Subject: Building Enclosure News #13
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Hi all, Richard here ...

As I know you're interested in Building Envelope issues, I'm sending you my "monthly" newsletter. As always, I'd be glad to discuss your concerns and comments on these issues.

News of the Month

Do not forget to register for Build Boston at www.buildboston.com/register.asp There are plenty of workshops on the building enclosure, many of which are sponsored by the Building Enclosure Council. And of course attendees receive AIA HSW credits for those workshops.

Tip of the Month

The subject this month is precast concrete panels as the single weather barrier. I am drawing largely from an online discussion of the Building Enclosure Council (BEC) Chairs along with my experience.

Large precast concrete panels can be an efficient way to enclose a building. They provide an especially durable enclosure and, with appropriate detailing and finishing (such as as-cast, bush-hammering, exposed aggregate or a combination), can be aesthetically pleasing.

Large precast panels are usually designed to act essentially as a barrier wall because of the difficulty and expense of trying to construct a drainage cavity and weather-resistive barrier clad wall behind the precast. When using this approach, getting connections back to the primary building structure with the backup wall in place is problematic at best.

However, there are issues with how to use the precast panels and effectively provide weather and thermal protection.

First, weather protection.

The joints should be sealed with a two-stage rainscreen joint which is wide enough to allow access to the inner stage (3/4″ is adequate) and also to accommodate thermal and building movements. The inner seal is the air and water barrier. The outer seal is weeped/vented to drain water and ventilate the cavity. The vertical inner seal is periodically brought out to the face seal where there is a baffled weep/vent.

A gunned standard joint sealer may be preferable to the use of a preformed expanding moisture-curing urethane preformed joint sealant for the inner sealant. One BEC chair reported that he did a precast job in 1990 with a preformed, expanding back seal back seal and a wet front seal. Before installing the front wet seal they did a water test of the back seal and the water went right through it. They substituted a double wet seal on that job because of the poor performance of the preformed expanding seal.

On the other hand, being so reliant upon a sealant application that is not observable makes him uncomfortable. The location of the deeply recessed non-weeped layer of sealant backer/liquid sealant makes it difficult to properly tool for adequate adhesion. Perhaps the best solution is to use the preformed expanding foam sealant as a backer for the inner sealant joint, a sort of belt-and-suspenders approach. The preformed joint sealant can be installed as individual precast units are set, providing a weathertight enclosure. The liquid sealant application can then be completed when ambient conditions are acceptable.

Another chair notes that he likes the preformed expanding foam, but it is expensive and the contractors complain. For the double line of sealant, he specifies that the interior line of sealant be completed, inspected, and tested before the outer line goes in. This also ensures that the inner line gets a good chance to cure. If the inner and outer lines get installed on the same day he has heard that the inner line might have trouble curing, though he has no first hand knowledge of this. Without a doubt this is a very difficult quality requirement to enforce. I would suggest that the joint (or an area of panels) also be tested for air leakage at the same time, while the inner seal is still accessible for repair. The frequency of testing should be adjusted, depending on the success (or lack thereof) of the tests.

A final concern about the preformed expanding foam sealant is that it (and the backer rods that would be used as the alternative backer for the sealant) are very difficult to install in joints that have a large variation in width.

The horizontal joints are particularly tricky with large precast panels. The precaster will not want to do it, but the joint needs to be sloped at least 1:12 to be sure there is no standing water against the inner bead of sealant. Otherwise, the inner bead (the critical air and water barrier bead) will be deteriorated by standing water. The outer bead will have to have weeps/vents if the panels are very wide (over five feet or so). These weeps/vents should have a baffle behind them to prevent direct water ingress to the inner seal, in case there may be imperfections.

Finally, consider the periodic application of a siloxane sealer to prevent water intrusion through hairline cracks in the panels that may be present or may develop.

Second, thermal protection.

It has been the practice of some to use glass or mineral fiber insulation with a foil vapor retarder secured by stick clips. The problem with insulating precast panels with fibrous insulation in northern climates like New England is those pesky convection currents that deposit tons of moisture, often through breaks in the fragile foil vapor retarder. As a result, minimum 90% closed-cell medium density spray polyurethane foam (1.7 - 2.0 pcf) is currently the insulation of choice. The condensation problem is gone if the insulation is over two or three inches thick. This is true for most space uses, but for high humidity occupancies a liquid vapor retarder may be required. The foam is terminated at the edge of the panels by L or J-shaped galvanized or plastic beads which also provide a surface for the membrane transition strips to adhere.

But there are still issues, which are 1) separation of foam plastics from the building interior; 2) flame spread rating and 3) whether or not the exterior wall is a fire-resistance rated assembly. The first two are discussed below.

The ICC pretty clearly addresses the issue by requiring that the foam be separated from the interior by 1/2 inch gypsum board or other material (extending full height from slab to slab) that has a 15 minute thermal rating (in paragraph 2603.4 Thermal barrier). Also, from my reading of product literature most of the medium density foams have flame spread less than 25 and smoke developed less than 450. The best thermal barrier is a spray fireproofing, such as W. R. Grace's Monokote Z-3306 (verify with foam manufacturer). The reason that this is preferred is that fire cannot propagate between the foam and the thermal barrier, although gypsum board or other materials allowed by the Code are legal. If a liquid vapor retarder is deemed necessary, the spray fireproofing thermal barrier may not be possible.

Another chair writes that they found extruded polystyrene to have a huge amount of embodied energy compared to the semi-rigid mineral wool products. When you put those two together the mineral wool appears to be a more "green" product. They assume the spray polyurethane foam likewise requires more energy; maybe some of the soy-based foams are better. Of course if it doesn't save energy because of those pesky convection currents then it's not really so green anymore.

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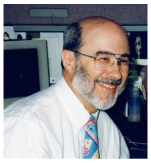
Richard



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