

NATHAN HALE ELEMENTARY SCHOOL – MERIDEN, CT **ROOFING OBSERVATIONS AND CONCLUSIONS**

Low-Slope Roofs:

The building has several relatively small areas of low-slope membrane roofs between and below surrounding areas of steep-slope shingle roofs. These roofs currently have modified-bitumen membrane roofing over tapered insulation with internal roof drains and rain leaders. These roofs appear to have the original roofing installed as part of the renovations in early 1990's.

These roofs have been in place for twenty years, show signs of repairs, and appear to have raised blistered areas that indicate moisture within the roofing assembly. These roofs currently only have primary roof drainage with no supplemental overflow emergency drainage, which is a Plumbing Code violation.

The low-sloped roofs should be replaced with new membrane roofs over a tapered insulation system that achieves the minimum roof slope and insulation values required to satisfy CT Building and Energy Code requirements. Supplemental overflow drains should be installed to comply with the Plumbing Code.

Steep-Slope Roofs:

The building is primarily covered with steep-slope shingle roofs that have a 4-inch per foot roof slope. These roofs currently have asphalt shingle roofing and underlayment over wood roof deck with external pole gutters, conductor heads and rain leaders. The wood roof deck is either 2" nominal tongue and groove planks on structural steel framing or 5/8" plywood on wood trusses. These roofs are over non-vented attics that are part of the thermal envelope with insulation applied directly to the underside of the wood roof deck. Approximately two-thirds of the roofs appear to have the original roofing installed as part of the renovations in early 1990's. The other third appears to be repaired with a layer of newer asphalt shingle roofing.

These roofs have been in place for over twenty years with significant signs of repairs and patching. The original asphalt shingles are cracked with numerous asphalt mastic patches and appear to be significantly older than their twenty plus year's age. This may be the result of shingle overheating due to solar heat buildup associated with their installation directly over an insulated wood deck without any ventilation. The newer asphalt shingle repairs appear to be a temporary fix installed directly over the failed original roofing to address asphalt mastic patching.

The external pole gutters are essentially roof-top water diverters that direct rain water into conductor heads at the top of rain leaders. These pole gutters are fabricated out of lead-coated copper sheets with seams soldered to form a continuous gutter assembly around the perimeter of all steep-slope roofs. The pole gutters do not have any expansion joints to allow for expansion and contraction with seasonal temperature changes. The soldered seam joints in the gutters appear to be cracking due to the stresses of expansion and contraction with numerous asphalt mastic patches to seal the cracked seams.

Initial roofing observations did not include a hazardous materials survey or collection of suspect hazardous materials for laboratory analysis. The roofing replacement project should include a survey of affected suspect hazardous materials and collection of suspect hazardous materials for laboratory analysis.

Replacing the existing shingle roofs with new asphalt shingle roofing installed directly on the non-vented wood deck does not appear to be a viable option. Most, if not all asphalt shingle roofing manufacturer warranties have an exclusion that voids the warranty if shingles are installed on non-vented roof decks. A minimum 20-year roofing warranty is required on all school roofing projects that are State funded.

The steep-sloped asphalt shingle roofs should be replaced with a roofing system that is not adversely affected by the solar heat buildup associated with insulation applied directly to the underside of the wood roof deck. One such system is standing-seam metal roofing. Another option would be to add a second ventilated layer of roof deck to allow the heat to dissipate by convection up and out of roofing assembly. Adding a second layer of ventilated roof deck would increase the dead load of the roofing assembly and require rechecking the building's structural design calculations. It would also require custom project specific detailing that would provide appropriate free area openings at the roof eave for outside air intake and at the ridge for heated air to exhaust.

The pole gutters should be replaced with a more conventional hung gutter assembly that is designed to allow for expansion and contraction with seasonal temperature changes. The new hung gutters should last as long as the warranted roofing system and be constructed with a comparably long-lasting solderable material with expansion joints to allow unrestricted movement. Downspout spacing should not exceed 50 feet with gutter expansion joints located at the mid-point between downspouts.