PIMA Technical Bulletin #106

Design Considerations

Polyiso Nailbase Insulation and Asphalt Roof Shingles

About Polyiso Insulation

Polyiso is a rigid foam insulation used in more than 70% of commercial roof construction and offers a continuous insulation solution for commercial and residential wall assemblies. As one of North America's most widely used and readily available building products, Polyiso is a cost-effective insulation option for reducing building energy use and improving the overall service-life of roofs and walls.

The benefits of using Polyiso include:

- High R-value per inch of thickness
- Excellent fire test performance
- Extensive building code approvals
- Cost-effective continuous insulation (ci) solution
- Compatible with most roof and wall systems
- Dimensional stability
- Compressive strength
- Moisture resistance
- Thinner walls and roofs with shorter fasteners
- Long service life
- Preferred insurance ratings
- Virtually no global warming potential
- Zero ozone depletion potential
- Recyclable through reuse
- Recycled content (amount varies by product)
- Regional materials (nationwide production network)
- QualityMark^{CM} certified LTTR-values

POLYISO

Surround yourself with the best.

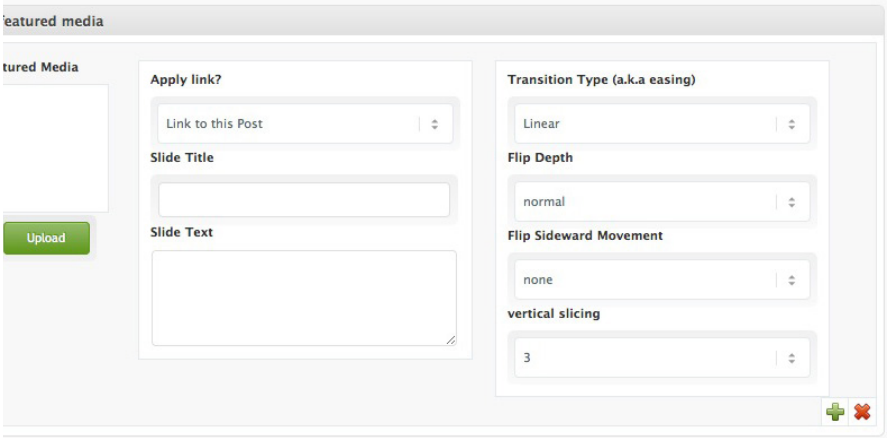
Polyiso roof insulation is used in approximately 60% of all new roof construction and close to 40% of re-roofing applications. While commercial and industrial low-slope roof systems account for much of this market dominance, the use of polyiso for steep-slope roof decks has grown significantly and is now one of the preferred insulation product.

The same attributes that make polyiso the product of choice for low-slope roof systems also make polyiso nailbase insulation an attractive choice for designers of commercial, industrial, and residential steep-slope roof systems. Polyiso insulation has:

- Excellent fire test performance
- Dimensional stability
- Compressive strength
- Moisture resistance
- Building code approvals
- Excellent R-value and thermal performance

What is Polyiso Nailbase Insulation?

Nailbase insulation is polyiso foam insulation bonded to APA (APA – The Engineered Wood Association) or TECO (Timber Engineering Company) rated oriented strand board (OSB) or plywood to provide above-deck roof insulation with a nailable surface. This surface enables the nailbase board to receive various steep-slope roofing products, such as clay and cement tiles, slate, metal roofing (standing seam and shingles). In addition, nailbase insulation is available with a ventilating airspace for use with asphalt shingles. Polyiso nailbase insulation offers designers, contractors, and building owners a simple solution to incorporating energy efficiency into contemporary designs, including cathedral ceilings, log homes, and steep-slope steel deck construction.slope steel deck construction.



Asphalt Shingles Applied to Nailbase Insulation

In the United States, asphalt shingles claim the largest steep-slope market share and their use over polyiso nailbase insulation is quite common. Asphalt-based shingles are manufactured in a variety of designs and colors, providing a versatile, economical, and attractive roof covering. However, their use with nailbase insulation requires special attention by designers and contractors to ensure the desired performance.

Ventilation

In North America, adequate attic ventilation is code required.

In the summer it can reduce temperatures in the attic and moderate roof surfaces. It can also transport moisture out of the attic before condensation occurs, thereby reducing the possibility of structural damage. In addition, ventilation reduces the likelihood of ice dams by maintaining a "cold roof."

The model building codes generally prescribe a ratio of 1 sq. ft. of net free intake and exhaust for each 300 sq. ft. of attic area when a warm-side vapor retarder is present in the ceiling or when at least 50% of the ventilating area is provided high on the roof, usually at the ridge.

Some polyiso nailbase products provide a ventilating airspace directly under the nailing panel, reducing temperature buildup of the panel and roof cover and dissipating small amounts of moisture when present. This ventilating airspace can also maintain a cold roof, thereby inhibiting the formation of ice dams. The dimension of the air space can be varied to increase the net free ventilating area as may be required by slope or distance from eave to ridge vents. Ventilating polyiso nailbase insulation meets or exceeds code ventilation requirements and may be required by shingle manufacturers for warranty purposes.

Shingle Buckling

Shingle buckling is a term used to describe the raised wrinkling or ridging of asphalt-based shingles along the outline of plywood or wood deck panels. It affects the appearance of the installed roof and can reduce the life of the shingle, which may crack along the stressed buckled area, as well as affect the wind resistance and drainage plane of the roof. Buckling is most commonly visible in lightweight, glass-mat asphalt shingle installations.

Buckling can be caused by wood panel movement or vapor absorption/condensation on the underside of the felt underlayment. In either case, the cause is moisture related.

If the wood panels that are used as the shingle substrate are drier than ambient conditions when delivered and installed, they will tend to absorb moisture after the shingle installation. They then swell or expand, causing changes in the position of the felt and shingle. Therefore, the wood panels should be allowed to reach moisture equilibrium with the job site environment prior to installation. In addition, they must be kept dry after installation by applying the underlayment and shingles as soon as possible. Adequate ventilation is also essential to prevent the wood panels from absorbing moisture that enters the attic or ventilating air space from the interior.

Vapor and Air Leakage Control

More common with insulated deck assemblies, interior moisture-laden air passes through joints in the deck and insulation until it reaches the underside of the underlayment, which is often No. 15 asphaltsaturated organic felt. Although the felt is considered asphalt-saturated, it is only partially saturated and can absorb both liquid water and water vapor, since its components include wood fiber and recycled paper. When the felt absorbs either liquid water or vapor, it swells and lifts toward the shingle, causing buckling along the joints of the nailbase insulation. The appearance of the buckle is therefore unrelated to the polyiso nailbase product.

The movement of vapor into the roof assembly is caused by vapor diffusion from areas of high to low vapor pressure and by air leakage that carries moisture directly into the assembly. This diffusion and

air leakage can be controlled by the use of a sealed, continuous vapor/air retarder placed on the deck prior to the installation of the nailbase insulation. The need for and placement of air/vapor retarders can vary based on climate and project design. Effective vapor/air retarders have a maximum perm rating of 0.5 and are often 4-6 mil polyethylene sheeting, kraft/foil laminates, or other proprietary products. Saturated felt underlayments are not considered effective vapor retarders and cannot serve as an air retarder unless laps are sealed.

Recommendations

PIMA members provide nailbase insulation products that have been used successfully for many years, providing a cost-effective and energy-efficient solution for designs that call for above-deck insulation in steep-slope assemblies. Like all building products, however, proper installation and design is essential:

- Nailbase insulation products should be installed according to manufacturers' recommendations.
- Wood panel materials should be allowed to reach moisture equilibrium with the jobsite environment, and should be kept dry before, during, and after installation.
- All wood panels should be installed with a minimum 1/8 in. gap between them to allow for expansion.
- Designers are responsible for determining the need for and location of a vapor/air retarder in abovedeck insulated roof assemblies.
- As required by many asphalt shingle manufacturers, a ventilating nailbase insulation should be used with asphalt shingles to reduce roof temperature, which may prolong the useful life of the shingle.

PIMA

For more than 30 years, PIMA (Polyisocyanurate Insulation Manufacturers Association) has served as the unified voice of the rigid polyiso industry proactively advocating for safe, cost-effective, sustainable and energy-efficient construction. PIMA's membership includes manufacturers of polyiso insulation and suppliers to the industry. The products of PIMA's members comprise the majority of the polyiso produced in North America.

PIMA produces technical bulletins to address frequently asked questions about polyiso insulation. These publications update and inform architects, specifiers, and contractors about and build consensus on the performance characteristics of polyiso insulation. Individual companies can provide specific information about their respective polyiso products.

For more information on polyisocyanurate insulation, visit www.polyiso.org

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