



SUSTAINABLE BUILDINGS AND COMMUNITIES GROUP ZONED HEATING & COOLING INNOVATION



CLEAN ENERGY TECHNOLOGIES

ADVANCED INTEGRATED MECHANICAL SYSTEMS

The comfort and energy savings provided by zoned forced air has traditionally been a luxury enjoyed by owners of expensive custom-built homes. Systems that offer selective distribution of heating and cooling throughout a home, and the subsequent reduction in energy use, often come at a price that makes this option cost prohibitive for many people.

The CANMET Energy Technology Centre (CETC) at Natural Resources Canada began researching opportunities for zoned forced air systems in the increasingly multi-storey and multi-unit residential construction sector. To take advantage of this opportunity, a system with broader appeal than conventional offerings – in price-point, energy efficiency, and performance – was needed.

The energy experts at CETC and private sector, government and university partners collaborated to develop, test and deploy a new zoned heating and cooling system. The end result was the remarkable one-year product development cycle of an affordable zoned forced air system that offered greater performance and ease of use.

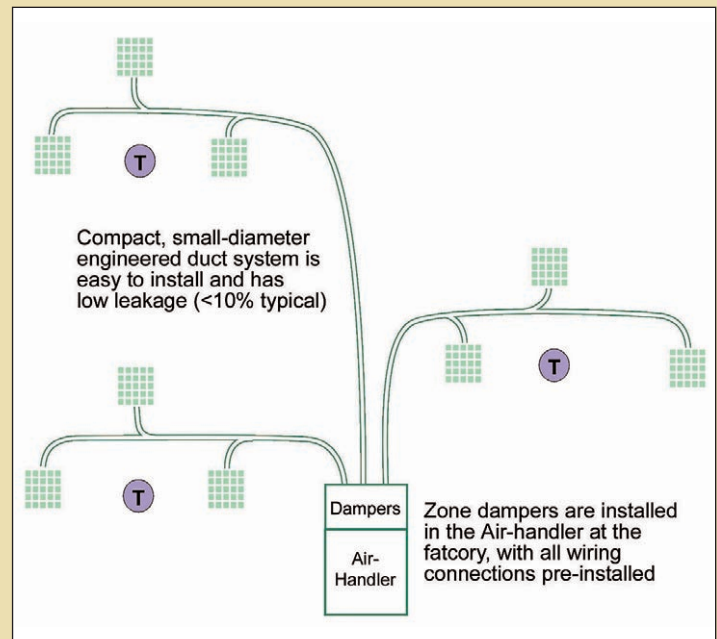
HOW IT WORKS

Forced zone air systems give occupants independent control of the temperature in different parts of their homes. With conventional systems this is accomplished by installing remote-controlled dampers at each supply register, with groups of registers connected to multiple thermostats throughout the home. The temperature settings in each zone can be tailored to suit

the particular needs of the homeowner. This *zoning* significantly improves the comfort of the occupants by providing a balanced distribution of air that eliminates the often encountered thermal disparity between cold basements and hot second or third floors. It also improves efficiencies by only heating or cooling the zones that need it. However, the design of conventional systems leads to high installation costs and less than optimal performance.

OPTIMAL ZONED HEATING & COOLING

A new design for zoned heating and cooling systems offers homeowners an affordable way to improve their comfort and reduce their energy consumption.



One of the most revolutionary aspects of the new zoned forced air design is that dampers are integrated into the central air handler. The factory-installed dampers allow for the use of small-diameter, high-velocity ducts that are less leaky than conventional ducts, improving the air distribution of the system. The small-diameter ducts also reduce installation costs by removing the need for bulkheads and duct enclosures.

From the air handler, high-velocity forced air is distributed by a central fan through three separate duct systems. There is one duct system per level with typical installation, each with its own thermostat. Sophisticated electronic controls connected to a variable-speed motor ensure that the fan runs at optimum speed to meet constantly changing demands for heating and cooling in different parts of the home.

CETC FACILITATES INNOVATION

As the energy research and development branch of Natural Resources Canada, CETC brought together private sector companies, funding partners, power utilities and energy distributors, provincial governments and universities to see this project through to success.

Working closely with project partners, CETC facilitated product development by leveraging funding sources and performing a technical risk assessment to mitigate barriers and costs.

With a wealth of experience in the research, development and deployment of innovative technology, CETC provided valuable guidance for market entry. Research was performed to evaluate market infrastructure issues for this new system, and through its networks CETC raised awareness of the product's benefits.

Collaborative field trials resulted in continued product testing and improvement through the evaluation of the system's energy performance. Data from these trials can be used by CETC's simulation modelling experts to legitimize the new system and examine its benefits on a regional basis.

BENEFITS & OUTCOMES

In addition to the home comfort benefits of such a system, it also saves money and energy. It is estimated to reduce the average household's annual electricity consumption by up to 30 per cent, or more than 3,000 kilowatt hours of electricity per year. With the system costing only 25 per cent more than a conventional heating and cooling system, the payback period is shorter than those available with other zoned forced air offerings.

The performance of this zoned forced air system means that the home's air-conditioning unit can be sized smaller than with a conventional system, without sacrificing comfort. Reductions of one third to one half are common. A state-of-the-art dehumidification mechanism within the air handler unit and the improved air distribution through small-diameter ducts combine to increase the performance of the air-conditioner.

By reducing the cooling load in homes, the new zoned forced air system can have significant impacts on peak electricity demand during the increasingly hot summers and can help to mitigate the strain on electrical infrastructure.

As an energy technology innovator, CETC has created an opportunity for new zoned forced air systems to enter the marketplace at an affordable price and offer improved comfort, energy efficiencies, and overall performance.

To find out how you can benefit from working with CETC, contact Natural Resources Canada at 613-995-0947 or visit www.sbc.nrcan.gc.ca.