

# ROOFING REVIEW

An Overview of Current T. Clear Protected Membrane Roof Systems Applications

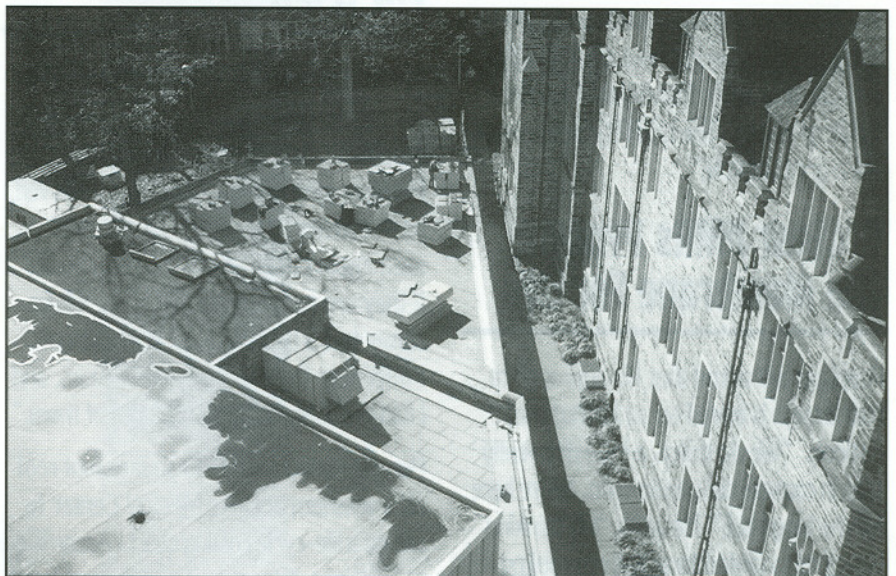
## Construction Coordinator Gets Education In Roof Systems At Duke University Medical Center

Duke University Medical Center has a lot of roofs. Approximately 300, comprising 2.5 million square feet of roof surface. So far.

When Tim Pennigar, Coordinator of Medical Center Maintenance and Construction, arrived over 12 years ago, he will tell you, "We probably had one of every roofing system known to man out here. A real smorgasbord of construction from the 1920s on." When Pennigar lead a second-generation of reroofing in the mid 1980s, he got a real education in what worked and what didn't. And why.

"We jumped on the single-ply bandwagon, using it to recover existing BURs. Some of those worked, but, because so many of our roofs are used for mechanical systems and see a lot of foot traffic, the single-ply approach was not a good match." So what changed his mind?

As Pennigar puts it, "Our main hospital is a 150,000 square feet gravel-ballasted PMR (protected membrane roofing system) with four-ply BUR on a concrete deck with 2 or 3 inch Dow blue board that was built back in the 70s. I was asked to evaluate this roof to look at the possibility of putting a heliport on top of the hospital. I thought this would be a great opportunity



Installing LIGHTGUARD® on one of the many T. Clear Protected Membrane Roof Systems at Duke University.

to show the architects that these roofs were a really bad idea. But, when I removed some of the insulation in different areas, low and behold, I found that I could track the asphalt with my thumbnail. On closer examination, we found that the only problems we had had with this roof were where the base flashings were exposed to the sun and were deteriorating. But, there wasn't anything wrong with the membrane after 17 or 18 years. We started looking at PMRs a little differently after that."

### T. Clear PMR: The Clear Choice For Experts

In time, Pennigar settled on a T. Clear Protected Membrane Roof System (PMR) that uses a fully-adhered bituminous membrane as his system of choice. As he says, "We don't do loose-laid. We don't want to give moisture a void to travel through." Is he satisfied with the results? He continues, "If we pay particular attention to our perimeters and penetrations, we are

having great success with PMRs. If we've done our jobs, leaks aren't in the field of the roofing. They are at a penetration, so they are pretty easy to find. Right now, we have about 120,000 square feet of reroofing going down on 50 separate roof elevations. We are using three plies of torch-grade SBS applied to concrete or gypsum plank roof decks. We also have another 85,000 square feet of new PMR going down on new clinic construction."

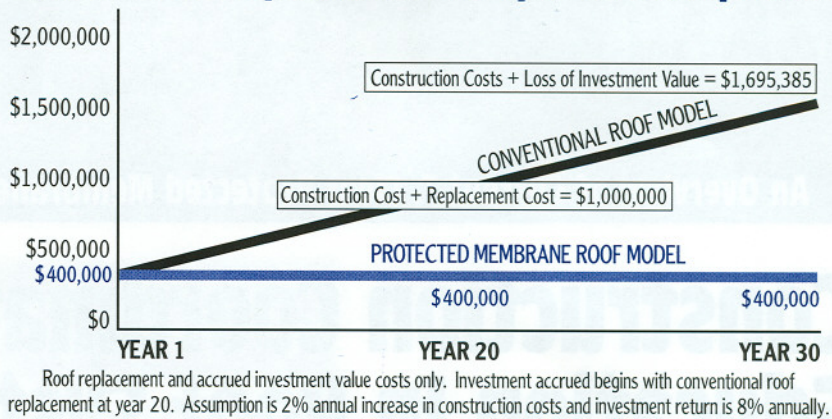
At Duke University, Pennigar is using a combination of stone-ballast and LIGHTGUARD® ballasted PMRs. Pennigar explains, "Typically what we do is in areas where the roof has no equipment on them, we tend to use stone. We've found a quarry that has a stone that blends in well with our buildings. What we'll do with LIGHTGUARD is to use it on roofs that have a lot of foot traffic or abuse. The LIGHTGUARD panels are a great match."

## T. Clear PMRs Protect The Membrane For Life

Pennigar will admit that his approach to roof design is based on an institutional outlook. "We do things a little differently than in commercial construction. We're here for the long haul." He adds, "My thinking was that I wanted to adapt our roofing designs to minimize roof maintenance."

In order to minimize maintenance costs on close to 2.5 million square feet of roof, Pennigar has gone exclusively to PMRs. Explains Pennigar, "In conventional roof designs, the membranes and flashings are exposed to sunlight, weather conditions, and maintenance traffic which deteriorates the roof over time. Covering roofs with T. Clear PMRs, we are able to minimize maintenance on these roofs. Based on what we've observed at our other facilities that have been here for twenty years, we think we can extend the life of a roof by at least ten years, maybe more."

## Vivarium Roof Replacement Life-Cycle Cost Comparison



Tim Pennigar's Life Cycle Cost Comparison Chart

## A T. Clear PMR Can Pay For Itself

Pennigar doesn't take anybody's word as fact, but comes to his own conclusions based on research and experience. Pennigar states, "From what I've observed, most conventional roofs around here aren't going to last. 25 years is a luxury. If they are not well-maintained, it will be closer to 15 or 20 years. But, I've got PMRs here that have lasted 30 years, and I can probably get 35 or 40 out of them."

Pennigar used a 40,000 square foot roof on a vivarium at Duke Medical Center to create a life-cycle costing chart. According to Pennigar, "Because it was a dead-level metal deck, a BUR would have cost a pretty good premium because we would have had to install a tapered insulation system. With an adequate number of drains, we were able to go dead-level with a PMR and save some money."

According to Pennigar's costing model, a \$400,000 PMR after 30 years will still have cost him only \$400,000. But a conventional roof that would have to be replaced after 20 years would cost another \$600,000 based on an annual inflation rate of 2% for construction. And another \$695,385 would be lost in accrued investment over the same period

based on an annual investment return of 8%. That makes the total cost of the conventional roof \$1,695,385 over 30 years compared to \$400,000 for the PMR. That is a yearly savings of \$43,000 on the PMR without factoring in reduced maintenance costs. In less than ten years, the PMR has literally paid for itself. As Pennigar puts it, "That money looks a whole lot better in Duke's asset management account than it does sitting on the roof."

As part of his institutional thinking, Pennigar wonders what will happen to the next generation. As Pennigar says, "One of the quickest rising components in a bid now is disposal fees. In 30 years, when I get ready to tear these roofs off or do something with them again, there's no reason why I can't simply pull up the LIGHTGUARD panels and store them to the side, torch down one more ply of mod bit over the two plies that are there, put the panels back, and be done with it." We couldn't agree more.

For technical information or a list of nationwide manufacturer's agents, call T. Clear Corporation at 1-800-544-7398.



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