Turner Building Science & Design, LLC

75 South Street Lyndonville, VT 05851 t: 802.626.8233 turnerbuildingscience.com

Field Observation Report No. BECx 1

Client: Westport Public Schools – Facilities	**Job Number**: S1291
Project: Coleytown Middle School	**Date:** 11/16/18
Location: Westport, CT	**Weather:** 73^{o}f,96% RH, Cloudy light rain
Mr. Theodore Hunyadi	
Contractor:	
Prepared By: Frederick T McKnight	

Site Observations: Initial observations and data collection 9/26/18

Background:

The Coleytowm Middle school was reportedly suffering from a number of issues that were, in general, related to indoor air quality. These included reports of:

- mold,
- high humidity,
- poorly maintained mechanical systems,
- poorly designed/built building envelope,
- outside air intakes for unit ventilators are at ground level,
- water pooling in front of outside air intakes for rooftop air handlers,
- boilers and chillers share one set of piping (two pipe system),
- improper drainage of condensate from cooling equipment
- grade and concrete walkways around perimeter of building that pitch toward the building

Summary:

The facility was closed (evacuated) when we arrived, making the collection of Carbon Dioxide (CO_2) as a means to verify ventilation rate, temperature and humidity (%RH) measurements inconsequential. Additionally, the building was not operating normally with respect to providing outdoor air for ventilation and exhausting air for contaminate control; therefore building air pressure mapping was not completed because the measured pressure driven air flow would not represent the normal occupied condition. We interviewed the facility personal who were on site at the time of our evaluation and competed a walk through with the facility folks to observe the walls, roofs, and site conditions. Our observations are detailed within this report and our

recommendations are based on those observations and information provided by the facility folks.

In subsequent phone conversations with the superintendent there was a request from the superintendent to provide additional recommendations outlining what would be necessary to reoccupy the facility. We have made some recommendations to improve the HVAC system and the site to improve the environment for temporarily reoccupying the facility as requested. However, re-occupancy should not be considered permanent. A series of high capitol cost improvements or replacement of the facility will be required to bring the building into compliance with normally expected building environments.

Sampling Methodology:

N/A

Discussion and Results:

The facility was closed (evacuated) when we arrived and the control system was in a non-normal sequence of operation to facilitate as rapid a dehumidification of the space as possible by the temporary dehumidification system. The operation of the system made the collection of Carbon Dioxide (CO_2) as a means to verify ventilation rate, temperature and humidity (%RH) measurements irrelevant.

Unit ventilators:

We learned from the facility folks on site at the time of our walk through that the wall assembly has been problematic for many years. These problems included moisture within the walls and odors also though to originate within the wall system. Additionally, the location of the OA intake s for the UV's were at ground level. The location is problematic from the stand point of minimizing water intrusion into the OA plenums behind the intakes as well as keeping the intakes clear during winter months. Some of the plenums have been rebuilt due to moisture damage and the need to reconfigure the UVs.

Site Drainage:

The perimeter of the classroom wings of the facility incorporates a concrete apron. While the apron may have been slightly pitched away from the building when it was new, movement as a result of frost, settling, and erosion have diminished and eliminated most of the pitch of the aprons and in many cases the apron now pitches towards the building, which directs surface water (from rain and snow storms) into the building walls. The loss of drainage of the aprons also directs storm water towards the classroom emergency exit doors. Reportedly, storm water routinely enters the classroom through the openings in the wall assembly for emergency exit doors.

Other areas of the site near the perimeter of the building that do not have concrete aprons also suffer from inappropriate site grading that directs water to the foundation walls where it seeps into the building at the joint between the foundation and the exterior wall assembly.

Wall Assemblies:

The exterior side of the building walls are a CMU block. The base of the walls at the classroom wings showed signs of dampness, moss like structures were growing on the wall surface suggesting that the wall areas stayed damp for extended periods of time. The exterior block was damp and water staining showed that water was present especially at the support connection for the sun shades. Some of the observed CMU block showed deterioration at the points where the supports were attached to the building. These observations suggest to us that water is frequently behind the CMU block façade. The façade is not intended to be a water proof surface and typically there is a drainage plane behind the block with weep holes that drain water from behind the block to the outside. A modern building wall will have a water resistive barrier behind the façade (CMU block) that prevents water from migrating further into the wall assembly. It is unclear what is behind the CMU block wall. The provided as-built drawings are lacking in details concerning components of the wall assembly.

Ground Contact Floors:

Most of the spaces observes had tiled floors as opposed to carpeted spaces. The tile appeared to be well adhered to the substrate.

Roof Assembly:

The roof assembly is reportedly old but not yet in need of replacement. We observed a number of patches but did not see any surfaces that would suggest that the roof was actively leaking. The roof wall connection at some places in the front tower is reportedly leaking and our observation suggest that there may be a flashing failure in the area of the leak. There was an exploratory opening of the tower wall above the roof. We decided against removing the patch due to the rainy weather that was being experienced at the time of our site visit.

Visible Mold:

We did not observe visible mold like growth inside the building at the time of our site visit. There were reports of odors that were believed to be originating in the wall assembly. Disassembly of the wall was not part of this scope of services.

HVAC Controls:

The heating ventilation & air conditioning (HVAC) control system was overridden at the time of our site visit. Reportedly, the outdoor air (OA) dampers on the classroom unit ventilators (UVs) and the roof top units (RTUs) were closed, OA was being provided by a separate temporary dehumidification system, which was feeding the classroom via a separate temporary duct. The

occupied unoccupied time clock was also overridden in an effort to keep the OA dampers at the UVs and RTUs closed.

Previous Reports:

Previous reports (if any) by other consultants concerning mold, ventilation capacity and other IAQ parameters were not available.

Building Air Pressure Mapping:

We did not complete pressure mapping because the building was not operating under normal conditions with respect to the amounts of OA being introduced and the amounts of air being exhausted.

Recommendations

Recommendations For Improvement:

1. Re-grade site to provide a more robust pitch of the finished grade away from the perimeter of building. Additional site engineering will be necessary to design and implement the required site revisions to manage the site water effectively.

2. Provide means to dehumidify the occupied environment in the classroom spaces, and other occupied spaces. The classroom UV's are unlikely to be able to provide any additional dehumidification, so additional systems will be required or replacement of the UVs with a new HVAC system will be necessary to provide the dehumidification requirements. Additional engineering services will be required to design the modified system or the new system as may be selected.

a. A separate dedicated outdoor air system (DOAS) could be added to existing UV's, but would have major effects to the aesthetics of the facility. Additional engineering service will likely be required to successfully install this system.

b. The existing roof top units (RTU's) could also be retrofitted with a dehumidifying DOAS. Additional engineering service will likely be required to successfully install this system.

c. Due to the age of the UVs a new mechanical HVAC system(s) for the classrooms may be a better solution with respect to overall controllability, maintenance, effective humidity control, and aesthetics. However, the building may not easily lend itself to installation of ductwork and will require engineering services to implement.

d. If UVs are to be considered for reuse then modify the OA intake louvers and associated plenums to raise the air intakes 12 to 18 inches above finished grade. The UV plenums and cabinets should be cleaned to remove all debris before being returned to service. Please note, the elevated age of the UV systems should be considered when evaluation the continued use of

the UV system. Newer replacement systems can be more energy efficient than the existing and annual maintenance costs would likely be much lower.

3. Evaluate existing wall structures, consider disassembly of wall assemblies to verify wall assembly components and to determine water resistive functions of assemblies. (We understand this task has been competed by others, however we have not seen any reports detailing the results of the disassembly activities. Further details on this recommendation can be provided after we have an opportunity to review the results of the wall disassembly.

4. Additionally, reported odors that may originate within the walls may require additional evaluation with respect to mold growth. Additional work to mitigate and repair the walls may be required as outline in recommendation #3 above.

5. Complete dew point calculations of proposed replacement / repaired wall assemblies. The determine the best arrangement of wall components to minimize condensation opportunities with in the wall structure.

Recommendations To Temporarily RE-Occupy Building

In addition, if re-occupancy is being considered the following are recommendations to provide temporary repairs and modifications to the existing HVAC systems. These recommendations are made with respect to temporarily re-occupying the space. There are repairs recommended above that will have large capital cost associated with them. These recommendations are not made to provide an acceptable space in lieu of completing the recommended tasks outlined above but, as a way to use the space temporarily while permanent repairs are being evaluated:

6. Reset controls to provide recommended ventilation air to occupied spaces.

7. Reset controls for occupied /unoccupied cycle.

8. Reset Economizer cooling control.

9. Provide temporary water dams or drainage trenches to divert rain water and other surface water away from building perimeter.

10. Provide dehumidification of occupied spaces. Note. Temporary systems will require additional heating of the air stream being delivered to the occupied classrooms to avoid depressed space temperatures and cold drafty conditions. RTUs may have the ability to heat air provided by a DOAS with dehumidification to meet acceptable occupied space temperatures.

11. Provide temporary water tight OA intake extensions to raise the OA intake louvers feeding the classroom UV's 12 to 18" above the finished grade.

12. Clean all UV's. Remove any debris found within the UV's and the OA plenums that serve the UV's. Clean drip pans, interior sides of cabinets and plenums, and coils. Replace any moldy liners and provide new filters.

13. Clean all RTU's. Remove any debris found within the RTU's. Clean drip pans, interior sides of cabinets, plenums, and coils. Replace any moldy liners. Provide new clean filters.

14. Temporarily provide means to positively pressurize the existing spaces (5 to 8 Pascals) with respect to the outside to minimize the migration of odors originating in some wall sections into the occupied spaces. The amount of outdoor air being introduced into the space via the RTU's and UV's could be increased to provide the required pressurization or a separate DOAS could be added to the current HVAC system. NOTE: The operation of the HVAC system when providing additional OA will be noticeably more expensive and is recommended only as a temporary system until the wall odors can be mitigated. See recommendation #3 above for initial work to address the wall odor issue.

15. Repair all roof leaks and flashing failures.

Submitted by:

Frederick T McKnight, P.E. LEED AP, CxA
Senior Vice President, Building Science
Turner Building Science & Design, LLC
Land (802) 626.8233 Cell (802) 684.2134
fmcknight@turnerbuildingscience.com

PERSONS CONTACTED: Mr. Theodore Hunyadi *thunyadi@westportps.org*
lcataudo@westportps.org

CC: Jeff Preble TBS