

Ask Jon Eakes

# Vent Stack Ice Capping or Evaporation : I GET SEWER ODOURS INSIDE THE HOUSE OCCASIONALLY IN THE WINTER.

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This is one of those problems that are not dealt with seriously enough by the building officials in really cold regions. I have opened a blog space at the bottom of this article for you to add in your case history so we can demonstrate that this is a large and continuing problem. Take a look; not only so you feel less alone, but to see that after years of struggling, my visitors are finding solutions that work for them. Read all the way down to the bottom of the article (just before the blog) because solutions are appearing and they are getting better and better as time goes on.

Plumbing traps, like the loop you can see under the sink, are designed to stay full of water and block those odours from coming back into the house from the sewage system while letting the plumbing waste through to the sewer system. At the end of use, water stays behind, keeping the trap full. They don't always work and you can get annoying to nasty smells in the house when the water does not close the trap. The good news is that although these odours are very disagreeable, health authorities tell me that this nasty smell is not really a health risk as the gasses are not biologically active (backed up sewage water is dangerous for the health but not the gasses that come off that water) and you would have to be a city maintenance man working in the sewer pipe itself before the concentrations of these gasses would be a real problem. That probably explains why there is not much plumbing code work done on making sure that plumbing traps work 100% of the time.

## The problem

There are two different mechanisms that can dry out these traps and let the smells into the house:

-- Evaporation: If a drain sitting in a dry atmosphere is not used for a long time, the water simply dries out -- something very common in basement floor drains -- or in houses or individual drains not used for a long time. That is part of the genius of the system, the more you use it, the more reliable it is. Sometimes your problem can be solved simply by occasionally pouring a cup of water into otherwise smelly drains.

-- Blockage of the plumbing stack: All of the water drains in the house are connected to a plumbing vent pipe which goes through the attic and sticks out on the roof. The drainage vent system is shown in the graphic in Red. This vent piping allows air to flow in the drain system and prevents water flowing down the drain from trying to draw air through the drain traps. If you didn't have such a vent -- or if it is blocked off -- things would drain very slowly indeed, and probably gurgle in every sink in the house when you drained the bathtub. If it gurgles enough it will suck the water right out of the trap, letting sewer gasses into the house until you fill the trap the next time you run a little water into it. This is why all toilets are designed to trickle a little water into the bowl after the flush is completed -- the flush is designed to completely empty the bowl with a syphon action and then the trickle is designed to add fresh water up high enough in the bowl to block the odours in the sewage piping.

## The Solutions

Evaporation problems, especially in basement drains can be dealt with in several ways.

-- Pour a little Mineral Oil in the drain to float on the water and slow down the evaporation. Highly refined Mineral Oil, found in drug stores, can solve the problem. I had said that it was bio-degradable, but Fred wrote in (see blog below) to point out to me that it is a petroleum product and is not bio-

degradable -- and Fred is basically right. Although some consider the drug store grade highly refined mineral oil to be slowly bio-degradable, its real characteristics that are useful here is that it is without any odour, it will not go rancid, it evaporates extremely slowly and it is really non-toxic. That last point is demonstrated by it being recommended to ingest for constipation -- the reason for which it is stocked in drug stores. This works for a long time in the drain, but not forever, and it takes a lot of water flow to flush it on down the drain pipe.

-- Run a water line to the drain connected to a special drain filler valve put in the line to the washing machine. Every time the washing machine kicks off, giving a shock to the plumbing line, the valve squirts a little water into the drain. This is a great permanent solution, but often requires digging up concrete to get that pipe to the drain.

-- Add a dry valve to the floor trap. This is a little inexpensive gadget that will let water into the drain but will not let gas out, so it doesn't matter if there is water in the trap or not -- the best known of these is called Dranger. Follow this link for details on difficult floor traps.

### Vent Stack blockage

Although a bird's nest in the spring can cause trouble, the most common source is ice build up at the top of the stack, called Ice Capping, which literally closes the vent pipe with a block of ice. The ice cap can often be seen from the ground with the zoom on a camera or a pair of binoculars. The traditional solution is to climb up on the roof and pour boiling water down the pipe -- and then relax the rest of the winter with a broken leg from falling off the roof. There are two mechanisms that can cause this icing to happen, and they can occasionally work together.

Wet blowing snow with just the right temperature conditions, as is common in Winnipeg, can deposit the ice on the top.

Hot water running down the drain gives off steam, particularly with a hot shower. This steam finds its way up the plumbing vent and out the top of the house. If you have heavily insulated your attic and live in an extremely cold climate, the upper portion of that vent pipe is much colder than it was before you insulated -- and so the steam freezes to the top of the vent pipe before it escapes out the top.

### Pipe Sizes

The building code was modified to require that old 1-1/2 inch pipes used for plumbing stacks be increased to 3" when they go out through the roof. The larger pipe prevents ice from totally closing off the top in many parts of Canada but I am getting more and more reports that even this is not working. At one point CMHC responded to this "Northern problem", which I am discovering is more prevalent than we think even in areas like northern Ontario, with a great little free publication on the problem. Unfortunately the Harper years saw CMHC research and publications shut down and the documents disappeared. Essentially this document said, make the vent stack short and keep it as warm as possible -- and they gave a number of options.

There has been a lot of success by putting a 3" to 4" transition in the attic just before the roof -- then going out onto the roof with a 4" pipe. The larger pipe tends to frost over less.

### The Insulation Solutions

Occasional ice capping can be driven away by simply wrapping a good quantity of fiberglass insulation (R-20) around the pipe in the attic space right up to the underside of the roof to keep the steam hotter longer. This is now relatively standard for new construction in cold climates -- and should probably be the first and least expensive thing to try.

You could build an insulated box around the vent stack on the roof. Far easier is to use an insulated flashing -- special vent stack flashings that have a foam insulation liner -- like an insulated Stack Jack Flashing from Thaler Metal Industries.

A plumber in the cold American prairies took on the task of inventing an insulated termination for the plumbing stack. He started with the idea of a vacuum thermos as a total vacuum is one of the best

insulators we can have. But that proved to be very difficult and expensive to produce. So he tested out a double PVC pipe with a simple air space – as you can see in the photo. The combination of a dead air space, warm gas coming up from the house and black paint on the outside to absorb heat from the sun gives tested temperatures that are almost magic: from minus 28 deg C outdoors to 4 deg C inside the dead air space and 9 deg C in the vent stack. Woodring Plumbing seems to be getting great results in a prairie climate for only \$50 US. [FrostFreeSewerVent.com](http://FrostFreeSewerVent.com)

### Heated Solutions

For those difficult cases where insulation isn't sufficient, buy some thermostatically controlled electric heating cables designed for cold-water pipes. Be careful on how you use these cables, they can cause fires. They come in 1-metre lengths for the smallest sizes and are approved for application to metal pipe (no insulation can be added over the heating cable). If your vent pipe is metal, the top foot inside the attic could be wrapped with this cable and the rest with insulation. The electric cable will keep the end of the vent pipe warm when the air outside is below 3 degrees Celsius. If the vent pipe is plastic, you could replace the upper portion with metal or go outside and add a foot of metal pipe which could then be wrapped in cable. With a bit more wiring, a cable could be installed without a thermostat and activated by a switch only when ice capping occurred. (Get a switch that has an "on" light to remind you to turn it off.) Never put such a cable inside the vent stack. These cables are not made to be explosion proof and there is methane gas inside that pipe.

The absolute solution is an ArcticVent, a product out of Ontario but which has proven its worth in Alaska and the Yukon. This is a total replacement for the top of the plumbing stack. It starts inside the attic, is connected to electricity inside the attic so there is no problem of running wires, has an explosion proof cable to deal with the presence of methane gas in the sewer gasses. Being in the business, they have run into and dealt with one problem that no-one else has dealt with -- if you have a large block of ice in this pipe and suddenly heat it -- the ice block breaks free from the pipe and slams down to the basement, doing considerable damage when it lands. So they have a retention system to hold the block there as it melts slowly. It is expensive until they get to mass distribution but it is the one system that works in every environment all the time.

### Help from Minnesota

The blog below has provided a most interesting solution from Mark in winter cold Minnesota:

"I live in Minnesota and used to have periodic problems with a frozen vent stack until my friend suggested taking a 1/2" diameter piece of PVC pipe (in my case about 9' long, but as long as you can make it before you run into your first elbow) with a PVC tee glued to one end of the pipe with short pieces of PVC pipe glued in each end of the tee to prevent it from falling down the vent stack. Drop this assembly down the stack (the tee prevents it from falling out of sight) and that's it. The warm air coming up the small pipe from inside the house keeps the vent stack from freezing over."

Now there's a creative solution, although I imagine it only works if there is no elbow inside the cold attic, allowing your pipe to get down to the heat of the house. Thanks Mark.

### The Sewer Skewer

In 2018 I was informed that Larry Vilella from Minnesota turned this into a very interesting copper product – the Sewer Skewer -- in 2022 it is available at the Home Depot in both the US and Canada. It is made out of copper and works exactly the same except probably more effective because of the metal. It is a hollow pipe like Mark used but the interesting features are that there are exhaust holes in the wide cross piece on the top to let a little air flow, which can have the effect of bring heat to the top for defrosting.

Also the metal cross pipe sticks out beyond the ice cap, and hence receives heat from the sun -- which can also initiate the defrosting. So this has both the ability to bring heat from the stack below and profit from the sun when it is there, which gives you a good chance of eliminating the ice formed after a good storm. They also offer multiple drop pipes and length extensions to get deeper into the stack. If you look carefully, the rather expensive extension they sell could be made by you to any

custom length - it is made out of standard copper plumbing parts and just screws into the fitting on the bottom of the Skewer.

Overall - this looks like a great product at a reasonable price and easily available. If you are using this product, let us hear your experience in the blog below. If this doesn't work. then upgrade to the product below which passively increases the heat flow into the ice even when the stack is totally blocked.

### PASSIVE HEATING USING A REFRIGERANT GAS

September 2017 : Darrel wrote in (see blog below) saying that he installed a device from NoFrostVenting.com and that it worked great. So I contacted them, they sent me one and we talked a lot. This is simply a brilliant device. As you read above, Mark in Minnesota had the idea of using the warm air in the vent pipe to heat the very top of the stack using a PVC pipe and Sewer Skewer improved that using copper and reaching out to the sun. The No Frost Venting company out of Manitoba takes this passive heating a giant step further, but of course it costs more.

They have a closed loop copper pipe that extends down into the vent stack while the top of the device is a sealed tubular chamber which becomes a short extension to the plumbing stack. This closed loop system is filled with refrigerant gas. Refrigerant gas does its magic in refrigerators and heat pumps by changing from a liquid to a gas – and from a gas to a liquid – and in doing so it can efficiently move heat from one place to another. Usually that phase change is accomplished with a motorized compressor – but in the NoFrostVenting device it uses the extreme temperature differences between the top rim of the plumbing stack and the air down in the protected part of the stack to boil and condense the gas passively. The colder it gets, the better it works!

With this device, some of the cold from the blowing wind that usually causes frost to seal off the plumbing stack actually condenses the gas into a liquid, which falls down to where it is warm enough to actually turn it back into a gas so the gas rises back up to the top. Since the warm air is always rising in the stack, nothing freezes down inside the stack – but the upper rim is kept exceptionally and actively warm – hence no frost build-up to close off the plumbing stack. This is a system that is far less expensive than the electrically powered Artic Vent, and far more efficient than the Minnesota passive copper pipe. A 24” residential unit sells for \$295 and you simply pop it into your existing vent from the top. <https://www.nofrostventing.com/>

Help me to document the extent of this problem

In October of 2010 I added a blog to the bottom of this entry to provide a forum for people with this problem. I want to encourage anyone who has experienced these sewage odours in the winter to make a quick blog entry -- especially if it is associated with ice capping. If there are enough of you we might even get some building code support in building houses to avoid these problems in the first place. Local health departments tell me they get "some" complaints every year but I am sure that most people just don't know that this is something that is well known and has solutions.

If you try one of the above solutions, please let us all know where you live and how well it worked in your climate. The codes are not moving, but the solutions are evolving.

#### **Keywords:**

Codes, Foam, Frost, Basement, Freezing, Odours, Attic, Bathtub, Health, Ice, Insulation, Maintenance, Methane, Drains, Flashings, Pipes, Plumbing, Gas, Problems, Shower, Sink, Trap, Valves, Vent Stack, Steam, Roof, System, Smell, Ventilation