

NOBLIN & ASSOCIATES L.C.
Consulting Engineers

**BUILDING ENVELOPE CONDITION SURVEY
CHILMARK SCHOOL
CHILMARK, MASSACHUSETTS**

SUBMITTED TO: Martha's Vinyard School District
4 Pine Street
Vinyard Haven, MA 02568

SUBMITTED BY: Noblin & Associates L.C.
4 First Street
Bridgewater, MA 02324

DATE: January 15, 2013

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January 15, 2013

Martha's Vinyard School District
4 Pine Street
Vinyard Haven, MA 02568

Attn: Amy Tierny

**RE: Building Envelope Condition Survey
Chilmark School
Chilmark, MA**

Dear Ms. Tierney:

In accordance with our proposal, NA12.09.286, this office traveled to Chilmark School in Chilmark, MA on the morning of November 19, 2012 to review the existing conditions of the school's building envelope.

The Chilmark School was reportedly constructed circa 1999, and has been plagued with many problems since day one. Reported problems included deteriorating/improperly functioning windows and doors, improperly functioning gutters, site grading and drainage, pipes freezing in attics, heating system issues, etc. A renovation project was conceived and implemented in 2004 that included the replacement of several deteriorated windows, modification to the existing resilient floor system, modifications to the existing hallway ceiling insulation, attic walkway installation, installation of additional gutters and downspouts, etc. At this time, it is unclear if all of the work was performed under one Contract or if it was split up into several as the original specifications and Contract Documents were reportedly lost.

The building is typical wood frame construction resting on either slab on grade or full height foundations. The building is sided with white cedar shingles with a 4 ½" exposure, using a combination of cedar and pine trim and finger jointed pine windows. The roof consist of 3-tab asphalt roofing shingles at the steep pitched sections of roof, and lead coated copper (LCC) roofing at the low sloped sections of roofing, the chimney enclosures are also clad in LCC. There is a photovoltaic array located on one of the steep roof planes, it is unclear if it is original to the building's construction. The gutters are 5" half round style and the downspouts are plain round downspouts with an inside diameter of 3 ¾", these are also constructed of LCC. The downspouts terminate into a subgrade leader system that appears to be constructed out of a combination of cast iron piping and PVC piping: the cast iron piping has an ID of 4". The sub grade leaders terminate at either daylight or into leaching pits.

We conducted a thorough, visual evaluation of all building envelope components, and photographically documented our findings.

FINDINGS:

SHINGLE ROOFING:

The steep slope roofing at the Chilmark School is a fiberglass-reinforced, three-tab roofing shingle likely of the 25-year variety that is assumed to be original to the construction, and therefore \approx 13 years old. The shingles are installed 5" to the weather with 6 nails per shingle. We were able to view the presence of asphaltic waterproofing membrane at all critical locations including the eaves and the rakes as well as asphalt saturated felt in the field of the roofs. All flashings were found to be either copper or LCC, and appear to be well placed and well installed. The roofs are vented with a baffled style vent at the ridge, and with screening at the soffits. At the locations accessed, the ridge cuts appear to be marginal, and at the soffits some are open while others have been retrofitted with a closed cell polyurethane backer rod to prevent air flow (likely due to the pipe freeze up in the early years).

The roofing shingles were found to be in relatively good shape for their age, with some damage likely associated with access, and some staining associated with organic growth along with some lichen growth (see photo). It was reported that blowoffs have not been a problem with the shingle roofs at the Chilmark School to date, and that leaks associated with the shingle roofs have not been prevalent. We found the roofing shingles to be well adhered, to have been installed in relatively straight courses, with consistent exposure. We did, however, note that fastener placement was generally higher than recommended (see photos). This could result in an increased vulnerability to blow-offs, but given the history and the well-adhered nature of the shingles, this may not be the case. Given the stand alone nature and the "simplicity" of the steep sloped sections of roofing at the Chilmark School, barring any large scale blow-offs, these roofs should achieve a total useful life in the order of 20 to 25 years or another 7 -12 years. No immediate corrective or preventative action was found to be necessary at the asphalt shingle roof planes,

LOW-SLOPED METAL ROOFING:

The low-sloped roofing on site is a flat seam LCC roof that ranges in pitch from \approx 5/8" in 12" to \approx 2" in 12". This roofing system relies on common locks, augmented in some cases, by sealants (see photo) to provide a watertight assembly. It has been reported that this roofing system has had leaks at its transition points to above-roof walls in the past. Because this roofing system is such a low slope and because the underside of this low-sloped roof was insulated with icynene, we are concerned that any ongoing leakage is being trapped by the insulation and not manifesting itself inside the building envelope. Over time, this could result in severe deterioration of the structure, not to mention the potential for organic growth.

Flat seamed copper roofs are generally suited for roofs with a pitch of 3" in 12" or more (14°). On roof pitches lower than 3" in 12", it is generally recommended that they be soldered. The seams on this roof, having been sealed with a chemical sealant, results in their vulnerability to

leakage. The aforementioned icynene insulation makes any leaks less likely to readily manifest themselves. It is always the recommendation of Noblin & Associates that low-sloped metal roofs with a pitch lower than 3" in 12", be either soldered or welded. Having aged and having been sealed with a sealant results in these panels being ineligible for soldering at this point in time, as contaminants in the seams will preclude the panels for being soldered. Therefore a chemical sealant joint is the only option short of replacement. Chemical sealant joints are not a long-term solution, if properly installed, they may have a useful life of 5 years. Our biggest concern, however, would be a slow leak that isn't readily detected.

GUTTERS:

The gutters on site are a 5", ½ round style gutter, attached to the building using brackets and hangers attached to the fascia and roof. Gutters have been installed at most locations where roof runoff would be directed to grade. In some locations, gutters direct water to downspouts that direct that runoff into other gutters, and in the instance at the right and left of the main entrance, the runoff from in excess of 2,300 sf of roofing is directed into one 18' gutter and one downspout. Based on the guidelines of SMACNA (Sheet Metal and Air Conditioning Contractors National Association), the width of a gutter capable of carrying the runoff from this roof area in a maximum storm in the Boston area would be 11.5" wide, the same roof area would require a 10" gutter in a five-year storm. We also ran the numbers on the sections immediately flanking the front of the building and found that the runoff associated with these locations would require a 7" gutter in a maximum storm, and a 6" gutter in a five-year storm. Clearly the gutters on several sections of the Chilmark School are insufficient to carry the associated runoff. This could be a contributing factor to the drainage problems being experienced at the Chilmark School.

EXTERIOR SIDING AND TRIM:

The exterior siding on the Chilmark School consists of white cedar shingles and a combination of cedar and pine trim. The siding appears to be aging well, having achieved the desired look, with only minor cupping and curling on the southernmost planes. The siding was fastened with hot dipped galvanized fasteners in the field, and stainless steel face nails where applicable (see photos). The trim, particularly the rakes, fascias, cornerboards and window trim, is constructed of a naturally durable product, likely cedar. This material is at this time in very good condition, with no problems reported or observed. The windows themselves, however, are a wood framed wood window constructed of finger jointed pine (see photo) that ranges in condition from fair, to severely deteriorated, (see photos).

Further investigation led us to the base of the wall where we found what appears to be a termite shield type flashing that appears to wrap around the but end of the OSB sheathing (It appears that in at least the locations we were able to view, that OSB sheathing was used). Because no destructive probing was performed, and because the clearance to grade is generally less than 8", we were only able to readily view this area at the basement entrance location on the Building's West wing. There, we investigated the circumstances and at a location beneath a window, we found deterioration of the OSB sheathing. At locations beneath the field of the siding, we found the OSB sheathing to have been intact. Due to the fragile nature of OSB sheathing, this finding has us very concerned, and due to the fact that another section of severely deteriorated sheathing

and framing was discovered on the East wing of the school during a bathroom addition, this may not be an isolated incident. In short, we have some concerns about the condition of the building's sheathing as a whole on this property. This concern shall be further discussed in the window and door section of this report.

With regard to clearance-to-grade, we found that at many locations around the school, the Code required 6" of clearance from grade to wood siding materials is not complied with, and in some cases, the siding is below grade (see photos). Code at the time of construction also requires a minimum pitch of 1" in 12" away from the building for a minimum of 8'. We found locations where this requirement of the Code was not complied with as well. Non-compliance of these items in conjunction with the undersized/insufficient guttering and downspouts, could be major contributors to the grading and drainage problem at the Chilmark School and will be further discussed in the grading and drainage section of this report.

WINDOWS AND DOORS:

Based on information provided to this office, the original windows and doors in the school were Pella, Wood-framed, Architect-Series, wood windows. If this information is correct, the windows have a design pressure of DP-30, LC. This, in the opinion of this office, is rather low given the school's exposure and location. It was further reported that due to premature deterioration, a number of the original Pella windows have been replaced to date. During our investigation, we found many more windows whose frames and sashes are severely deteriorated and in need of replacement (see photos). Properly installed windows would be placed in a metal pan (preferably copper with soldered seams) to direct any water that enters the building envelope through the window or the window opening (due to a deteriorated frame, sash or trim) to the outside of the building envelope. Based on the probing that we have done to date, it does not appear that a metal pan flashing was used in conjunction with the installation of these windows (see photo). Another accepted, but less effective method of flashing windows is using a membrane pan flashing. It is unclear if this method of pan flashing was used, but based on the deterioration of the sheathing beneath the window that we viewed on the rear of the West wing, we conclude that any flashings in place at that window were as a minimum, improperly installed.

The possible lack of, or improper installation of any underlayments and flashing at and around the windows at the Chilmark School have us very concerned, in that, the deterioration found associated with the existing window frames is likely affecting the building envelope (see photo). If allowed to progress, severe structural damage and/or organic growth problems could result in the need for costly repairs.

The doors at the Chilmark School are also reportedly an Architect Series, wood-framed, wood-door, manufactured by Pella. It was reported that there have been problems with these doors to date and that several were replaced with fiberglass equivalents in conjunction with the 2004 renovation project. Based on the information provided, it appears that more doors had been slated for replacement than were actually replaced. The original wood doors, located primarily in the courtyard were found to be, as a minimum, functionally deficient. The hardware was not working properly, and their operability and weather tightness were found to be questionable.

The fiberglass replacement doors were also found to be questionable from an operability standpoint as well as from an ability to serve their intended purpose. Although the fiberglass doors were provided with closers, it is the opinion of this office that the doors are not suited for a commercial application, and the chosen/provided hardware was not suited for the environment (see photo). We also found doors that are damaged due to contact with the surrounding walkways (see photo).

GRADING AND DRAINAGE:

The site grading around the Chilmark School is at most locations minimal with clearance to grade ranging from 0" to in some cases 8" – 10" or more (see photos). Code, at the time of construction requires 6" minimum clearance. We found that in some cases, the clearance to grade had been altered from the original likely due to natural as well as man-made (addition of mulch) build up of the landscape. We also found the land surrounding the school to be relatively flat with little to no slope at the front and East side of the building. Code at the time of construction also required a pitch of 1" in 12" away from the building for a minimum of 8', or an approved alternate method of directing water away from the foundation can be used. There are many locations where this requirement has not been met, particularly on the front of the building. To bring this building to code compliance with regard to the aforementioned items would require significant regrading, involving significant landscape disruption.

An alternate approved method could be a new, more substantial, sub-grade leader system that picks up the new downspouts as well as incorporates several catch basins at newly installed sumps around the building's perimeter. This could satisfy Code as well as alleviate some of the water related issues being experienced at the school. This project should include the installation of a new 10" subgrade leader system with 4" feeders servicing each downspout on the building. The 10" trunks should be located in the centerline of a trough cut to satisfy the 1" in 12" slope away from the building as well as in front of the walkway to the main entrance in the front.

RECOMMENDATIONS AND COST ESTIMATES:

SHINGLE ROOFING:

As previously mentioned, no major problems were found with the steep-sloped shingled roof sections of the roof. These sections of roof should remain serviceable for another 7 – 12 years. We estimated in today's dollars the cost to replace the asphalt shingle roofs at the Chilmark School to be approximately \$76,100. Please note that this cost estimate assumes replacement with a heavy-weight, architectural style shingle.

LOW SLOPED METAL ROOFING:

It is unclear if active leaks exist at the low-sloped metal roof at the Chilmark School. What is clear, is that the roof is vulnerable to infiltration due to its method of installation, and that a proper repair (i.e. soldering) is not possible at this time due to contaminants. Therefore the only option for repair is with a chemical sealant. As previously mentioned, a chemical sealant is only a temporary repair, and will likely have a useful life of around 5 years. We estimate that

preparation and sealing all of the seams on the LCC roof at the Chilmark School to cost approximately \$8,910.

The ultimate, and most complete "fix" for the LCC roof at the Chilmark School is replacement. Although this is quite premature, it is the only way to insure the roof's integrity over the long term. We estimate the cost of replacement of the LCC roof to be approximately \$176,490.

GUTTERS:

The gutters as they exist on the Chilmark School are clearly insufficient to direct a significant rainfall to grade. Based on the SMACNA guidelines referenced earlier, the sizes necessary, as the gutters and downspouts are configured now, particularly to the right and left of the main entrance, are significantly larger than the 5" gutters that are in place now. If, however, the guttering was expanded to carry the water from each entire roof plane and direct it to grade, a 6" gutter may be sufficient. It must be understood that this will change the aesthetics of the building and will result in downspouts in locations where they are not currently present. This will further result in the need to replace the existing subgrade leader system as the new capacity would likely overwhelm the system as it exists.

To replace the existing gutters with a properly sized gutter at all eave locations is estimated to cost approximately \$40,975. To replace the existing subgrade leader system with a 10" line we estimate the cost to be approximately \$81,400. Please note that this cost estimate does not include any necessary engineering, permitting, or environmental impact studies.

EXTERIOR SIDING AND TRIM:

The exterior siding and trim at the Chilmark School are in, for the most part, good serviceable condition. What has us concerned is the areas of known deterioration particularly beneath the wood-framed wood windows. Although the extent of the damage is at this time unclear, what is clear is that damage is occurring and needs to be stopped. We would recommend performing some destructive investigation work at and around windows that show clear signs of deterioration in an effort to determine if any type of pan flashing was incorporated into the assembly, and to better understand the extent of the deterioration that we have identified. Because the siding itself is in reasonable shape, any costs associated with this particular building envelope component will be directly related to the results of the destructive probing. The costs associated with this component could range from \$5,000 for investigative work and repairs to known locations of deterioration to as much as \$44,500 if there is deterioration at the base of all walls. If a full-scale siding replacement is chosen, the cost can be expected to reach approximately \$200,000, assuming that the cedar trim is retained and was originally properly underlaid/flashed.

WINDOWS AND DOORS:

Again, it is the opinion of Noblin & Associates that the doors and windows used at the Chilmark School are, as a minimum, not suited for their intended use or for the environment in which they were installed. Furthermore, it appears that the methods of installation may have compromised other aspects of the building envelope. This will be confirmed or refuted during the investigatory probing.

With regard to the windows, a significant percentage of them have deteriorated components resulting in the need for their replacement. The question will become will spot replacement with the same window be acceptable or will wholesale replacement, with a more superior window be necessary. At this point in time, not all windows are deficient, and if the investigatory probing determines that these windows are not affecting the building envelope, their replacement can be forgone. Based on our investigation, we have found that approximately 25% of the existing windows have the beginning signs to advanced deterioration of the window's structural components. Wholesale replacement of the windows is the only true way to assure that all of the surrounding materials are intact and that the building envelope is protected, and the aesthetics are maintained. We have estimated replacement of the windows at the Chilmark School at approximately \$179,550. If replacement of only the deficient windows is chosen, we would expect the cost to be approximately \$82,600.

With regard to the doors at the school, it is the opinion of this office that their condition warrants replacement. We recommend replacement of the doors at the school with metal-framed, metal doors with appropriate hardware for their intended use. We estimate the cost to replace the existing doors at the School to be approximately \$62,300. Please note that heavy commercial metal-framed metal doors will only mimic the style of the existing, they will not be an exact match.

GRADING AND DRAINAGE:

As previously mentioned, the installation of a new subgrade leader system which includes catch basins at newly "sumped" locations and picks up all newly installed downspouts would alleviate many of the schools drainage problems. We estimated the cost of a new 10" subgrade system that dumps to grade at or around the location of the existing drainage easement to be approximately \$94,700.

In addition to the subgrade leaders, cutting in proper drainage swales around the building's perimeter in which to locate catch basins will likely be required. We estimated the cost to cut and sod new sumps on the North and east side of the building to be approximately \$26,000. Please note that this cost does not consider replacement of the fenced in play yard or the flower/garden boxes.

If you are in need of additional information, please do not hesitate to contact us.

Sincerely,

Michael D. Lagace
Senior Project Manager

Encl: Photographs

PHOTOGRAPHS

CHILMARK SCHOOL
CHILMARK, MASSACHUSETTS
NOVEMBER, 2012



OVERVIEW OF THE CHILMARK SCHOOL



OVERVIEW OF THE COURTYARD AT THE CHILMARK SCHOOL

CHILMARK SCHOOL
CHILMARK, MASSACHUSETTS
NOVEMBER, 2012



OVERVIEW OF SOME OF THE ROOFING AT THE CHILMARK SCHOOL



BLACK STAINING AND LICHEN GROWTH ON THE THREE TAB SHINGLES AT THE CHILMARK SCHOOL

CHILMARK SCHOOL
CHILMARK, MASSACHUSETTS
NOVEMBER, 2012



TYPICAL HIGH NAILING OF THE ASPHALT SHINGLES



MORE HIGH NAILING

CHILMARK SCHOOL
CHILMARK, MASSACHUSETTS
NOVEMBER, 2012



EVIDENCE OF SEALANTS USED AT THE LOW SLOPED LEAD COATED COPPER ROOF



MORE SEALANT USE AT THE LCC LOW-SLOPED ROOF

CHILMARK SCHOOL
CHILMARK, MASSACHUSETTS
NOVEMBER, 2012



FAILED SEALANT AT THE LCC LOW-SLOPED ROOF



OVERVIEW OF A TYPICAL GUTTER CONFIGURATION AT THE CHILMARK SCHOOL, NOTE- DOWNSPOUTS BEING DIRECTED INTO A LOWER GUTTER OF INSUFFICIENT SIZE TO CARY THE RUNOFF

CHILMARK SCHOOL
CHILMARK, MASSACHUSETTS
NOVEMBER, 2012

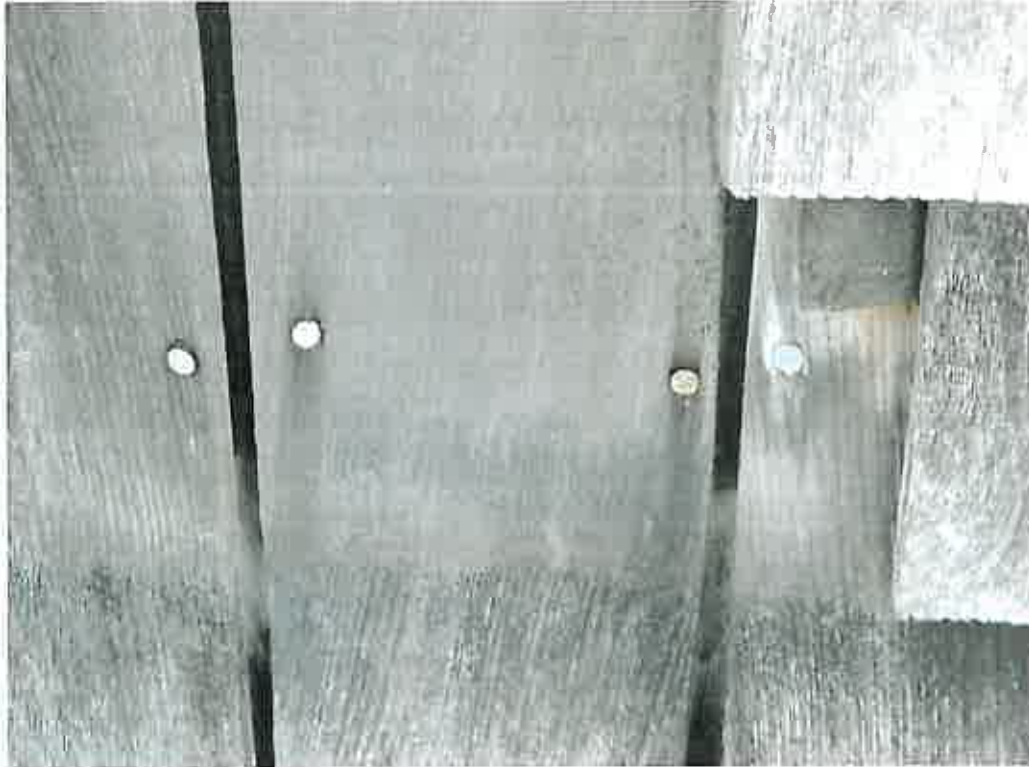


ROOF PLANE DIRECTING ROOF RUNOFF TO LOWER ROOF WHICH DRAINS TO THE GUTTER OF INSUFFICIENT SIZE DEPICTED ABOVE



ROOF PLANE DIRECTING THE MAJORITY OF ITS RUNOFF DIRECTLY TO SURROUNDING GRADE

CHILMARK SCHOOL
CHILMARK, MASSACHUSETTS
NOVEMBER, 2012



EVIDENCE OF HOT DIPPED GALVANIZED FASTENERS IN THE FIELD OF THE SIDING



STAINLESS STEEL FACE NAILS ON RECENTLY REPLACED SHINGLES

CHILMARK SCHOOL
CHILMARK, MASSACHUSETTS
NOVEMBER, 2012



CEDAR RAKE TRIM IN VERY GOOD CONDITION



FINGER JOINTED PINE WINDOW SILL AND SASH SHOWING SIGNS OF THE EARLY STAGES OF FAILURE

CHILMARK SCHOOL
CHILMARK, MASSACHUSETTS
NOVEMBER, 2012



SEVERELY DETERIORATED WINDOW SILL LIKELY AFFECTING THE BUILDING ENVELOPE



ANOTHER SEVERELY DETERIORATED WINDOW SILL

CHILMARK SCHOOL
CHILMARK, MASSACHUSETTS
NOVEMBER, 2012



ANOTHER SEVERELY DETERIORATED WINDOW SILL



ANOTHER SEVERELY DETERIORATED WINDOW SILL

CHILMARK SCHOOL
CHILMARK, MASSACHUSETTS
NOVEMBER, 2012



ANOTHER SEVERELY DETERIORATED WINDOW SILL



SEVERELY DETERIORATED WINDOW SASH

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SEVERELY DETERIORATED WINDOW SILL AT COURTYARD LOCATION



SEVERELY DETERIORATED DOOR FRAME

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SEVERELY DETERIORATED WINDOW-TO-DOOR FRAME TRANSITION



SEVERELY DETERIORATED DOOR TRIM

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ANOTHER DETERIORATED WINDOW-TO-DOOR TRANSITION WITH LIKELY FRAMING DETERIORATION



MORE DETERIORATED DOOR TRIM AND LIKELY DOOR FRAME DETERIORATION

CHILMARK SCHOOL
CHILMARK, MASSACHUSETTS
NOVEMBER, 2012



DETERIORATED OSB SHEATHING DIRECTLY BELOW A WINDOW (DIFFICULT TO MAKE OUT)



SIDING NEARLY IN CONTACT WITH GRADE, NOT CODE COMPLIANT



DETERIORATED SIDING IN CONTACT WITH GRADE



MORE DETERIORATED SIDING IN CONTACT WITH GRADE

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NOVEMBER, 2012



RODENT HOLE AT LOCATION OF SIDING IN CONTACT WITH GRADE



DETERIORATED SIDING IN CONTACT WITH A CONCRETE WALKWAY

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SIDING IN CONTACT WITH WALKWAY/GRADE



RUSTING DOOR HINGE, IMPROPER HARDWARE FOR THIS ENVIRONMENT