Introduction
Welcome to Building Genius, a podcast from Icynene. Icynene offers a complete portfolio of innovative, high-performance spray foam insulation solutions, which are sold in more than 30 countries around the world.

In this podcast series, we speak to building science experts, and share ideas and advancements in the building industry. We also touch on some interesting projects where spray foam insulation has been used to help address design issues – and other topics of interest to architects and design professionals. We'll be looking at topics like moisture management, the benefits of continuous insulation, and much more. All from a *practical* point of view to help architects, design professionals and builders realize their project's true potential. We hope you enjoy listening.

The benefits of closed-cell spray foam in continuous insulation applications.
Do you want to get a better understanding about continuous insulation applications? Do you want to understand the various options available for this application, the comparison of traditionally used rigid XPS foam board to a modern alternative such as spray foam, air barrier qualities, cost factors and more?

In this episode of the Building Genius podcast, our guest John Broniek talks about why closed-cell spray foam in a continuous insulation application is often the better, and more cost-effective, option. John is senior engineer with Icynene. He has been involved in improving the energy efficiency and durability of buildings throughout North America since 1990.

Interviewer: John, for those who are unfamiliar, what is continuous insulation?

John: Continuous insulation is a layer of insulation that is basically applied to an interior or exterior surface and it's uninterrupted, so it's, as the name says, continuous. It's a layer that is not interrupted by, say, major construction elements, like studs or other parts of the wall system, for instance.

Interviewer: What makes it a better insulation option in commercial design compared to, say, standard interior insulation that is insulating cavities within a wall assembly?

John: Continuous insulation creates a complete, uninterrupted layer of insulation versus a cavity wall system where you have stud work, which is a high conductor of heat loss or heat gain and has very poor insulation properties. A cavity wall system composed of, let's say, steel studs has very poor insulating elements with the studs and then very high insulating elements of insulation. With continuing insulation, you don't have the poor insulating elements with the studs coming into play. It's a continuous layer of insulation with no energy-draining elements like studs involved.

Interviewer: Right. What are some of the more common options for continuous insulation used by architectural firms?

John: I think the first consideration for architectural firms with doing designs is whether the continuous insulation is going to go on the inside of the envelope or the exterior

or outside of the envelope. Putting the continuous insulation on the exterior is preferred because you're keeping the structural element of the wall within that blanket, so it will be either warmer in the winter time or cooler in the summer time. That's going to result in a better performing wall system in terms of energy efficiency and occupants will be a lot more happier with more even temperatures in that wall system.

There are different products that can be used for continuous insulation. Closed-cell medium-density spray foam can be used as exterior continuous insulation or interior continuous insulation, and foam board products, whether we're talking about extruded polystyrene or polyiso products can be used in that regard, as well.

Interviewer: Why is that materials like XPS rigid foam that you mentioned, rigid foam board, why has that become the default?

John: I think XPS rigid foam board is more familiar to architects and probably building owners and general contractors, as well, because it's been out there for a longer period of time. All intents and purposes, I think it can perform well, but it does take a lot of either labor-intensive sealing and taping at the joints or an entirely different membrane system to give it the elements of the air barrier and the water-resistive barrier, as well. People are very familiar with it, but it does have its limitations.

Interviewer: How does factor in? Wouldn't using materials like XPS in many people's minds be less expensive than something like spray foam?

John: I think you need to consider the system cost because the XPS board system is more than just the XPS board. You're going to need to do something with the board joints, either seal them, tape them, or use a membrane either underneath the board, which will go directly against, say, the exterior sheeting or exterior block work or put a membrane, like a house wrap over top of the XPS board in order to give it the air barrier and water-resistive barrier elements, as well. Once you factor in the addition of those membranes or sealing of joints or taping of joints on the rigid board cost and compare that to the spray foam, which gives the air barrier, the water-resistive barrier, and the insulation layer all in one, then you usually find out that the closed-cell foam system comes out to be a lot more cost favorable.

Interviewer: It really does sound like cost is an advantage in that scenario. Can you talk about the other advantages that stem from using closed-cell spray foam in this way?

John: Closed-cell foam, because it is applied in a continuous, uninterrupted layer, can conform to building shapes a lot more easily, particularly curved shapes or non-rectangular shapes, so that gives architects, building owners a lot more freedom. They also can have a higher R-value per inch than particularly extruded polystyrene rigid boards. That means that actually less of the spray foam could be needed on the exterior in order to achieve the R-value that you're trying to get in terms of continuous insulation.

The other aspect is because it's sprayed on, it conforms well to any kind of penetrations in the wall assembly, whether we're talking about plumbing or

electrical penetrations, but also common ones in the exterior walls, like attachments and brick ties, for instance, that the foam can easily fit around and create a nice, tight seal and a tight layer of insulation against, so you get full performance in terms of insulation and air barrier around the penetrations.

Because of the greater R-value per inch offered by medium-density spray foam, you could use less of it to achieve the R-values you need and, therefore, that can result in width savings in terms of the wall and possibly result in greater square footage within the building.

Interviewer: I understand that closed-cell spray foam provides an air barrier. We've talked about that, but what about moisture and vapor ingress? How does a product like this address these issues?

John: There are many closed-cell spray foams that have gone through testing as a moisture barrier or a water-resistive barrier or a weather barrier. There's different terms out there. Basically, what that means is that bulk water, water that gets to the spray foam will basically drain down it, and then at the bottom of the wall, that water will need a route for escape, so spray foam does really well in that aspect.

It can also act as a vapor barrier or a vapor retarder, certain thicknesses, usually inch, inch and a half thickness, and so that can help to keep water vapor out of the wall assembly, which is pretty important, particularly in southern locations where there's a lot of moisture, humidity in the air, and that moisture tends to move from the outside towards the inside, so keeping that out of the building envelope and the building itself is important for comfort and energy efficiency.

Interviewer: Icynene has a growing portfolio of closed-cell spray foam solutions. How did these products complement this type of application?

John: Icynene has products that have a very high R-value. The ProSeal product has an R-value of 7.1 per inch. That's very high. That can result in some thickness savings in terms of the wall while still maintaining the R-value requirements that are needed to be achieved. There are other products that we have in our line. ProSeal Eco has a more standard R-value, about 5 per inch, but it is a water-based spray foam, which means that it has less environmental impact because its global warming potential is very low. There's different options in terms of R-value and environmental impact that allows the architects to make a choice in terms of what is the most important aspect that they're trying to achieve.

Interviewer: Does this application also apply to commercial construction in Canada? I'm wondering if there are product differences and perhaps regional concerns, such as building codes or differences that Canadian architects need to think about.

John: Yes. Exterior continuous insulation is definitely possible in Canada. It makes a whole lot of sense to have that layer of insulation in Canada because of the cold winters that are experienced up there. Very popular technique. Icynene has products that meet that requirement. We have a type 2 insulation ProSeal. It has the higher R-value that meets that requirement quite effectively. In Canada, the CCMC, Canadian

Construction Material Centre, allows for air barrier systems to be recognized. Icynene has one of their products recognized as an air barrier system. That's ProSeal. It's gone through an element of testing as a wall system that includes not only the ProSeal continuous insulation spray foam system, but also membranes to make sure that connections are tight over the long term to different penetrations.

Architects can find out which air barrier systems are out there and approved by CCMC to give them better confidence that what they're specifying is a tested and approved and qualified system. That is something that Canadian architects can rely on.

Interviewer: While we're on the subject of Canadian differences, let's discuss weather. People in Canada love to talk about weather, right? How does closed-cell spray foam perform in cold weather? Are there limitations during cold snaps in the winter?

John: No. The nice thing about closed-cell spray foam is that it has that high R-value and so it can keep a building quite warm during the winter time and I guess more appropriately the occupants warm. It performs very well in cold winter because it has that higher R-value per inch. The more that you spray of it or use of it and therefore the higher R-value means the less chances of any heat loss that is going to occur in that building during particular cold snaps. The more the better, and that applies to all insulation products in terms of insulation to a certain point, of course, to handle really extreme cold weather.

Interviewer: One last question for you, John. How are building code changes affecting the way commercial buildings are designed and do architects across North America need to be more aware of how their designs affect the performance of the building?

John: I think we're seeing a lot more exterior continuous insulation requirements in building codes in, let's say, the southern U.S. where they typically use cavity wall insulation. The recognition is that exterior continuous insulation makes sense in those climates, as well, because you're keeping buildings and occupants cooler for the majority of the season, and you're not worried about heat gain through elements, like metal studs, so continuous insulation makes sense for all climate zones because you're going to have that layer of insulation and that air barrier and the water-resistive barrier so you can have a more durable building, more comfortable occupants, and it should result in better indoor air quality, as well, because you're keeping outdoor pollutants out of the building with the air barrier aspect of continuous exterior insulation.

Interviewer: Thank you, John.

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