



International Energy Conservation Code Consensus Committee-Commercial

Meeting Agenda (Draft 4/20/23)

April 26, 2023

3:00 PM Eastern to 4:30 PM Eastern (1.5 hours)

[Webex Link](#)

Committee Chair: Duane Jonlin

Committee Vice Chair: Emily Hoffman

1. Call to order.
2. Meeting Conduct. Staff
 - a. Identification of Representation/Conflict of Interest
 - b. ICC [Council Policy 7](#) Committees: Section 5.1.10 Representation of Interests
 - c. ICC [Code of Ethics](#): ICC advocates commitment to a standard of professional behavior that exemplifies the highest ideals and principles of ethical conduct which include integrity, honesty, and fairness. As part of this commitment it is expected that participants shall act with courtesy, competence and respect for others.
 - d. ICC [Antitrust Compliance Guideline](#)
3. Roll Call – Hoffman
4. Approval of Agenda
5. Approval of Minutes from April 19, 2023
6. Administrative issues.-
7. Action Items.
 - a. Public Comment Draft 1 Proposals
CED1-14-22(Electric Ready) 4/19 E4C motion to approve as modified failed 18-11-3
CED1-15-22(All-electric comm. Bldg. provisions) HVACR disapprove 8-4/Electrical as modified 10-0-3
CEPC1-3-22(Energy Monitoring)
CEPC1-7-22(Renewable Energy system comment)
CEPC1-10-22(Electrical energy storage system)
CEPC1-11-22(Electrical energy storage system)
8. Subcommittee Reports
9. Other business.
 - a. CED1-39-22

b. Public comment on any matters discussed at the meeting (Please limit comments to 2 minutes. Further comments can be directed to the Secretariat following the meeting to be considered at a future meeting.)

10. Next meeting TBD

11. Adjourn.

FOR FURTHER INFORMATION BE SURE TO VISIT THE ICC WEBSITE:

IECC Commercial Consensus Committee Webpage

<https://www.iccsafe.org/products-and-services/i-codes/code-development/cs/iecc-commercial-consensus-committee/>

ICC Energy webpage

<https://www.iccsafe.org/products-and-services/codes-standards/energy/>

Code Change Proposal Submittals

<https://energy.cdpass.com/login/>

FOR ADDITIONAL INFORMATION, PLEASE CONTACT:

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International Code Council

kstenger@iccsafe.org

CED1-14-22 Electric Ready Proposal: As heard at 4.19.23 E4C meeting

[PLR SC mods are highlighted in yellow]

Add new text as follows:

C103.2.2 Electrification system. The construction documents shall provide details for additional electric infrastructure, including branch circuits, conduit, pre-wiring, panel capacity, and electrical service capacity, as well as interior and exterior spaces designated for future electric equipment.

Revise text as follows:

C105.2.5 Electrical system. Inspection shall verify lighting system controls, components, and meters, and additional electric infrastructure as required by the code, approved plans and specifications.

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.

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

COMMERCIAL COOKING APPLIANCES. ~~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.

~~**FUEL GAS.** *A natural gas, manufactured gas, liquified petroleum gas or a mixture of these.*~~

~~**FUEL OIL.** *Kerosene or any hydrocarbon oil having a flash point not less than 100°F (38°C).*~~

Revise text as follows:

C405.5.3 Fuel Gas lighting. *Fuel gas*-fired lighting ~~appliances~~*appliances* shall not be equipped with continuously burning pilot ignition systems permitted.

Add new text as follows:

C403.15 Hydronic Heating Design Requirements. For all hydronic space heating systems, the design entering water temperature for coils, radiant panels, radiant floor systems, radiators, baseboard heaters, and any other device that uses hot water to provide heat to a space shall be not more than 130°F (55°C).

Add new text as follows:

C405.17 Additional electric infrastructure. Electric infrastructure in buildings that contain combustion equipment shall be installed in accordance with this section.

C405.17.1 Combustion space heating. Spaces containing *combustion equipment* for space heating shall comply with Sections C405.17.1.1, C405.17.1.2 and C405.17.1.3.

C405.17.1.1 Designated exterior locations for future electric space heating equipment. Spaces containing *combustion equipment* for space heating shall be provided with designated exterior location(s) shown on the plans and of sufficient size for outdoor space heating heat pump equipment, with a chase that is sized to accommodate refrigerant lines between the exterior location and the interior location of the space heating equipment, and with natural drainage for condensate from heating operation or a condensate drain located within 3 feet (914 mm) of the location of the **future exterior** space heating heat pump equipment.

C405.17.1.2 Dedicated branch circuits for future electric space heating equipment.

Spaces containing combustion space heating equipment with a capacity not more than 65,000 Btu/h shall be provided with a dedicated 240-volt, branch circuit with ampacity of not less than 50 . The branch circuit shall terminate within 6 feet (1829 mm) of the space heating equipment and be in a location with ready access accessible with no obstructions. Both ends of the branch circuit shall be labeled with the words "For Future Electric Space Heating Equipment" and be electrically isolated.

Spaces containing *combustion equipment* for space heating **with a capacity of not less than 65,000 Btu/h** shall be provided with a dedicated branch circuit rated and sized in accordance with Section C405.17.1.3, **Section 424.4** and terminating in a junction box within 3 feet (914 mm) of the location the space heating equipment without obstructions. Both ends of the branch circuit shall be labeled "For Future Electric Space Heating Equipment."

Exceptions:

1. Where a branch circuit provides electricity to the space heating *combustion equipment* and is rated and sized in accordance with Section C405.17.1.3
2. Where a branch circuit provides electricity to space cooling equipment and is **both Sections 440.4(B) and 440.35** rated and sized in accordance with Section C405.17.1.3.
3. Where future electric space heating equipment would require three-phase power and the space containing *combustion equipment* for space heating is provided with an electrical panel with a label stating, "For Future Electric Space Heating Equipment" and with a bus bar rated and sized in accordance with Section C405.17.1.3.
4. **Buildings where the 99.6 percent design heating temperature is not less than 50°F (10°C)**

C405.17.1.3 Additional space heating electric infrastructure sizing. Electric infrastructure for future electric space heating equipment shall be sized to accommodate not less than one of the following:

1. An electrical capacity not less than the **nameplate** space heating *combustion equipment* heating capacity multiplied by the value in Table C405.17.1(1)~~as shown in equation below based on the climate zone and building occupancy group served by the space heating equipment. Where the space heating equipment serves multiple occupancies, the values in Table C405.17.1(1) shall be weighted by the gross floor area of each occupancy served by the space heating equipment and multiplied by the space heating *combustion equipment* heating capacity, or~~

$$VA_e = Q_{com} \cdot P_e$$

Where:

VA_s = The required electrical capacity of the electrical infrastructure in volt-amps

Q_{com} = The nameplate heating capacity of the combustion equipment in kBtu/h

P_s = The VA per kBtu/h from Table C405.17 in VA/kBtu/h _____

- An electrical capacity not less than the peak space heating load of the building areas served by the space heating *combustion equipment*, calculated in accordance with Section C403.1.1, multiplied by the value for the 99.6 percent design heating temperature in Table C405.17.1(2) based on the climate zone and building occupancy group served by the space heating equipment. Where the space heating equipment serves multiple occupancies, the values in Table C405.17.1(2) shall be weighted by the gross floor area of each occupancy served by the space heating equipment and multiplied by the peak space heating load of the building areas served by the space heating equipment per the equation below, or

$$VA_s = Q_{design} \cdot P_s$$

Where:

VA_s = The required electrical capacity of the electrical infrastructure in volt-amps

Q_{design} = The 99.6 percent design heating load of the spaces served by the *combustion equipment* in kBtu/h

P_s = The VA per kBtu/h from Table C405.17.1 in VA/kBtu/h

- An *approved* alternate design that uses no energy source other than electricity or *on-site renewable energy*.

Table C405.17.1(1) ALTERNATE ELECTRIC SPACE HEATING EQUIPMENT CONVERSION FACTORS (VA/kBtu/h) –CAPACITY BASIS

99.6% Heating Design Temperature		P_s
Greater Than (°F)	Not Greater Than	VA/kBtu/h
50	N/A	N/A
45	50	94
40	45	100
35	40	107
30	35	115
25	30	124
20	25	135
15	20	149
10	15	164
5	10	184
0	5	210
-5	0	243
-10	-5	289
-15	-10	293

Building Occupancy Group	Climate Zone

	<u>0A</u>	<u>0B</u>	<u>1A</u>	<u>1B</u>	<u>2A</u>	<u>2B</u>	<u>3A</u>	<u>3B</u>	<u>3C</u>	<u>4A</u>	<u>4B</u>	<u>4C</u>	<u>5A</u>	<u>5B</u>	<u>5C</u>	<u>6A</u>	<u>6B</u>	<u>7</u>	<u>8</u>	
<u>R-2, R-4, and I-1</u>																				
<u>I-2</u>																				
<u>R-1</u>																				
<u>B</u>																				
<u>A-2</u>																				
<u>M</u>																				
<u>E</u>																				
<u>S-1 and S-2</u>																				
<u>All Other</u>																				

Table C405.17.1(2) ALTERNATE ELECTRIC SPACE HEATING EQUIPMENT CONVERSION FACTORS (VA/kBtu/h) – LOAD BASIS

<u>Building Occupancy Group</u>	<u>Climate Zone</u>																			
	<u>0A</u>	<u>0B</u>	<u>1A</u>	<u>1B</u>	<u>2A</u>	<u>2B</u>	<u>3A</u>	<u>3B</u>	<u>3C</u>	<u>4A</u>	<u>4B</u>	<u>4C</u>	<u>5A</u>	<u>5B</u>	<u>5C</u>	<u>6A</u>	<u>6B</u>	<u>7</u>	<u>8</u>	
<u>R-2, R-4, and I-1</u>																				
<u>I-2</u>																				
<u>R-1</u>																				
<u>B</u>																				
<u>A-2</u>																				

424.4 and terminating in a junction box within 3 feet (914 mm) of the location the water heating equipment without obstructions. Both ends of the branch circuit shall be labeled “For Future Electric Water Heating Equipment.”

Exception: Where future electric water heating equipment would require three-phase power and the main electrical service panel has a reserved space for a bus bar rated and sized in accordance with Section C405.17.2.3 and labeled “For Future Electric Water Heating Equipment.”

C405.17.2.43 Additional water heating electric infrastructure sizing. Electric infrastructure water heating equipment with a capacity of greater than 75,000 Btu/h shall be sized to accommodate one of the following:

- 4- An electrical capacity not less than the *combustion equipment* water heating capacity multiplied by the value in Table C405.17.2 plus electrical capacity to serve recirculating loads as shown in the equation below. ~~based on the climate zone and building occupancy group served by the water heating equipment. Where the water heating equipment serves multiple occupancies, the values in Table C405.17.2 shall be weighted by the gross floor area of each occupancy served by the water heating equipment and multiplied by the *combustion equipment* water heating capacity, or~~

$$VA_w = (Q_{capacity} \cdot P_w) + \left(Q_{recirc} \cdot 293 \frac{VA}{Btu/h} \right)$$

Where:

VA_w = The required electrical capacity of the electrical infrastructure for water heating in volt-amps

Q_{capacity} = The water heating capacity of the *combustion equipment* in kBtu/h

P_w = The VA per kBtu/h from Table C405.17.2 in VA/kBtu/h

Q_{recirc} = The capacity required for temperature maintenance by recirculation, if applicable, in Btu/h

2. An alternate design that complies with this code, that is approved by the authority having jurisdiction, and that uses no energy source other than electricity or *on-site renewable energy*.

Table C405.17.2 ALTERNATE ELECTRIC WATER HEATING EQUIPMENT CONVERSION FACTORS (VA/kBtu/h)

<u>99.6% Heating Design Temperature</u>		<u>P_w</u>
<u>Greater Than</u> <u>(°F)</u>	<u>Not More Than</u>	<u>VA/kBtu/h</u>
<u>55</u>	<u>60</u>	<u>118</u>
<u>50</u>	<u>55</u>	<u>123</u>
<u>45</u>	<u>50</u>	<u>129</u>
<u>40</u>	<u>45</u>	<u>136</u>
<u>35</u>	<u>40</u>	<u>144</u>
<u>30</u>	<u>35</u>	<u>152</u>

<u>25</u>	<u>30</u>	<u>162</u>
<u>20</u>	<u>25</u>	<u>173</u>
<u>15</u>	<u>20</u>	<u>185</u>
<u>10</u>	<u>15</u>	<u>293</u>
<u>5</u>	<u>10</u>	<u>293</u>
<u>0</u>	<u>5</u>	<u>293</u>
<u>Less than 0 °F (-17.8°C)</u>		<u>293</u>

<u>Building Occupancy Group</u>	<u>Climate Zone</u>																		
	<u>0A</u>	<u>0B</u>	<u>1A</u>	<u>1B</u>	<u>2A</u>	<u>2B</u>	<u>3A</u>	<u>3B</u>	<u>3C</u>	<u>4A</u>	<u>4B</u>	<u>4C</u>	<u>5A</u>	<u>5B</u>	<u>5C</u>	<u>6A</u>	<u>6B</u>	<u>7</u>	<u>8</u>
<u>R-2, R-4, and I-1</u>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<u>I-2</u>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<u>R-1</u>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<u>B</u>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<u>A-2</u>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<u>M</u>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<u>E</u>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<u>S-1 and S-2</u>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<u>All Other</u>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

C405.17.3 Combustion cooking. Spaces containing combustion equipment for cooking shall comply with either C405.17.3.1 or C405.17.3.2

C405.17.3.1 Commercial cooking. Spaces containing *commercial cooking appliances* shall be provided with a dedicated branch circuit with a minimum electrical capacity in accordance with Table 405.17.3.1 based on the *appliance* in the space. The branch circuit shall terminate within 3 feet (914 mm) of the *appliance* with no obstructions. Both ends of the branch circuit shall be labeled with the words “For Future Electric Cooking Equipment” and be electrically isolated.

Table 405.17.3.1 COMMERCIAL COOKING MINIMUM BRANCH CIRCUIT CAPACITY

<u>Commercial Cooking Appliance</u>	<u>Minimum Branch Circuit Capacity</u>
<u>Range</u>	<u>114 VA/kBtu/h</u>
<u>Steamer</u>	<u>469 VA/kBtu/h</u>

<u>Fryer</u>	<u>200 VA/kBtu/h</u>
<u>Oven</u>	<u>266 VA/kBtu/h</u>
<u>Griddle</u>	<u>195 VA/kBtu/h</u>
<u>All other commercial cooking appliances<i>appliances</i></u>	<u>114 VA/kBtu/h</u>

–

C405.17.3.2 All other cooking. Spaces containing all other cooking equipment not designated as *commercial cooking appliances* shall be provided with a dedicated branch circuit in compliance with NFPA 70 Section 422.10. The branch circuit shall terminate within 6 feet (1829 mm) of fossil fuel ranges, cooktops and ovens and be accessible with no obstructions. Both ends of the branch circuit shall be labeled with the words “For Future Electric Cooking Equipment” and be electrically isolated.

C405.17.4 Combustion clothes drying. Spaces containing combustion equipment for clothes drying shall comply with either C405.17.4.1 or C405.17.4.2

C405.17.4.1 Commercial drying. Spaces containing clothes drying equipment, and end-uses for commercial laundry applications shall be provided with conduit that is continuous between a junction box located within 3 feet (914 mm) of the equipment and an electrical panel. The junction box, conduit and bus bar in the electrical panel shall be rated and sized to accommodate a branch circuit with sufficient ~~cap~~capacity for an equivalent electric equipment with an equivalent equipment capacity. The electrical junction box and electrical panel shall have labels stating, “For Future Electric Clothes Drying Equipment.”

C405.17.4.2 Residential drying. Spaces containing clothes drying equipment, ~~appliances~~*appliances*, and end-uses serving multiple *dwelling units* or sleeping areas with a ~~cap~~capacity less than or equal to 9.2 cubic feet shall be provided with a dedicated 240-volt branch circuit with a minimum ~~cap~~capacity of 30 ~~amps-and~~ shall terminate within 6 feet (1829 mm) of fossil fuel clothes dryers and shall be accessible with no obstructions. Both ends of the branch circuit shall be labeled with the words “For Future Electric Clothes Drying Equipment” and be electrically isolated.

Reason Statement:

In order for the U.S. to reach net zero carbon emissions, the country must not only reduce energy use through energy efficiency and move to utility scale and on-site renewable energy, but also begin to transition away from using combustion equipment in buildings that run on fossil fuels to electric equipment. In 2021, combustion equipment in commercial and residential buildings accounted for 35% of US greenhouse gas emissions.[1] The cost of installing electric-ready infrastructure when a building is under construction, walls are open, and the trades are already on-site, is small in comparison to the cost of retrofitting a building to install the same level of electric equipment. Having electric-ready

infrastructure in place gives building owners or occupants the choice to shift to electric appliances at time of replacement or retrofit without incurring the costs and delays of retrofitting panels, opening walls to install conduit, etc. The residential 2024 IECC has included mandatory electric-ready requirements for water heating, cooktops and clothes drying into the public comment review draft #1. The California Building Energy Efficiency Standards 2022 update (Title 24, Part 6) has also moved in this direction, including electric-ready requirements for heat pump space heating, cooktops and clothes drying in both single family homes and multifamily buildings, and for water heating in single family homes. The Chicago Energy Transformation Code has also included electric-ready requirements for residential single family and multifamily buildings in their energy code. Attached is a letter with others stating the support for this proposal from 50 organizations, 16 of which are from local or state governments and universities, 12 of which are from NGOs, and 22 of which are from design and construction industry. In addition to the letter of support, this proposal includes more than 30 co-proponents.

Requiring buildings to be electric-ready will not only reduce costs for building owners who choose to electrify their building at a later date but it will also give building residents the option to improve their own health. Gas appliances release harmful pollutants like nitrogen dioxide (NO₂) and carbon monoxide (CO) either indoors because of gas stoves or outdoors because of space-heating and water heating equipment. A recent study from the Harvard Chang School of Public Health and RMI shows that in Illinois in 2017, air pollution from burning fuels in buildings led to an estimated 1,123 early deaths and \$12.574 billion in health impact costs.[2] These emissions can particularly affect children. In a meta-analysis analyzing the connections between gas stoves and childhood asthma, children in homes with gas stoves were 42% more likely to experience asthma symptoms, and 32% more likely to be diagnosed with asthma. [3] Therefore, ensuring all-electric appliances can be installed in our buildings in the future is critical to reducing air pollution, protecting public health, reducing utility and construction costs, and meeting climate goals.

NBI, ACEEE, and 2050 Partners on behalf of the California Investor Owned Utilities worked together to address many of the technical concerns raised when NBI's original proposal, CEPI-22, was discussed by the Commercial Consensus Committee in June of 2022. The main revisions to this proposal include:

1. Separating the original CEPI-22 proposal into three pieces, an electric-ready proposal, an all-electric appendix, and a requirement for more energy efficiency credits in buildings that do not primarily use heat pumps for space and water heating. Each piece stands alone with its own independent support, so each proposal can be discussed and voted on separately.
2. Requiring buildings with central water heating or space heating systems to have the electrical capacity but not conduit for a new system to ensure that unnecessary conduit is not placed in buildings that choose to install distributed and not central systems at a future date.
3. Clear electrical capacity requirements for electric-ready space and water heating based on occupancy type and climate zone to ensure that there is sufficient capacity to install efficient heat pumps for space heating and water heating without requiring full design and sizing of an all-electric alternative to a fuel-based system (though that option remains for flexibility). 2050 Partners is conducting energy modeling to determine capacity requirements. This modeling is not yet complete but will be complete before this proposal is considered by the commercial consensus committee.
4. Clear capacity requirements for commercial cooking appliances based on research conducted by NBI on the minimum branch circuits needed for a variety of commercial cooking appliances.
5. Additional flexibility that allows designers to submit an alternate design for the electrical infrastructure needed for water and space heating that would allow the building to use no energy source other than electricity or on-site renewable energy in the future.
6. Restructuring of the proposal to make it easier to understand and enforce.

Cost Impact:

The code change proposal will increase the cost of construction.

Recent analysis by NBI and partners using cost data from RSMeans for a medium office indicates that additional electrical infrastructure costs for water-heating and space-heating would cost a typical office building an additional \$0.09 per square foot of conditioned floor area. [4] However, if a building owner were to have to retrofit their building from using combustion equipment to natural gas equipment costs without these requirements in place, costs could be exorbitant. California Energy Codes & Standards “2021 Reach Code Cost-Effectiveness Analysis: Non-Residential Alterations” report estimated labor costs for electrification retrofit of mechanical systems as a 25 to 50% increase from new construction labor cost due to building-specific considerations such as tight conditions, prepping surfaces, elevated work, material handling, specialty rigging, and protecting existing finishes that can vary building to building. [5]

Attached Files

Bibliography:

[1] “U.S. Energy Information Administration - EIA - Independent Statistics and Analysis.” *Energy and the Environment Explained: Where Greenhouse Gases Come From*, U.S. Energy Information Administration (EIA), <https://www.eia.gov/energyexplained/energy-and-the-environment/where-greenhouse-gases-come-from.php#:~:text=In%202021%2C%20petroleum%20accounted%20for,energy%2Drelated%20CO2%20emissions>.

[2] *Health Air Quality Impacts of Buildings Emissions*. RMI, 5 May 2021, rmi.org/health-air-quality-impacts-of-buildings-emissions#MI.

[3] *Gas Stoves: Health and Air Quality Impacts and Solutions*. RMI, 1 Feb. 2021, rmi.org/insight/gas-stoves-pollution-health/.

[4] *Cost Study of the Building Decarbonization Code*, New Buildings Institute, Apr. 2022, <https://newbuildings.org/wp-content/uploads/2022/04/BuildingDecarbCostStudy.pdf>.

[5] *2021 Reach Code Cost-Effectiveness Analysis: Non-Residential Alterations*, California Energy Codes and Standards, 27 Jan. 2022, <https://localenergycodes.com/>.



International Energy Conservation Code Code Change Proposal Tracking Sheet

Proposal #	CED1-15-22 Add an All-electric Appendix
CDP ID #	810
Code	IECC CE
Code Section(s)	New Appendix
Location	base
Proponent	Diana Burk <diana@newbuildings.org>
Proposal Status	SC review
Subcommittee	CE HVACR and Water Heating Subcommittee
Subcommittee Notes	Reason Statement: Electrification is not cost effective in all areas of the country and will add significant additional expense.
Recommendation	Disapprove
Vote	Disapprove Need Vote Tally
Recommendation Date	04/06/2023
Next Step	To Subcommittee To Advisory Group _____ To Consensus Committee <u> X </u> _____
Consensus Committee	
Committee Response	
Vote	Affirmative _____ Negative _____ Table _____ To Subcommittee _____
Date	



International Energy Conservation Code Code Change Proposal Tracking Sheet

Proposal #	CED1-15-22 Add an All-electric Appendix
CDP ID #	810
Code	IECC CE
Code Section(s)	New Appendix
Location	base
Proponent	Diana Burk <diana@newbuildings.org>
Proposal Status	SC review
Subcommittee	CE HVACR and Water Heating Subcommittee
Subcommittee Notes	
Recommendation	<ul style="list-style-type: none"> ○ Motion to approve as modified (two modifications shown on screen) <ul style="list-style-type: none"> ▪ 1st – Joe Cain ▪ 2nd – Payam Bozorgchami ▪ Vote: 10 yes 0 no 3 abstain – chair not voting ▪ Reason: Provides the optional ability for jurisdictions to adopt all-electric provisions to support further reducing carbon emissions and healthier buildings.
Vote	Approve as modified 10-0-3
Recommendation Date	04/06/2023
Next Step	To Subcommittee _____ To Advisory Group _____ To Consensus Committee <u> X </u> _____
Consensus Committee	
Committee Response	
Vote	Affirmative _____ Negative _____ Table _____ To Subcommittee _____
Date	

CED1-15-22 (PLR mods are highlighted yellow) As distributed at 4.19.23 meeting

Proponents: Diana Burk, representing New Buildings Institute (diana@newbuildings.org); Michael Waite, representing American Council for an Energy-Efficient Economy (mwaite@aceee.org); John Bade, representing California Investor Owned Utilities (johnbade@2050partners.com); Rachael Dorothy, representing self (dorothy.2@osu.edu); Erin Sherman, representing RMI (esherman@rmi.org); Melissa Kops, representing CT Green Building Council (melissa@ctgbc.org); Andy Woommavovah, representing Healthcare (andy.woommavovah@trinity-health.org); Jenny Hernandez, representing Las Cruces Sustainability (jehernandez@las-cruces.org); Khaled Mansy, representing self (khaled.mansy@okstate.edu); Brad Smith, representing City of Fort Collins (brsmith@fcgov.com); Brad Hill, representing Honeywell International Inc. (brad.hill@honeywell.com); David Goldstein, representing Natural Resources Defense Council (dgoldstein.nrdc@gmail.com)

2024 International Energy Conservation Code [CE Project]

Add new text as follows:

APPENDIX CG

ALL-ELECTRIC COMMERCIAL BUILDING PROVISIONS

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

User note:

About this chapter: Appendix CG provides cities and states an appendix to the Commercial Provisions of the 2024 International Energy Conservation Code® (IECC®) that would result in all-electric commercial buildings. Jurisdictions have the prerogative to adopt the appendix in support of policy goals related to carbon emission reductions. The provisions contained in this appendix are not mandatory unless specified as such in the jurisdiction's adopting ordinance.

Whether an all-electric buildings is less expensive to construct and operate depends heavily on climatic and market variables. Therefore, before adopting this appendix, jurisdictions should carefully consider the local climate and market conditions such as utility costs, local equipment costs and local workforce and equipment availability.

SECTION CG101

GENERAL

CG101.1 Intent. The intent of this Appendix is to amend the *International Energy Conservation Code* to reduce greenhouse gas emissions from buildings and improve the safety and health for commercial building occupants by requiring new *all-electric buildings* and efficient electrification of existing buildings.

CG101.2 Scope. The provisions in this appendix are applicable to commercial buildings. New construction shall comply with Section CG103.

Additions, alterations, repairs and changes of occupancy to existing buildings shall comply with Chapter 5 and Section CG104.

SECTION CG102

DEFINITIONS

CG102 ALL-ELECTRIC BUILDING. A building using no purchased energy other than electricity when utility power is available that contains no combustion equipment, or plumbing for combustion equipment, installed within the building or building site.

CG102 APPLIANCE. A device or apparatus that is manufactured and designed to utilize energy and for which this code provides specific requirements.

CG102 COMBUSTION EQUIPMENT. Any equipment or *appliance* used for space heating, *service water heating*, cooking, clothes drying, humidification, or lighting that ~~uses a fossil fuel fuel gas or fuel oil.~~

CG102 FUEL GAS. Natural gas, manufactured gas, liquified petroleum gas or a mixture of these.

CG102 FUEL OIL. Kerosene or any hydrocarbon oil having a flash point not less than 100°F (38°C).

CG102 SUBSTANTIAL ENERGY ALTERATION. An alteration that includes replacement of two or more of the following:

- ~~1. 50 percent or greater of the area of interior wall covering material of the *building thermal envelope* or *fenestration*.~~
- ~~2. 50 percent or greater of the area of the exterior wall covering material of the *building thermal envelope* or *fenestration*.~~
- ~~3. Space conditioning equipment constituting 50 percent or greater of the total input capacity of the space heating or space cooling equipment serving the *building*.~~
- ~~4. *Water* heating equipment constituting 50 percent or greater of the total input capacity of all the water heating equipment serving the *building*.~~
- ~~5. 50 percent or greater of the luminaires in the *building*.~~

CG102 PURCHASED ENERGY. Energy or power purchased for consumption and delivered to the building site.

CG102 SUBSTANTIAL IMPROVEMENT. Any *repair*, reconstruction, rehabilitation, *alteration*, *addition* or other improvement of a building or structure, the cost of which equals or **exceeds is more than** 50 percent of the market value of the structure before the improvement **or repair is started.** **If-Where** the structure has sustained *substantial damage*, as defined in the International Building Code, any repairs are considered substantial improvement regardless of the actual *repair* work performed. **The term Substantial improvement does not, however, include either the following:**

- 1. Any project for i** Improvement of a *building* required to correct **existing** health, sanitary or safety code violations **identified ordered** by the *building official*, **or-and that are the minimum necessary to assure safe living conditions.**
- 2. Any a** *Alteration* of a *historic structure historic building* provided that where the *alteration* will not **preclude affect the structure's building's continued** designation as a *historic structure-historic building*.

SECTION CG103

NEW COMMERCIAL BUILDINGS

CG103.1 Application. New commercial buildings shall be *all-electric buildings* and comply with Sections C401.2.1 or C401.2.2.

Exceptions:

- 1. Purchased energy** other than electricity shall be permitted where it has been demonstrated to the building official that the building is required by an applicable law or regulation to provide space

- heating with an emergency power system or a standby power system.
2. Purchased energy shall be permitted for an emergency power system or a standby power system.

CG103.2 Electric resistance heating equipment. The sole use of electric resistance equipment and appliances for space and water heating shall be prohibited other than for *buildings* or portions of *buildings* that comply with not less than one of Sections CG103.2.1 through CG103.2.8.

CG103.2.1 Low space heating capacity. Electric resistance appliances or equipment shall be permitted in buildings or areas of buildings not served by a mechanical cooling system and with a total space heating capacity not greater than 4.0 BTU/h (1.02 watts) per square foot of *conditioned space* ~~are shall be permitted to be heated using electric resistance appliances or equipment.~~

CG103.2.2 Small systems. Buildings in which electric resistance *appliances* or equipment comprise less than 5 percent of the total system heating capacity or serve less than 5 percent of the *conditioned floor area*.

CG103.2.3 Specific conditions. Portions of buildings or specific equipment and appliances that require electric resistance heating that cannot practicably be served by electric heat pumps as approved by the code official.

CG103.2.4 Kitchen make-up air. Make-up air for commercial kitchen exhaust systems required to be tempered by Section 508.1.1 of the International Mechanical Code is permitted to be heated by electric resistance.

CG103.2.5 Freeze protection. ~~The Use~~ of electric resistance heat for freeze protection shall comply with Sections CG103.2.5.1 through CG103.2.5.2.

CG103.2.5.1 Low indoor design conditions. Space heating systems sized for spaces with indoor design conditions of ~~no higher not greater~~ than 40°F (4.5°C) and intended for freeze protection, including temporary systems in unfinished spaces, are shall be permitted to use electric resistance. The building envelope of any such space shall be insulated in compliance with Section C402.1.

CG103.2.5.2 Freeze protection systems. Freeze protection systems shall comply with Section C403.13.3.

CG103.2.6 Pre-heating of outdoor air. Systems with energy recovery ventilation ~~are shall be~~ permitted to utilize electric resistance to preheat outdoor air for defrost or temper ~~supply~~ air entering the energy recovery device to not more than 45°F (7.2°C). Hydronic systems without energy recovery ventilation ~~are shall be~~ permitted to utilize electric resistance to temper ~~supply~~ air entering the energy recovery device to not more than 40°F (4.5°C).

CG103.2.7 Small buildings. Buildings with a conditioned floor area of not more than 250 square feet (23.2 m²) and not served by a mechanical space cooling system shall be permitted to use electric resistance *appliances* or equipment for space heating.

CG103.2.8 Supplemental heat. Electric resistance heat shall be permitted as supplemental heat when installed with heat pumps sized in accordance with Section CG103.3 and when operated only when a heat pump cannot provide the necessary heating energy to satisfy the thermostat setting.

CG103.3 Heat pump sizing for space heating. Heat pump space heating systems shall be sized to meet the *building* heating load at the greater of 0°F (-18°C) or the 99 Percent Annual Heating Dry-Bulb for the nearest weather station provided in the ASHRAE Handbook of Fundamentals. The ~~heat pump~~ space heating system shall not require the use of supplemental electric heat at or above this temperature other than for defrosting. Lower capacity heat pumps that operate in conjunction with thermal storage shall be permitted if the system meets the requirements of this section.

CG103.4 Heat pump sizing for water heating. Heat pump *service heating systems* shall be sized to meet ~~not less than~~ the *building service water heating load* at the greater of 15°F (-18.9°C) or the 99 Percent Annual Heating Dry-Bulb for the nearest weather station provided in the latest edition of the ASHRAE Fundamentals Handbook. Supplemental electric heat shall not be required at or above this temperature other than for temperature maintenance in recirculating systems and defrosting.

CG103.5 Heating outside a building. Systems for heating outside a building shall comply with C403.13.1.

CG103.6 Low capacity cooling equipment. ~~New unitary~~ ~~SAIR~~ ~~conditioners~~ with capacity less than 240,000 Btu/hr (70 kW) shall be electric heat pump equipment sized and configured to provide both space cooling and space heating.

SECTION CG104 EXISTING

COMMERCIAL BUILDINGS

CG104.1 Combustion equipment in additions. ~~Additions shall use no purchased energy other than electricity not be permitted to contain combustion equipment~~ and new equipment installed to ~~serve additions shall use no purchased energy other than electricity not be combustion equipment.~~ Where ~~existing systems using purchased energy other than electricity with combustion equipment are extended into serve~~ an addition, the existing ~~building~~ and addition together shall use no more ~~purchased energy other than electricity fossil fuel energy~~ than the existing ~~building~~ alone.

CG104.2 Substantial improvement. Buildings undergoing ~~substantial improvements~~ shall be ~~all-electric buildings,~~ comply with C402.5 and meet a site EUI by building type in accordance with ASHRAE Standard 100 Table 7-2a.

Exception: Compliance with Standard 100 shall not be required where Group R-2 occupancies achieve an ERI score of 80 or below without on-site renewable energy included in accordance with RESNET/ICC 301, for each dwelling unit.

~~CG104.3 Additional energy efficiency credits for substantial energy alterations. Substantial energy alterations of all electric buildings shall comply with Section C503.6 and mixed-fuel buildings shall achieve not less than twice the number of required efficiency credits from Section C503.6.~~

Exceptions:

- ~~1. Alterations that are part of an addition complying with section CG104.1.~~
- ~~2. Alterations that comply with Section C407.~~
- ~~3. Alterations that comply with Section CG104.2.~~

CG104.3 Cooling equipment. New and replacement ~~unitary~~ air conditioners shall be electric heat pump equipment sized and configured to provide both space cooling and space heating. Any existing space heating systems other than existing heat pump equipment that serve the same zone as the new equipment shall be configured as supplementary heat in accordance with Section CG104.6.

CG104.4 Service water heating equipment. Where ~~service water heating equipment is water heaters are~~ added or replaced, ~~new service hot water equipment~~ they shall use no purchased energy other than electricity.~~not be combustion equipment.~~

CG104.5 Furnace replacement. Newly installed warm air furnaces provided for space heating shall only be permitted as supplementary heat controlled in accordance with Section CG104.6.

CG104.6 Heat pump supplementary heat. Heat pumps having ~~combustion equipment~~ or electric resistance equipment for supplementary space or ~~service water heating~~ shall have controls that limit supplemental heat operation to only those times when one of the following applies:

1. The heat pump is operating in defrost mode.
2. The vapor compression cycle malfunctions.
3. For space heating systems, the thermostat malfunctions.
4. For space heating systems, the vapor compression cycle cannot provide the necessary heating energy to satisfy the thermostat setting.
5. The outdoor air temperature is less than the design temperature determined in accordance with Section CG103.3.
6. For service water heating, the heat pump ~~water heater~~ ~~water heater~~ cannot maintain an output water temperature of at least not less than 120°F (49°C).
7. For temperature maintenance in service water heating systems.

New supplementary space and service water heating systems for heat pump equipment shall not be permitted to have a heating ~~input~~ ~~output~~ capacity greater than the heating ~~input~~ ~~output~~ capacity of the heat pump equipment.

Add new standard(s) as follows:

ASHRAE

ASHRAE
180 Technology
Parkway NW
Peachtree Corners,
GA 30092

100-2018

Energy Efficiency in Existing Buildings

Reason: In order for the U.S. to reach net zero carbon emissions, the country must not only reduce energy use through energy efficiency and move to utility scale and on-site renewable energy, but also begin to transition away from using combustion equipment in buildings that runs on fossil fuels to electric equipment. In 2021, combustion equipment in commercial and residential buildings accounted for 35% of US greenhouse gas emissions.[1] The purpose of a model code is to provide cities and states with a starting point on which each jurisdiction can base their energy code. Growing interest in establishing all-electric building requirements is evidenced by several cities and states passing ordinances banning fossil fuel combustion equipment in buildings including Washington DC, New York City, Ithaca, New York; Brookline, Massachusetts; Berkeley, Los Angeles, Sacramento, San Francisco, Oakland and San Jose, California; and Washington State. Including an appendix in the 2024 IECC that specifies requirements for all-electric commercial construction will streamline adoption and implementation of all-electric construction for policy makers and the building industry. We strongly encourage that the code language in this appendix minimizes the use of inefficient electric resistance heat for space heating in new buildings to avoid an unintended consequence of higher operational costs and carbon emissions for the life of the building. Attached is a letter with others stating the support for this proposal from 50 organizations, 16 of which f from local or state governments and universities, 12 of which are from NGOs, and 22 of which are from design and construction industry. In addition to the letter of support, this proposal includes more than 30 co-proponents.

All-electric buildings not only reduce carbon emissions but are also healthier for building occupants. Gas appliances release harmful pollutants like nitrogen dioxide (NO₂) and carbon monoxide (CO) either indoors because of gas stoves or outdoors because of space-heating and water heating equipment. A recent study from the Harvard Chang School of Public Health and RMI shows that in Illinois in 2017, air pollution from burning fuels in buildings led to an estimated 1,123 early deaths and \$12.574 billion in health impact costs.[2] These emissions can particularly affect children. In a meta-analysis analyzing the connections between gas stoves and childhood asthma, children in homes with gas stoves were 42% more likely to experience asthma symptoms, and 32% more likely to being diagnosed with asthma. [3]Therefore, ensuring all-electric appliances are installed is critical to reducing air pollution, protecting public health, reducing utility and construction costs, and meeting climate goals.NBI, ACEEE, and 2050

Partners on behalf of the California Investor Owned Utilities worked together to address many of the technical concerns raised when NBI's original proposal, CEPI-22, was discussed in June of 2022. The main revisions to this proposal include:

1. Separating the original CEPI-22 proposal into three pieces, an electric-ready proposal, an all-electric appendix, and a requirement for more energy efficiency credits in buildings that do not primarily use heat pumps for space and water heating. Each piece stands alone with its own independent support, so each proposal can be discussed and voted on separately.
2. Ensuring that jurisdictions encourage efficient electrification by only allowing the use of electric resistance heat for space and water heating in certain applications.
3. Additional requirements on appropriately sizing heat pumps for space heating and water heating are included so that electric resistance heat for supplementary heat is reduced. 2050 partners is conducting additional modeling to for a variety of building types in multiple climate zones to determine if additional requirements are needed. This modeling is not yet complete but will be complete before the commercial consensus committee considers this proposal.
4. A new section addressing the use of combustion equipment in existing buildings. This new section:
 - a. Does not permit new combustion equipment in additions
 - b. Requires buildings undergoing a substantial improvement, defined as work that exceeds 50% of the market value of the structure to both be all-electric and meet EUI targets outlined in ASHRAE Standard 100.
 - c. Incentivizes heat pumps in new buildings by requiring buildings undergoing a substantial energy alteration to achieve additional energy efficiency credits.
 - d. Requires new and replacement cooling equipment to be electric heat pump equipment configured to provide both space cooling and space heating and requires existing space heating systems that are not heat pump systems are required to provide supplementary heat.
 - e. Requires new or replacement service hot water equipment to be electric.
 - f. Requires new furnaces provided for space heating to only be permitted to be used as supplementary heat.
 - g. Reduces the use of electric resistance and combustion equipment for supplementary heat through the use of improved controls.

Cost Impact: The code change proposal will decrease the cost of construction.

All-electric commercial buildings are less expensive to build than mixed fuel buildings because electric appliances and equipment are typically less expensive than combustion equipment and appliances. In addition developers avoid the cost of installing natural-gas lines and meters. Recent analysis by NBI and partners utilizing data from RS Means indicates that an all-electric 53,000 s.f. office building with a central heat pump water heater and minimum code compliant air source heat pump costs \$0.07/s.f. to \$0.24/s.f. less to build than a mixed-fuel office building of the same size. [4] Additional analyses from a recent CASE study indicate that all-electric high-rise multifamily buildings are also less expensive to build and operate than mixed-fuel buildings. HVAC costs, for example, are on the order of \$2,504 to \$7,131 lower per dwelling unit depending on the HVAC system installed. Installing electric space heating and water heating equipment instead of natural gas equipment in the majority of California's climate zones also yielded a positive benefit to cost ratio over the 15- year analysis period despite California's high electricity rates. This is perhaps why close to half of commercial buildings currently do not use natural gas. [5] Moving to all-electric construction also results in more stable utility bills because electricity prices are not as volatile as natural gas prices. [6]

Bibliography: [1] "U.S. Energy Information Administration - EIA - Independent Statistics and Analysis." *Energy and the Environment Explained: Where Greenhouse Gases Come From*, U.S. Energy Information Administration (EIA), <https://www.eia.gov/energyexplained/energy-and-the->

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[2] *Health Air Quality Impacts of Buildings Emissions*. RMI, 5 May 2021, rmi.org/health-air-quality-impacts-of-buildings-emissions#MI.

[3] *Gas Stoves: Health and Air Quality Impacts and Solutions*. RMI, 1 Feb. 2021, rmi.org/insight/gas-stoves-pollution-health/.

[4] *Cost Study of the Building Decarbonization Code*, New Buildings Institute, Apr. 2022, <https://newbuildings.org/wp-content/uploads/2022/04/BuildingDecarbCostStudy.pdf>.

[5]"U.S. Energy Information Administration - EIA - Independent Statistics and Analysis." *Commercial Buildings Energy Consumption Survey (CBECS)*, Energy Information Administration (EIA), 2018,
https://www.eia.gov/consumption/commercial/data/2018/pdf/CBECS_2018_Building_Characteristics_Flipbook.pdf.

[6] Slanger, Dan. *Reality Check: The Myth of Stable and Affordable Natural Gas Prices*, RMI, 5 May 2022,
<https://rmi.org/the-myth-of-stable-and-affordable-natural-gas-prices/>.

Attached Files

- Commercial Electrification Sign On Letter 2024 IECC.pdf

<https://energy.cdpaccess.com/proposal/810/1704/files/download/384/>

Workgroup Recommendation

Proposal # 810

FLOOR MODIFICATION

CE1-39-22-HOLLAND-2

Proponent: Bryan Holland, representing National Electrical Manufacturers Association (NEMA) (bryan.holland@nema.org)

2024 International Energy Conservation Code [CE Project]

C405.14.4 EVSE Spaces. An installed EVSE with multiple output connections shall be permitted to serve multiple EVSE spaces. Each EVSE installed

to meet the requirements of Section C405.14.1, serving either a single EVSE space or multiple EVSE spaces, shall comply with the following:

1. Have a minimum system and circuit capacity in accordance with C405.14.5.
2. ~~Have a minimum charging rate in accordance with C405.14.4.1.~~ Have a nameplate rating not less than 6.2 kW.
3. Be located within 3 feet (914 mm) of each EVSE space it serves.
4. Be installed in accordance with Section C405.14.6.

C405.14.5 System and Circuit Capacity. C405.14.5.1 System Capacity. The electrical distribution equipment supplying the branch circuit(s)

serving each EV capable space, EV ready space, and EVSE space shall comply with one of the following:

1. Have a calculated load of 7.2 kVA or the nameplate rating of the equipment, whichever is larger, for each EV capable space, EV ready space, and EVSE space.
2. Meets the requirements of C405.14.5.3.1

C405.14.5.2 Circuit Capacity. The branch circuit serving each EV capable space, EV ready space, and EVSE space shall comply with one of the following:

1. Have a rated capacity not less than 50 amperes or the nameplate rating of the equipment, whichever is larger. .
2. Meets the requirements of C405.14.5.3.2.

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