

CASE in POINT

a CUFCA case history of polyurethane foam insulation / air barrier systems

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New construction concepts, especially existing materials used in new applications, often face criticism, doubt and tough questions, long after they have achieved all necessary government approvals.

Site-applied polyurethane foam, for example, has been used as a combination air barrier sealant and insulation material for over thirty years. In some circles, it still seems to face criticism for lack of a performance history. To assess the comments of its critics, it's worth taking a look at the 32-year-old Toronto high-rise apartment building where this application was first used.

Alex Benedek Architect started practice in 1965 in Toronto. Leaside Towers was one of his early major projects, a building that at that time was owned at the time by London Life and Goldlist Construction. It was also the test building for the innova-

tive concept of sprayed-in-place polyurethane foam, an application which had to have a special test approval from CMHC.

"Our concrete cast in place system was very fast," says the still-practising architect. We were pouring two floors a week. Leaside Towers was to be the tallest (43 storey) residential structure in Toronto at that time. Our on-site precasting of the exterior envelope was timed to follow closely the erection of the structure. We needed a way to make the structure waterproof as soon as the windows were in place."

Benedek was looking for ways of sealing and insulating the envelope. There were a number of problems with the existing insulation methods. Expanded polystyrene board would have been a typical insulation application for concrete struc-

tures like Leaside Towers, but the architect was aware of some cases where the beadboard had delaminated. The adhesion and the board's structural integrity, he says, was some-

times subjected to moisture freeze/thaw damage.

"Many of these walls ended up with a fair amount of moisture migrating into them under pressure. When you get up to the upper floors you have a considerable outward pressure caused by the stack effect.

"We were looking for a kind of insulation that would solve that problem. There were several issues: one was the rapid deterioration of interior finishes which are very difficult to fix, the other being the deterioration of the exterior walls which are even more expensive to maintain. "Something was needed to create

**Sprayed polyurethane
foam defies critics with
30-year installed
performance**



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continuity in the wall system itself. When you applied weather-resistant board you had to attach it with some kind of glue and press it in with a mechanical fastener or some sort of a channel system to hold it in place. Both leave an air space behind. Plus, we were looking for ways of sealing the building from the inside at the precast joints."

Applied in place urethane was Benedek's answer. It hadn't been done before. The foam, as he recalls, was shipped from Allied Chemical in Chicago. "We told them what we needed and they said they had a product that would not be sensitive to the application temperatures. They were willing to test core samples. The density we had to achieve was 2 pounds per cubic foot. We kept to this pretty well, even though we were pouring it at 0 degrees and sometimes even close to -5 degrees. We also, of course, had to test for adhesion.

He had to create horizontal and vertical fire breaks at each suite. These were made of concrete with a light-weight foamed glass aggregate to make an insulated one-hour rated fire stop.

Another problem he had to look after was that the formulae of poured-in-place urethane that were available at that time would expand up to 7 percent. Benedek solved the problem by pouring with spacers. He created a panel in front of a column using two pieces of plywood wrapped in polyethylene. As the foam hardened the plywood was removed and the polyethylene left in place. "We ended up with a one-inch space which gave us separation between the exterior envelope and the structure," he says.

This was before drywall became common practice in Ontario, so there were solid two-inch plaster partitions between rooms. The finishes on the walls were constructed with applied in place plaster on pencil rods and wire. The plaster was actually directly touching the foam. The foam was poured in more or less level, then the pencil rods put in front acting as vertical studs. Says

Benedek "you would tie the rods to the mesh then the mesh would present a straight surface. The plaster contractor would put in the rods after the foam was cured. If there was any foam sticking out they would just shave it off."

There was a four-pipe heating and air conditioning system with vertical cast iron piping with horizontal branches. To accommodate vertical movement, the insulation contractor wrapped the vertical pipes in a heavy duty waxed paper and applied a preformed flexible urethane foam block around the horizontal joints and then sprayed the entire pipe assembly with urethane. This way the piping could move without destroying the integrity of the insulation membrane

Nearly 30 years later, how is the building? Most important, has the insulation/air barrier combination offered by sprayed-in-place polyurethane foam, been successful. To prove his success, the architect tells a story:

"Quite recently, I went to a seminar on the exterior envelope. A consultant from a prominent exterior envelope consulting firm told us about rain screen technology and how people assumed that if you could have one rain screen pressure equalization cavity around the building that would look after the problem. Then they found that if you have pressure on one side of the building it creates problems, which you have to correct by compartmentalizing the rain screen with additional equalization chambers. The expert's solution became more and more complex, in my view, until it was too much technology. I told him that there was a successful way to achieve a good result -- precast concrete with solid sealed insulation on the inside. It's worked for thirty years with no problem.

"The consultant said: "Yes I know I live in Leaside Towers".

Benedek still takes people around



the building, including groups from as far away as China. The current property management says everything is fine. No leaks from the exterior, either windows or walls and no problems on the upper floors, which makes Benedek particularly happy when he constantly observes similar problems with other high rises in the city.

Mr. Benedek does not keep his design methods a professional secret, and can be reached by e-mail at benedek@globalserve.net.

For more information on spray polyurethane foam insulation, the Canadian Urethane Foam Contractors Association, or the CUFCA Quality Assurance Program, please call 1-866-Go Spray.

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