Kresge’s deterioration traces roots to 1950’s errors

by Laura Farber

Editor’s Note: this is the first part of a two-para review of Kresge’s problems.

After several mistakes in the past twenty-five years as to the choice and implementation of outer roof material for Kresge Auditorium, the Physical Plant believes that the standing seam copper roof which will be put on this spring will be “permanent.”

“The roof we are putting on this time is conventional,” says Bill Dickson, Director for Physical Plant. “It’s been used for hundreds of years.” The standing seam copper roof will consist of long, eighteen-inch wide strips of copper soldered together tightly so as to be completely waterproof.

Troubles with the outer roof coating began as soon as Kresge was completed in 1955. The application of the original under-concrete cap and acrylic plastic to the Kresge shell was a then-new process. The first roof was put on too fast in wet weather. The shell later began to wrinkle and crack, allowing water to seep in and permeate the insulation.

Six months after the building was finished, a new outer roof was applied. This time a new formula of acrylic was implemented. It was mixed with “Fiberglas” and beach sand to give an appearance of weathered limestone. However, it also began to wrinkle and crack, and by 1961, Physical Plant was looking for a new roof coating.

According to Dickson, the two roofing mistakes were no one person’s fault. The original decision to use acrylic was an agreement made by the original architects, the structural consultant, the general contractor and Physical Plant. However, it was not the structural consultants (Ammanin and Whitney of New York City) who recommended the acrylic, but rather the original architects, Eero Saarinen & Associates, who felt it would be “sympathetic to the building.”

MIT’s maintenance engineers were also cited as sharing partial blame, in a report sent to the architectural consultants, (Anderson, Beckwith and Haible, a firm whose senior members were MIT professors) on July 19, 1962. The report said, “MIT’s maintenance engineers, who, incidentally, collaborated on the original design, watched in dismay as violent and unexpected thermal stresses weakened and destroyed the outer layer of the shell’s three-layer system. Their observations taught them a valuable lesson in the behavior of multiple-layer shells...”

In the summer of 1961, the architects attempted to coat the roof with diamond-shaped plates of lead-coated copper. However, when designs tend to join sample sheets together, there were intersecting problems. Where four diamonds came together at the corners of the pattern, the craftsmen found twelve thicknesses of sheetmetal piled up. The process of making these corner joints was found to be much too slow to be practical.

When asked why these problems were not anticipated beforehand, Dickson replied, “The intersecting problems only occurred once you pick the pattern.” Dickson stated that the process in which the concrete will be put on the roof this spring was not thought of in 1961 because of “ambiguity problems.”

Unable to make a copper roof, the designers made the mistake of specifying an acrylic polymer binder with liquid-applied covering of fine limestone chips.

The report to Anderson, Beckwith and Haible cites a description of what happened with the newly-implemented roof: “In service the roof sustained pronounced differential heating. At times, one side of the roof would be covered with snow, while the other side, completely dry, would be baked by a brilliant winter sun. Steep temperature gradients occurred across the thickness of the roof system, too. The inside surface remained fairly constant (because the auditorium is air-conditioned) while the outside surface temperature varied with changes in the weather.

The result of the uneven heating of the roof system was unequal expansion and contraction of the elements of the system. Because the lightweight concrete acoustic layer was unconnected to the structural shell, expansion of this element could accumulate across wide areas of the roof surface. To relieve the stresses induced by thermal expansion, fissures developed in the concrete layer and caused surface irregularities as great as 1/4 in. At the edges of the shell where the concrete top fill buttressed against a structural edge beam, the flashing was destroyed.

Water entered the roof system through these first openings and lodged under the top layer of con-