C403.1.4 Use of electric resistance and fossil fuel-fired HVAC heating equipment. HVAC heating energy shall not be provided primarily though ~~by~~ electric resistance or fossil fuel combustion appliances unless those appliances have a COP greater than 1.0. For the purposes of this section, electric resistance HVAC heating appliances include but are not limited to electric baseboard, electric resistance fan coil and VAV electric resistance terminal reheat units and electric resistance boilers. For the purposes of this section, fossil fuel combustion HVAC heating appliances include but are not limited to appliances burning natural gas, heating oil, propane, or other fossil fuels. For the purposes of this section, gas-fired HVAC heating appliances include but are not limited to appliances consuming natural gas, synthetic natural gas, propane, renewal natural gas, hydrogen, or blends of these gases.

Exceptions.

1. **Low heating capacity.** Buildings or areas of buildings, other than *dwelling unit*s or sleeping units, that meet the interior temperature requirements of IBC Chapter 12 with a total installed HVAC heating capacity no greater than 8.5 BTU/h (2.5 watts) per square foot of *conditioned space* are permitted to be heated using electric resistance or gas-fired appliances. For the purposes of this exception, overhead or wall-mounted radiant heating panels installed in an unheated or semi-heated space, insulated in compliance with Section C402.2.8 and controlled by occupant sensing devices in compliance with Section C403.11.1 need not be included as part of the HVAC heating energy calculation.

2. **Dwelling and sleeping units.** Dwelling or sleeping units having an installed HVAC heating capacity no greater than 750 watts in Climate Zone 4, and 1000 watts in Climate Zone 5, in any separate habitable room with exterior fenestration are permitted to be heated using electric resistance appliances. For buildings in locations with exterior design conditions below 4°F, an additional 250 watts above that allowed for Climate Zone 5 is permitted.

    2a. Corner rooms. A room within a dwelling or sleeping unit that has two primary walls facing different cardinal directions, each with exterior fenestration, is permitted to have an installed HVAC heating capacity no greater than 1000 watts in Climate Zone 4, and 1300 watts in Climate Zone 5. Bay windows and other minor offsets are not considered primary walls. For buildings in locations with exterior design conditions below 4°F, an additional 250 watts above that allowed for Climate Zone 5 is permitted.

3. **Small buildings.** Buildings with less than 2,500 square feet of *conditioned floor area* are permitted to be heated using electric resistance and gas-fired appliances.

4. **Defrost**. Heat pumps are permitted to utilize electric resistance as the first stage of heating when a heat pump defrost cycle is required and is in operation.

5. **Air-to-air heat pumps.** Buildings are permitted to utilize internal electric resistance or gas-fired heaters to supplement heat pump heating for air-to-air heat pumps that meet all of the following conditions:

a. Internal electric resistance heaters have controls that prevent supplemental heater operation when the heating load can be met by the heat pump alone during both steady-state operation and setback recovery.
b. The heat pump controls are configured to use the compressor as the first stage of heating down to an outdoor air temperature of 17°F or lower.
c. The heat pump complies with one of the following:
    1. Controlled by a digital or electronic thermostat designed for heat pump use that energizes the supplemental heat only when the heat pump has insufficient capacity to maintain set point or to warm up the space at a sufficient rate,
    2. Controlled by a multistage space thermostat and an outdoor air thermostat wired to energize supplemental heat only on the last stage of the space thermostat and when outdoor air temperature is less than 32°F.
    3. The minimum efficiency of the heat pump is regulated by NAECA, its rating meets the requirements shown in Table C403.3.2(2), and its rating includes all usage of internal electric resistance heating.
d. The heat pump rated heating capacity is sized to meet the heating load at an outdoor air temperature of 32°F or lower and has a rated heating capacity at 47°F no less than 2 times greater than supplemental internal electric resistance heating capacity in Climate Zone 4 and no less than the supplemental internal electric resistance heating capacity in Climate Zone 5, or utilizes the smallest available factory-available internal electric resistance heater.

6. **Air-to-water heat pumps.** Buildings are permitted to utilize electric resistance ~~(for climate Zone 4 or 5)~~ or fossil fuel-fired ~~(for climate Zone 5)~~ auxiliary heating to supplement heat pump heating for hydronic heating systems that meet all of the following conditions:

a. Controls for the auxiliary electric resistance or fossil fuel-fired heating are configured to lock out the supplemental heat when the outside air temperature is above 36°F, unless the hot water supply temperature setpoint to the building heat coils cannot be maintained for 20 minutes.

b. The heat pump controls are configured to use the compressor as the first stage of heating down to the lowest exterior design temperature for which the equipment is rated except during startup or defrost operation.
c. The heat pump rated heating capacity at 47°F is no less than 75% of the design heating load at 29°F.

7. **Ground source heat pumps**. Buildings are permitted to utilize electric resistance auxiliary heating to supplement heat pump heating for hydronic heating systems with ground source heat pump equipment that meets all of the following conditions:

a. Controls for the auxiliary resistance heating are configured to lock out the supplemental heat when the outdoor air temperature is above 32°F, unless the hot water supply temperature setpoint to the building heat coils cannot be maintained for 20 minutes.
b. The heat pump controls are configured to use the compressor as the first stage of heating.
c. The heat pump rated heating capacity at 32°F entering water conditions is no less than 70% of the design heating load.

8. **Small systems.** Buildings in which electric resistance or fossil fuel appliances, including decorative appliances, either provide less than 5 percent of the total building HVAC system heating capacity or serve less than 5 percent of the *conditioned floor area*.

9. **Specific conditions.** Portions of buildings that require fossil fuel or electric resistance space heating for specific conditions *approved* by the *code official* for research, health care, process or other specific needs that cannot practicably be served by heat pump or other space heating systems. This does not constitute a blanket exception for any occupancy type.

10. **Kitchen exhaust.** 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 using electric resistance appliances in .

11. **District energy.** Steam or hot water district energy systems that utilize fossil fuels as their primary source of heat energy, that serve multiple buildings, and that were already in existence prior to the effective date of this code, including more energy-efficient upgrades to such existing systems, are permitted to serve as the primary heating energy source.

12. **Heat tape.** Heat tape is permitted where it protects water-filled equipment and piping located outside of the *building thermal envelope*, provided that it is

configured and controlled to be automatically turned off when the outside air temperature is above 40°F.

13. **Temporary systems.** Temporary gas-fired or electric resistance heating systems are permitted where serving future tenant spaces that are unfinished and unoccupied, provided that the heating equipment is sized and controlled to achieve interior space temperatures no higher than 40°F.

14. **Pasteurization.** Electric resistance heat controls are permitted to reset the supply water temperature of hydronic heating systems that serve service water heating heat exchangers during pasteurization cycles of the service hot water storage volume. The hydronic heating system supply water temperature shall be configured to be 145°F or lower during the pasteurization cycle.

15. **Freeze Protection.** Spaces sized for indoor design conditions of 45°F or lower, intended for freeze protection, and insulated as conditioned are permitted to use electric resistance heating.

Table C407.2

MANDATORY COMPLIANCE MEASURES FOR TOTAL BUILDING PERFORMANCE METHOD

Section	Title	Comments
Envelope		
C402.5	Air Leakage	
Mechanical		
C403.1.2	Calculation of heating and cooling loads	
C403.1.3	Data centers	
C403.1.4	Use of electric resistance and fossil fuel-fired HVAC heating equipment	
C403.2	System design	
C403.3.1	Equipment and system sizing	
C403.3.2	HVAC equipment performance requirements	

C403.3.6	Ventilation for Group R occupancy	
C403.4	HVAC system controls	
C403.4.1	Thermostatic controls	Except for C403.4.1.4
C403.4.2	Off-hour controls	Except for Group R
C403.4.7	Combustion heating equipment controls	
C403.4.8	Group R-1 hotel/motel guestrooms	See Section C403.7.4
C403.4.9	Group R-2 and R-3 dwelling units	
C403.4.10	Group R-2 sleeping units	
C403.4.11	Direct digital control systems,	
C403.5.5	Economizer fault detection and diagnostics (FDD)	
C403.7	Ventilation and exhaust systems	Except for C403.7.6
C403.8	Fan and fan controls	
C403.9.1.1	Variable flow controls	For cooling tower fans ≥ 7.5 hp
C403.9.1.2	Limitation on centrifugal fan cooling towers	For open cooling towers
C403.10	Construction of HVAC elements	
C403.11	Mechanical systems located outside of the building thermal envelope	
Service Water Heating		
C404	Service Water Heating	
Lighting and Electrical		
C405.1	General	
C405.2	Lighting controls	
C405.3	Exit signs	
C405.4	Interior lighting power	
C405.5	Exterior building lighting power	
C405.6	Electrical transformers	

C405.7	Dwelling unit energy consumption	
C405.8	Electric motor efficiency	
C405.9	Vertical and horizontal transportation	
C405.10	Controlled receptacles	
C405.11	Voltage drop in feeders	
Other Requirements		
C407	Total Building Performance	
C408	System commissioning	
C409	Energy metering	
C410	Refrigeration requirements	
C411	Solar readiness	

C503.4.1 New mechanical systems. All new mechanical systems in existing buildings, including packaged unitary equipment and packaged split systems shall comply with Section C403, except as noted in the subsections below.

- **C503.4.6 New and Replacement HVAC heating system equipment.** Where building HVAC mechanical heating equipment is added or replaced, the new equipment shall comply with Section C403.1.4 if one or more of the following project conditions exist: An existing heat pump is replaced, or new heating capacity is added to an existing system.
- An existing fossil fuel-fired or electric resistance unit with DX cooling is replaced, or new heating capacity is added to an existing system.
- A fossil fuel-fired furnace or electric resistance unit is replaced, and cooling is added to the same previously uncooled space
- A fossil fuel-fired or electric resistance boiler is replaced. If exception 6, 7, 8, or 9 of C403.1.4 is used and an electric service upgrade would be required, gas auxiliary heat in lieu of electric resistance auxiliary heat is permissible for any climate zone. The auxiliary heat can be used at the outdoor air temperature required by the load.

Exceptions:

- Where only one heating appliance is failing and is replaced by another having the same or lesser heating capacity and the same or higher efficiency, C403.1.4 does not apply. This exception cannot be used within the same building more than once in a 24-month period.
- Code officials have discretion to grant additional exceptions based on space impracticality.

If the alteration does not meet one of the above conditions yet opts to comply with C403.1.4, the project is exempt from all requirements of C406.

C503.4.6.1 Added or Replaced Heating Hydronic Equipment. Any added or replaced heating hydronic equipment shall be designed with a supply water temperature of 120F or less.