



Preventing Moisture Problems in Direct Vent Gas Applications

**An Ounce of Prevention:
Why Installers Should Insulate Direct Gas Vent Penetrations
with Non-Combustible Insulation**



Leaders in-Venting Innovation™

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This white paper is available for download at no cost at www.duravent.com
This paper is written with regard to applicable codes and standards and intended for use and application in North America.

DirectVent® Pro

Moisture problems can be a frequent source of frustration. Unfortunately, most homeowners may not pay much attention until the damage is already done. Where is this moisture coming from, and how can it be stopped?

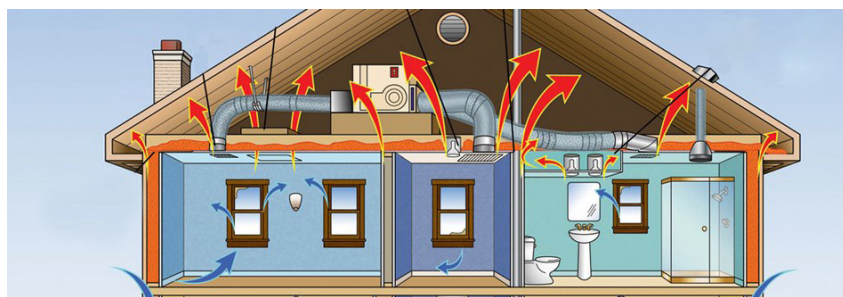
There are many different trades involved in residential construction. Plumbers, gasfitters, and electricians all routinely cut holes in exterior walls and up through attic ceilings, but the fireplace installer is usually responsible for the largest openings of them all. Not taking care to repair these openings properly will result in a world of hurt for the homeowner. Fortunately, in these cases, an ounce of prevention can save the homeowner *gallons* in damage.

Regardless of the region or season, condensation can occur when warm, moist air comes in contact with cool surface temperatures that are below the dew point. Cold air holds less moisture, so when this occurs, water vapor in the air will condense and collect on cool surfaces. Most of us have noticed the droplets of condensation that often collect upon a window's exterior during summer mornings. This is the result of warm, humid outdoor air contacting the window's surface, made cooler by air conditioning. In winter the physics are the same, but the circumstances are reversed. The moisture will collect on the window's interior surface instead.

Most cold-weather condensation is due to warm air escaping from within a heated structure. This leakage is usually due to wall or ceiling penetrations that have not been sealed or insulated properly. In cold winter climates, condensation can accumulate as frost. With warmer weather, the frost begins to melt. If the moisture cannot easily escape, soaked wall and ceiling / attic assemblies will gradually deteriorate. Ironically, the tighter the home, the more problematic this can be. While there may be enough air leakage to cause condensation, there is not enough air circulation or venting available to allow this moisture to dry or escape to the outdoors. During long bouts of cold weather, severe frost can build up within an attic. A sudden spike in temperature can lead to a rapid melt leading to a phenomenon known as "attic rain" as water begins dripping down from the ceiling around vents or ceiling light fixtures.

"During a heating season, air leakage through a sheet of gypsum board with a [1-inch²] hole in the middle will result in 28.4 L (30 quarts) of water. Vapor diffusion through a solid sheet of gypsum board (i.e. no hole), however, will only result in 0.3 L (1/3 quart) of water."¹

This is with a 70°F/ 21°C interior ambient temperature and 40% relative humidity (RH) over a typical heating season.



A Preemptive Strategy

How does this relate to the wall or ceiling penetration for a typical direct vent gas fireplace? A mere 3/8-inch gap left around 5"X8" direct vent pipe is equivalent to a 1-inch hole. The severe air leakage and subsequent condensation that will occur could be equivalent to over 7-1/2 gallons of water accumulating within an attic space or wall cavity over the course of just a single winter.

1 <https://www.constructioncanada.net/controlling-condensation-from-air-leakage-and-vapour-diffusion/>

The problem has proven so widespread among solid-fuel fireplace installations that it prompted DuraVent to research, test, and ultimately approve the use of non-combustible rock (mineral) wool insulation around the wall thimble on sidewall penetrations and support boxes used for vertical attic terminations. When the vapor barrier is sealed and insulation is used, this helps to eliminate air leakage and to minimize heat loss from within the structure. This combined approach has proven quite successful on installations in the cold regions of Canada and the Northern mountain states in the US.

Building on the success of this preemptive strategy, DuraVent now encourages manufacturers of direct vent gas fireplaces to recommend and approve this same approach.

“Condensation problems can occur any time you cut a hole through a wall or ceiling. If proper steps are taken to repair and insulate the penetration, the condensation problem can be eliminated. We are already doing this with wood-burning systems even though they operate at much higher temperatures. As such, we know the same methods will work well with direct-vent gas appliances too.”
Explained Dalton Hooker, DuraVent Regional Sales Manager, Western Canada.

The insulation provides a thermal barrier at the vent penetration, thus helping to maintain the overall thermal integrity of any well-insulated wall structure. Not only is the homeowner protected from potential condensation, but home efficiency gets a boost as well. High temperature silicone is typically used to seal the pipe to the wall thimble on the interior or exterior of the penetration. Sealing on the exterior will prevent rain and cold air from entering the house, while sealing the interior will prevent room air from entering the wall/ceiling space.



Role of the Vapor Barrier

In cold winter climates, maintaining the integrity of the vapor barrier is a crucial part of this strategy.

In retrofit applications, the installer has no choice but to cut the vapor barrier and penetrate through existing insulation. Once the thimble or support box is installed and insulated, the vapor barrier must be repaired. This is done by sealing it to the outer perimeter of the thimble or support box while also paying close attention to maintaining the required clearances to combustibles.

“It is really a two-part approach to the problem. Insulating the penetration to match surrounding construction helps to minimize heat-loss. Repairing the vapor barrier is absolutely necessary to close off air leakage,”
said Hooker.

DuraVent has tested non-combustible rockwool (mineral wool) insulation that is listed and compliant with ASTM E126/ULC S114 as non-combustible within the wall and ceiling passthrough components of the DirectVent Pro coaxial vent system. These tests have been conducted in cooperation with UL and have confirmed suitably low transfer of heat from the vent to any surrounding combustible framing materials.

Although DuraVent is absolutely confident that this solution will not only improve home energy efficiency when installing direct-vent gas fireplaces while also preventing long-term damage due to condensation, the ultimate approval to use field-installed mineral wool within our thimbles or ceiling supports must come from the appliance manufacturer. DuraVent is currently working to make appliance manufacturers aware of this solution. Dealers and installers can help facilitate this process by discussing this topic with manufacturers as well. DuraVent has created a [sample form letter](#) which installers can submit to manufacturers, asking for their approval to use field-installed mineral wool around the wall thimbles and support boxes.

“While we can test and approve non-combustible insulation products on our own for our solid-fuel venting products, direct-vent appliances and vent assemblies must be tested and approved by the appliance manufacturer per the ANSI appliance standard,” said Tony Wang, Product Manager, DuraVent.

Rather than offer parts that come pre-insulated with a one-inch or two-inch thickness from the factory, experienced installers want the freedom and flexibility to match the thickness of the insulation with the R-Value of insulation used in surrounding construction.

“In the end, we see our solution as a slam-dunk. It could potentially save homeowners thousands of dollars in moisture mitigation and repair, while also making a dramatic improvement in home energy efficiency. DuraVent is committed to creating more awareness on this topic. We look forward to a day when insulating and sealing vent penetrations for direct-vent gas appliances is standard operating procedure,” said Tony Wang.

Note: The requirement for insulation and need for vapor barrier can vary widely according to climate or region. What works in cold climates may not work in warm, temperate climates. Familiarize yourself with building code, and check for any restrictions or rules that may apply in your location.



For more information on DirectVent® Pro solutions, visit:
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