Mold/Water Damage Investigation

Templeton Center School
17 South Road
Templeton, Massachusetts

Prepared by:
Massachusetts Department of Public Health
Bureau of Environmental Health
Indoor Air Quality Program
March 2011

Background/Introduction

At the request of Ms. Joyce Crouse, Health Director, Templeton Board of Health (BOH), the Massachusetts Department of Public Health (MDPH) Bureau of Environmental Health's (BEH) Indoor Air Quality (IAQ) Program conducted an assessment at the Templeton Center School (TCS) located at 17 South Road, Templeton, Massachusetts. On February 25, 2011, the building was visited by Michael Feeney, Director of BEH's IAQ Program. During the assessment, Mr. Feeney was accompanied by Ms. Crouse and Mr. William Claybaugh, Head of Maintenance, Narragansett Regional School District (NRSD). The request was prompted due to concerns related to a ceiling tile failure due to roof leakage in classroom 107 during school hours.

The TCS is a brick building with wooden roof constructed in 1941. At the time of the visit, repairs to the roof and classroom ceiling were in progress. The NRSD retained the firm of Klienfelder/SEA Consultants to evaluate the roof and make recommendations to repair the ceiling area/framing of classroom 107 (Klienfelder/SEA Consultants, 2011). A number or recommendations were made regarding the repair of the suspended ceiling in room 107 (Appendix A).

Methods and Results

BEH staff performed a visual inspection of building materials for water damage and/or microbial growth in classroom 107 and the attic above this area.

Discussion

Microbial Concerns

Both classroom 107 and the attic above did not appear to have mold colonization at the time of the IAQ Program's evaluation. Classroom 107 did, however, have some water-damaged ceiling tiles remaining (Picture 1). Water-damaged ceiling tiles can indicate sources of water penetration and provide a source of mold growth. Ceiling tiles should be replaced after a water leak is discovered and repaired. The US Environmental Protection Agency (US EPA) and the American Conference of Governmental Industrial Hygienists (ACGIH) recommends that porous materials (carpeting, ceiling tiles, etc.) be dried with fans and heating within 24 to 48 hours of becoming wet (US EPA, 2001; ACGIH, 1989). If porous materials are not dried within this time frame, mold growth may occur. Water-damaged porous materials cannot be adequately cleaned to remove mold growth. The application of a mildewcide to moldy porous materials is not recommended.

BEH staff examined the ceiling of classroom 107 as well as the attic area above the leak. The school has a hip roof ***without*** a peak/ridge, meaning the center of the roof is flat with sloped sides. The area where the roof leak occurred is near a roof valley, in a location that roughly faces northeast (Picture 2). The part of the roof would be highly prone to lingering snow accumulation during nor'easters. The orientation of the building also keeps this location shaded from direct sunlight, which inhibits melting. Therefore, it is highly likely the support structure of the roof would be subjected to prolonged snow loads, resulting in ice dams, chronic moisture, and exposure to roofing materials, all of which can result in roof leaks.

A series of passive air vents that allow warm air to pass into the attic were installed near the center of each sloped roof plane in an effort to prevent ice dams and prevent heated air from

accumulating in the roof peaks. A roof venting system is typically designed to have a vent draw air into the attic at the roof's edge and expel air through a vent in the peak of the roof (e.g., a ridge vent). In its current configuration, heat accumulates in the attic because no ridge vent (or an equivalent) exists in the flat roof. Therefore no means exist for heat to exit the roof, which likely results in ice dam formation on the roof.

The area of the attic beneath the water leak was examined. Of note is the diagonal brace system, which appears to support the roof at the junction where the roof transfers from a flat to sloped plane. Each of these braces are notched and inserted beneath the roof rafter at the flat/slope roof junction (Picture 3). BEH staff observed that the diagonal brace beneath the area of the roof leak is split down the middle (Picture 4) and has shifted out of position where it connects to the floor joist (Picture 5). In this condition, the damaged diagonal beam likely cannot bear the same load as intact beams, which likely allowed the roof to sag under snow load, resulting in leaks.

Another sign of roof movement beneath the leak location is the rotation of a brace connecting the diagonal roof rafters beneath the water leak. One end has rotated to split the end of the brace at its fastener (Picture 6). The condition of each of these braces appears to indicate that load was depressing the roof in this location, which can lead to roof damage and subsequent water leaks.

Conclusions/Recommendations

No visible mold growth was observed in classroom 107 and the attic during the assessment. The following are several recommendations to prevent possible potential/future water penetration.

1. Repair roof braces to prevent further damage and roof leaks. Either replacement of the braces or repair by “sistering” the braces should be examined.
2. Replace all water-damaged ceiling tiles and wet insulation material.
3. The base of the diagonal brace in Picture 6 needs to be re-footed.
4. Continue to implement recommendations made in the Klienfelder/SEA Consultants report.

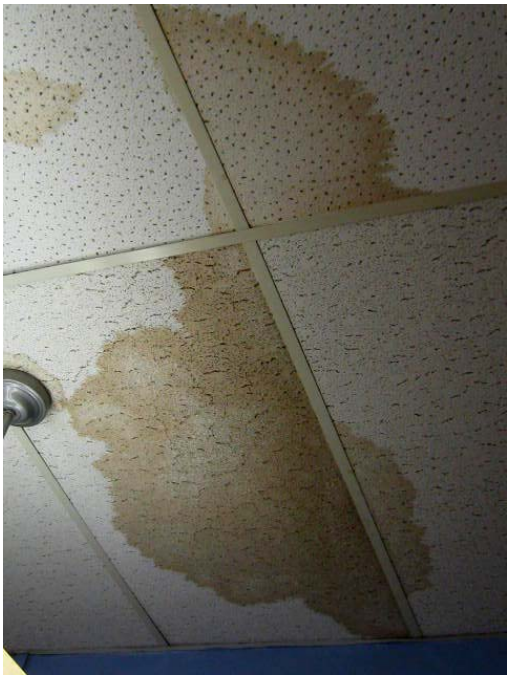
References

ACGIH. 1989. Guidelines for the Assessment of Bioaerosols in the Indoor Environment. American Conference of Governmental Industrial Hygienists, Cincinnati, OH.

Klienfelder/SEA Consultants, 2011. Letter to Massachusetts Interlocal Insurance Association from Wade Brown, Principal Structural Engineer, Klienfelder/SEA Consultants, 2011, Regarding Templeton Center School 17 South Road, Templeton, MA. Recommendations Regarding Ceiling Tile Damage, dated February 15, 2011. Klienfelder/SEA Consultants, Cambridge, MA.

US EPA. 2001. "Mold Remediation in Schools and Commercial Buildings". Office of Air and Radiation, Indoor Environments Division, Washington, DC. EPA 402-K-01-001. March 2001. Available at: http://www.epa.gov/iaq/molds/mold_remediation.html

Picture 1



Remaining Water-Damaged Ceiling Tiles in Classroom 107

Picture 2

Location of Roof Leak (Arrow)

Picture 3

Diagonal Brace, Not Notch at End of Beam (Arrow)

Picture 4

Diagonal Brace Is Split Down the Middle

Picture 5

Brace Holding the Base of the Diagonal Brace in Place was Kicked Outward (Arrow)

Picture 6

Rotation of a Brace Connecting the Diagonal Roof Rafters beneath the Water Leak (Note Split at the Nail and that the Brace Junction Where the Brace Ends are no Longer Flush. Also Note Water Stains on the Braces and Adjacent Rafter on Left Side of Picture)

Appendix A

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February 15, 2011

Massachusetts Interlocal Insurance Association
12 Gill Street, Suite 1500
P.O.Box 4043
Woburn, MA 01801-1728
Attn: Thomas Donaldson, General Adjuster

FEB 16 2011 AM 9:13

Re: Templeton Center School,
17 South Road, Templeton, MA
Recommendations Regarding Ceiling Tile Damage

Dear Mr. Donaldson:

Introduction

On February 14, 2011 from 2:00 to 3:30 p.m., at the request of the Massachusetts Interlocal Insurance Agency (MIIA), KLF-S E A's Principal Engineer, Wade R. Brown, P.E. and Staff Engineer, Krystian Kozlowski, E.I.T., conducted a site visit to evaluate the interior damage at the Templeton Center School located at 17 South Road, Templeton, MA. Mr. William Claybaugh (Head of Maintenance) provided access and information about the school building and its present situation. Other employees of the school and town were also present during the site visit. According to Mr. Claybaugh, the Templeton Center School is a two level structure, built in the 1940s. As of Thursday Feb. 10, 2011, the school has been vacant due to safety concerns. Soon after the school's closure, an independent inspection of the damage in question was performed by Whetstone Engineering.

KLF-S E A's visit was primarily focused to observing the damaged ceiling area within Classroom 107 and to the ceiling framing, above the damaged area of Classroom 107, as observed from within the attic.

KLF-S E A also provided a cursory observation of the roof and bearing wall framing, within the attic, and walked the roof to observe the existing snow and roofing conditions.

Observations

In Classroom 107, loose fill ceiling insulation was supported by square sound board ceiling panels fixed to the bottom of the ceiling joists. A modern suspended ceiling was hung approximately 5 inches below the sound board panels. In several locations, it was observed that the sound board had sagged significantly or detached from the timber ceiling joists. In some locations the sound board was in contact with the suspended ceiling. The damage, non-structural in nature, appeared to have been caused by the added weight of the water saturated insulation and an unsatisfactory method in which the panels had been attached to the underside of the ceiling joists.

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Appendix A

The structural members supporting the ceiling panels above Classroom 107 consisted of 2X12 timber ceiling joists spaced at 16 inches on center with cross style bridging at thirds of each joist length. These joists spanned 22'-6" from the interior bearing wall to the exterior bearing wall.

It should be noted that the ceiling support framing, observed from within the attic, appeared to be in satisfactory condition and is completely independent of the roof framing, which is described below.

The roof structure consisted primarily of 2" nominal width timber framing members supported on exterior and interior 2" nominal width timber frame bearing walls. The center portion of the roof was flat, supported on the two interior walls, while the perimeter slopes at approximately a 4 on 12 pitch to the exterior bearing walls. Although the observation of the roof structure was general in nature, the timber members appeared to be in satisfactory condition.

From atop the roof, standing water near the flat/sloped roof transition, was noticed to be leaking and dripping into a temporary catchment system of tarps and buckets located within the attic above Classroom 107. The catchment system was built by Mr. Claybaugh who noted he had witnessed the roof leaking over the last 10 years. At the time of our site visit, the snow had been mostly cleared off of the entire roof, while on average about 4" of wet snow remained.

Recommendations

Based on the limited visual observations of this part of the building as described above, and from the verbal information provided by Mr. Claybaugh and other staff at the school, we offer the following recommendations:

1. The northeast room (Classroom 107) on the 2nd level should remain closed from public use until repairs to the ceiling panels are complete. Other areas of the school may now be re-occupied provided the School/Town ensures there are no current water leaks above such areas.
2. The repair should consist of attaching 1x3 timber furring strips, below the sound board panels, with structural screws to the underside of the ceiling joists in the areas of damage, as suggested by Whetstone Engineering (see enclosed drawing SK-1). The wood furring strips shall be spaced at approximately 12" o.c. along the ceiling joists with a minimum of three per panel.
3. The Town continues to maintain snow removal operations throughout the remainder of the winter. The roofing should be repaired and/or replaced as soon as practical to avoid future leaks, which could lead to further damage.
4. The Town continues to collect and remove water as it leaks into the attic until the roofing is repaired and/or replaced.
5. Since it is assumed that the ceiling panels in the other classrooms are currently affixed in the same manner as in Classroom 107, such ceiling panels should also be reinforced with 1/3 furring strips as soon as practical (also see recommendation No. 1 that references conditions for re-occupancy).

Appendix A

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6. School/Town shall on a regular base review/look for signs of water leaks throughout the building to help ensure the safety of occupants until corrective steps outlined in the recommendations are implemented

This letter has been assembled by means of conversations with the parties, and site observations. The letter reflects our opinions, to the best of our knowledge, based on the conditions present on the day of our visit.

If you have any questions or would like to discuss any part of this letter, please feel free to call me at (603) 623-4400.

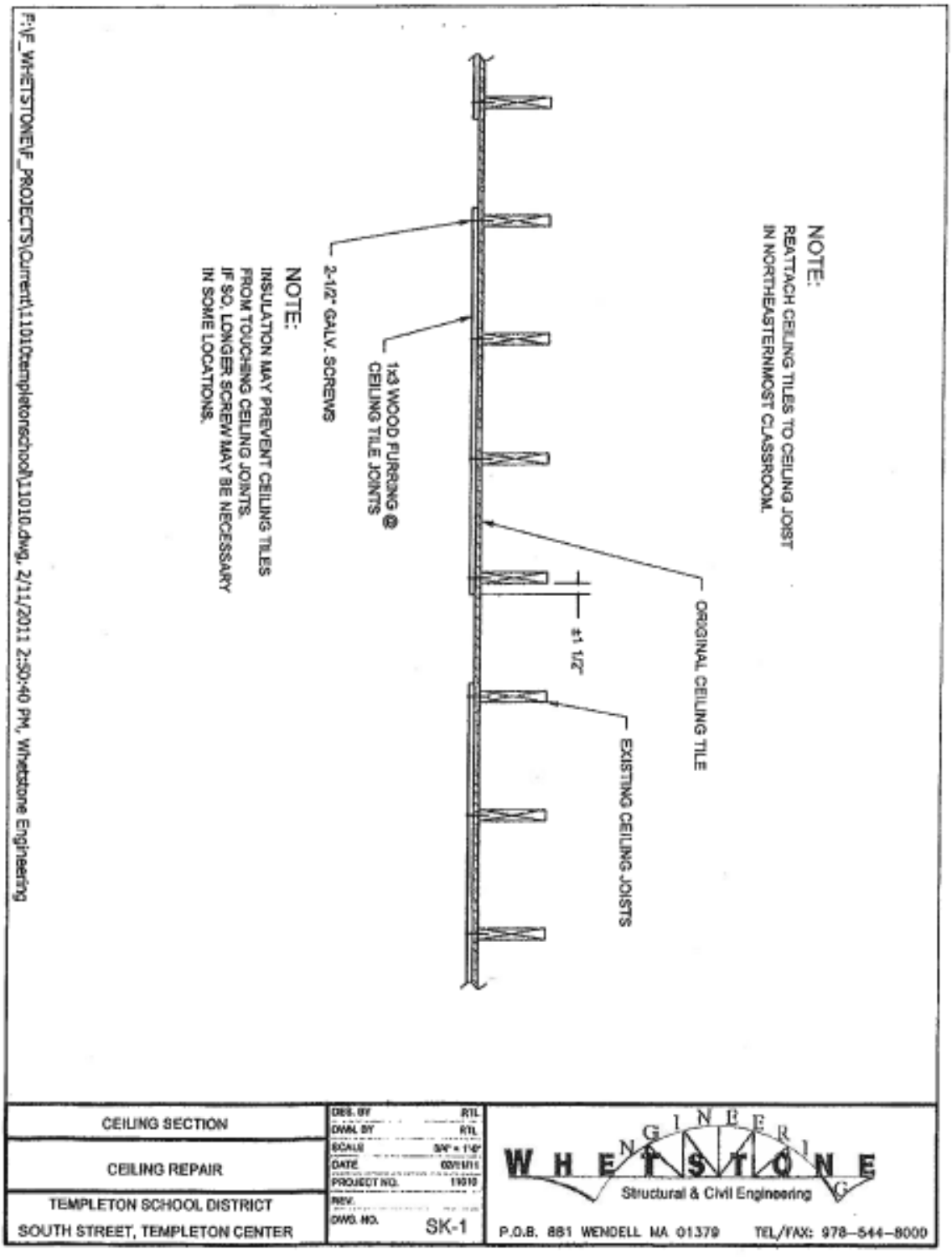
Sincerely,
Kleinfelder/S E A Consultants, Inc.

Wade R. Brown, P.E
Principal Structural Engineer

Enclosure

Cc: Carol Skelton, Town of Templeton

Appendix A


NOTE:
REATTACH CEILING TILES TO CEILING JOIST IN NORTHEASTERNMOST CLASSROOM.
ORIGINAL CEILING TILE
±1 1/2"
EXISTING CEILING JOISTS
1x3 WOOD FURRING @ CEILING TILE JOINTS
2-1/2" GALV. SCREWS
NOTE:
INSULATION MAY PREVENT CEILING TILES FROM TOUCHING CEILING JOINTS. IF SO, LONGER SCREW MAY BE NECESSARY IN SOME LOCATIONS.
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CEILING SECTION
CEILING REPAIR
TEMPLETON SCHOOL DISTRICT
SOUTH STREET, TEMPLETON CENTER
DES. BY RTL
DWN. BY RTL
SCALE 3/4" = 1'-0"
DATE 02/11/11
PROJECT NO. 11010
REV.
DWG. NO. SK-1
WHETSTONE ENGINEERING
Structural & Civil Engineering
P.O.B. 881 WENDELL MA 01379 TEL/FAX: 978-544-8000