PE235 – AUXILIARY HEATING SYSTEM GUIDANCE

Guidelines

The purpose of this guidance is to direct modellers in modifying the NECB 2015-Qc reference for bids under the PE235 Efficient New Construction Program.

Unless otherwise specified, article numbers refer to NECB 2015-Qc.

Guidance Number	Heat Pump Technology	Source–Load	Heat Pump Location	Type of Auxiliary Heating in the Proposed Design	Technical Guidance
1	Air-to-Air Heat Pump (Unit Heater)	Air-to-Air	Central HVAC System	Electric Heating Coil	N/A
				Natural Gas Burner	- Article 8.4.4.6.2(b) is not applied. - Installation of the air-to-air heat pump is replaced in the reference building by a natural gas warm-air furnace as specified in Article 8.4.4.9.(3). - Warm-air furnace efficiency is as specified in Article 8.4.4.1.9. - Part-load efficiency uses the curves in Article 8.4.4.21. - Energy substitution: Energy recovered from the air-to-air heat pump compressor in the proposed building installation must be deducted from eligible natural gas savings, as indicated in Section 8.4 of the Participant's Guide.
				Water Loop Coil: Electric Boiler	N/A
				Water Loop Coil: Hybrid - Electric Boiler + Gas Boiler	See Guidance 5
				Water Loop Coil: Gas Boiler	See Guidance 5
2	Mini-Split Heat Pump	Air-to-Air	Single-Zone HVAC System	Electric Heating Coil	N/A
				Electric Baseboards	N/A
				Hot-Water Baseboards: Electric Boiler	N/A
				Hot-Water Baseboards: Hybrid - Electric Boiler + Gas Boiler	See Guidance 5
				Hot-Water Baseboards: Gas Boiler	See Guidance 5
3	Decentralized Heat Pump on Mixed-Water Loop	Water-to-Air	Single-Zone HVAC System	Electric Heating Coil in Central HVAC system	N/A
				Hot-Water Coil in Central HVAC System	See Guidance 5
				Mixed Loop Powered by an Electric Boiler	N/A
				Mixed Loop Powered by a Gas Boiler	See Guidance 5
				Mixed Loop Powered by a Hybrid – Electric Boiler + Gas Boiler	See Guidance 5
4	Variable Refrigerant Flow (VRF) System	Air-to-Air	Standalone Unit in a Central HVAC System	Electric Heating Coil in Central HVAC System	N/A
				Natural Gas Burner in Central HVAC System	- Article 8.4.4.6.2(b) is not applied. - Installation of the air-to-air heat pump is replaced in the reference building by a natural gas warm-air furnace as specified in Article 8.4.4.9.(3). - Warm-air furnace efficiency is as specified in Article 8.4.4.1.9. - Part-load efficiency uses the curves in Article 8.4.4.21. - Energy substitution: Energy recovered from the air-to-air heat pump compressor in the proposed building installation must be deducted from eligible natural gas savings, as indicated in Section 8.4 of the Participant's Guide.
				Hot-Water Coil in Central HVAC System	See Guidance 5
			Condenser in a Microclimate (e.g., Shelter or Shed)	Electric Unit Heater	N/A
				Natural Gas Burner in Central HVAC System	- Article 8.4.4.6.2(b) is not applied. - Installation of the air-to-air heat pump is replaced in the reference building by a natural gas warm-air furnace as specified in Article 8.4.4.9.(3). - Warm-air furnace efficiency is as specified in Article 8.4.4.1.9. - Part-load efficiency uses the curves in Article 8.4.4.21. - Energy substitution: Energy recovered from the air-to-air heat pump compressor in the proposed building installation must be deducted from eligible natural gas savings, as indicated in Section 8.4 of the Participant's Guide.
				Water Loop Unit Heater	See Guidance 5
			Terminal Unit	Electric Heating Coil	N/A
				Electric Baseboards	N/A
				Hot-Water Baseboards: Electric Boiler	N/A
				Hot-Water Baseboards: Hybrid – Electric Boiler + Gas Boiler	See Guidance 5
				Hot-Water Baseboards: Gas Boiler	See Guidance 5
5	Water Loop Unit Heater	Air-to-Water	Thermal Power Plant	Electric Boiler	N/A
	Geothermal (Open Loop, Lake, River, Etc.)	Water-to-Water		Hybrid: Electric Boiler + Gas Boiler	- Article 8.4.4.6.2(b) is not applied. - Installation of the air-to-air heat pump is replaced in the reference building by a natural gas warm-air furnace as specified in Article 8.4.4.9.(3). - Warm-air furnace efficiency is as specified in Article 8.4.4.1.9. - Part-load efficiency uses the curves in Article 8.4.4.21. - Energy substitution: Energy recovered from the air-to-air heat pump compressor in the proposed building installation must be deducted from eligible natural gas savings, as indicated in Section 8.4 of the Participant's Guide.
	Recovery Chiller	Water-to-Water		Gas Boiler	- Article 8.4.4.6.2(b) is not applied. - Installation of the heat pump is replaced in the reference building by a hydronic system with a boiler(s) operating on natural gas, in accordance with section 8.4.4.9.2). - Boiler efficiency is as specified in Article 8.4.4.1.9. - Part-load efficiency uses the curves in Article 8.4.4.21. - Energy substitution: Energy recovered from the compressors must be deducted from eligible savings, as indicated in Section 8.4 of the Participant's Guide.
6	Pool Installation	Water-to-Water	Thermal Power Plant	All Types of Auxiliary Heating	Follow Article 8.4.4.19.(3) and Guidance 5 for auxiliary heating management.
	Refrigeration Installation (Arenas and Supermarkets)	Water-to-Water	Thermal Power Plant	All Types of Auxiliary Heating	Follow Article 8.4.4.19.(2) and Guidance 5 for auxiliary heating management.

PE235 PROGRAM – EFFICIENT NEW CONSTRUCTION

TECHNICAL GUIDANCE 01

Air-to-Air Heat Pumps (Unit Heaters)

GUIDANCE OVERVIEW

The PE235 Efficient New Construction Program uses Chapter I.1 of the *Quebec Construction Code* (NECB 2015-Qc) as a reference for determining eligible natural gas savings. More specifically, Part 8 of the Code (compliance through energy performance) is used to determine the energy consumption of the reference building.

In the case where the proposed design uses heat pump technologies with natural gas backup systems, the reference as stipulated by the articles of NECB 2015-Qc uses a higher proportion of electricity than natural gas. As a result, eligible natural gas savings under the program are limited, if not eliminated.

The purpose of this guidance is to adjust the way in which the NECB 2015-Qc reference building is configured to consider the energy savings provided by heat pump technologies as natural gas savings eligible for the PE235 Efficient New Construction Program.

TECHNOLOGIES CONCERNED

This guidance concerns the production of heat by unit heater (air-to-air) heat pump technologies in a ventilation system.

Variable refrigerant flow (VRF) heat pumps are excluded from this guidance and are addressed in a specific guidance.

APPLICATION BY AUXILIARY/SUPPLEMENTARY HEATING TYPE	
This guidance applies separately for each air-to-air heat pump installation in the proposed design. **Make the adjustments applicable to the reference building according to the type of auxiliary heating installed in the ventilation system of the proposed design that directly takes over from the installed heat pump equipment.**	
A	**100% Electric Coil(s):** No adjustment applicable; the reference is electric.
B	**Natural Gas Burner:** – Article 8.4.4.6.2(b) is not applied. – Installation of the air-to-air heat pump is replaced in the reference building by a natural gas warm-air furnace as specified in Article 8.4.4.9.(3). – Warm-air furnace efficiency is as specified in Article 8.4.4.1.9. – Part-load efficiency uses the curves in Article 8.4.4.21. – Energy substitution: Energy recovered from the air-to-air heat pump compressor in the proposed building installation must be deducted from eligible natural gas savings, as indicated in Section 8.4 of the Participant's Guide.
C	**Water Loop: 100% Electric Boiler(s):** No adjustment applicable; the reference is electric.
D	**Water Loop: Natural Gas Boiler(s) with Electric Boiler(s) (Off-Peak or Not):** – Installation of the air-to-air heat pump is replaced in the reference building by a hot water coil. – Refer to Guidance 5 to determine the configuration of the reference building thermal power plant.
	Water Loop: Natural Gas Boiler(s): – Installation of the air-to-air heat pump is replaced in the reference building by a hot water coil. – Refer to Guidance 5 to determine the configuration of the reference building thermal power plant.

PE235 PROGRAM – EFFICIENT NEW CONSTRUCTION

TECHNICAL GUIDANCE 02

Mini-Split Heat Pumps

GUIDANCE OVERVIEW

The PE235 Efficient New Construction Program uses Chapter I.1 of the *Quebec Construction Code* (NECB 2015-Qc) as a reference for determining eligible natural gas savings. More specifically, Part 8 of the Code (compliance through energy performance) is used to determine the energy consumption of the reference building.

In the case where the proposed design uses heat pump technologies with natural gas backup systems, the reference as stipulated by the articles of NECB 2015-Qc uses a higher proportion of electricity than natural gas. As a result, eligible natural gas savings under the program are limited, if not eliminated.

The purpose of this guidance is to adjust the way in which the NECB 2015-Qc reference building is configured to consider the energy savings provided by heat pump technologies as natural gas savings eligible for the PE235 Efficient New Construction Program.

TECHNOLOGIES CONCERNED

This guidance concerns the production of heat by mini-split (air-to-air) heat pump technologies in a single-zone system.

AUXILIARY/SUPPLEMENTARY HEATING TYPE	
This guidance applies separately for each mini-split heat pump installation in the proposed design. **Make the adjustments applicable to the reference building according to the type of auxiliary heating installed in the ventilation system of the proposed design that directly takes over from the installed heat pump equipment.**	
A	**100% Electric Coil(s) in the System:** No adjustment applicable; the reference is electric.
B	**Electric Baseboard(s):** No adjustment applicable; the reference is electric.
C	**Hot-Water Baseboards with Water Loop: 100% Electric Boiler(s):** No adjustment applicable; the reference is electric.
D	**Hot-Water Baseboards with Water Loop: Natural Gas Boiler(s):** – Installation of the mini-split heat pump is replaced in the reference building by a hot-water baseboard with water loop. – Refer to Guidance 5 to determine the configuration of the reference building thermal power plant.
E	**Hot-Water Baseboards with Water Loop: Natural Gas Boiler(s) with Electric Boiler(s) (Off-Peak or Not):** – Installation of the mini-split heat pump is replaced in the reference building by a hot-water baseboard with water loop. – Refer to Guidance 5 to determine the configuration of the reference building thermal power plant.

TECHNICAL GUIDANCE 03

DECENTRALIZED HEAT PUMPS ON MIXED-WATER LOOP

PE235 PROGRAM – EFFICIENT NEW CONSTRUCTION

TECHNICAL GUIDANCE 03

Decentralized Heat Pumps on Mixed-Water Loop

GUIDANCE OVERVIEW

The PE235 Efficient New Construction Program uses Chapter I.1 of the *Quebec Construction Code* (NECB 2015-Qc) as a reference for determining eligible natural gas savings. More specifically, Part 8 of the Code (compliance through energy performance) is used to determine the energy consumption of the reference building.

In the case where the proposed design uses heat pump technologies with natural gas backup systems, the reference as stipulated by the articles of NECB 2015-Qc uses a higher proportion of electricity than natural gas. As a result, eligible natural gas savings under the program are limited, if not eliminated.

The purpose of this guidance is to adjust the way in which the NECB 2015-Qc reference building is configured to consider the energy savings provided by heat pump technologies as natural gas savings eligible for the PE235 Efficient New Construction Program.

TECHNOLOGIES CONCERNED

This guidance concerns the production of heat by decentralized heat pumps on a mixed water-to-air loop in a zone system.

TECHNICAL GUIDANCE 03

DECENTRALIZED HEAT PUMPS ON MIXED-WATER LOOP

AUXILIARY/SUPPLEMENTARY HEATING TYPE	
This guidance applies separately for each decentralized heat pump installation in the proposed design. **Make the adjustments applicable to the reference building according to the type of auxiliary heating installed in the ventilation system of the proposed design that directly takes over from the installed heat pump equipment.**	
A	**100% Electric Coil(s) in the System:** No adjustment applicable; the reference is electric.
B	**Water Loop Coil(s):** – Installation of the decentralized heat pump is replaced in the reference building by a hot water coil. – Refer to Guidance 5 to determine the configuration of the reference building thermal power plant.
C	**Mixed Loop Powered by 100% Electric Boiler(s):** No adjustment applicable; the reference is electric.
D	**Mixed Loop Powered by Natural Gas Boiler(s):** – Installation of the decentralized heat pump is replaced in the reference building by a hot water coil. – Refer to Guidance 5 to determine the configuration of the reference building thermal power plant.
E	**Mixed Loop Powered by Natural Gas Boiler(s) with Electric Boiler(s) (Off-Peak or Not):** – Installation of the decentralized heat pump is replaced in the reference building by a hot water coil. – Refer to Guidance 5 to determine the configuration of the reference building thermal power plant.

AUXILIARY/SUPPLEMENTARY HEATING TYPE	
This guidance applies separately for each decentralized heat pump installation in the proposed design. **Make the adjustments applicable to the reference building according to the type of auxiliary heating installed in the ventilation system of the proposed design that directly takes over from the installed heat pump equipment.**	
F	**Electric Baseboard(s):** No adjustment applicable; the reference is electric.
G	**Hot-Water Baseboards: 100% Electric Boiler(s):** No adjustment applicable; the reference is electric.
H	**Hot-Water Baseboards: Natural Gas Boiler(s) with Electric Boiler(s) (Off-Peak or Not):** – Installation of the mini-split heat pump is replaced in the reference building by a hot-water baseboard. – Refer to Guidance 5 to determine the configuration of the reference building thermal power plant.
I	**Hot-Water Baseboards: Natural Gas Boiler(s):** – Installation of the mini-split heat pump is replaced in the reference building by a hot-water baseboard. – Refer to Guidance 5 to determine the configuration of the reference building thermal power plant.

PE235 PROGRAM – EFFICIENT NEW CONSTRUCTION

TECHNICAL GUIDANCE 04

VRF Heat Pump Systems

GUIDANCE OVERVIEW

The PE235 Efficient New Construction Program uses Chapter I.1 of the *Quebec Construction Code* (NECB 2015-Qc) as a reference for determining eligible natural gas savings. More specifically, Part 8 of the Code (compliance through energy performance) is used to determine the energy consumption of the reference building.

In the case where the proposed design uses heat pump technologies with natural gas backup systems, the reference as stipulated by the articles of NECB 2015-Qc uses a higher proportion of electricity than natural gas. As a result, eligible natural gas savings under the program are limited, if not eliminated.

The purpose of this guidance is to adjust the way in which the NECB 2015-Qc reference building is configured to consider the energy savings provided by heat pump technologies as natural gas savings eligible for the PE235 Efficient New Construction Program.

TECHNOLOGIES CONCERNED AND LOCATION

This guidance concerns heat production through VRF (air-to-air) heat pump technologies used in the following locations:

- Standalone Unit in a Central HVAC System
- Outdoor Unit in a Cabin
- Conventional use: Outdoor unit(s) exposed to open air and indoor zone unit(s)

AUXILIARY/SUPPLEMENTARY HEATING TYPE	
This guidance applies separately for each VRF heat pump installation in the proposed design. **Make the adjustments applicable to the reference building according to the type of auxiliary heating installed in the ventilation system of the proposed design that directly takes over from the installed heat pump equipment.**	
Standalone Unit in a Central HVAC System	
A	**100% Electric Boiler(s):** No adjustment applicable; the reference is electric.
B	**Natural Gas Burner:** – Article 8.4.4.6.2(b) is not applied. – Installation of the VRF heat pump is replaced in the reference building by a natural gas warm-air furnace as specified in Article 8.4.4.9.(3). – Warm-air furnace efficiency is as specified in Article 8.4.4.1.9. – Part-load efficiency uses the curves in Article 8.4.4.21. – Energy substitution: Energy recovered from the compressors must be deducted from eligible savings, as indicated in Section 8.4 of the Participant's Guide.
C	**Water Loop Coil:** – Installation of the VRF heat pump is replaced in the reference building with a water loop coil. – Refer to Guidance 5 to determine the configuration of the reference building thermal power plant.

AUXILIARY/SUPPLEMENTARY HEATING TYPE	
This guidance applies separately for each VRF heat pump installation in the proposed design. **Make the adjustments applicable to the reference building according to the type of auxiliary heating installed in the ventilation system of the proposed design that directly takes over from the installed heat pump equipment.**	
Condenser in a Microclimate (e.g., Shelter or Shed)	
A	**100% Electric Unit Heater(s):** No adjustment applicable; the reference is electric.
B	**Unit Heater with Natural Gas Burner:** – Article 8.4.4.6.2(b) is not applied. – Installation of the VRF heat pump is replaced in the reference building by a natural gas warm-air furnace as specified in Article 8.4.4.9.(3). – Warm-air furnace efficiency is as specified in Article 8.4.4.1.9. – Part-load efficiency uses the curves in Article 8.4.4.21. – Energy substitution: Energy recovered from the compressors must be deducted from eligible savings, as indicated in Section 8.4 of the Participant's Guide.
C	**Unit Heater with Water Loop:** – Installation of the VRF heat pump is replaced in the reference building with a water loop coil. – Refer to Guidance 5 to determine the configuration of the reference building thermal power plant.

AUXILIARY/SUPPLEMENTARY HEATING TYPE	
Follow the guidance according to the type of auxiliary heating installed in the proposed design to take over from the installed heat pump equipment and make the applicable adjustments to the reference building.	
Conventional Use – Terminal Units	
A	**100% Electric Coil(s):** No adjustment applicable; the reference is electric.
B	**Electric Baseboard(s):** No adjustment applicable; the reference is electric.
C	**Hot-Water Baseboards with Water Loop: 100% Electric Boiler(s):** No adjustment applicable; the reference is electric.
D	**Hot-Water Baseboards: Natural Gas Boiler(s):** – Installation of the VRF heat pump is replaced in the reference building with a hot-water baseboard. – Refer to Guidance 5 to determine the configuration of the reference building thermal power plant.
E	**Hot-Water Baseboards: Natural Gas Boiler(s) with Electric Boiler(s) (Off-Peak or Not):** – Installation of the VRF heat pump is replaced in the reference building with a hot-water baseboard. – Refer to Guidance 5 to determine the configuration of the reference building thermal power plant.

PE235 PROGRAM – EFFICIENT NEW CONSTRUCTION

TECHNICAL GUIDANCE 05

Thermal Power Plant Heat Pump Systems

GUIDANCE OVERVIEW

The PE235 Efficient New Construction Program uses Chapter I.1 of the *Quebec Construction Code* (NECB 2015-Qc) as a reference for determining eligible natural gas savings. More specifically, Part 8 of the Code (compliance through energy performance) is used to determine the energy consumption of the reference building.

In the case where the proposed design uses heat pump technologies with natural gas backup systems, the reference as stipulated by the articles of NECB 2015-Qc uses a higher proportion of electricity than natural gas. As a result, eligible natural gas savings under the program are limited, if not eliminated.

The purpose of this guidance is to adjust the way in which the NECB 2015-Qc reference building is configured to consider the energy savings provided by heat pump technologies as natural gas savings eligible for the PE235 Efficient New Construction Program.

TECHNOLOGIES CONCERNED

This guidance concerns heat production through the heat pump technologies listed below:

- Unit Heater (Air-to-Water)
- Geothermal (Water-To-Water), Including Open Loop/Closed Loop, Soil/Lake/River
- Recovery Chiller (Water-to-Water)

AUXILIARY/SUPPLEMENTARY HEATING TYPE	
This guidance applies separately for each heat pump installation in the proposed design. **Make the applicable adjustments to the reference building according to the type of auxiliary heating installed in the thermal power plant system of the proposed design that directly takes over from the installed heat pump equipment.**	
A	**100% Electric Boiler(s):** – No adjustment applicable; the reference is electric.
B	**100% Natural Gas Boiler(s):** – Article 8.4.4.6.2(b) is not applied. – Installation of the heat pump is replaced in the reference building by a hydronic system with a boiler(s) operating on natural gas, in accordance with section 8.4.4.9.2). – Boiler efficiency is as specified in Article 8.4.4.1.9. – Part-load efficiency uses the curves in Article 8.4.4.21. – Energy substitution: Energy recovered from the compressors must be deducted from eligible savings, as indicated in Section 8.4 of the Participant's Guide.
C	**Hybrid Formula: Natural Gas Boiler(s) with Electric Boiler(s) (Off-Peak or Not)** – Article 8.4.4.6.2(b) is not applied. – Installation of the heat pump is replaced in the reference building by a hydronic system with a boiler(s) operating on natural gas, in accordance with section 8.4.4.9.2). – Boiler efficiency is as specified in Article 8.4.4.1.9. – Part-load efficiency uses the curves in Article 8.4.4.21. – Energy substitution: Energy recovered from the compressors must be deducted from eligible savings, as indicated in Section 8.4 of the Participant's Guide.

PE235 PROGRAM – EFFICIENT NEW CONSTRUCTION

TECHNICAL GUIDANCE 06

Pool and Refrigeration Heat Pump Systems

GUIDANCE OVERVIEW

The PE235 Efficient New Construction Program uses Chapter I.1 of the *Quebec Construction Code* (NECB 2015-Qc) as a reference for determining eligible natural gas savings. More specifically, Part 8 of the Code (compliance through energy performance) is used to determine the energy consumption of the reference building.

In the case where the proposed design uses heat pump technologies with natural gas backup systems, the reference as stipulated by the articles of NECB 2015-Qc uses a higher proportion of electricity than natural gas. As a result, eligible natural gas savings under the program are limited, if not eliminated.

The purpose of this guidance is to adjust the way in which the NECB 2015-Qc reference building is configured to consider the energy savings provided by heat pump technologies as natural gas savings eligible for the PE235 Efficient New Construction Program.

TECHNOLOGIES CONCERNED

This guidance concerns the production of heat by heat pump technologies for installation of:

- Pool
- Refrigeration (Arena and Supermarket)

AUXILIARY/SUPPLEMENTARY HEATING TYPE	
This guidance applies separately for each heat pump installation in the proposed design. **Make the adjustments applicable to the reference building according to the type of auxiliary heating installed in the ventilation system of the proposed design that directly takes over from the installed heat pump equipment.**	
A	**Pool:** – Article 8.4.4.19.(3) is used. – Refer to Guidance 5 to determine the configuration of the reference building thermal power plant.
B	**Refrigeration (Arena and Supermarket):** – Article 8.4.4.19.(2) is used. – Refer to Guidance 5 to determine the configuration of the reference building thermal power plant.