

Radon Reduction with Tight Construction

The U.S. Surgeon General has warned that radon is the second leading cause of lung cancer in the United States. It is estimated that 1 in 15 homes in the U.S. experience elevated radon problems. The U.S. Environmental Protection Agency and the Surgeon General recommend that all homes be tested for radon. They also recommend reducing elevated levels through isolation and sub-slab depressurization if necessary.

Where Radon comes from

Radon is a radioactive isotope that occurs naturally in soil and rock. It is created through the natural decay of uranium in soil, rock and ground water. As a gas, radon moves up through the ground to the atmosphere via fractures and fissures in rock and porous soils. Radon gets into buildings through seams, cracks and penetrations in foundation floors and walls. Not all areas are equally prone to radon; the U.S. EPA publishes maps on those regions that have the highest concentrations.

With conventional construction methods, stack and wind effects cause significant air leakage producing negative pressures at lower levels in buildings (see design note titled: Healthy Indoor Air Quality & Ventilation). Negative pressures in basements and crawl spaces allow soil gasses including radon into buildings below grade. Once inside, radon moves freely up through the building into the living spaces, affecting the occupants within.

The EPA recommends solving this health hazard by installing a gravel layer below a sealed basement floor or slab that is directly vented through the roof of the building. Radon accumulating in the gravel layer is passively vented directly to the atmosphere with a stack that runs up through the roof. In those regions where radon concentrations are very high, an attic-mounted fan may be required.

This approach is sound in theory, but it requires an airtight structure. When considering the air-sealing capabilities of The Icynene Insulation System[®], a cost-effective approach to radon control can now be taken with the shell of the building itself.

The solution: Build Tight and Ventilate Right

Since radon infiltrates buildings due to negative pressure differences caused by air-leakage, it follows that a tightly constructed, positively pressurized building is far less likely to draw radon gas from the soil around it. Ventilation requires a tight structure in which to operate properly. This is where The Icynene Insulation System[®] comes in. In areas of particularly high radon concentrations, passive sub-slab depressurization consisting of vent pipe as previously described may be all the further control that is needed. It should only be in extreme cases that fan forced sub-slab depressurization system is required.

Radon Reduction with Tight Construction... the Easy Way!

Many builders go to considerable extra costs for material and labor to reduce air leakage in new structures. This is most commonly done to reduce heating and cooling costs and to improve comfort levels. It has been known for some time that tight construction reduces energy consumption but buildings are complicated, and air tightness is difficult to achieve with conventional materials.

Unlike other types of insulation, The Icynene Insulation System[®] is multi-functional, providing excellent insulating value and superior air sealing. The Icynene Insulation System[®] eliminates the need for an air/wind barrier (housewrap and associated taping). And where a vapor barrier is deemed necessary, a coating of vapor diffusion retarder primer on the inside surface is sufficient. This approach has been used on homes that,



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for energy efficiency program requirements, must test below 1.5 ACH @50 Pa (air-changes/hour at -50 Pascals pressure) with a blower door air-leakage test. Some of these homes have actually tested below 1.0 ACH @50 Pa. With tight construction and positive pressure ventilation, buildings are not affected to the same degree by wind or stack effects as those without these systems. Thus extreme lower level negative pressures (which draw radon in) will not be experienced.

Existing Buildings with Elevated Radon Levels

Where living space exists over an unconditioned crawlspace or basement, an isolation technique can be employed using The Icynene Insulation System®. When applied to the floor and joists from below, Icynene® effectively isolates the living area from the radon source. The unconditioned area can then be ventilated to the atmosphere using wall vents or a passive vent pipe up through the building. In cold climates, care must be taken to prevent plumbing from freezing below insulated floors.

