## Types of Radon Mitigation Systems

The most effective way of mitigating radon gas is to perform “Active Soil Depressurization”. This includes a fan unit which continuously vents radon gas from the ground under a home to the exterior. This is a permanent solution, requiring that the fan run non-stop for the life of the home. The construction of your home will dictate the design required. Most homes have either a slab, a crawlspace, or a mixture of both. Slab foundations tend to be less expensive to mitigate, as they don’t require a radon barrier to be installed over the earth surface. Often a home with both types will require both systems. Whenever possible it is best to have one fan unit even if multiple suction locations are required.

**Sub-Slab Depressurization System (Slab Construction)**

You need to locate a suitable location to create your suction pit. If possible, it should be toward the center of the slab you want to depressurize. Often a garage slab is not suitable, as it is often a separate lower elevation slab then the living space. If the home has multiple slabs under living space, the system could require multiple suction pits. Often you are limited to a location where a 3” or 4” pipe can be inconspicuously routed to the outside.

The suction pit typically consists of a 6” hole through the slab foundation. In floor hydronic heating and reinforcement rod can present possible obstacles. The hole should be kept 12” away from foundation walls, as there typically are footings that extend out from load bearing foundation walls. The 6” hole allows enough space to remove soil, between 5-10 gallons. This increases the soil surface area and will considerably enhance system effectiveness. A 6” reducer is sealed to the floor and converts the diameter down to 3” or 4” schedule 80 PVC. Systems run with 3” pipe will be less expensive, though will create more noise and can limit effectiveness of the system.

**Sub-membrane depressurization systems (crawlspace construction)**

When a home is constructed with a perimeter foundation that creates an underfloor crawlspace, a membrane should be installed. This can consist of plastic that is no less than 12 mill thickness, or a laminated radon approved barrier down to 6 mill thickness. Prior to installing the barrier, it is wise to run a collection matt or perforated drainage pipe to increase the suction area of the system. Then a t-fitting can be purchased to connect to the collection system. This provides a seal gasket for the barrier that will be installed above collection system.

The barrier can be pre-cut to length, leaving extra material on each end to go up foundation walls. The barrier should overlap itself at seams, and be sealed to perimeter foundation, interior footings, and itself, with an approved sealant/adhesive. There are specialty products designed for this, or you can utilize rain gutter sealant, or butyl caulking. Most of our systems utilize barrier termination strips and a ramset anchoring system to provide a durable connection to foundations. This additional cost can provide significantly increased durability compared to sealant/adhesive alone.

**Exterior fan installation**

In most cases, it is less costly to run the radon plumbing on the exterior of the home. The plumbing would penetrate to the exterior, keeping in mind that exterior plumbing should avoid areas where snow shedding is likely. It is preferable to use the gable end of the home where snow is less likely to shed off the roof. One can either provide line voltage (120 volts/20 amp) to the exterior of the home with an approved weatherproof conduit. For easier installation, often you can use a low voltage fan. This

includes a transformer that can be plugged into an existing outlet inside the home/crawlspace and utilized a low voltage wire that runs directly to the fan.

The fan should be installed in a location above typical snow levels in winter. The plumbing should be adequately secured to the home, and fan should be protected by a housing if it is in high risk areas. Providing moisture protection to the fan is essential for longevity. Exterior fan installations can use a device called a hydrosep that allows condensation and precipitation to exit the line without any air leakage. The exhaust should be above any operable windows and home vents. There are specific requirements for vent termination as it exhausts air with very high levels of radon. A manometer should be installed on the line in a visible location to indicate possible issues with the system.

**Interior fan installation**

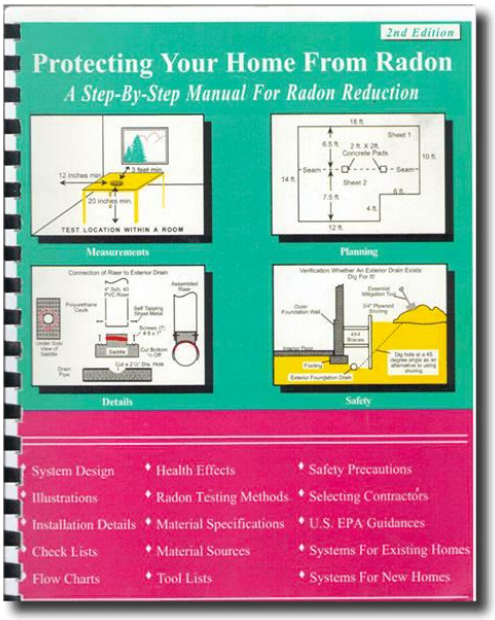
Due to the cost of roof penetrations, this is often not a cost effective solution. Plumbing can be run to either an attic, a garage, or an attached shed where the fan can be located. Often power will need to be run to this area, or one can utilize a low voltage fan. Fans should never be installed in interior closets, living space, or any other area where leakage could impact indoor levels. Moisture protection should be provided with a diverter hose that has collection above the fan and discharge back into the line below the fan. All roof penetrations should utilize a suitable roof jack and on sloped roofs, a snow diverter unless installed within the top 3’ of the peak of the roof.

**Crawlspace Ventilation**

Less effective than installing a barrier, this is the process where a fan unit continuously pulls air from a crawlspace. Instead of installing a barrier and pulling air from under that, this system would simply take the air out of the crawlspace and create negative pressure in that environment. It requires covering all outside vents throughout the crawlspace. Often air will also be pulled from the living space through electrical and plumbing holes in the subfloor. This can lead to significant heat loss if the floor system is not sealed with foam. There can be no gas heating devices requiring make up air in the crawlspace area being depressurized. This system should only be installed if the crawlspace is inaccessible and is often less effective than barrier systems.

**Radon in Water (from a private well)**

Radon can also enter a home through it’s water system. When water is in use, especially during showering, radon enters through the water and can get released into the air. Public water is at low risk for radon impacting the water supply. Often this water is stored in tanks or open bodies where the water is exposed to the air for an extended period of time. However private water supplies that pull water from radon laden areas of the ground can have significantly high levels. Aeration is the process where the water is exposed to air that is then vented through a radon discharge pipe. There are also filters available that remove radon from water. By removing radon from the water, filters will gain radioactivity and can present a possible exposure risk.




https://www.astm.org/Standards/E1465.htm

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