

Tearing Off the Foam Plastic Insulation May Be Unnecessary

The History of SPRI's Re-Cover Subcommittee Activities

By Mike Blanchette, RRC, RRO, FRCI, and Richard Roe, RRC, CCPR, LEED™ AP

Throughout the 1980s, as the use of single-ply membranes grew, the practice of recovering existing roof systems also grew, primarily because single-ply systems were considered less vulnerable to moisture under the new membrane than was traditional BUR. Re-cover roof projects grew from approximately 11 percent of all low-slope roofing activity in 1983 to 22 percent in 1988. This growth continued into the nineties, reaching at least 33 percent by 1997. Economics and the environment were also driving forces behind the growth of re-cover projects. Eliminating costly roof removal (tear-offs) from the price of a new roof has obvious benefits. Re-covering existing roofs provides environmental benefits as well, since less waste – at least in the short term – finds its way to already limited landfills.

With this growth, however, came concerns and a certain level of controversy about reroofing over wet roof insulation and potential failures resulting from this practice, such as structural deck deterioration, reduced thermal performance, insulation integrity, and fastener corrosion. Fifteen years ago, in response to the re-cover trend and questions arising from it, the SPRI Re-cover Subcommittee, the Roof Consultants Institute (RCI), and Oakridge National Laboratory (ORNL) jointly undertook the task of gathering data that could begin to answer these questions and address the concerns still debated today with accurate information drawn from actual field experiments.

With the help of industry volunteers, this group decided to install a re-cover roof over an existing roof system known to contain a large amount of water – the more the better. Periodic monitoring and analysis would then follow to determine the effects of the moisture on the entire roof assembly. A set of building criteria was established to help determine the right building candidate for the experiment. It was understood that the chosen building might not meet every detail of these criteria.

- The building size should be between 3000 and 10,000 ft².
- The building should be located in a northern climate and have a conditioned interior.

- 30% of the total roof insulation must be wet.
- The roof assembly must allow for downward drying (no vapor retarder).
- The roof system should be a common construction: metal deck, roof insulation, and a traditional membrane.
- The deck must be structurally sound.
- Roof access and special detailing should not add appreciably to the project costs.
- The building owner must grant permission to install the roof and conduct necessary experiments.
- The building should be owned by a non-profit group that would thereby benefit from a new roof.

Finally, in 1994, the Roof Consultants Institute identified a good candidate that met the most important criteria. The existing roof on the Municipal Building in Pembroke, VA, consisted of a 22 gauge primed type B metal deck, 2-inch-thick wood fiberboard, and a four-ply organic felt BUR with an aggregate surfacing. The new re-cover roof consisted of .5 inch and 3.0 inch extruded polystyrene (XEPS) covered with both black and white TPO single-ply membranes mechanically attached with standard, corrosion-resistant fasteners meeting minimum requirements of FM Approval Standard 4470. The early results of this experiment are detailed in a paper presented at the Fourth International Symposium on Roofing Technology 1997¹. Among other findings, it was shown that the existing wet roof insulation had already begun to dry after one year and eventually dried completely.

Despite the apparent success of this experiment, however, some in the industry voiced concerns that the use of XEPS – a highly moisture-resistant roof insulation – might

have played a role in the positive outcome of the experiment. It was decided to identify another building for re-cover, this time using wood fiberboard in some areas and polyisocyanurate insulation in others.



Layout of "cool black" TPO sheets on west side of church roof.



Dave Scott of Genflex detailing black TPO to wall.

In September 1997, a second re-cover site was identified. Representatives from RCI, SPRI, and ORNL visited the New Mount Bethel Fellowship Church in Rossville, IL, to assess the new candidate according to the established criteria (see above). The existing roof consisted of 18 ga steel deck, 1.5 inches of perlite insulation, 4 ply BUR, aggregate surfacing, cap sheet mopped to aggregate, and an aluminum coating. The last two components had been added in attempts to repair leaks. Over half of the roof area contained wet insulation.



Peter Garrigus of Trufast (formerly of Stevens Roofing) and Dave Scott roll out TPO sheets.

The recover system, installed in June 1998, consisted of white and black TPO membranes placed over wood fiberboard on half of the roof and 2-in. polyisocyanurate insulation on the other half, creating quadrants containing the variables of color and R-value. In addition to periodic moisture measurements and analysis, the thermal values and compressive properties of the existing and new insulation were also measured over time. The compressive properties of the original insulation were considered important in evaluating its ability to support the recover roof. Fastener pullout tests were also performed periodically to assess deck integrity and fastener corrosion resistance. Finally, the change in reflectance values of the membranes was also recorded.



Participants in the project, squatting in front, left to right: Peter Garrigus and André Desjarlais. Standing, left to right: Jim Sheahan, J.P. Sheahan Associates; Dave Scott, GenFlex; Stan Choiniere, Olympic Fasteners; Phil Childs, ORNL; Jerry Spangler, Trufast; Ross Robertson, Firestone.

thermal values improved, and the experiment was deemed a success. Detailed information regarding this project is contained in a paper presented to the International Conference on Building Envelope Systems and Technologies (ICBEST-2001) held in Ottawa, Canada.²

Since 1992, the committee has spent several years analyzing re-cover issues and criteria and gathering data from two successful test roofs that included several variables and provided a great deal of useful data. (A summary article, entitled "Recover Test Site Wanted," can be found at SPRI's website, www.spri.org.) The first project contained wood fiberboard roof insulation in its existing roof system, and the second contained perlite, both very sensitive to moisture exposure. The re-cover roof systems contained three types of insulation with different thermal properties and varying resis-



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tance to moisture: wood fiberboard, polyiso, and extruded polystyrene. Both test roofs were divided into areas covered by a black membrane and areas covered by a white one. This design, it was hoped, would determine if color and roof temperature play a role in drying rates. However, because polyiso is the most commonly used roof insulation, the committee concluded that a final test containing polyiso in the existing roof system would be necessary to round out and complete the test program.

The search for a third candidate began two years ago. RCI and SPRI members were asked to report any roof containing polyiso insulation that might fit the profile. At least two candidates in

Michigan were presented, but investigation found they did not contain sufficient wet polyiso. To date, no candidates have been located. The difficulty in locating this third candidate has led to speculation that perhaps one does not exist or, if one does, it may never be discovered. This conclusion holds that, although some factors on polyiso are susceptible to moisture absorption, the foam itself is closed-cell and overall quite resistant to moisture uptake. Therefore, if a roof leak developed, large areas of insulation would not become wet, as was the case in the first two test roofs.

Consequently, even greater care should be given to deciding whether or not to tear off a roof containing polyiso insulation or other closed-cell foam plastic insulation that is placed directly over a permeable deck. In certain roof systems, undamaged insulation, including polyiso, molded expanded polystyrene, and extruded



Church members assisted in the installation of the roof systems.



Installing black TPO sheets on east side of church roof.

polystyrene could be used over and over indefinitely. Removal to the landfill would be an unnecessary expense, a disservice to the owner and environment, and a violation of sustainable building principles, which include a call to reduce, recycle, and reuse. Reusing the existing insulation during reroofing also makes it less expensive to meet or exceed energy code requirements.

Despite the data gathered from the first two experiments and the difficulty so far in locating a third, the Re-Cover Subcommittee has decided to appeal once more to the industry in the hopes of finding a candidate before disbanding the current re-cover task group and closing the file on this successful test program. The committee asks everyone – owners, manufacturers, contractors, specifiers, consultants – to stay alert for a candidate, keeping in mind

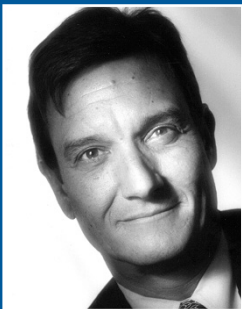
the criteria listed above. If one is located, please notify Linda King at SPRI (781-647-7026 or info@spri.org).

And keep in mind the results of this subcommittee's work to date. Think very carefully before specifying the complete removal of an existing roof system. It may not be necessary. ■

Footnotes

- 1 Patten, Sheahan, Garrigus, Desjarlais, Choiniere, "Full-Scale Demonstration of Roof Re-Cover," *Proceedings of the Fourth International Symposium on Roofing Technology*, pp. 334-340, 1997.
- 2 Desjarlais, Sheahan, and Garrigus, *Proceedings of the International Conference on Building Envelope Systems and Technologies*, pp. 205-214, 2001.

ABOUT THE AUTHORS

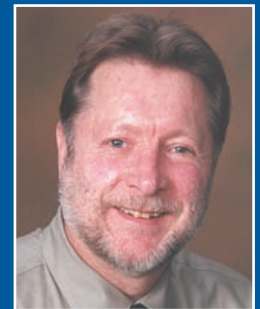


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