Radon mitigation with after-market draintile

How to install draintile without compromising your radon mitigation system
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The radon system Active Soil Depressurization is the preferred method for mitigating radon. It involves connecting a 3" pipe to your drain tile system (a "suction point"), routing the pipe to above the roof, and putting a small fan on the pipe. The fan pulls air from the draintile, and the draintile acts like an underground perforated duct, spreading the vacuum created by the fan around the entire perimeter of your basement. From the perimeter, the vacuum then spreads all the way to the center of the basement floor. The goal is to be able to puff smoke by a crack anywhere in the basement floor (with the fan running) and watch the smoke get pulled down through the crack. (With the fan off, the smoke will blow up out of the crack.) So, when the fan is running, radon no longer enters the home through the cracks and openings in the floor. If the draintile system has "leaks" that allow too much house air to be drawn into the draintile, the fan may not have enough suction left to get the vacuum to spread to the center of the slab. If this happens, it could be difficult or impractical to mitigate your radon. Here are two examples of draintile with these problematic leaks.

Draintile technique #1 (With drainage mat)

The black drainage mat creates an air gap, and the radon fan will pull house air through the gap. This does not meet the Minnesota building code and could not be done in a new home.

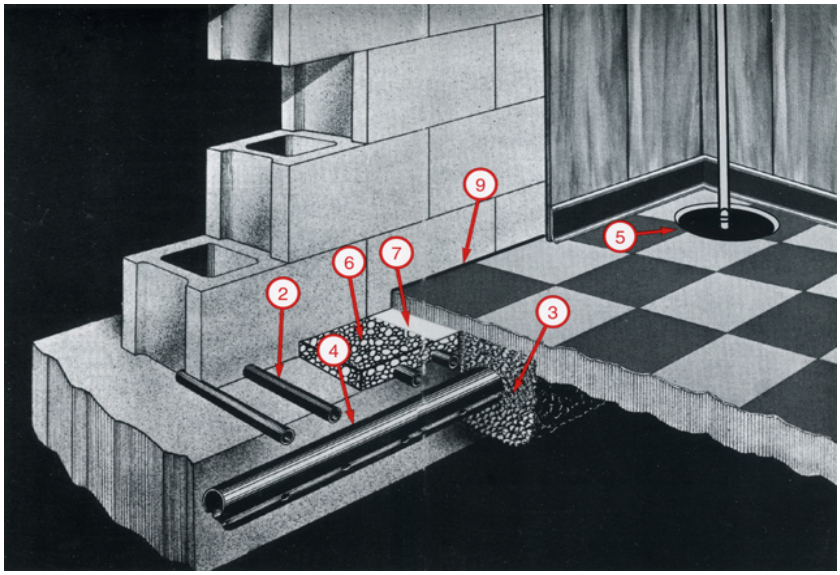
With poured walls: This technique ***may*** cause reduced effectiveness of the radon mitigation system, loss of conditioned house air and possibly the need for multiple radon suction points and a high volume radon fan (noisy and expensive to operate). Caulking the top of the mat will fix the problem.

With concrete block walls: This technique ***will*** cause reduced effectiveness of the radon mitigation system, loss of conditioned house air and possibly the need for multiple radon suction points and a high volume radon fan (noisy and expensive to operate). Sealing the top of the drainage mat does not fix the problem, as lots of house air will still be pulled from the blocks. The average radon level after mitigation will be 1.2 pCi/L, compared to 0.6 pCi/L for homes without drainage mat.

A better option: Eliminate the drainage mat. With block walls, use weep tubes instead. With poured *and* block walls, pour the floor tight to the footing and to the wall.

An optional option: To provide a capillary break and prevent wicking problems, a product like Ice and Water Shield could be applied to the bottom several feet of the wall. On a poured wall, it would start at the footing. On a block wall, it would start at the top of the weep tubes.

Draintile technique #2 (With rock on the footing and a gap where the floor meets the wall)



The rock on top of the footing (6) creates a ***significant*** air gap, and the radon fan will pull a ***significant*** amount of house air through the gap. Sealing the gap where the floor and wall meet (9) does not fix the problem, as lots of air will still be pulled from the blocks. This technique does not meet the Minnesota building code and could not be done in a new home.

This technique ***will significantly*** reduce the effectiveness of the radon mitigation system because the radon fan will be exhausting a lot of house air and not enough underground air. To overcome this and create a vacuum under the entire basement floor, the radon contractor will often install multiple radon suction points (in both finished and unfinished rooms), multiple radon fans and high volume radon fans (noisy and expensive to operate). Studies also show that this technique increases basement humidity in the summer (The air you paid to air condition and dehumidify is exhausted from the basement and is replaced with hot humid air from outside.) Because of these challenges and unpleasant consequences, many radon contractors will not attempt to fix homes with this type of draintile.

A better option
Eliminate the rock on the footing and pour the floor tight to the footing and to the wall.

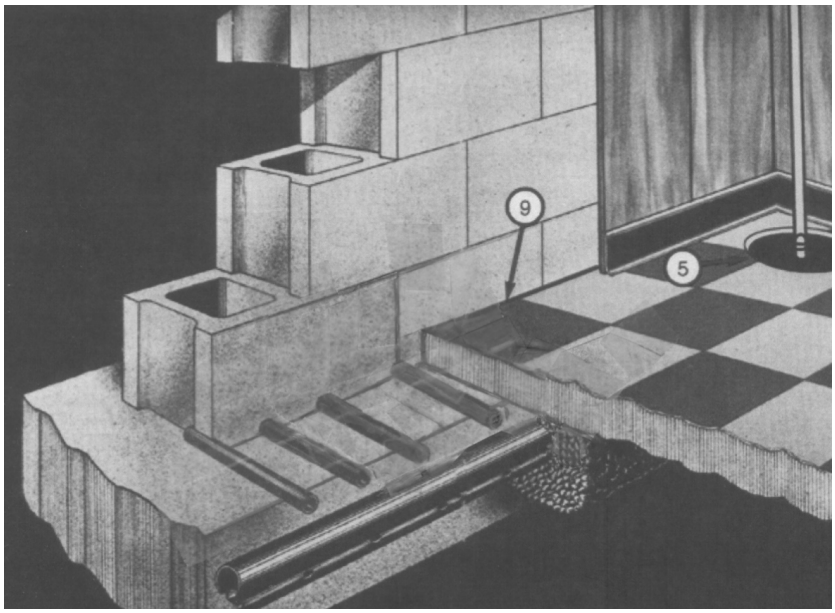
An optional option
To provide a capillary break and prevent wicking problems, a product like Ice and Water Shield could be applied to the bottom several feet of the wall. It should start at the top of the weep tubes.

What does the Minnesota building code say? When remodeling, your inspector may not make you meet the code for new homes. But there is a reason for the code, and it would be wise to comply with it. Here are two sections relevant to draintile:

International Residential Code R404.1, sub heading 1 says *"Full basement floor shall be 3.5 inches thick concrete slab poured tight against the bottom of the foundation wall."* This means no rock on the footing and no plastic fitting or air gap between the floor and the foundation wall.

Minnesota's amended IRC Appendix F, AF103.4.2 (the radon code) says ***"Concrete joints.*** *All joints ... between slabs and foundation walls shall be sealed with a caulk or sealant. Gaps and joints shall be cleared of loose material and filled with polyurethane caulk or other elastomeric sealant ...."* This means no plastic fitting or air gap between the floor and the foundation wall (9).

Draintile technique # 3: Conducive to radon mitigation (Weep tubes, no rock on the footing and no gap where the floor meets the wall. Meets Minnesota building code.)



The radon fan will pull a small amount of house air through the weep tubes, but it is insignificant. Since 1988, we have never had a problem making a mitigation system work when this technique was used.

An option
To provide a capillary break and prevent wicking problems, a product like Ice and Water Shield could be applied to the bottom several feet of the wall. It should start at the top of the weep tubes.