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HEADING up to the ATTIC

On a hot summer day, can you think of any worse place to be than in an attic? Well, as I crawled my way through the cramped, dusty, blazingly hot 100-year-old attic of my brother's house last summer, a couple of thoughts came to mind that are perhaps of interest to mechanical contractors.

First, it prompts an assessment of the risks involved with putting any mechanical equipment or ductwork in attics at all. That is why I was up there in the first place – to troubleshoot problems with the air conditioning system that had been shoe-horned into that space many years ago.

Second, you start to wonder if it might be effective or efficient to find a way to reduce the attic temperature to reduce cooling costs, increase comfort and perhaps even increase the life span of roofing materials.

From the street that big 12/12 pitch roof may seem like an attractive, open space for mechanical equipment and ductwork, or at the very least an opportunity for an attic fan, but before making any recommendations I encourage you go wander around that attic on the hottest summer day and contemplate the science behind how modern attics really work. It should take about five minutes to decide how much work you want to do up there in future.

Taking on the whole house

The “whole house” fan option was an old-southern strategy to use cool night air to flush out houses before central air conditioning became widely available. The whole house fan is typically installed in the ceiling, and new versions of the equipment have tight fitting, well-insulated louvers that open up as the fan comes on.

In a Canadian context, making sure this assembly is truly air tight and well insulated is critical since the fan is not going to be used in the winter months.

The strategy relies on homeowners opening windows on lower levels as soon as the temperatures outside are cool enough to provide some benefit, and turning on the fan that exhausts into the attic. Of course, adequate roof or gable vents are needed to allow for the escape of air.

There are risks to this approach, however. Do not overlook the backdraft potential of water heaters, nor the impact of the introduction of cool, damp air in humid climates.

Where to use whole house fans

I was in the foothills west of Calgary a while back, in a house that had large west-facing glass with lots of evening heat gain. The cool, dry mountain night air was a great alternative to a central air conditioner in this application.

Similarly, summer homes or cottages, climates where there is only very occasional overheating, and in older homes without forced air heating ductwork where adding central air is prohibitively expensive, are all potential opportunities for whole house fans.

There are commercial applications as well, such as summer evening gathering halls, theatres or churches where the high intermittent people loads can be offset by cool summer air.



ATTIC OPPORTUNITIES for HVAC contractors

Looking at mechanical attic ventilation strategies, remember that the purpose of traditional attic ventilation was to wipe away potential condensing moisture on the underside of the roof deck in winter, and to keep the underside of the roof deck cooler in the summer to extend shingle life. The intent was not to ventilate the entire attic but to create air movement across the underside of the roof deck.

We now know, with the added levels of insulation in virtually all attics, the best way to avoid winter attic condensation problems is to ensure the attic floor (the

ceiling of the house) is properly and thoroughly air sealed to eliminate leakage of warm, moist air into the much colder attic space in the first place.

Any attempt to use mechanical ventilation to try and reduce moisture levels in attics without first air sealing the attic floor creates more problems than it solves because the negative pressure induced by the mechanical exhaust increases the moist air leakage.

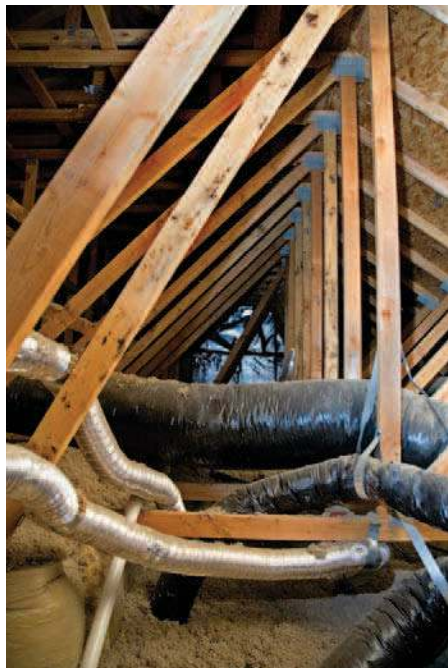
Mechanical attic ventilation is a summer opportunity where powered attic fans and whole house fans may come into play.



Why put HVAC systems in ATTIC SPACES?

I hope we can all agree that the highly variable temperature and moisture regime in an attic, coupled with the poor access and compromise of insulation and air barrier integrity should eliminate attics as a suitable place for mechanical equipment or ductwork at all.

I know that in some applications – such as my brother’s house, which had old cast iron radiator heating and no easy access for ductwork – that the attic is about the only place to run air conditioning ductwork, but be reminded that they have been putting ductwork in attics for many years in the U.S. and they are now spending millions of dollars in retrofit programs and are trying to change building codes quickly to get it back out.



Learn from the mistakes of others and find creative ways to keep ducts in conditioned space – especially in new homes. Dropped ceilings, boxed-in ductwork and open web floor joists between floors are all options being used with great success in the U.S. to keep ducts inside.

Another popular strategy is to “condition” the attic, making it part of the thermal enclosure. This means taking the insulation to the underside of the roof deck. In a Canadian context, in my opinion, this can only be durably and reliably done using properly applied spray foam insulation to ensure an air tight and consistent thermal break at the roof line.

It does have the added advantage of providing extra conditioned storage space in the attic, however, and in a new house with proper truss design, it could even allow for “bonus” rooms within the ever-higher pitched roofs that have become popular.

If you are left with no choice but to put heating or cooling ducts in unconditioned attic space, be reminded that most building codes in Canada require supply and return ducts to be insulated to no less than R12 in unconditioned areas. Most pre-insulated flexible duct systems are less than R4, some have an option of R8.

Be ready to double wrap ductwork, or ensure it is buried in the insulation. More importantly, take great care to durably air seal the ducts. After all, they may be in service for 30 years (or more) with little access for service.