Air-Source Heat Pump Retrofit

The purpose of this brochure is to provide guidance to homeowners and contractors on City of Burnaby's requirements for the retrofit of air-source heat pumps into existing dwelling units.

"This information is provided for convenience only and is not in substitution of applicable City Bylaws or Provincial or Federal Codes or laws. You must satisfy yourself that any existing or proposed construction or other works complies with such Bylaws, Codes or other laws."

What is an Air-Source Heat Pump?

An air-source heat pump is a system that provides year-round heating and cooling, through the extraction and transfer of heat energy from the surrounding air via refrigerant lines. In the winter, an air-source heat pump can move heat from the outside environment into the home, whereas in the summer, it can move heat from inside the home to the outside environment.

Heat pumps are currently one of the most energy-efficient systems available for space heating and cooling- these systems can provide ample energy savings relative to electric baseboard heaters and/or air conditioners, and have the potential to reduce greenhouse gas emissions.

To learn more about heat pump systems, or about provincial / federal rebates for upgrading to a heat pump system from other heating systems, visit https://www.betterhomesbc.ca/heatpumps/.

For information about City of Burnaby requirements on ground-source heat pumps, refer to the Geoexchange (Geothermal) Systems informational guide.

Types of Air-Source Heat Pumps

Air-source heat pump systems consist of one or a combination of the two system types:

- **Ductless System**
  Energy transfer from the exterior condenser unit via refrigerant lines to single / multiple interior units to deliver heating and cooling.

- **Ducted System**
  Energy transfer from the exterior condenser unit via refrigerant lines to the interior central / multi-zone duct system to deliver heating and cooling.

Standards & Certifications

Design & Installation Standards

Design and installation of an air-source heat pump system is required to comply with relevant standards and codes, such as:

- Canadian Standards Association (CSA),

    - C656 “Performance Standard for Air-Source Heat Pump”,
    - C273.5 “Installation of Air-Source Heat Pumps and Air Conditioners”,
    - F280 “Heat Loss and Heat Gain Calculation”,
    - B52 “Mechanical Refrigeration Code”,
    - C22.1 “Safety Standard for Electrical Installations”,
    - B149.1 “Natural Gas and Propane Installation Code”,
    - B139 “Installation Code for Oil-burning Equipment”,
- BC Building Code (BCBC), Division B,
    - Part 6 - Heating, Ventilating and Air-Conditioning,
    - Part 7 - Plumbing Services,
    - Part 9 - Housing and Small Buildings,
    - Part 10 - Energy Efficiency,
- BC Safety Standards Act,
    - Power Engineers, Boiler, Pressure Vessel & Refrigeration Safety Regulation, and
    - Electrical Safety Regulation.

It is the responsibility of the certified contractor to ensure that the heat pump system’s design and installation is in compliance with manufacturer specifications, applicable editions of the relevant standards and codes, and best practices.

Certified Designers & Installers

Design and installation of the air-source heat pump system is required to be performed by a certified contractor with the appropriate licences and qualifications, including:

- Thermal Environmental Comfort Association (TECA)
    - Forced Air Guideline Certification (with heat pump endorsement),
    - Air to Air Heat Pump Certification (effective once course is available),
    - Principles of Moving Air Certification (where involving ducted systems),
    - Municipal Heat Pump Certification (where involving air-to-water systems), and
- Technical Safety BC (TSBC) Class REF License (where TSBC Refrigeration Installation Permit is required).

The certified contractor is required to apply for a Refrigeration Installation Permit through TSBC where the proposed heat pump system has a total prime mover kW rating of 5 kW or more, or contains toxic/flammable contents in a building containing more than four dwelling units.

Permitting & Inspections

Required Permits

Prior to the installation of ductless air-source heat pump systems within existing dwelling units, application and issuance is required for:

- **Electrical Permit** – where proposed system operates on electricity, or where altering / decommissioning of electrical heating systems is within scope of work, and / or
- **Gas Permit** – where proposed system operates on gas, or altering / decommissioning of gas appliances are within the scope of work.

A **Building Permit** is not required for the self-contained installation of a ductless air-source heat pump system with ground-mounted condenser unit within an individual dwelling unit, unless the installation of the system requires modification / disassembly of the existing building structure

(i.e. ducted system within floor, wall or roof assemblies, air to water system within floor assemblies). Under these circumstances, the **Building Permit** is required to be applied for prior to the **Electrical Permit** and/or **Gas Permit**.

Figure 1 below illustrates the described circumstances under which the respective permits are required.

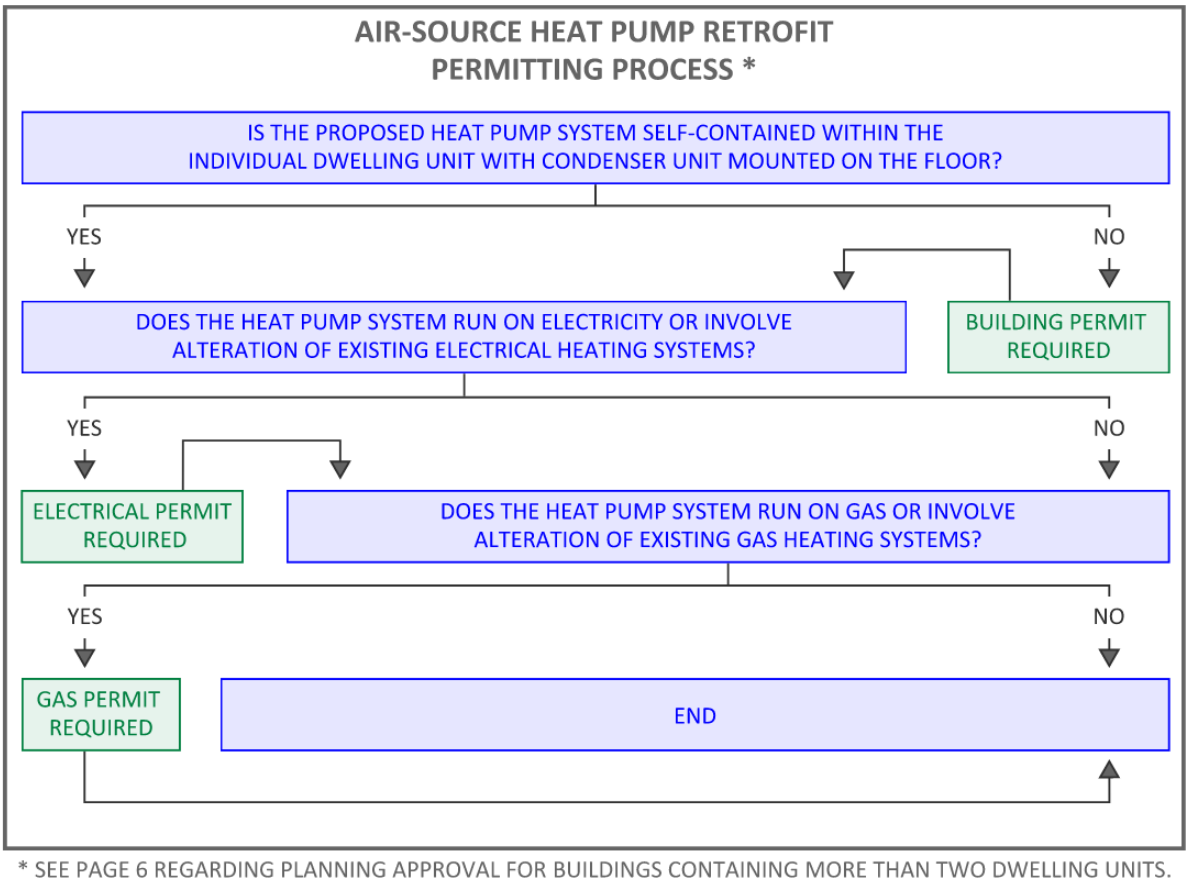

Figure 1 - Permitting Process Flow Chart

As part of the electrical or gas permit application, a **design package** is required to be submitted to confirm that sufficient service capacity will be provided by the proposed system.

The **design package** is required to include the following documents:

- Electrical Load Calculations (for entire building),
- Building Plan Drawing (identifying heat pump condenser unit location),
- TECA (or Professional Engineer) Sealed Design,
    - CSA F280 Heat Loss Calculations,
        - room by room or block load for retrofit,
        - room by room for new construction,
    - Appliance Selection Worksheet (including supplementary heating details),
    - CFM Distribution Worksheet
    - Thermal Balance Point Calculations,
    - Ducting Layout (where involving ducted system), and
    - the following where involving Air-to-Water Systems,
        - Design Summary Sheet,

- Project Reference Sheet,
- System Guideline Drawings, and
- Boiler Load Sizing / Appliance Selection.

The certified contractor is required to determine heat pump type and capacity sizing based on manufacturer's data and/or capacity data from Air-Conditioning, Heating and Refrigeration Institute (AHRI) Directory, and provide details on supplementary heating systems where determined to be required.

Inspections

Upon completed installation of the heat pump system, the certified contractor is required to call for City inspection and submit a **compliance letter** at the time of inspection, confirming that the system has been designed, installed, and commissioned in conformance with the manufacturer's specifications, relevant codes and standards, and best practices.

The **compliance letter** is required to include the following attachments:

- TECA (or Professional Engineer) Sealed Final Commissioning Sheet,
- Commissioning Sheet by Red Seal Certified Refrigeration Mechanic, and
- where TSBC Refrigeration Installation Permit is required,
    - copy of TSBC Refrigeration Inspection Declaration Form, and
    - copy of TSBC issued final Certificate of Inspection.

The heat pump system installed under electrical or gas permit are required to be inspected by the City's Electrical or Gas Inspector, with the certified contractor present. Requests for electrical or gas inspection can be made by telephone at 604-294-7130.

Please provide the following information during the telephone request for inspection:

- electrical or gas permit number,
- address of the property,
- type of inspection requested, and
- mobile contact number and name of the site contact person.

Requests for inspection are required to be made at least 24 hours prior to the inspection.

Installation Location

Permitted Locations

The exterior condenser unit of the heat pump system is permitted to be ground-mounted in locations adjacent to the building's exterior wall, provided the:

- condenser unit is not located within any paths of travel for building access,
- condenser unit's condensation outlet does not drain onto any paths of travel, and
- condenser unit is located outside of the required front and side yard depths (refer to Outdoor Appliances and Structures information guide).

The required front and side yard depths will vary based on the zoning of the residential district. Refer to the Burnaby Zoning Map to determine the zoning of the residential district, and the Zoning Bylaw for the specific requirements on front and side yard depths.

If wall or roof-mounting of the condenser unit is desired, then application for a Building Permit will be required, with submission of **structural drawings prepared by a Designated Professional Engineer**.

An example of permitted locations for installation of the condenser unit is illustrated in **Figure 2**.

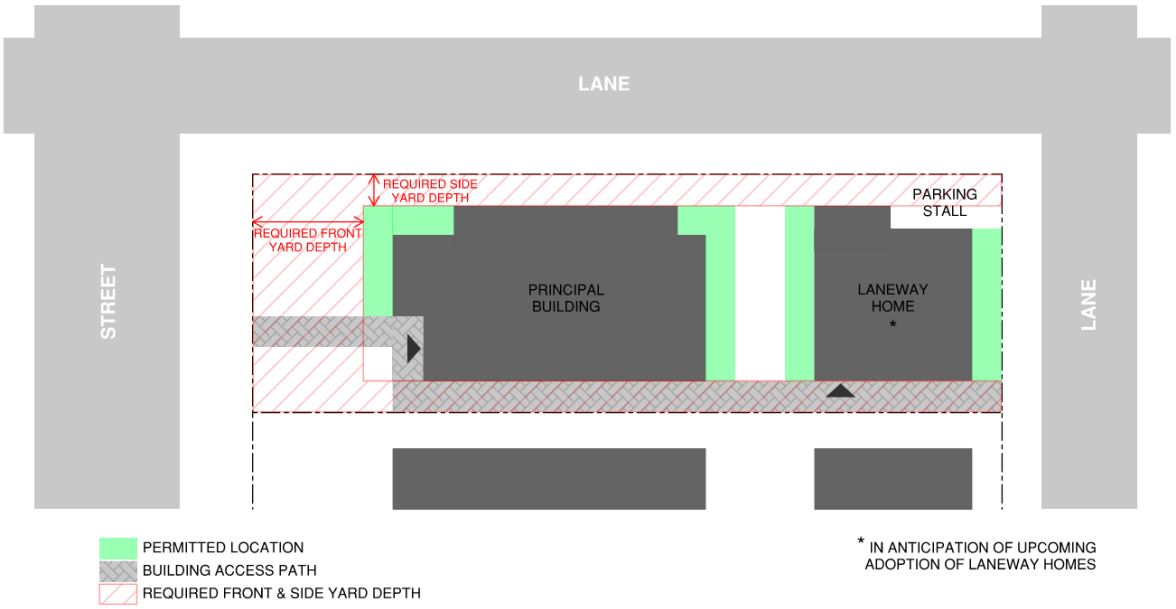

Figure 2 - Permitted Installation Locations for Condenser Unit

Installation on Balcony / Deck above Ground Level

Where the exterior condenser unit of the heat pump system is proposed to be located on balconies or decks, the unit is required to:

- be positioned not less than 1070 mm radius away from top of the guard, or be positioned with all climbable surfaces not less than 1070 mm above from the balcony / deck floor, where the balcony / deck floor is more than 4.2 m below above the adjacent ground,
- not penetrate the floor assembly where located above interior space, or the floor / wall assemblies of suite(s) adjacent to the one serviced by the heat pump system, and
- be mounted upon the balcony / deck floor.

Likewise, if roof or wall-mounting of the condenser unit is desired, application for a Building Permit will be required with submission of **structural drawings prepared by a Designated Professional Engineer**.

An example of permitted positioning of the condenser unit on balconies / deck more than 4.2 m above the adjacent ground is illustrated in **Figure 3**.

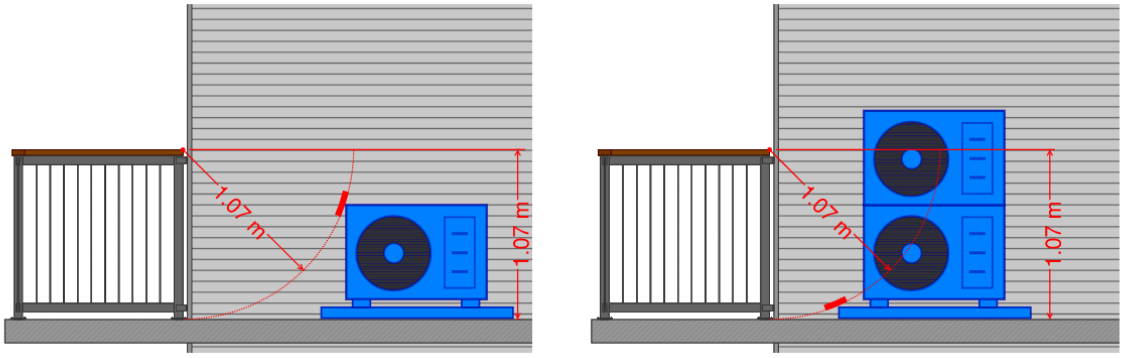

Figure 3 - Permitted Positioning of Condenser Unit on Balcony / Deck more than 4.2 m above Adjacent Ground

Noise Minimization

In accordance with City of Burnaby Bylaw No. 7332, continuous noise emanated from the property is not permitted to exceed:

- **55 dBA's** between the hours of **7:00 AM to 10:00 PM**, and
- **45 dBA's** between the hours of **10:00 PM to 7:00 AM**.

In order to minimize noise disruption to neighbouring residents from the continuous noise of heat pump systems in operation, it is recommended to have a heat pump system specified with sound rating not more than **60 dBA**, with the condenser unit of the heat pump system located:

- away from neighbouring properties as much as possible,
- away from neighbouring building's windows or door openings,
- at the rear side of the property (preferably), and
- facing barriers taller than the condenser unit (i.e. solid fencing).

Appropriately locating the condenser unit of the heat pump system will provide reduction in the noise to impacted neighbouring residents. In general, if the condenser unit is within the view of neighbouring residents, then the emanating noise is likely to be perceived as a disruption.

If existing barriers are insufficient to minimize noise disruption to neighbouring residents, then acoustic treatment or acoustic barriers are required to be provided for the heat pump system.

Planning Approval

Buildings with more than Two Dwelling Units

Where installation of the heat pump system is for a dwelling unit within a building containing more than two dwelling units, there is potential for multiple future installations on the building exterior to adversely impact the visual of the district.

Under this circumstance, the Building Department front counter will direct the applicant to go to the Planning Department front counter, to obtain confirmation on the permit application form as to whether Preliminary Plan Approval (PPA) is required. Should PPA be required, then the applicant is also required to make a Building Permit application.

Further Information

It is recommended for the homeowner to review the HPSC Heat Pump Best Practices Installation Guide for Existing Homes for in-depth information on heat pump systems and a visual guide on how to identify quality installation, and for the homeowner to discuss design and installation considerations with the certified contractor.

For further information on TSBC requirements for safe heat pump installation, operation and maintenance, refer to the TSBC website or contact TSBC by telephone at 1-866-566-7233.

For further questions relating to City of Burnaby's heat pump requirements, please contact the Building Department by telephone at 604-294-7130.

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