

Optimizing furnace efficiency and performance

Replacing a standard or mid-efficiency furnace with a high-efficiency or condensing model offers an excellent opportunity for homeowners to cut their utility bills and improve their home's comfort. However, without proper sizing, installation and commissioning, the new high-efficiency furnace will not operate to its designed intent.

To help encourage quality installations, FortisBC recently published a best practices guide designed to support homeowners and HVAC contractors with general information on completing high-efficiency furnace replacements.

The guide, *High-Efficiency Furnace Installation Guide for Existing Homes*, provides an overview of key steps to achieve optimized furnace performance including best practices for pre-changeout, installation, commissioning and consumer education and maintenance.

A consortium of industry experts, including the Province of British Columbia, FortisBC, TECA, HRAI, RDH Building Science, Ecolighten Energy Solutions, and HVAC contractors and experts in the field, all provided input and support in the development of the guide.

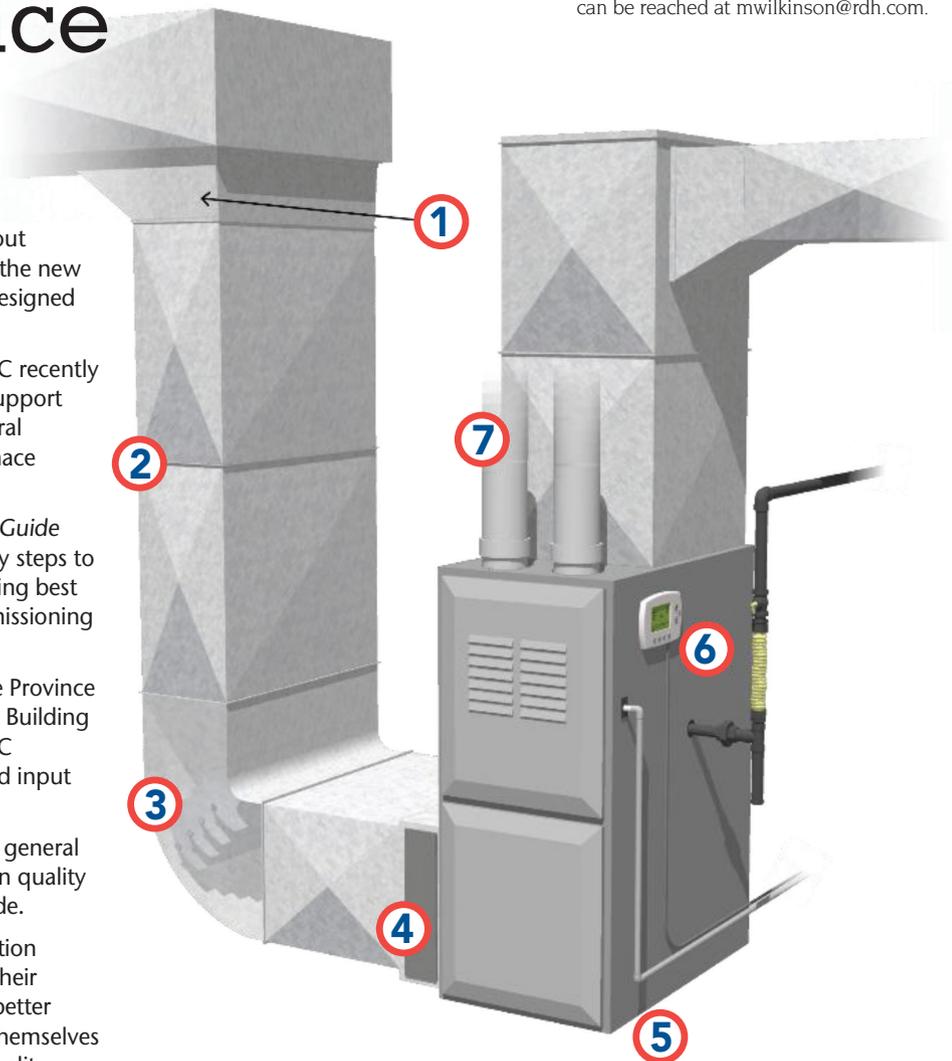
A primary objective for the guide is to advance general understanding on the importance of installation quality and the benefits that improved practices provide.

For HVAC contractors, applying quality installation practices from the retrofit-centric guide offers their business a significant opportunity to deliver a better overall customer experience and differentiate themselves from competitors focused on least-cost, low-quality installations.

Additionally, the guide helps educate consumers on the key characteristics associated with a quality installation.

Although the publication is very general in nature, and is not intended to replace furnace installation materials developed by industry manufacturers and associations for contractors, it is an exciting development for the HVAC industry as it provides education and awareness on best practices and quality installations.

One of the main sections covers the installation phase, where furnace equipment is selected and integrated into the existing home and ductwork. Here is a "Top 7 List" of installation measures from the guide aimed at improving energy performance, occupant comfort and equipment longevity.



1 Tapered return air drop

- One of the challenges with replacement furnaces is dealing with existing ductwork and how the distribution system may impact overall performance, including thermal comfort, energy consumption and noise.

- Changing out poor ducting and installing new duct fittings, like a tapered transition at the top of the return air drop, can reduce turbulent air flow and result in lower static pressure within the ductwork.

- As an added benefit, reducing the external static pressure through proper duct fittings may also lead to lower electricity consumption since the furnace's blower motor may not need to ramp up to deliver required system air flow.

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2 Sealed ductwork joints

As part of overall system performance, sealed ductwork is required to ensure a furnace is delivering heated air to the design areas in order to maximize thermal comfort. If air is lost or leaked along the route, there may not be enough static pressure or velocity for all the conditioned air to get to its desired location.



To address this, all joints and connections that are visible on the existing ductwork and potential new fittings should be air sealed using aluminum tape or paint-on mastic to improve overall system performance.

3 Radius elbow and/or turning vanes

An important ducting enhancement that is often overlooked is a radius throat that incorporates turning vanes in the return drop elbow.

The radius throat at the return drop elbow can reduce turbulence and lower pressure drop at the fitting, which may decrease the load on the furnace blower fan and lead to electricity savings.



Additionally, turning vanes are designed to spread the return air more evenly across the filter so that particulates do not accumulate in one section, which can reduce the filter's performance and potential service life.

4 Filter cabinet & quality

Incorporating a sealed, accessible filter cabinet with a quality filter is an important consideration to maximize overall furnace performance.

The filter cabinet should be accessible and non-obstructed, so the filter can easily be replaced by the homeowner as part of the service and maintenance of their furnace. The filter cabinet should also have a positive door seal and be well sealed to eliminate any air bypass around the cabinet or filter.



In terms of filter performance and selection, a thicker, pleated media filter will have more surface area, which extends the service life of the filter since it takes longer to load up than thinner filters.

Incorporating a high-quality filter should result in quieter operation, equipment longevity and reduced energy use.

5 Proper furnace placement and levelling

As part of the combustion process, high-efficiency furnaces produce acidic condensate. This condensate must be drained from the furnace so that it doesn't build up inside the furnace over long periods of time and potentially cause premature equipment failure. Contractors should always refer to the manufacturer's levelling requirements before installation.

As part of furnace placement, consideration should be given to potentially raising the furnace off the floor with isolation vibration pads to reduce equipment noise and protect the furnace in the event of a minor flood or liquid spilling on the floor.



6 Matching thermostat & compatible wiring

Most manufacturers offer high-efficiency furnaces with a choice of two, three and/or variable stage gas valves with variable speed blower motors in their furnace offerings. To achieve the benefits of these features, high-efficiency furnaces require a matching thermostat that is wired correctly.

A matching thermostat that incorporates an appropriate number of wires may reduce energy use, improve home comfort and enhance overall HVAC system performance.

7 Double-pipe combustion

Replacement furnace installations should incorporate a double pipe system with combustion air taken from the outside.

In a single-pipe exhaust, combustion air is drawn from inside the home creating negative pressure which results in wasting energy to heat the resulting infiltrating outside colder air. Overall, a two-pipe system can reduce several common heating/ventilation issues, including air leakage, incidence of unwanted smells and equipment performance problems related to building depressurization.