2021 WSEC-C - Editorial Comments & Questions
EPAC Proposals being considered for MVE Meeting on 9/8/2023
Version: 2023-09-07
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See below for editorial comments for the proposed code language for code change proposals to be reviewed at the MVE Committee Meeting on 9/8/2023.

Log No. 21-GP3-036 Ver. 3 8/24/23

Comment 036-1:

TABLE C407.2

MANDATORY COMPLIANCE MEASURES FOR TOTAL BUILDING PERFORMANCE METHOD

Section[a]	Title	Comments
Envelope		
C401	Thermal envelope certificate	
C402.2.7	Airspaces	
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	
C403.3.3	Hot gas bypass limitation	
C403.3.4.4	Boiler turndown	
~~C403.3.6~~	~~Ventilation for Group R occupancy~~	

EVM Comment:
Is exception from C403.3.6 being added to C403.7.6.1?

Current 2021 WSEC-C Language for Reference

C403.3.6 Ventilation for Group R-2 occupancy. For all Group R-2 dwelling and sleeping units, a balanced ventilation system with a heat recovery system shall provide outdoor air directly to all habitable space. The heat recovery system shall have a 60 percent minimum *sensible recovery effectiveness* as calculated in accordance with Section C403.3.5.1. The ventilation system shall allow for the design flow rates to be tested and verified at each habitable space as part of the commissioning process in accordance with Section C408.2.2.

Exception: Heat recovery and energy recovery ventilators (H/ERV) that are rated and *listed* in accordance with HVI 920 can demonstrate compliance with the sensible recovery effectiveness requirements using the adjusted sensible recovery effectiveness (ASRE) rating of the equipment at 32°F test conditions. Applied flow rate for ASRE rating shall be no less than the design flow rate or the closest value interpolated between two listed flow rates

C403.7.6 Energy recovery ventilation systems. Energy recovery ventilation systems shall be provided as specified in Sections C403.7.6.1 and C403.7.6.2.

C403.7.6.1 Ventilation for Group R-2 occupancy. For all Group R-2 dwelling and sleeping units, a balanced ventilation system with heat recovery system with minimum 60 percent sensible recovery effectiveness shall provide outdoor air directly to each habitable space in accordance with the *International Mechanical Code*. The ventilation system shall allow for the design flow rates to be tested and verified at each habitable space as part of the commissioning process in accordance with Section C408.2.2. The return/exhaust air stream temperature for heat recovery device selection shall be 70°F (21°C), or as calculated by the *registered design professional*.

Comment 036-2:

If 036 is moved forward without 036B/037 and 037 moving forward only changing C407 and not prescriptive/C406 will C406 credits still be amended to include a credit option for service hot water heating systems that utilize electrical heat pumps for more than 50% of the primary service hot water heating load?

Comment 036B/037-1:

Comment 037-1:

Comment applies to both of these code proposals

Amended version of 21-GP3-037

WA Code Potential Fossil Fuel Compliance Pathway

Kocher revised draft 8/28/23 With TAG Revisions 8/29/23

C403.1.4 Use of electric resistance and fossil fuel-fired HVAC heating equipment. Commercial buildings shall comply with one of the following:

1. **Fossil Fuel Space Heating Pathway:** HVAC heating provided by a fossil fuel combustion appliance shall comply with Section C406.1.3. Fossil fuel combustion appliances are permitted for HVAC heating, and shall comply with the applicable efficiency standards referenced in Section C403.3.3.2. ~~Dedicated circuits at the main building panel shall be provided with sufficient power to support future conversion of all fossil fuel-fired HVAC heating to electric heat pump appliances.~~ Additionally, the following provisions shall be required for new construction:

   1.1. Provide a spare electrical branch circuit conduit to that appliance sized to support an equivalent heat pump appliance.

   1.2. Provide spare electrical service entrance conduits for the purpose of upgrading the main electrical service to support all heat pump appliances throughout the building.

   1.3. The main electrical room has sufficient space to accommodate increasing the main electrical service's size to support all heat pump appliances throughout the building.

   ~~1.1.~~1.4. Additional accommodations for the utility equipment comprised of transformer(s) and other equipment necessary to support an electrical service upgrade. These accommodations shall include adequate space on the site. Where the utility equipment is located in a transformer vault, that vault must include not only the space but the additional cooling for larger transformer(s).

EVM Comment:
Code language is specific to projects with utility transformers.
Recommend this is revised to include the electrical service size upstream of utility transformers.
Recommend this is revised to allow sizing electrical service sizing for buildings that do not have utility transformers that are part of medium voltage campus electrical networks and have private building transformers.

Comment 036B/037-2:

Comment 037-2:

Comment applies to both of these code proposals

2. **Heat Pump Space Heating Pathway:** HVAC heating energy shall not be provided by electric resistance or fossil fuel combustion appliances. 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.

Exceptions:

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

5.1. 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.

5.2. 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 (-8°C) or lower except when in defrost.

~~5.3.~~ The heat pump complies with one of the following:

5.2 .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.

5.2 .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 (0°C) except when in defrost.

5.2 .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.

5.4. The heat pump rated heating capacity is sized to meet the heating load at an outdoor air temperature of 32°F (0°C) or lower and has a rated heating capacity at 47°F (8°C) 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.

EVM Comment:
Per recent discussions in the last two weeks with some of the PTHP air-to-air heat pump manufacturers and other small unitary equipment air-to-air heat pump manufacturers the standard controls that are configured to meet ASHRAE 90.1 federal requirements do not meet the both items 5.2 and 5.3.

Recommend confirming with PTHP equipment manufacturers if they can meet both items 5.2 and 5.3. Our understanding is they are using the NAECA exceptions in ASHRAE 90.1 so they cannot meet both.

One possible editorial solution could be to combine Items 5.2 and 5.3 into a single item. More review is likely required that does not preempt equipment requirements in ASHRAE 90.1 Federal Energy Code requirements.

Comment 036B/037-3:

Comment 037-3:

Comment applies to both of these code proposals

2. **Heat Pump Space Heating Pathway:** HVAC heating energy shall not be provided by electric resistance or fossil fuel combustion appliances. 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.

Exceptions:

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:

auxiliary heating sources

6.1. Controls for the internal ~~auxiliary electric resistance heating~~ are configured to lock out the supplemental heat when the outside air temperature is above 36°F (2°C), unless the hot water supply temperature setpoint to the building heat coils cannot be maintained for 20 minutes.

6.2. 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.

6.3. The heat pump rated heating capacity at 47°F (8°C) is no less than 75 percent of the design heating load at 29°F (-2°C).

EVM Comment:
Most AWHPs do not have options for internal auxiliary heaters. This is not feasible and will greatly limit available AWHP equipment options.

Note: section above indicates its an auxiliary heater.

I only know of one manufacturer that has this option for auxiliary electric heat backup heat that is integrated packaged AWHP.

I do not know of any AWHP's that have internal fossil fuel auxiliary heaters so this would limit the option for auxiliary natural gas heat.

Recommend Item 6.1 is revising to:
"auxiliary heating sources" to clarify this requirement applies to both the electric and fossil fuel auxiliary heaters.

Comment 036B/037-4:

Comment 037-4:

Comment applies to both of these code proposals

2. **Heat Pump Space Heating Pathway:** HVAC heating energy shall not be provided by electric resistance or fossil fuel combustion appliances. 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.

Exceptions:

auxiliary

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

auxiliary heating sources

7.1. Controls for the ~~internal auxiliary resistance heating~~ are configured to lock out the supplemental heat when the equipment source-side entering water temperature is above 42°F (6°C), unless the hot water supply temperature setpoint to the building heat coils cannot be maintained for 20 minutes.

7.2. The heat pump controls are configured to use the compressor as the first stage of heating.

7.3. The ground source heat exchanger shall be sized so that the heat pump annual heating output is no less than 70 percent of the total annual heating output in the final year of a 30-year simulation using IGSHPA listed simulation software.

EVM Comment:
WWHPs do not have options for internal auxiliary heaters.

Don't know of any manufacturers that have electrical resistance or fossil fuel internal heaters.

This is not feasible and will greatly limit available equipment options.

Recommend removing the word "internal" and using consistent language for "auxiliary" to be consistent with exception 6.

Comment 036B/037-5:

Comment 037-5:

Comment applies to both of these code proposals

As currently proposed if Proposals 036B/037 and 037 were to move forward to change the prescriptive requirements of the WSEC-C for service hot water heating systems it does not appear that this was analyzed for the energy efficiency or carbon emissions reductions for process service hot water heating systems.

Per C401.2.2 it is clear that all energy using equipment for manufacturer, industrial, or commercial processes have to comply with Section C404.2. So the service hot water heating system serving any process loads in these facilities need to be 50% electric heat pump per the current version of 2021 WSEC-C.

Comment A: Since these process service hot water systems are not subject to C406 per C401.2.2 the additional C406 credits options proposed will not work for service hot water systems that select fossil fuels as the energy source.
Will this be addressed by the MVE Committee to maintain the stringency of the 2021 WSEC-C?

Comment B: Electric heat is often also used as an energy source for these process service hot water production. The proposals as written do not allow use of electric resistance heat in C404.2.1 but now allow fossil fuels.
Will this be addressed by the MVE Committee?

Current 2021 WSEC-C Language for Reference

SECTION C401
GENERAL

C401.1 Scope. The provisions in this chapter are applicable to commercial *buildings* and their *building sites*.

C401.2 Application. Commercial buildings shall comply with one of the following:

1. Prescriptive Compliance. The prescriptive compliance option requires compliance with Sections C402 through C406, and Sections C408, C409, C410, C411, and C412.
2. Total Building Performance. The total building performance option requires compliance with Section C407.
3. When adopted by the local jurisdiction, the requirements of Appendix F, Outcome-Based Energy Budget, Sections C408, C409, C410, C411, C412 and any specific section in Table C407.2 as determined by the local jurisdiction. The Proposed Total UA of the proposed building shall be no more than 20 percent higher than the Allowed Total UA as defined in Section C402.1.5.

C401.2.1 Application to existing buildings. Additions, alterations, repairs, and changes of space conditioning, occupancy, or use to existing buildings shall comply with Chapter 5.

C401.2.2 Application to process equipment. Energy using equipment used by a manufacturing, industrial, or commercial process other than for conditioning spaces or maintaining comfort and amenities for the occupants shall comply with Section C403.3.2, Tables C403.3.2(1) through (16) inclusive, Sections C403.3.4.1 through C403.3.4.3, C403.7.7, C403.9.2.1, C403.10.3, C403.11.2, C403.11.3, C404.2, Table C404.2, and Sections C405.8, C410, and C412.

PROCESS APPLICATION. A manufacturing, industrial, or commercial procedure or activity where the primary purpose is other than conditioning spaces and maintaining comfort and amenities for the occupants of a building.

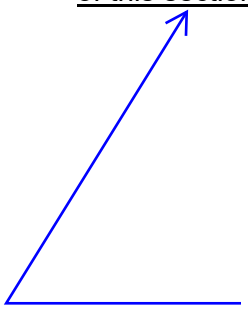
Comment 037-6:

WA Code Potential Fossil Fuel Compliance Pathway

Jonlin revised draft 8/28/23 With changes from the TAG 8/29/23

C401.3.1 Modification of code requirements. For use of this compliance path only, the following changes shall be made to this code:

1. **Section C403.1.4 – space heating.** Strike the phrase "…or fossil fuel combustion…" from the first sentence of Section C403.1.4.
2. **Section C404.2.1 – service water heating.** Revise the first sentence of Section C404.2.1 to read: "Service hot water shall be provided by fossil fuel appliances or an electric air-source heat pump water heating (HPWH) system meeting the requirements of this section or any combination of the two."



EVM Comment:
The "statement of any combination of the two" is confusing as written.

Recommending revising to to maintain consistent language between sections and Table C404.2:
Service hot water shall be provided by fossil fuel water heating equipment, electric air-source heat pump water heating equipment, or a combination of the two equipment types meeting the requirements of this section.

Current 2021 WSEC-C Language for Reference

C404.2 Service water-heating equipment performance efficiency. Water-heating equipment and hot water storage tanks shall meet the requirements of Table C404.2. The efficiency shall be verified through certification and *listed* under an *approved* certification program, or if no certification program exists, the equipment efficiency ratings shall be supported by data furnished by the manufacturer. Water-heating equipment intended to be used to provide space heating shall meet the applicable provisions of Table C404.2.

C404.2.1 Service water heating system type. Service hot water shall be provided by an electric air-source heat pump water heating (HPWH) system meeting the requirements of this section. Supplemental service water heating equipment is permitted to use electric resistance or fossil fuel in compliance with Section C404.2.1.4.

TABLE C404.2
MINIMUM PERFORMANCE OF WATER-HEATING EQUIPMENT

Equipment Type	Size Category (input)	Subcategory or Rating Condition	Draw Pattern	Performance Required[a,j]	Test Procedure[b]