



January 31, 2018

Tim Peet, Facility Director
Hinesburg community school
10888 RT 116
Hinesburg, Vt. 05461

Re: 32'x32' Roof at north end of the Hinesburg Community School

Dear Mr. Peet:

On January 18 I visited the property located at 10888 VT-116 in Hinesburg, VT. The purpose of my visit was to determine whether a wood-framed roof at the North end of the school, could support the added weight of stone ballast. You were present during the visit. The following observations and conclusions are based upon evidence readily available during the site visit, and upon conversation with you:

1. The area in question is approximately 32'x32' in area and contains a mechanical room, bathrooms, small entry vestibule and an office. The structure was built in the 50's and originally had a built-up roof, which was removed at some point. Currently you report that the roof assembly consists of a PVC membrane, on 4" of insulation, on 1/2" asbestos cement panels. The membrane roof needs to be replaced; however the roof has asbestos-cement panels and the only type of new roof which can be installed is a ballasted system.
2. Originally the roof framing was 3-2x10's at 4' on center; however in 1987, the longer spans were reinforced with 2 additional plies; probably to help resist drifting snow from a 7' higher roof (circa 1969) to the east. The rafters span approximately 15'-6" and 11'-4". No load capacity or brand information is available for the asbestos cement panels or window/door lintels.
3. The rafters and underside of the asbestos cement panels appear to be in good condition, where exposed and a few areas where we removed some ceiling tiles.
4. The rafters were evaluated for drifting snow in accordance with the 2015 Vermont State Building Code and IBC 2015/ASCE 7-10 and the following assumptions:
 - a. rafters are equivalent of SPF #2
 - b. 76 psf (maximum tapered) drifting snow for 14.9 ft (Lu=83 ft, pg=50 psf)
 - c. 40 psf minimum flat roof snow; except when combined with drift, flat roof snow of 38.5 psf.
 - d. 10 psf maximum stone ballast (#4 ballast per ANSI/SPRI RP-4 2013 Wind Design Standard For Ballasted Single-ply Roofing Systems)
 - e. 5 psf assumed weight of 1/2" asbestos cement panel
 - f. 1.5 psf maximum membrane and insulation
5. The results of the rafter analysis are:
 - a. The 5 ply rafters spanning 15'-6", supporting the drifting snow, are marginally adequate for the assumed loads including 10 psf of ballast, but no additional loads.
 - b. The 3 ply rafters spanning 11'-4" are more than adequate for the assumed loads including 10 psf of ballast.

Date: January 31, 2018

Re: 10888 VT-116 in Hinesburg, VT.

6. There is an area in the mechanical room where two of the longer 3 ply rafters could not be sistered so a steel beam support was added. The steel beam is a W6 with an approximate flange width of 6" and is supported by 3" sq tube steel. The beam was checked assuming it was a W6x16, A36 and was found to be adequate if the beam is laterally braced at each end (no attachment to the rafters was visible). Lateral bracing can consist of a couple of self-tapping screws, thru the flange into the wood joists nearest the ends of the steel beam, or otherwise clipping the flange to the rafters with a piece of bent steel plate. The three ply rafters supported by the steel beam were also found to be adequate.
7. A segment of the interior hallway masonry wall was removed at the entrance to the office (a distance of 5'-8"); resulting in one of the 3 ply rafters being un-supported for 16 feet. This rafter should be sistered with a new 2x10 each side or a header over the opening should be installed. The header can consist of a HSS 4x4x1/4" (tube steel) or 2 ply LVL 1.75X5.5. The header should bear on the masonry at each end.
8. We were not able to check the asbestos cement panels, or the existing lintels, for the additional load since no information was available.

In conclusion, the shorter span 3-ply rafters are adequate and the longer span 5-ply rafters are marginal for the assumed loads and 10 psf of ballast. We recommend that the steel beam in the mechanical room be braced at each end by attaching to the wood rafters as described in item 6; and that a header be installed as described in item 7.

We were not able to check the capacity of the asbestos cement panels, or the existing lintels, for the additional load since no information was available. Should drawings or information be found, we would be happy to analyze those conditions as well. In the absence of the information; if the code official allows, and if the exposed top surface of the asbestos cement panels reveal no deterioration, then you could propose to monitor the underside of the panels for cracking and shovel off snow in excess of 18" in height (30 psf), in conjunction with adding the 10 psf of ballast load.

If you have any questions regarding this matter, please feel free to call.

Sincerely,



Barbara J Evans, P.E.
Knight Consulting Engineers, Inc



Attachment: Photos #1-4



Photo #1



Photo #2



Photo #3



Photo #4