EnkaTech *Note*

Colbond Building Products — Radon Control

Radon Control

In the early 1980's, Colbond (formerly Akzo Industrial Systems) began researching the use of composite geomatrix mattings for radon control in residential and other structures. Since that time, numerous structures in the United States had been mitigated using either Enkavent or Enkadrain matting. Approximately half of the installations are new construction applications — the rest being retrofit. The mitigation designs developed using geomatrix materials are categorized as three types: Subslab Grid, Crawlspace Overlay and Subsurface Wall Encapsulation.

Design Theory

Several different pressure-related forces cause radon gas to enter a structure. These are hydrostatic pressure and source accumulation — which are external to the structure and negative pressure (suction) developed within the structure. Enkavent and Enkadrain are designed to neutralize these forces, while providing a preferable and manageable alternate pathway for soil gas and moisture flow.

Any increase in hydrostatic pressure or source accumulation (strength), will contribute to radon being forced into an occupied space. Hydrostatic pressure is a phenomenon often associated with rain events. As soil becomes saturated, the available soil air gaps are filled — causing radon and other soil gases to seek a void-rich dry area (usually beneath the slab). Furthermore, the creation of radon gas is an ongoing process since it is a product of radioactive decay. Therefore the gas will cause increasing pressure to develop over time, similar to that exerted inside a balloon as it is inflated. Both additional hydrostatic pressure and radon source accumulation will create significant increases in external positive gas pressure, which in turn causes radon to be "pushed" into a structure.

Inside the structure, certain events cause a negative pressure (suction) to occur that "pulls" the radon into the building or residence. Events causing radon suction include turning on a clothes dryer or lighting the fireplace. Both will use indoor room air if no external sources have been provided. Radon-laden soil gas will then enter the structure to replace the consumed source air. Outdoor winds can also cause in-house suction to occur. In all cases, the radon should be intercepted before it enters the structure.

Enkavent and Enkadrain geomatrix mattings have provided a zone of radon interception and channelling in a wide variety of installations.

Subslab Grid

The Enkavent matting has been specifically developed for subslab mitigation — primarily in new structure construction. The matting is placed, with the filter fabric side down, along the perimeter of the subslab at the footing and wall joint. Also, a strip is unrolled down through the center adjoining the perimeter box. Expansion joint stripping, vapor barrier and riser pipe are placed, as specified, before the slab is poured.

The primary design for an Enkavent matting grid is based on a 1500 square foot slab and would be applicable for up to a 2000 square foot slab. However, special consideration will be necessary for larger slab areas. The center Enkavent strip(s) should be no more than 15 feet apart from each other or the perimeter strips running the same direction. Furthermore, a capped stub riser pipe is recommended for each 2000 square feet of slab area. For example, a 6000 square feet slab installation should provide three outlet pipe access points — preferably remote from one another for the greatest effectiveness.

Once the stubbed system is in place, a structure is said to be "radon control ready." The system can be accessed at any future date for radon mitigation purposes. If in the future radon levels become excessive, the owner of the structure has a two-step option: (1) Attach a pipe to the riser and through to the roof — line for passive ventilation and (2), if necessary, place an in-line fan for active suction of the subslab.

Colbond Inc.
PO Box 1057
Enka, NC 28728
Telephone 800-365-7391
Fax 828-665-5009

Crawlspace Overlay

Crawlspace mitigation is equally applicable for new and retrofit construction. Often times, the only structure mitigation effort necessary will be that of sealing off the underlying crawlspace soil and venting the emanating soil gases. In order to maintain an adequate airflow beneath the sealed vapor barrier (and to protect it), a flexible Enkadrain matting venting layer is necessary. Enkadrain allows the system to vent either in a passive or fan-driven mode.

In crawlspaces with irregular and intricate surfaces, Enkadrain has proven most useful as a means to ensure airflow beneath a liner. In traffic areas like a wine cellar in a crawlspace, Enkadrain has provided sufficient cushioning for the liner while ensuring airflow beneath the liner. In Pennsylvania, Enkadrain is installed for crawlspace mitigation on a routine basis.

Subsurface Wall Encapsulation

Enkadrain has provided a blanket of moisture drainage media around the subsurface walls of commercial and residential structures. In such a design, Enkadrain provides a neutralizing zone that intercepts the hydrostatic pressure field inherent to soils surrounding a building. Before moisture is allowed to migrate into the structure, it is diverted to a sump or away from the site.

The same interception and diversion process influences soil gases — which are also driven into a structure by the build-up of hydrostatic pressure. It is well known, for example, that significant increases in radon levels will occur during and after a rain event. The primary force driving radon into the structure is hydrostatic pressure. Furthermore, one of the most dominant radon infiltration points in a structure is the basement slab and wall joint. The reason is that the most convenient relief point for hydrostatic pressure build-up is in the zone around the footing. Enkadrain intercepts and neutralizes this zone of hydrostatic influence.

In some radon reduction situations, the mitigator will find that placing a suction on the exterior perimeter footer drain is helpful for reducing indoor radon levels. Enkadrain will increase the effectiveness of an exterior perimeter suction system. Both products create a much greater zone of influence for the system by allowing free passage of soil gas to the pipe — while maintaining a pressure buffer around the structure envelope. Exterior passive designs utilizing Enkadrain and pipe configurations are also feasible.

Q & A

Why is Enkavent matting hinged 2 inches from the edge?
Radon seeps through walls and around slabs so one of the dominant radon infiltration zones is along the slab/wall joint over the footer. Enkavent is hinged so that when placed at the footer/ wall joint, radon can be pulled from a cinderblock wall as well as the subslab. Hinging provides two additional benefits including, good quality control of installation and wall moisture drainage.

What is the maximum distance apart that Enkavent strips should be placed?
The general rule for Enkavent is 15 feet. The conservative effective draw zone for an Enkavent strip (18” wide) is 7.5 feet from center on either side. Therefore, we recommend that a strip be placed at least every 15 feet.

How many riser pipe outlets do I need? What size pipe?
The general rule is one riser pipe per 2000 square feet of slab area. The risers should be placed as far apart as possible. Four inch (wide) pipe is preferable, even though a two inch pipe has been sufficient in most cases. We have had good experience with 4” flanged toilet pipe fixtures.

Does Enkavent replace gravel?
Enkavent does not replace gravel, but it does alleviate the need for perforated pipe and any additional gravel. Gravel for beneath slabs (for example, #57 stone, washed) is necessary for four reasons: (1) it levels the bed for the slab (2) it provides a zone for drainage and shifting (3) it creates a good structural foundation for the slab and (4) it provides a zone to bury pipes, etc. Gravel does not, though, provide a uniform, predictable air venting zone because it is randomly placed and the thickness of the gravel layer will vary considerably across the site. Due to the leveling value of gravel, the layer may taper to even less than an inch in an area of the subslab. An Enkavent system provides uniform predictable performance, yet will cost approximately 20% less than gravel and perforated pipe in most cases.

Colbond Inc.
PO Box 1057
Enka, NC 28728
Telephone 800-365-7391
Fax 828-665-5009

Q & A

Should the builder connect a pipe to the Enkavent system and run it to the roof before the house is finished?
Many builders will choose to go ahead and run the pipe(s) to the roof. Others will leave it as an additional cost item for the homebuyer or building owner. In either case, the Enkavent system is available for present or future access as needed. Many owners will choose to defer “finishing” their radon mitigation system.

Where would a fan be adapted? What is a good type of fan?
A fan should be installed inline either outside the house or in the attic. Never install a radon mitigation suction fan in the basement or living area. The Kanalflakt family of centrifugal inline fans (R-Series) has proven appropriate for radon mitigation efforts. Further information on Kanalflakt fans can be obtained from FanTech in Sarasota, Florida, at (813) 351-2947. Other sources of radon mitigation fans are Radon Detection Systems and The RDS Remediator at (201) 788-3080, and Sunn Corporation and the In-Line Turbo Fan at (412) 828-9100.

What is an appropriate vapor barrier for the Enkavent system?
The Enkavent system has been designed in consideration of the common building practices of local builders. Enkavent, therefore, does not require the use of any exceptional vapor barrrier lining. In most cases, a builder will lay down a polyethylene sheet 4-8 mils thick. The flow-through capacity of Enkavent has been tested with as thin as a 4 mil poly barrier. The most important feature of vapor barriers is that they should not be punctured. It is important to limit foot traffic over the vapor barrier before the slab is poured. For specialty applications, a Tu-Tuf vapor barrier would be appropriate — (815) 675-2358.

How should the Enkavent system be tested for effectiveness?
The ultimate test of the Enkavent system will be when it is accessed and the in-house radon levels decline. Enkavent provides a flat radon plumbing system so testing the flow and suction capacity of the “lines” would be appropriate. To test the airflow through the Enkavent, simply attach a suction fan to the stub-up riser pipe and go to a remote corner of the slab. Light a smoke stick or cigar near the slab to see if the smoke is visibly suctioned down beneath. Not only will you be able to evaluate the communication effectiveness of the Enkavent system, but you will also be able to isolate areas where slab or wall caulking may be necessary.

When should Enkadrain be used in radon mitigation instead of Enkavent?
Enkavent matting has been specifically developed for *subslab* radon applications. The 18” width and the hinge make Enkavent ideal for new construction subslab radon applications.

Enkadrain also has an extensive history in radon mitigation. Enkadrain has been installed in thousands of structures for *crawlspace* mitigation. In an EPA test, Enkadrain 9120 was found to help reduce radon levels by up to 97%. In crawlspaces, Enkadrain is installed as a blanket overlain by a vapor barrier and accessed by a vent pipe.

The value of Enkadrain on *subsurface walls* has also been recognized. The matting is proven to help prevent wet basements (and all the consequential health concerns of mold, bacteria, etc.). As the Enkadrain cavity allows moisture flow away from a building, it creates a zone of “radon relief” by interrupting radon flow and allowing it to exit as well.

Colbond Inc.
PO Box 1057
Enka, NC 28728
Telephone 800-365-7391
Fax 828-665-5009