devices and other components of systems other than appliances that are permanently installed and integrated to provide control of environmental conditions for buildings. This definition shall also include other systems specifically regulated in this code.*

Revise text as follows:

C401.2 Application. Commercial buildings shall be all-electric buildings and shall comply with Section C401.2.1 or C401.2.2.

The change in application requires that new construction be all-electric. Where a jurisdiction does not wish to require electrification of specific end uses but wants to advance electric buildings further than electric-readiness, exception language can be added. Where exception language is added, electric infrastructure language should be brought over from the mixed-fuel version of the overlay to ensure easy accessibility to future electric equipment installation.

Recommended exception language for specific equipment or end uses is: Exception: The following combustion equipment is permitted as approved by the code official (list specific equipment types).

Recommended exception language for specific building types: Exception: Buildings containing (list IBC occupancy types) occupancies are permitted to use the following combustion equipment as approved by the code official (list specific equipment types).

Revise text as follows:

C404.9.1 Heaters. The electric power to all heaters shall be controlled by an on-off switch that is an integral part of the heater, mounted on the exterior of the heater, or external to and within 3 feet (914 mm) of the heater in a location with ready access. Operation of such switch shall not change the setting of the heater thermostat. Such switches shall be in addition to a circuit breaker for the power to the heater. Gas-fired heaters shall not be ~~equipped with continuously burning ignition pilots~~ permitted.

All electric buildings will not need language that relates to fossil fuel systems. Vestigial language around pool heaters has been removed to avoid confusion in implementation of this overlay.

Revise text as follows:

C405.4.3 Gas lighting. Gas-fired lighting appliances shall not be ~~equipped with continuously burning pilot ignition systems~~ permitted.

While the use of gas lighting is nearly extinct for both indoor and outdoor new construction uses, gas lamps remain a nostalgic feature in historic neighborhoods. Since the IBC and IFGC do not prohibit the installation of fuel gas lighting, it is critical to ensure that the adoption of this overlay does prohibit these installations.

Demand Responsive Thermostats

DEMAND RESPONSIVE CONTROL. An automatic control that can receive and automatically respond to demand response requests from a utility, electrical system operator, or third-party demand response program provider.

Add new text as follows:

C403.4.1.6 Demand responsive controls. All thermostatic controls shall be provided with *demand responsive controls* capable of the following:

1. Automatically increasing the zone operating cooling set points by a minimum of 4°F (2.2°C)
2. Automatically decreasing the zone operating heating set points by a minimum of 4°F (2.2°C)
3. Automatically decreasing the zone operating cooling set points by a minimum of 2°F (1.1°C).
4. Automatically increasing the zone operation heating set points by a minimum of 2°F (1.1°C)
5. Both ramp-up and ramp-down logic to prevent the building peak demand from exceeding that expected without the DR implementation.

The thermostatic controls shall be capable of performing all other functions provided by the control when the *demand responsive controls* are not available. Systems with direct digital control of individual zones reporting to a central control panel shall be capable of remotely complying

Exception: Health care and assisted living facilities.

Demand responsive controls for thermostats are added based on language from California Title 24 and ASHRAE Standard 189.1. Any thermostat listed as "Title 24 compliant" would meet this requirement. The controls allow for dialing back heating and cooling, as well as to accept additional cooling when renewable energy generation is high, and both ramp up and down requirements in relationship to the DR signal to prevent rebound issues on the grid after the signal is released.

In health care and assisted living facilities, thermostat setpoints can impact more than just thermal comfort, and temperature can be part of the health care being provided. To ensure that this requirement cannot have an adverse impact on those services, these facilities have been exempted from this requirement.

Demand Responsive Water Heating

DEMAND RESPONSIVE CONTROL. An automatic control that can receive and automatically respond to demand response requests from a utility, electrical system operator, or third-party demand response program provider.

Add new text as follows:

C404.11 Demand responsive water heating. All electric storage water heaters, or a group of water heaters, in a building with a total storage tank capacity greater than 37 gallons (140 L) shall be provided with *demand responsive controls* that comply with ANSI/CTA-2045-B or another *approved demand responsive control*.

Exception: Health care facilities.

ANSI/CTA-2045-B standardizes the socket, and communications protocol, for heat pump water heaters so they can communicate with the grid, and with demand response signal providers. In addition, 2045-B adds control and communications requirements for mixing valves in HPWH to enable them to provide greater storage capacity to support increased load shifting. Versions of this standard are included in codes or other requirements in California, Oregon, and Washington.

The requirement is limited to electric storage water heaters, excluding small, point-of-use water heaters; these water heaters also have very limited capacity for demand response. Additionally, it only applies to water heaters, or a group of water heaters, over 37 gallons. Research has indicated that 37 gallons is the optimum size for this measure to have a meaningful contribution to DR signals in commercial buildings.

In health care facilities, such as hospitals, nursing facilities, and outpatient facilities, hot water can be critical to support the care being provided. To ensure that this requirement cannot have an adverse impact on those services, health care facilities have been exempted from this requirement.

Add new standard as follows:

CTA

Consumer Technology Association
1919 S. Eads Street
Arlington, VA 22202

Standard reference number	Title	Referenced in code section number
ANSI/CTA-2045-B	Modular Communications Interface for Energy Management	C404.11

Mandatory On-site Renewable Energy

RENEWABLE ENERGY CERTIFICATE (REC). An instrument that represents the environmental attributes of one megawatt-hour of renewable electricity; also known as an energy attribute certificate (EAC).

Add new text as follows:

C405.13 On site renewable energy. Each building site shall have equipment for on-site renewable energy with a rated capacity of not less than 0.25 W/ft² (2.7 W/m²) multiplied by the sum of the gross conditioned floor area of the three largest floors.

Exceptions:

1. Any building located where an unshaded flat plate collector oriented towards the equator and tilted at an angle from horizontal equal to the latitude receives an annual daily average incident solar radiation less than 3.5 kWh/m²·day (1.1 kBtu/ft²·day).
2. Any building where more than 80 percent of the roof area is covered by any combination of equipment other than for on-site renewable energy systems, planters, vegetated space, skylights, or occupied roof deck.
3. Any building where more than 50 percent of 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 AM and 4:00 PM.

C405.13.1 Renewable energy certificate documentation. Documentation shall be provided to the code official that indicates that renewable energy certificates (RECs) associated with the on-site renewable energy will be retained and retired by or on behalf of the owner or tenant.

A version of this requirement has been approved for ASHRAE 90.1-2019 as Addendum by,² and will be published in ASHRAE 90.1-2022. The three exceptions are written to ensure that the requirement is not being applied to buildings without adequate space on the roof, to buildings that are in areas of the country where unblocked insolation levels do not provide enough energy to make the equipment cost-effective (according to ASHRAE cost-effective criteria), and to buildings where solar access is wholly or partially blocked.

Revise text as follows:

C406.5 Onsite renewable energy. The total minimum ratings of on-site renewable energy systems, not including onsite renewable energy system capacity used for compliance with Section C405.13, shall be one of the following:

² Addendum by to ASHRAE 90.1-2019 is posted at https://www.ashrae.org/file%20library/technical%20resources/standards%20and%20guidelines/standards%20addenda/90_1_2019_by_ck_cp_20200731.pdf

With the addition of C405.13 for mandatory inclusion of onsite renewable energy this section is revised to allow only additional renewable energy to be counted toward compliance with the additional efficiency requirements.

Electric Vehicles

Revise as follows:

C103.2 Information on construction documents. Construction documents shall be drawn to scale upon suitable material. Electronic media documented are permitted to be submitted when *approved* by the *code official*. Construction documents shall be of sufficient clarity to indicate the location, nature and extent of the work proposed, and show in sufficient detail pertinent data and features of the building, systems and equipment herein governed. Details shall include the following as applicable:

16. Location of designated *EVSE spaces*, *EV-Ready spaces*, and *EV-Capable spaces* in parking facilities.

To assist in enforcement of electric vehicle infrastructure requirements, and to serve as a plan for full installation of EVSE equipment in EV-ready and EV-capable spaces in the future, plans should clearly indicate the intended locations of EV infrastructure.

Add new definitions as follows:

AUTOMATIC LOAD MANAGEMENT SYSTEMS (ALMS). A control system that allows multiple connected *EVSE* to share a circuit or panel and automatically reduce power at each charger, reducing the total connected electrical capacity of all *EVSE*.

ELECTRIC VEHICLE (EV). An automotive-type vehicle for on-road use, such as passenger automobiles, buses, trucks, vans, neighborhood electric vehicles, electric motorcycles, and the like, primarily powered by an electric motor that draws current from a rechargeable storage battery, a fuel cell, a photovoltaic array, or another source of electric current. Plug-in hybrid electric vehicles are electric vehicles having a second source of motive power. Off-road, self-propelled electric mobile equipment, such as industrial trucks, hoists, lifts, transports, golf carts, airline ground support equipment, tractors, boats and the like, are not considered electric vehicles.

ELECTRIC VEHICLE SUPPLY EQUIPMENT (EVSE). The conductors, including the ungrounded, grounded, and equipment grounding conductors and the *electric vehicle* connectors, attachment plugs, 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*.

Definitions for EV and EVSE are mirrored from NEC-2020 to be useful in defining requirements for

Definition of equipment is mirrored from 2021 IMC to be useful in defining combustion equipment.

EV-CAPABLE SPACE. An automotive parking space that is reserved for the future installation of an *EVSE*.

EV-READY SPACE. An automotive parking space that is provided with an electrical circuit capable of supporting an installed *EVSE*.

EVSE SPACE. An automotive parking space that is provided with a dedicated *EVSE*.

The definitions of EV spaces have been updated to be descriptive rather than prescriptive to allow for consistent use of the definitions and deferring requirements to be set in the body of the text. This allows

the requirements to match the specific requirements and needs of the adopting jurisdiction and for EV spaces to be tailored for different EV charging scenarios (charging at different building types, parking types, residential types, business types, times of day, etc.) as well as different levels of penetration of EV charging spaces in a parking facility. These definitions build off of the IBC proposal G66-21 as modified by public comment from the 2024 development cycle.

Revise table as follows:

TABLE C405.12.2 ENERGY USE CATEGORIES

LOAD CATEGORY	DESCRIPTION OF ENERGY CUSE
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 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.
<u>Electric vehicle charging</u>	<u>Electric vehicle charging loads.</u>
Building operations and other miscellaneous	The remaining loads not included in this table, including but not limited to vertical transportation systems, automatic doors, motorized shading systems, ornamental fountains, ornamental fireplaces, swimming pools, in-ground spas and snow-melt systems.

Electric Vehicle charging is a transportation load, not a building load, but is often provided through a building electrical service connection. Adding a category for monitoring EV charging separately allows the building load to be measured independently from this non-building load. This will be critical with the wider adoption of Building Performance Standards or other existing building energy use policies as it will allow EV charging to be easily excluded from the building loads for the purposes of regulating actual energy use in buildings.

Add new text as follows:

C405.14 Electric vehicle charging infrastructure. Parking facilities shall be provided with electric vehicle charging infrastructure in accordance with this section and Table C405.14 based on the total number of parking spaces and rounded up to the nearest whole number. EVSE, EV ready spaces and EV capable spaces may be counted toward meeting minimum parking requirements. EVSE spaces may be used to meet requirements for EV ready spaces and EV

capable spaces. EV ready spaces may be used to meet requirements for EV capable spaces. Where more than one parking facility is provided on a building site, the number of parking spaces required shall be calculated separately for each parking facility. EV spaces shall be uniformly distributed in the parking facility.

Exception: In parking garages, the conduit required for EV capable spaces may be omitted provided the parking garage electrical service has no less than 1.8 kVA of additional reserved capacity per EV capable space.

The EV charging infrastructure requirements have been tailored to different charging scenarios. EV Ready spaces are utilized in residential occupancies where EV owners are more likely to choose specific EVSEs with features that meet their personal, long-term needs. The minimum capacity of those EV Ready spaces has been set at Level 1 charging in order to maximize access to EV charging:

1. Residential park times are generally much longer which makes Level 1 charging more feasible.
2. All EVs come with at least a Level 1 charger, eliminating the need for EV owners to invest in additional equipment to charge at their homes.
3. Level 1 charging minimizes the cost of enabling EV charging at a parking space, allowing for the maximization of the number of EV spaces, which maximizes access to charging.

EVSE spaces are required for commercial parking lots where shorter parking times are typical and Level 2 or 3 parking is more appropriate. Additionally, while the car connection side of Level 2 EVSE are standard, the grid connection side is not, so utilizing EVSE rather than EV Ready spaces maximizes the utility of parking spaces in commercial lots that have more transient parking.

This EVCI language is based on the approach used in the electrification reach codes adopted by various California cities. It captures recent developments in the national conversation about the best way to bring EVCI requirements to code in a way that is consistent, understandable, feasible and ensures the societal benefit of the widest penetration of EV charging possible.

The exception is added to allow capacity to be substituted for conduit in parking garages. EVCI retrofits have different cost considerations in parking garages compared to surface parking lots. Parking garage retrofits do not require retrenching, so the conduit in EV capable spaces does not come with the same future avoided costs.

TABLE C405.14
ELECTRIC VEHICLE CHARGING INFRASTRUCTURE REQUIREMENTS

<u>OCCUPANCY</u>	<u>EVSE SPACES</u>	<u>EV READY SPACES</u>	<u>EV CAPABLE SPACES</u>
<u>Group B Occupancies</u>	<u>15%</u>	<u>NA</u>	<u>40%</u>
<u>Group M Occupancies</u>	<u>25%</u>	<u>NA</u>	<u>40%</u>
<u>R-2 Occupancy</u>	<u>NA</u>	<u>100%^a</u>	<u>NA</u>
<u>All other Occupancies</u>	<u>10%</u>	<u>NA</u>	<u>40%</u>

a. Or one EV ready space per dwelling unit.

The percentages in Table C405.14 can be adjusted to tailor the requirements for the specific market needs of a jurisdiction. However, the EV Capable space requirements included for all commercial lots recognizes that future needs for EV charging will be much greater than they are now. EV capable spaces avoid the significant cost of parking lot re-trenching, which is one of the largest single costs of EVCI retrofits but only a minor investment in new construction.

C405.14.1 EV Capable Spaces. *EV Capable Spaces shall be provided with electrical infrastructure that meets the following requirements:*

1. Conduit that is continuous between a junction box or outlet located within 3 feet (914 mm) of the parking space and an electrical panel serving the area of the parking space.
2. The electrical panel to which the conduit connects shall have sufficient dedicated physical space for a dedicated dual-pole, 40-amp breaker.
3. The conduit shall be sized and rated to accommodate a 40-amp, 208/240-volt branch circuit and have a minimum nominal trade size of 1 inch.
4. The electrical junction box and the electrical panel directory entry for the dedicated space in the electrical panel shall have labels stating “For future electric vehicle charging”.

The requirements for EV Capable spaces ensure a low-cost path to retrofitting the spaces with EVSE in the future. One of the most significant costs to upgrading parking lots for EVCI is the retrenching of the lot for electrical wiring runs. These requirements ensure that the wiring can be easily run through conduit to spaces without retrenching.

C405.14.2 EV Ready Spaces. *The branch circuit serving EV Ready Spaces shall meet the following requirements:*

1. Wiring capable of supporting a 40-amp, 208/240-volt circuit.
1. Terminates at an outlet or junction box located within 3 feet (914 mm) of the parking space.
3. A minimum capacity of 1.8 kVA.
4. The electrical panel directory shall designate the branch circuit as “For electric vehicle charging” and the junction box or receptacle shall be labelled “For electric vehicle charging.”

The approach for multifamily can be characterized as “upgradeable Level 1 charging.” This approach balances objectives for equity, controlling first costs and future upgradeability. The wiring requirement ensures that the wiring is capable of supporting Level 2 charging, but the circuit capacity requirements can be met by a branch circuit that supports only Level 1 charging. All EVs come with at least a Level 1 charger, so this approach maximizes the number of EV spaces for which charging is immediately available without incurring the higher upfront costs of full Level 2 EVSE at every space. This is an important equity consideration since access to charging is one of the larger barriers to EV use for multifamily tenants. The oversized wiring ensures that these spaces can be upgraded to load managed Level 2 charging in the future and that the building has sufficient capacity for a reasonable minimum level of simultaneous charging.

C405.14.3 EVSE Spaces. *The EVSE serving EVSE spaces shall meet the following requirements:*

1. Capable of supplying not less than 6.2 kW to an electric vehicle.

Exception: An ALMS may be used to reduce the total electrical capacity required by EVSE spaces provided that all EVSE spaces are capable of simultaneously charging at a minimum rate of 1.4 kW.

2. Located within 3 feet (914 mm) of the EVSE space.

The charging rate for an EVSE space is set at 6.2 kW. This is equivalent to a 30A/208V EVSE. 30 and 32A chargers are the most common Level 2 chargers and the highest capacity chargers that can be installed on a 40A branch circuit. kW is used as the metric to indicate total power delivered rather than the specific combination of Volts and Amps.

Energy Storage Readiness

Revise as follows:

C103.2 Information on construction documents. Construction documents shall be drawn to scale upon suitable material. Electronic media documented are permitted to be submitted when *approved* by the *code official*. Construction documents shall be of sufficient clarity to indicate the location, nature and extent of the work proposed, and show in sufficient detail pertinent data and features of the building, systems and equipment herein governed. Details shall include the following as applicable:

14. Location of pathways for routing of raceways or cable from the renewable energy system to the electrical service panel and electrical energy storage system area.

15. Location and layout of a designated area for electrical energy storage system.

For ease of enforcement, information for both renewable energy and electrical energy storage have been included as part of construction documents. Language has been migrated from Appendix CB Solar-Ready Zone to the applicable location in the base code and modified to fit into current structure.

Revise as follows:

C105.2.5 Electrical system. Inspection shall verify lighting system controls, components, and meters as required by the code, approved plans and specifications. Where an electrical energy storage system area is required, inspections shall verify space availability and pathways to electrical service.

Add new text as follows:

C405.15 Energy storage infrastructure. Each building site shall have equipment for on-site energy storage not less than 2 feet (610 mm) in one dimension and 4 feet (1219 mm) in another dimension and located in accordance with Section 1206.2.8 of the International Fire Code and Section 110.26 of the NFPA 70.

Exception: Where an onsite electrical energy system storage system is installed.

C405.15.1 Electrical service reserved space. The main electrical service panel shall have a reserved space to allow installation of a two-pole circuit breaker for future electrical energy storage system installation. This space shall be labeled “For Future Electric Storage.” The reserved spaces shall be positioned at the end of the panel that is opposite from the panel supply conductor connection.

Infrastructure for energy storage has been migrated up from Appendix CB Solar-Ready Zone into the main body of the code. This language includes revisions from the 2019 Group B Public Comment that were not incorporated into the final text of the 2021 IECC but modify the language to ensure needed correlation with the IFC and NFPA.