

Understanding the Radon Vent Pipe: A Key Component of Mitigation Systems

When I first started working in radon mitigation over a decade ago, I remember a homeowner in St. Louis asking me what the point of that white pipe sticking out of their basement slab was. It looked like something left over from a plumbing project, but I explained that it was the heart of their radon mitigation system. That pipe, properly called a radon vent pipe, is what pulls soil gas from beneath the foundation and sends it safely above the roofline. Without it, the whole system is just a hole in the floor.

Over the years, I have seen plenty of systems that were installed with good intentions but failed because the radon vent pipe was undersized, blocked, or not sealed properly. The pipe is not just a passive conduit. It has to be sized for the fan assembly, run continuously without traps, and exit above the roof in a location that prevents re-entry. The physics are simple, but the execution requires care. That is why I want to walk through what a radon vent pipe does, how it fits into a complete sub-slab depressurization system, and what homeowners should look for during a radon test or post-mitigation verification.



How a Radon Vent Pipe Works in a Sub-Slab Depressurization System

The most common type of radon mitigation system for homes with a basement slab is sub-slab depressurization. The idea is to create a low-pressure zone beneath the concrete floor so that soil gas, which contains radon, is drawn toward a suction pit or sump instead of seeping through cracks and joints into the living space. That gas then travels up through a PVC pipe, the [radon vent pipe](#), and is expelled outside. The fan assembly, usually installed in the attic or outside the living envelope, provides the suction.

A properly installed radon vent pipe has a few critical features. First, it must be at least three or four inches in diameter for most residential jobs. Smaller pipes create too much friction for the fan to pull effectively. Second, every joint should be solvent-welded and airtight. I have seen systems where a loose coupling or a crack in the pipe let the fan pull indoor air instead of soil gas, completely defeating the purpose. Third, the pipe must have a continuous upward slope with no dips where condensation could collect and block the flow. In cold climates, insulating the pipe may also be necessary to prevent frost from forming inside the riser.

Where the Pipe Goes: From Sump to Roofline

The radon vent pipe typically starts at a suction pit cut into the basement slab or, in homes with a crawl space, in a sealed sump beneath the vapor barrier. The pipe then runs up through the wall, sometimes inside a chase or along an exterior wall, and exits above the roofline. The termination point matters. If the exhaust is too close to windows, doors, or eaves, radon can be pulled back into the house by the stack effect. The EPA recommends that the vent pipe terminate at least ten feet above grade and at least two feet above any roof surface within ten feet.

Pipe flashing is used where the radon vent pipe penetrates the roof. This flashing must be watertight and compatible with the roofing material. I have seen cases where a roofer cut corners and just caulked around the pipe, which led to leaks and water damage. A proper flashing kit, installed by someone who understands both roofing and mitigation, is a small investment that prevents big problems.

Monitoring the System: The Manometer and Vacuum Gauge

Once the system is running, how do you know the radon vent pipe is actually moving air? That is where the manometer comes in. This simple U-tube gauge, filled with colored fluid, shows the pressure difference between the pipe and the basement air. When the fan is on, the fluid levels should be different, typically an inch or more apart. If the levels are equal, the pipe is blocked, the fan has failed, or there is a leak somewhere.

A vacuum gauge mounted near the fan assembly gives a more direct reading of the suction being pulled. I have seen systems where a homeowner noticed the manometer reading drop over time, which turned out to be a small animal nest in the radon vent pipe. Clearing it restored the vacuum and the radon levels dropped back to safe. A post-mitigation verification should always include a manometer reading and a radon detector placed in the lowest livable area for at least 48 hours. Without that step, you are just guessing.

Dampers and Balancing: Fine-Tuning the Flow

In some homes, especially those with multiple suction points or a large foundation footprint, a damper may be installed in the radon vent pipe. The damper allows the technician to adjust the air flow to each suction pit. Think of it like a valve for the vacuum. If one part of the slab has high permeability and another has clay soil, balancing the dampers helps pull evenly from both areas. Too much suction in one spot can short-circuit the system and leave other areas untreated.

I have worked with Air Sense Environmental on a few jobs in St. Louis where the soil composition varied widely across the same foundation. In one house, the front half was on gravel and the back half was on dense clay. Without a damper, the fan would pull most of its air from the gravel side, and the clay side would still show high radon readings. Adding a damper to the gravel-side suction pit forced the fan to pull from the clay side, and the system balanced out. That kind of adjustment requires real-time measurement with a digital manometer and a good understanding of air flow dynamics.



Common Mistakes and How to Avoid Them

Over the years, I have seen the same handful of problems crop up again and again with radon vent pipes. Here are the most common ones, along with what to do about them:

- **Undersized pipe.** A two-inch radon vent pipe may work for a very small slab, but most homes need three or four inches. Using a smaller pipe increases friction and reduces the effective reach of the fan.
- **Too many bends.** Every 90-degree elbow adds resistance. Keep the pipe run as straight as possible, and use two 45-degree bends instead of one 90-degree where you must turn.
- **No condensation drain.** In cold climates, moisture in the soil gas can freeze inside the pipe. A small drain tee at the lowest point, with a trap, allows water to escape without breaking the vacuum.
- **Poorly sealed joints.** Solvent-weld every joint, and use PVC primer and cement rated for pressure applications. A leak at a joint can let radon re-enter the basement.
- **Exhaust too low.** The EPA recommends a minimum of ten feet above grade. I have seen pipes terminating right at the eaves, which can lead to re-entrainment of radon through attic vents.

Post-Mitigation Verification: The Final Check

After the radon vent pipe is installed and the fan assembly is running, the job is not finished until a post-mitigation verification is done. This involves placing a radon detector in the lowest livable area of the home, usually the basement, and running it for at least 48 hours. The test should be conducted during normal occupancy conditions, with the home in closed-house mode as much as possible. If the result is below the EPA action level of 4 picocuries per liter, the system is working.

But verification is not just about the final number. It includes a visual inspection of the entire radon mitigation system. The manometer should show a steady reading. The radon vent pipe should be free of cracks, the flashing at the roof should be intact, and the fan assembly should be running quietly. I also check the suction pit or sump to make sure it has not filled with water, which can block the flow. A simple test is to place a piece of plastic sheeting over a basement floor crack and see if it holds against the suction. If it lifts, the system is pulling from that area.

Why Professional Installation Matters

I have seen homeowners try to install their own radon vent pipe after watching a YouTube video. Sometimes they get lucky, but more often they end up with a system that does not reduce radon levels enough. The problem is that you cannot see soil gas, and you cannot measure radon without a test. A professional who understands soil dynamics, fan curves, and

building science will size the pipe, choose the right fan, and seal every connection. Companies like Air Sense Environmental in St. Louis have the experience to handle tricky installations, such as those with crawl spaces, sump pits, or multiple suction points under an existing slab.

One job that sticks with me was a house built over a limestone shelf. The radon vent pipe had to be routed through a crawl space that was only eighteen inches high. The solution was to dig a shallow sump beneath the vapor barrier, install a short section of PVC pipe, and run the riser up through an exterior wall. The fan was mounted on the outside of the house to keep noise out of the living space. After post-mitigation verification, radon levels dropped from 12 pCi/L to under 2 pCi/L. That kind of result comes from understanding the building and the geology, not just following a diagram.

Final Thoughts on a Simple but Critical Component

The radon vent pipe may look like just a piece of plumbing, but it is the backbone of any sub-slab depressurization system. When installed correctly, with the right diameter, sealed joints, proper routing, and a working fan, it quietly pulls radon from beneath the foundation day after day. When it fails, radon levels can spike without warning. Regular checks of the manometer and a radon test every few years will catch problems early. If you are considering a radon mitigation system for your home in St. Louis or anywhere else, pay attention to the radon vent pipe. It is the one component that connects the soil under your house to the sky above, and it deserves the same care as the fan and the test that confirms the system is working.