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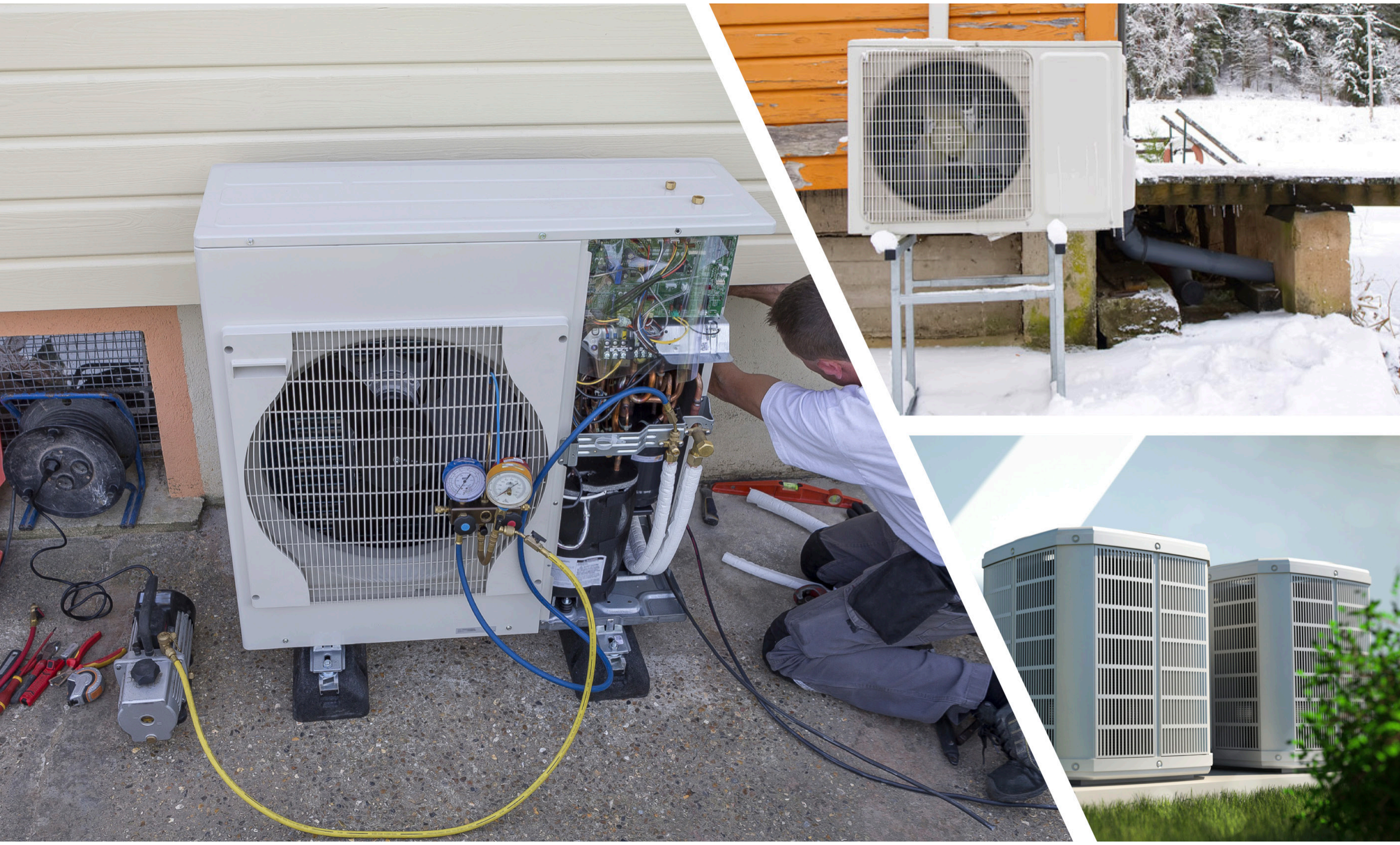

Home Renovation Rebate Program

Contractor Guidelines for All-Electric Heat Pumps in Electric Heated Homes

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Contents

1.0 Program Updates for Electric Heated Homes

The Home Renovation Rebate program is making changes to the rebates and equipment eligibility requirements for all-electric heat pumps when converting from electric resistance heating (baseboards, electric furnace, etc.). The following section provides details on these program changes including incentive amounts and eligibility requirement.

1.1 Incentive Amounts

All-Electric Central & Ductless Heat Pump (Partial & Whole Home Heating Rebate)	
Whole Home Heating: Efficiency Rebate **$4,000 Rebate** **EFFECTIVE MAY 1ST, 2025**	**Primary Heating System** — The heat pump must replace a primary all-electric heating system. This can be any electric baseboards, radiant ceiling, radiant floors or forced-air furnace **Back-Up Heating** — The primary back-up system must not be natural gas, oil, or propane. Homes with natural gas or propane fireplace(s) are eligible, if the fireplace(s) is a supplementary heating system. **Distribution** — The heat pump must provide primary heating to serve **80% or more** of the home's conditioned space in a main living area. The remaining **20% or less** of the home's conditioned space would utilize electric resistance heating. **Capacity** — The heat pump (and electric resistance if required) must be sized with sufficient capacity to maintain a minimum indoor temperature of 22°C at local design temperature conditions (e.g. -23°C in Kamloops). **Sizing** — It is recommended the heat pump is sized to minimize the use of electric resistance heating. At a minimum, the heat pump (excluding electric resistance heat) must be sized to maintain an indoor temperature of 22°C at an outdoor temperature of -5°C or colder. Please refer to **Section 2.3** — Balance Points for details. **Additional** — Northeast Energy Efficiency Partnerships (NEEP) listed Cold Climate Heat Pump and CSA F280-12 verified software required for the heat load calculation. Please refer to **Section 1.2** — Eligibility Requirements for details.
Partial Home Heating: Efficiency Rebate **$1,500 Rebate** **EFFECTIVE MAY 1ST, 2025**	**Partial Heating System** — The heat pump must replace a partial all-electric heating system. This can be any electric baseboards, radiant ceiling, radiant floors, or forced-air furnace **Distribution** — The heat pump must provide primary heating to serve **50% or more** of the home's conditioned space in a main living area. The remaining **50% or less** of the home's conditioned space would utilize electric resistance heating. **Capacity** — The heat pump (and electric resistance if required) must be sized with sufficient capacity to maintain a minimum indoor temperature of 22°C at local design temperature conditions (e.g. -23°C in Kamloops). **Sizing** — It is recommended the heat pump is sized to minimize the use of electric resistance heating. At a minimum, the heat pump (excluding electric resistance heat) must be sized to maintain an indoor temperature of 22°C at an outdoor temperature of -5°C or colder. Please refer to **Section 2.3** — Balance Points for details.

1.2 Eligibility Requirements

Supplemental Heating

The supplemental heating system must be electric. Please refer to **Section 2.4** — Supplementary Heating for definitions and details.

Back Up Heating

Homes with natural gas or propane fireplace(s) are eligible if the fireplace(s) is a back up heating system. Please refer to **Section 2.4** — Supplementary Heating for definitions and details.

Equipment Performance

Equipment must meet the following performance specifications:

- SEER ≥ 16; HSPF (Region IV) ≥ 10.00 or SEER2 ≥ 15.20; HSPF2 (Region IV) ≥ 8.50
- Variable speed compressor
- Minimum capacity of 12,000 BTU (1 ton)

Cold Climate Rated

Product eligibility has been updated to include a requirement for heat pumps (ductless and centrally ducted) to be designated as **Cold Climate Air Source Heat Pump** (ccASHP) as per **Northeast Energy Efficiency Partnerships** (NEEP).

NOTE: *Cold climate rated heat pump not required for Partial Home Heating Rebate.*

Design Conditions for Heat Loss Calculations

The design temperature to be used for the load calculation should be the design temperature for the location. At a minimum, the heat pump must meet the BTU/h requirements for the home at −5°C.

Heat Loss Calculations

Installation eligibility has been updated to include a requirement for room-by-room or whole house heat loss calculations. Contractors must use the **CSA F280-12** methodology with **verified software tools** (see below) to inform equipment sizing and selection since program requirements will be updated at a later date to require CSA F280-12 verified software tools. Commercially available CSA F280-12 verified software tools are listed below. All CSA F280-12 verified software that are acceptable are listed on HVAC Designers of Canada website. For an interim period, the program will accept load calculations based on Manual J, CSA F280-90, and CSA F280-12 methodologies.

NOTE: *CSA F280-12 verified software tools are recommended but not required for the Partial Home Heating Rebate.*

NOTE: *The program will also accept heat load calculations based on Manual J, CSA F280-90, and CSA F280-12 methodologies until October 31, 2025.*

F280-12 Verified Software Tools	
Avenir Software Inc. HeatCAD / LoopCAD	HeatCAD LoopCAD
Thermal Environmental Comfort Association Heat Loss & Heat Gain Calculaton	teca thermal environmental comfort association
Volta Research Inc. Volta Snap	volta SNAP
MiTek Wrightsoft Right-Suite Universal	MiTek WRIGHTSOFT

CONTRACTOR TIP

The BC Building Code 2024 provides a reference starting on Page 764 for climatic data in Table C-2 (BCBC Division B — Appendix C: Climatic and Seismic Information for Building Design in British Columbia).

2.0 Best Practices with Heat Pump Upgrades

The Home Renovation Rebate program recognizes the importance of HVAC industry best practices to support contractors and homeowners with quality heat pump installations. Through proper sizing, installation, and performance verification, a heat pump will achieve the intended home comfort, energy-saving, and carbon reduction benefits. The following section provides guidance on best practices with heat pump upgrades including pre-changeout, load calculations, balance points, supplementary heating, and controls.

2.1 Pre-Changeout Procedures

Pre-changeout procedures are designed to better understand the existing HVAC system and overall home performance that should inform proper heat pump sizing and equipment selection. Two commonly overlooked steps to support informed decision making and recommendations of a new heat pump are homeowner discovery and an HVAC system performance assessment.

Homeowner Discovery is a process of gathering information from the consumer to better understand their expectations and needs.

When asked the right questions, homeowners have useful feedback on their experience with the existing HVAC systems performance, and motivations for investing in an upgrade.

Topics that should be considered by HVAC contractors when gathering input from homeowners include:

- Have you completed or are you planning other energy upgrades? This is important to understand overall building performance that could influence heat pump sizing?
- What is your experience with the existing HVAC equipment and distribution system? This type of question allows for exploration on whether the homeowner has experienced hot or cold rooms, noisy ductwork, or equipment short cycling.
- What are your motivations for upgrading to a heat pump? A consumer might be interested in upgrading to a heat pump due to environmental considerations, interest in home cooling options, accessing rebates, or otherwise. This information helps shape a contractor approach to presenting their proposal for equipment retrofit.
- Do you have any concerns with the heat pump outdoor unit placement? Finding a suitable location that does not compromise outdoor living space and meets municipal requirements (e.g. setbacks and noise considerations) can be challenging. As such, the opportunity to collect feedback on potential locations from the homeowner should help inform contractor installation options.

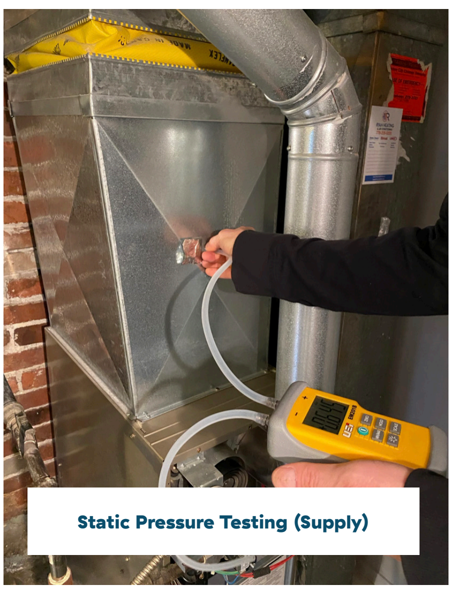
Performance Assessment of the existing HVAC equipment is critical for gathering empirical data used to inform heat pump options and potential limitations.

For centrally ducted heat pumps, it is important to understand existing ductwork capacity and its ability to accommodate a heat pump.

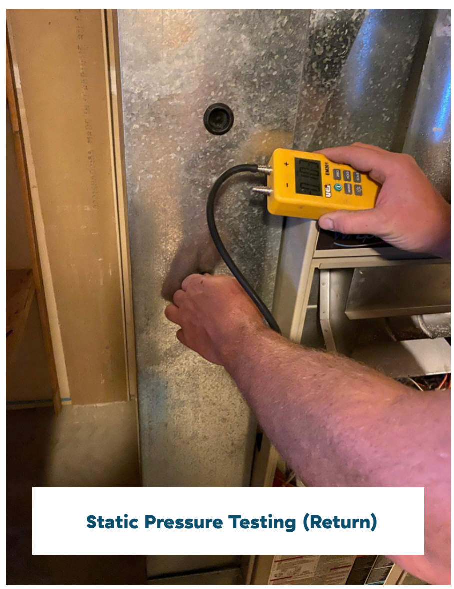
Since a heat pump may operate at a different cubic foot per minute (CFM) of air flow than the equipment being replaced, it is important to understand the existing ductwork capacity and its ability to accommodate a heat pump. Additionally, the HVAC performance assessment also allows a contractor an opportunity to propose improvements to the distribution system through accessible ductwork modifications (e.g. improved transitions, duct sealing, etc.) or enhancements (e.g. adding return air).

As part of an HVAC performance assessment, contractors at a minimum should complete external static pressure testing, and calculations to determine whether the existing ductwork and fittings are adequate for system distribution, and to gather insight into whether the new heat pump will have enough air flow to operate effectively. More recently, the utilization of air flow testing technologies such as the True Flow Grid allows HVAC contractors to gather even more precise CFM readings by using a device that provides an accurate measurement of airflow through a residential air handler.

The combination of static pressure testing, ductwork measurements, and air flow testing is the most comprehensive approach to better understand existing ductwork capacity that should be used to inform heat pump sizing and selection.



Static Pressure Testing (Supply)



Static Pressure Testing (Return)

Air Flow Testing (Flow Grid)

CONTRACTOR TIP

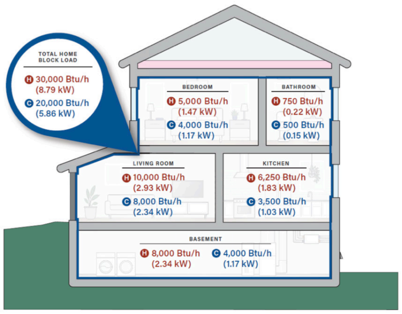
Natural Resources Canada's Local Energy Efficiency Partnerships team has developed an Air Source Heat Pump Sizing and Selection App. The app helps HVAC designers and contractors identify important factors that should be considered to determine potential heat pump solutions in both new-builds and retrofits of existing homes.

2.2 Load Calculations

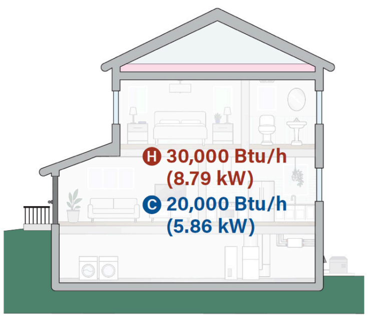
A CSA F280-12 compliant heat load calculation should always be completed to help right size the heat pump for the home. Any rule-of-thumb approach to equipment sizing without an actual load calculation should be avoided since older space heating equipment as a reference may not have been sized correctly and existing home conditions may have changed.

HVAC Designers of Canada has published a list of **verified software tools** that are compliant with CSA F280-12. Using verified software gives both the HVAC contractor and those who rely on the outputs from the software confidence that the tool can generate correct results in line with the CSA standard.

A CSA F280-12 compliant load calculation can be completed using a room-by-room or whole house approach.



Room-By-Room Calculations provide the heating and cooling requirements for the individual rooms along with a total design heat loss and heat gain for the home. This approach is typically used in new construction applications since it is used to inform HVAC design and provides a predicted amount of heating and cooling needed for each specific room in a home.



Whole House Calculations provide the total heating and cooling requirements for the entire conditioned space of the home. This approach is typically used in retrofit applications and should not be confused with BTU/h per sq. ft. calculations which is a rule-of-thumb.

An accurate heat load calculation requires attention to detail on key components that contribute to the design heat loss and gain. This includes building location, indoor design conditions, orientation, and building construction. The use of F280-12 verified software to calculate heating and cooling loads helps simplify the process. Here is a list of critical inputs for HVAC contractors to ensure an accurate load calculation:

Component	Details
Design Conditions	○ Location ○ Building orientation ○ Outdoor design temperature ○ Indoor design temperature and humidity
Building Conditions	○ Insulation (R-values) of walls, ceilings, and floors ○ Window size and performance (u-values and solar heat gain coefficient) ○ Infiltration (air leakage) rates ○ Ventilation ○ Interior and exterior shading

Home Characteristics

LOCATION:
Burnaby (Climate Zone 4)

YEAR BUILT:
1980

HEATED FLOOR AREA:
2,595 sq. ft

F280-12 DESIGN HEAT LOSS (DHL)	F280-12 DESIGN HEAT GAIN (DHG)
33,362 BTU/h	**18,949 BTU/h**

Existing Space Heating Equipment

This home has an existing mid-efficiency gas furnace is 70,000 BTU/h (input) / 56,000 (output) that covers 100% of heated floor area.

Determining Ductwork Capacity — General Testing Information

Equipment manufacturers publish maximum Total External Static Pressure (TESP) for installed systems on the rating plate for the air handling equipment. A typical manufacturer range for TESP could be 0.5” to 0.8” W.C. to allow proper equipment performance. Since ductwork is a fixed size, it has limitations to how much air will flow through it. As air flow increases the static pressure will increase exponentially, so understanding duct work capacity is critical to equipment sizing and selection.

To accurately evaluate duct capacity, you need to take static pressure readings at a known air flow, usually in cubic feet per minute (CFM). There are **three (3) methods** available to determine the CFM from existing forced air equipment.

METHOD #1 (RESEARCH) — Review the equipment installation manual and look up blower CFM based on model, dipswitch settings and blower setting.

METHOD #2 (TEMPERATURE RISE) — Use the sensible heat formula: 1.08 x CFM x ΔT = BTU/h output.
You identify the furnace BTU/h output, take temperature rise measurement, and then re-arrange the above formula to:
BTU/h output / (1.08 X temperature rise) = CFM

- **Example: 56,000 BBTU/h output / (1.08 * 52.9°F temperature rise) = 980 CFM**

METHOD #3 (MEASURE) — There are three (3) options to measure the CFM of a forced air heating system using available tools and devices.

- **Filter Slot Airflow Grid Method** — A filter slot airflow grid temporarily replaces a filter in a filter slot to measure airflow. Measurements of static pressure in the supply side of the system are used to correct the actual measured airflow to include the impact of the filter. This correction may be done automatically by the measurement device or may need to be done manually.
- **External Blower Method** — This method requires an external blower that is often used for duct leakage testing. The external blower concurrently generates and measures airflow. The external blower is connected to the air handler cabinet and the return ducting is blocked such that all airflow must travel through the external blower and then through the supply side of the system. Both the existing blower and external blower are used to generate airflow. Airflow in normal operating conditions is determined by adjusting the airflow through the external blower until the supply static pressure matches that in normal operating conditions.
- **Duct Traverse Method** — A duct traverse is completed in the return or supply side of the system in accordance with ANSI/ASHRAE 41.2-2022. Air velocity measurements at different points across a duct cross section are used to determine airflow.

Ductwork Capacity (Measured with Filter Slot Airflow Grid Method) — Mid-Efficiency Furnace

Large Ductwork	Medium Ductwork	Small Ductwork
980 CFM @ 0.30 in. W.C. (current furnace on high-fire)	980 CFM @ 0.40 in. W.C. (current furnace on high-fire)	980 CFM @ 0.50 in. W.C. (current furnace on high-fire)

Calculating Duct Capacity

Once CFM and Static Pressure (SP) are known then a simple calculation based on CFM of new equipment will show expected static pressure of existing ductwork system at new higher CFM.

- Fan Law #2: Static Pressure 2 (SP2) = Static Pressure 1 * (CFM2/CFM1)^2
- Example using Medium Ductwork: 980 CFM at 0.40 in. W.C.
- New heat pump 3.5 tons at 400 CFM/ton = 1,400 CFM
- Calculation example: 0.4 * (1,400/980)^2 = 0.816 in. W.C. (SP2)

Ductwork Capacity (Rated) — Heat Pump Upgrade (3.5 tons – 42,000 BTU/h output)

Large Ductwork	Medium Ductwork	Small Ductwork
1,400 CFM @ 0.612 in. W.C. (new heat pump full output)	1,400 CFM @ 0.816 in. W.C. (new heat pump full output)	1,400 CFM @ 1.020 in. W.C. (new heat pump full output)

From the pre-changeout air flow testing for this home, the existing ductwork could accommodate 3.5-ton heat pump with large ductwork and medium ductwork but not small ductwork. The options to address a heat pump retrofit with smaller ductwork may include:

- Ductwork modifications to reduce static pressure.
- Split-system with centrally ducted 3-ton heat pump and 1 ductless head.
- Supplemental electric resistance heat added to heat pump.

2.3 Balance Points

For a contractor, the capacity balance point and understanding the outdoor temperature at which the heat pump no longer has the capacity to provide adequate heating for the home is critical to equipment sizing, selection, and determining if supplementary heating is needed and how it should be sized.

The capacity balance point is calculated by plotting the heat loss of the home against the performance curve of the heat pump to ensure the equipment meets the necessary heat load at the outdoor design temperature where the home is located. It is important to note that the performance curve of a heat pump will vary between various technologies, brands, and models of heat pumps. This means there is no such thing as a universal balance point.

As a reminder, a four (4) step process will assist contractors with proper sizing and selection of an appropriate heat pump for a retrofit application.

- **STEP 1** — Ductwork Evaluation (**see Section 2.1**)
- **STEP 2** — Load Calculations (**see Section 2.2**)
- **STEP 3** — Identify Heat Pump Options and Performance Curves (**see Section 2.3**)
- **STEP 4** — Determine Supplemental Heating Need and Strategy (**see Section 2.4**)

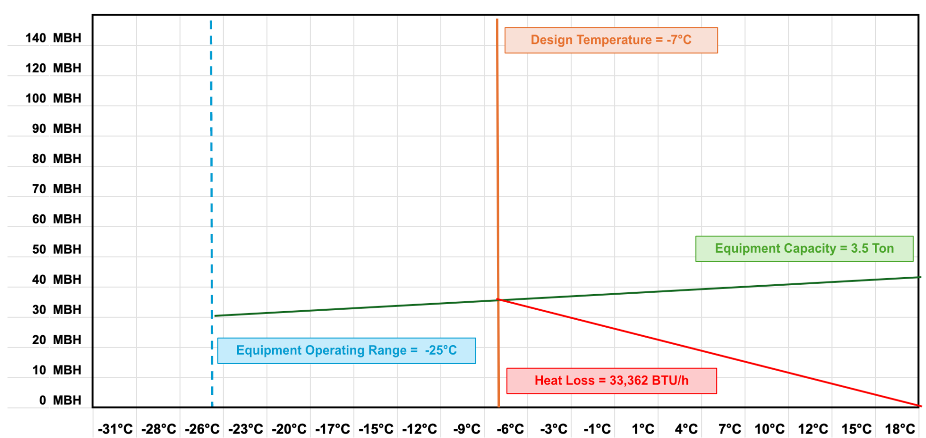
Capacity Balance Point Comparison

Burnaby	Kamloops	Prince George
33,362 BTU/h (DHL)	48,362 BTU/h (DHL)	64,772 BTU/h (DHL)
18,949 BTU/h (DHG)	24,832 BTU/h (DHG)	19,249 BTU/h (DHG)
−7°C (Design Temperature)	−23°C (Design Temperature)	−31°C (Design Temperature)

Burnaby (Climate Zone 4)

OPTIMIZED PERFORMANCE

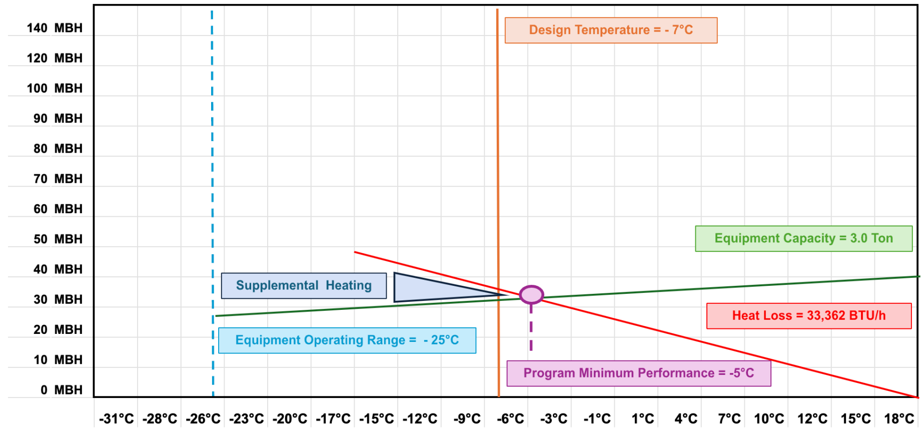
- Heat pump achieves 100% of capacity at design temperature.
- No supplemental heating needed.



Burnaby (Climate Zone 4)

MINIMUM PROGRAM REQUIREMENTS

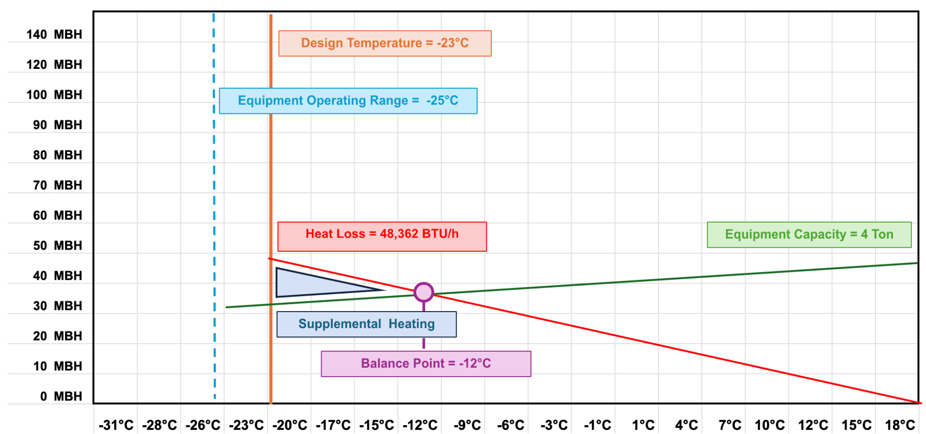
- Modest supplementary heating needed with smaller heat pump (3.0–ton unit) installed to meet minimum program requirement.



Kamloops (Climate Zone 5)

OPTIMIZED PERFORMANCE

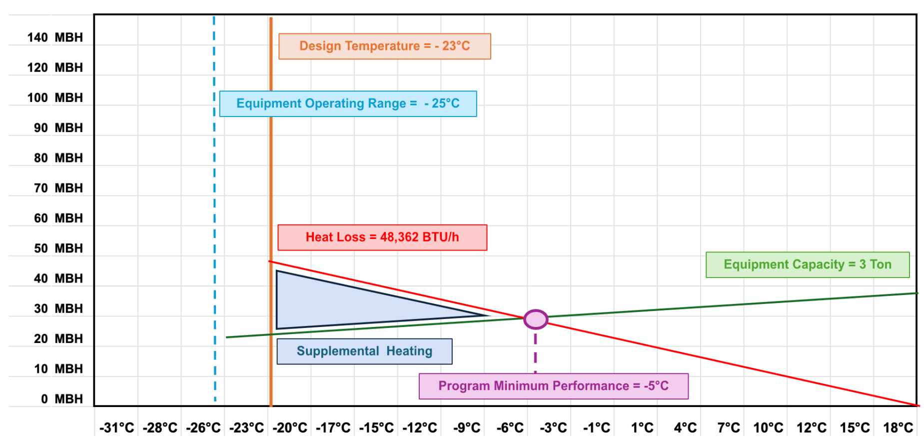
- Heat pump achieves ~70% of capacity at design temperature.
- ~5kW (or 17,000 BTU/h) of supplemental heating required.



Kamloops (Climate Zone 5)

MINIMUM PROGRAM REQUIREMENTS

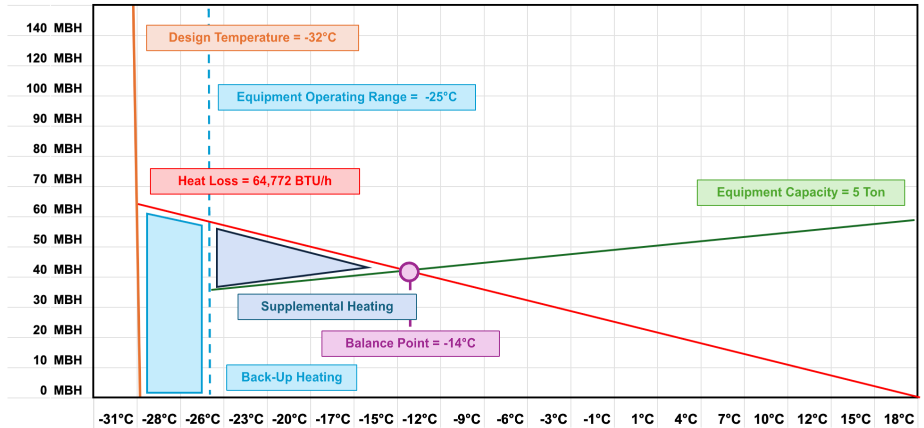
- Heat pump achieves ~50% of capacity at design temperature.
- ~7kW (or 23,884 BTU/h) of supplemental heating required.



Prince George (Climate Zone 6)

OPTIMIZED PERFORMANCE

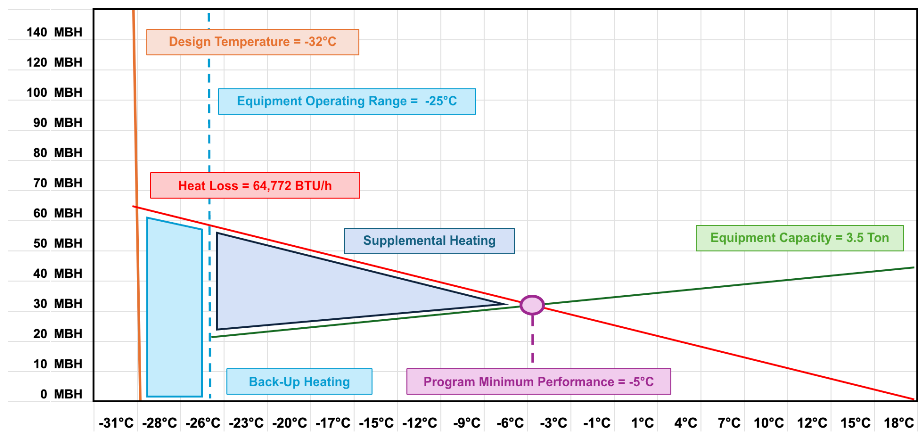
- Heat pump achieves ~50% of capacity till equipment is beyond operation range @ −25°C.
- ~20kW (or 68,240 BTU/hr) of 100% back-up required for coldest days. Increments of resistance heat will be staged with heat pump until outdoor shut-off temperature.



Prince George (Climate Zone 6)

MINIMUM PROGRAM REQUIREMENTS

- Heat pump achieves ~33% of capacity till equipment is beyond operation range @ −25°C.
- ~20kW (or 68,240 BTU/hr) of 100% back-up required for coldest days. Increments of resistance heat will be staged with heat pump until outdoor shut-off temperature.



2.4 Supplementary Heating

Supplementary heating is the additional heat that is needed if the heat pump is not able to keep up with the heating needs of the home during peak cold conditions. This terminology should not be confused with “back-up” or “emergency” heat which is a heating source that should only come on if there is a failure of the primary heating system.

Supplemental / Auxiliary / Secondary Heat

Refers to the heating equipment that is used to supplement the principal heating system when the capacity of the principal equipment has been exceeded. Examples include central ducted air source heat pump with supplementary gas furnace or supplementary electric heat kit, air to water heat pump with supplementary gas boiler, and packaged dual fuel system (electric heat pump with supplementary gas heater).

Back-up / Emergency Heat

Refers to the heating equipment that is equipped with controls and is not required to meet the space-conditioning load of a home. Examples include gas fireplace heaters, wood fireplaces, and wood pellet stoves.

For most locations in British Columbia, a cold climate rated heat pump will continue to run down to the design temperature and still function by providing good equipment efficiency and capacity. However, homes may still require some supplemental heat but significantly less than full back-up / emergency heat. In the coldest locations, the heat pump will shut off below a certain temperature depending on the manufacturer. As such, the full back-up / emergency heat will need be accommodated and required as part of the installation.

For all-electric central heat pumps, supplementary heating is provided by electric resistance heater elements. As part of pre-changeout planning, it is important to size any electric resistance heating to match the requirements of the home since oversizing supplementary heating may lead to additional costs for the homeowner including potential upgrades to the electric panel and/or service. Only when proper F280-12 heat load calculations and balance point calculations are completed then, and only then, can supplemental heat be sized properly while avoiding any unnecessary default practices of installing 100% back-up / emergency heat.

Electric resistance heater elements typically come in 5 kW (17,060 BTU/h) increments. As example, a 5kW resistance heater will use just over 20-amp at 240 volts and will require a 30-amp 240-volt breaker. A 10kW resistance heater will require a 50- amp 240-volt breaker. Any larger electric resistance heater elements for back-up / emergency heating will typically use multiples of 5 kW and 10 kW elements and this has potential to add significant panel loads that may trigger panel upgrades.

In all cases, the approach to supplemental and/or back-up heating should be reviewed by the HVAC contractor (or electrician) and discussed with the homeowner to inform a strategy for the heat pump retrofit based on the individual needs and location of the home. The following items provide an illustration of considerations with sizing a heat pump along with supplemental or back-up heating:

- Type(s), number, and size of external supplemental heating (e.g. gas or wood fireplace, electric baseboards, etc.) in home outside of the heat pump system.
- Ductwork capacity and potential ductwork modifications and improvements.
- Potential sizing for extreme weather events that may occur every 20 to 50 years.
- Available heat pump and electric resistance heater sizes from the manufacturers and large incremental jumps from one size to another.
- Maximum size limitation for 240-volt single phase heat pumps. Some equipment has a maximum 5-tons whereas others have a maximum 4-tons.
- Cold ambient locations where the outdoor temperature drops below the heat pump lock out temperature.
- Occupant specific requirements (e.g. older homeowners that may want or need more heating redundancy).
- Electrical panel capacity and ability to install additional supplementary resistance heating.

CONTRACTOR TIP

If a heat pump and/or electric resistance heating loads listed exceed the electrical panel capacity (when calculated as per the Canadian Electrical Code), then Load Share Devices or a Smart Electrical Panel might be an option to avoid a electrical panel and service upgrade. To learn more about these technologies, see Building to Electrification Coalition article titled: "Home Electrification: Service Upgrade Not Required!"

2.5 Controls

An important part of maximizing the performance of a heat pump is ensuring an integrated control strategy between the thermostat and equipment. The interoperability between the thermostat and heat pump should achieve the desired home comfort and energy savings, while limiting the use of the supplementary heating system.

Existing Thermostats — In retrofits, using the existing thermostats is typically not an option. An electric baseboard thermostat is line voltage (240-volt) and not compatible with new heat pump installations. An existing gas furnace thermostats (24-volt) may or may not be compatible. Additionally, many older thermostats are heating only operation and the generic thermostats including only basic furnace/heat pump thermostats with one or two stages of heat and one or two stages of cooling.

Heat Pump Thermostats (Minimum Performance) — A basic heat pump thermostat provided by the equipment manufacturer or 3rd party control/smart thermostat manufacturer are relatively inexpensive and provide scheduling, remote access (in some cases) along with on/off control of the heat pump in heating and cooling. Typically, the manufacturer programming in the heat pump will determine how quickly the heat pump ramps up and down and these thermostats may overshoot and undershoot the desired setpoint and have small penalty for comfort and efficiency (due to cycling losses). This category would include Honeywell, Nest, Ecobee, and any thermostat that is not fully communicating.

Heat Pump Thermostats (Optimized Performance) — The heat pump manufacturer proprietary, fully communicating thermostats provide optimized performance when used with fully modulating and inverter technology. These communicating thermostats incorporate full functionality for premium comfort and efficiency. They can determine the thermal characteristics of the home to perfectly arrive at a set temperature and time. They can perfectly meet the heating or cooling load and will run for longer periods providing better comfort and efficiency. Fully communicating thermostats include several other functionalities like self-diagnostics, communicate a problem directly to the installer, and in some cases provide energy usage data. Communicating thermostats will usually require a factory wiring harness to go from thermostat to fan coil.

CONTRACTOR TIP

In existing homes with gas furnaces, the wires from mechanical space to the thermostat are two wires. Heat pumps require more wires to operate. Some manufactures (e.g. Honeywell and BC-based Tekmar) have developed technology that turns the thermostat into a front end and sensor utilizing the existing two-wire which connects to a relay box down next to the heat pump. The multiple wires then run from the relay box to the heat pump to provide control. These systems allow the use of the existing two-wires but are not always compatible with fully communicating thermostats.