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When it comes to insulation—applied and installed properly—can be an integral measure in creating an effective and efficient envelope.

In fact, Hodgson says it’s crucial to evaluate the whole-wall package of the assembly, since the insulation is often one part of creating a tight, well-insulated envelope. For example, he claims DOE research shows that a 4-in. structural insulation panel (SIP) will rate at R-14, but performs as a 2 x 6 stud wall with R-12 fibreglass insulation.

"It comes down to significantly less air leakage, thermal bridging and convective looping for a better performing assembly," says Hodgson.

Unfortunately, insulation is too often treated as an afterthought, as Hodgson says it needs to get the right R-value around the structural systems instead of being an integral part of them, making it difficult to achieve R-20+ with SIPs. He notes, address this by incorporating both in one assembly.
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NEW VS. LATER

Longevity is another consideration when it comes to R-values. "It's common for building professionals to look at R-value per inch at the time of installation," says Ram Maihvanathan, product marketing manager with Insulfoam. "Yet, it makes more sense to evaluate insulations long-term thermal performance and the return on investment."

His company manufactures RB Composite EPS Insulation, which contains expanded polystyrene (EPS) foam in a high-density polyethylene board, a combination that has high thermal efficiency and provides significant fire-rated buildings. Plus, Maihvanathan says it can be used to achieve UL Class A fire ratings on combustible roof decks without the use of gypsum or other cover boards.

"Many rigid foam insulations experience thermal drift, which is a loss of R-value over time as insulating gases within them dissipate and are replaced by air. Maihvanathan continues, "Some materials lose up to 25% of their insulating capacity during their time in service."

On the other hand, EPS insulation, he explains, not only resists a high initial moisture but it also doesn't lose R-value with time. And, it can be used in wall, roof, below-grade and under-slab applications.

THE ULTIMATE GAUGE

R-value adds, there are other factors to consider. Commercial occupants spend an average of eight hours 8/25 in the building, making them the ultimate gauge for the performance and comfort of the structure," says Lincoln Krajewski, PhD, global director of the Building Science Group for Owens Corning. "From pipes leaking and standing the ceiling tiles to indoor temperature fluctuations, occupants are the first to feel the effects if the commercial building environment has performance issues.

Of course, moisture management remains another key metric for building performance, notes Krajewski. "Add non-permeable membranes to address water and vapor diffusion control and construction professionals are making a critical component of comfort. His company addresses the issue with its COMOsame AirXplore, a key component of the company's Commercial-Complexe Wall Systems. Furthermore, Krajewski says the product possesses high thermal and moisture strength and maintains a high R-value throughout the life of the building. The system, he explains, is water-resistant because it is manufactured in a continuous extrusion process. This process produces a homogeneous "extruded" matrix with cellulose and polyurethane binders. Because the heterogeneous cross section, very little water is absorbed into the cell structure. This also means it will not lose its R-value as easily as other types of foam board.

NO PENALTY FOR PANELS

Of course, part of creating a tight envelope is ensuring that all components work well together. "Every building envelope component has individual thermal performance capabilities, but it is the integration of the products that builds the real performance," says Masser, CEM, energy services manager with Kingspan Insulation.

"Designers sizing for energy efficiency should not neglect the component interaction with each other, since the performance of one can greatly affect the performance of another—leading to less than expected overall performance."

The problem: Masser says, nongap installation of insulation in data-bus systems, often caused by thermal effects in the insulation itself, insulated metal panels, bar grates, provide a lousy built-in, single-component assembly alternative. Kingspan's system, the Benchmark Building Insulated Wall Panel, is a single insulated panel system that can-
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**RIGID ROOF**
Non-combustible insulation system is complete without considering the roof. While part of the envelope, roof has many requirements, and can also provide a simple but effective strategy to improving energy efficiency of the building. According to Jim Lambert, a building and construction expert with Bow Material Solutions, insulation can easily be added without significant changes to existing envelope. Considering that it requires replacement on average every 20 years, low-slope roofing provides one of the most cost-effective means for increasing the energy efficiency of existing buildings.

Remember that low-slope roofing, which Lambert explains, is typically an insulating solution for deep vapor/air assemblies where it creates a pathway for vaporization directly to the metal deck. It offers the best possible resistance per inch (one thickness resistance range from 3 to 4 times the equivalent resistance). Polycarbonate, combined with closed-cell spray urethane foam (SIP), such as the company’s Kirby-CSC or OCP foam, can be used for continuous insulation of exterior walls as well. The board is attached to the building structure with galvanized nails or screws, and adhesive bases are then taped to provide a continuous sealed plane. The board can be cut to fit around existing trusses and other penetrations, then taped or caulked to seal. If SIP is used as the insulation material, it expands in place to help reduce the likelihood of infiltration and achieve a well-insulated building material.

Another advantage of a double-wall system, says John, building science specialist with Atlas Wall OBD (formerly Taylor Atlas/Wall OBD), is its ability to use less permanent fit-up in the field—thereby preventing costly mistakes on the bar. The product comprises an insulation, a barrier, vapor barrier, or radiant barrier depending on insulation and building needs.

"In the past, we have been able to accommodate the pressure on materials and other factors, but now we need to ensure that we are using the most efficient materials for the job," says John. In order to achieve this, certain types of insulations can be better suited for certain applications.

**LIGHTEN THE LOAD**
Despite the consideration when it comes to insulating a building envelope, it is possible to achieve it. But the market is dominated by engineers and the installation is often perceived as an insulating barrier on the envelope, a barrier, vapor barrier, or radiant barrier.

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