Slab-Edge Insulation Completes the Line of Defense Against Heat and Energy Loss in Homes and Buildings

By Mark DaSilva

Inspired by current federal tax incentives for energy conservation, today's home and building owners have a heightened interest in making their structures more energy efficient. As a result, there is a growing demand for greater amounts of insulation in both new construction and retrofit projects. Typically, this insulation is installed where the need for it is more obvious, such as wall cavities and attics. There is one additional area of the home or building, however, that is often overlooked as a source of thermal energy loss—the concrete slab foundation edge.

An uninsulated slab edge can cause significant heat loss from an otherwise tightly sealed building envelope. Installing insulation along the perimeter of a slab obstructs the path of outward heat flow, improving thermal resistance and energy efficiency. Insulating the slab edge is most critical, as the majority of heat lost from uninsulated slabs happens on and above grade.

According to the U.S. Department of Energy (DOE),[1] in most parts of the nation, insulating the exterior edge of the slab can reduce heating bills by 10% to 20%. In addition to improving energy efficiency, an insulated slab heats to room temperature more quickly than an uninsulated slab and maintains this temperature longer. This causes a significant improvement to occupant comfort, as cold floors are a common wintertime complaint.

Figure 1 – The patent-pending EnergyEdge® slab insulation system, distributed by CertainTeed, consists of PVC rails, snap-on braces, and expanded polystyrene (EPS) insulation. These components are used to form a perimeter for the construction of the slab and remain in place after the concrete is poured, saving the step of stripping and cleaning forms. In rough foundation installations, EnergyEdge® rails can be used as the concrete form with a kicker (as in the adjacent photo) or as a form liner.

Figure 2 – EnergyEdge® remains in place as part of the foundation, leaving a finished and insulated slab edge with an R-10 thermal resistance value, meeting International Energy Conservation Code (IECC) requirements.

SLAB INSULATION SPECIFICS

Traditional forming procedures create an exposed slab and foundation. The common practice of placing below-grade insulation behind the foundation and under the slab does little to isolate the concrete from the exterior. Because of the complexities existing at this critical juncture of materials and environmental conditions, detailing of a functional slab-edge insulation solution has been difficult. With no consistent answer available, design, construction, and code enforcement professionals have defaulted to acceptance of substandard details yielding minimal performance.

The preferred and most effective location for slab-edge insulation is the exterior face of the slab. This allows the slab-edge insulation to align effectively with the wall insulation and create a consistent thermal barrier to prevent heat loss. A unique, new slab-edge insulation product option on the market is the EnergyEdge® insulating concrete footing form system, which consists of PVC rails, snap-on braces, and expanded polystyrene (EPS board) with a thermal resistance of R-10. The braces clip into the bottom and top of each 12-ft rail and anchor the rails into the concrete slab. The forms can be for various foundation types, such as mono pour, rough foundation, preleveled foundation, crawl spaces, and basements. If exterior support is needed during the pour, various techniques can be used. Once installed, the weather-resistant PVC rails can be left visible above grade or can be concealed by backfilling along the base of the slab. With its components, the system provides a stay-in-place foundation footing for —eliminating the need to strip and clean traditional wood forms—and insect-resistant rigid foam insulation that meets energy codes. EnergyEdge® provides the transition from the wall system above to below-grade insulation at the foundation, completing the envelope and saving energy.

Another important factor influencing insulation of the slab edge is the recommended foundation R-value for the climate where the structure is located and the depth at which insulation is to be installed.

SELECTING PROPER R-VALUE FOR SLAB INSULATION

The International Energy Conservation Code (IECC) recommends slab-edge insulation for all homes and buildings in U.S. climate zones 4 and above. The IECC has set guidelines for R-value and minimum distance of insulation from the top of the slab downward, based on the locality's heating degree days (HDD). The HDD is an index based on daily temperature observations and the energy needed to heat or cool a given structure at a specific location. *Table 1* provides visual representation of the IECC's guidelines. As the table demonstrates, if a structure falls within the 0 to 2,499 HDD range, it will not require slab insulation. On the other end of the spectrum, however, if a building is in the 12,400 to 14,000 HDD range (or high-

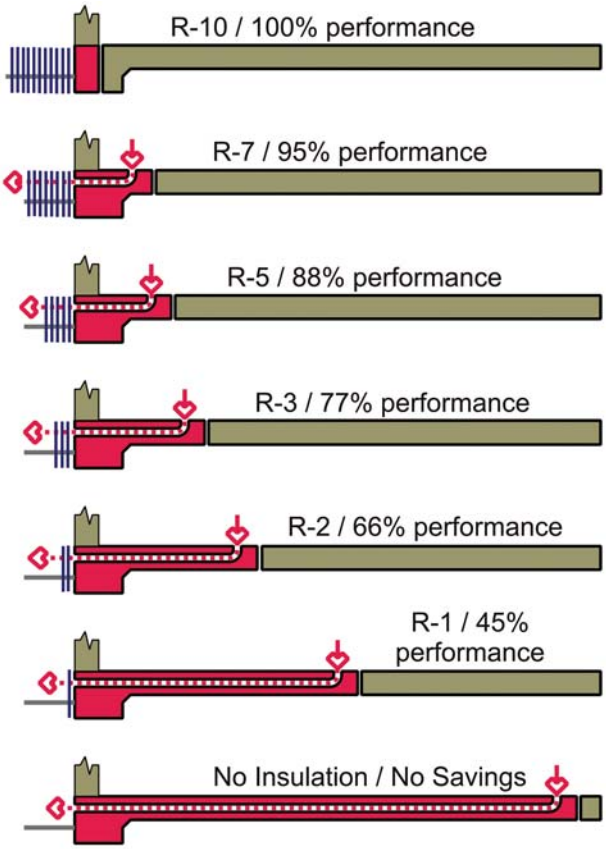
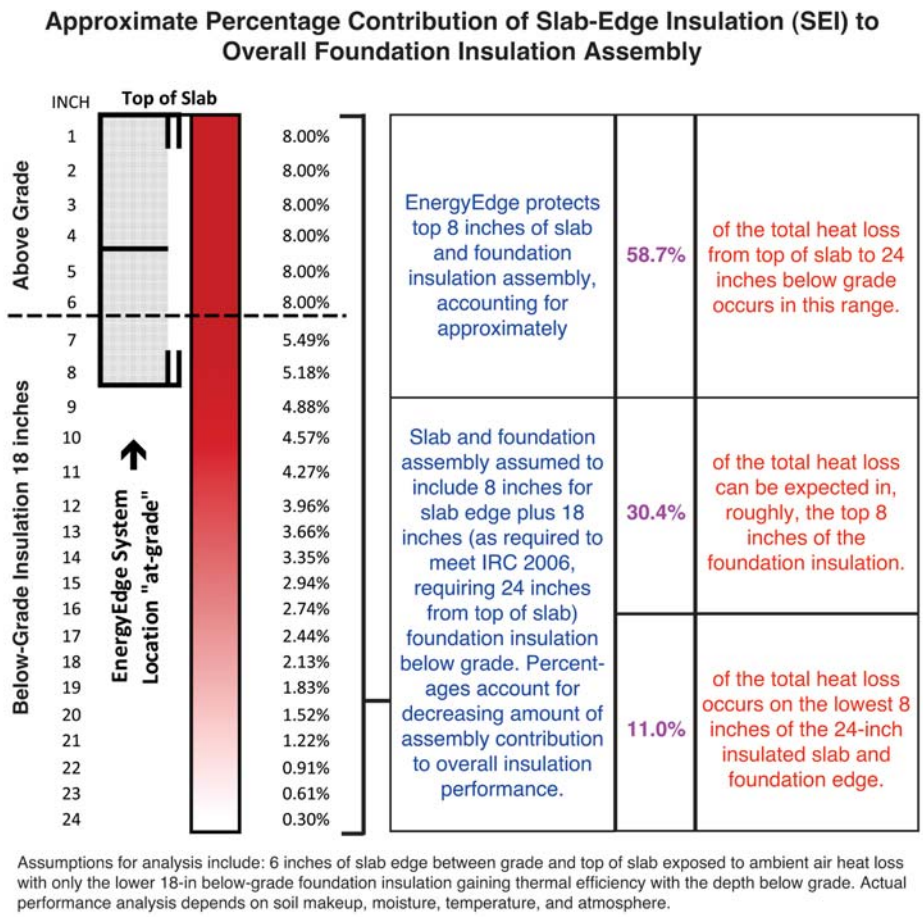


Figure 3 – This graph demonstrates how homeowners can increase energy efficiency and how utility savings increase incrementally along with the thermal resistance value of the foundation slab edge. The more insulated the slab edge, the more utility savings the building owner can expect. Note, IECC requires R-10 slab-edge insulation in climate zones 4 and above.



Assumptions for analysis include: 6 inches of slab edge between grade and top of slab exposed to ambient air heat loss with only the lower 18-in below-grade foundation insulation gaining thermal efficiency with the depth below grade. Actual performance analysis depends on soil makeup, moisture, temperature, and atmosphere.

Figure 4 – This chart shows the importance of slab-edge insulation and how it contributes to the collective energy efficiency of the building envelope.

er), it will need slab insulation with an R-value of R-10.

Typically, colder climates will have the highest number of HDDs. Contractors can determine the project area's specific number of HDDs by contacting the local weather bureau.

CONCLUSION

The proper amount and strategic placement of insulation play major roles in achieving maximum energy efficiency from a structure. No area that presents potential for energy loss should go uninsulated. By educating clients about the energy-efficiency benefits of slab-edge insulation, building and design professionals are doing them a good service. Properly installing the appropriate slab-edge insulation assembly completes the line of defense against thermal energy loss and provides customers with a more energy-efficient structure.

Table 1. Recommended R-Values and Depth for Slab Insulation

Heating Degree Days	Feet Installed	R-Value
0 to 2,499	none required	none required
2,499 to 4,500	2 feet	R-4
4,500 to 6,000	4 feet	R-5
6,000 to 7,200	4 feet	R-6
7,200 to 8,700	4 feet	R-7
8,700 to 10,000	4 feet	R-8
10,000 to 12,400	4 feet	R-9
12,400 to 14,000	4 feet	R-10

REFERENCES

1 U.S. Department of Energy, Office of Building Technology, State and Community Programs for Energy Efficiency and Renewable Energy. "Technology Fact Sheet: Slab Insulation." http://apps1.eere.energy.gov/buildings/publications/pdfs/building_america/29237.pdf

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