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September 18, 2018

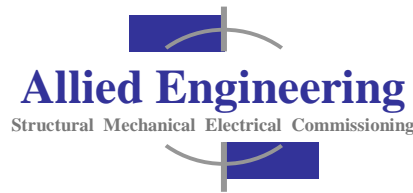
Mr. Anthony T. Plante
Town Manager
Town of Windham
8 School Road
Windham, ME 04062

Re: WINDHAM SAND/SALT STORAGE SHED INTERIOR WALL CONDITION, WINDHAM PUBLIC WORKS FACILITY, WINDHAM, ME

Tony:

While on site September 12, 2018, I met with Todd Desmarais (GFC) and Doug Fortier. We walked along the inside the Sand/Salt Storage building to review the condition of the long length of foundation wall that runs parallel with Windham Center Road. The following is a summary of my observations.

- Much of the bituminous coating applied to the inside face of the wall has been scraped away or is peeling in place as a result of sand buildup and removal activities that have occurred since the building went into service back in 2000. It does not appear that any replacement applications of this bituminous coating were ever applied to these interior wall surfaces.
- For approximately 70-80 feet of the exposed wall length, there is a considerable amount of either spalled (missing) concrete on the interior wall face extending from interior paved grade up to nearly 2/3rds of the concrete wall height. Where spalling has not occurred, the outer 2-3 inches of the concrete is generally separated away and currently suspended away from the solid concrete behind it.
- The rebar along this interior face of wall is #10 (1 ¼" diameter) rebar installed at 9" on-center spacing. The exposed rebar is corroded and has expanded to varying degrees along the length of the wall. Rebar that is exposed to weather, or in this case an environment that has a prevalent salt presence, tends to corrode. When rebar corrodes, it will expand in diameter as rust develops along the perimeter of the rebar. This creates a tremendous amount of pressure against the surrounding concrete. The result is a break of the bond between the rebar and the concrete. As the rebar further corrodes and the thickness of the rust scale around the bar increases, the weakest element (the concrete) spalls or separates from the rebar. Once this occurs, the rebar is no longer a functional element of the system and the wall strength is severely compromised.
- We were not able to see the area where the mixed sand/salt is stored up against the wall but expect to find more of the same conditions present here as well.



Recommendations:

The retaining walls are subject to a combination of loads. First, the wall is resisting both a vertical load and outward thrust load resulting from the wood arch roof assembly to the top of the wall. These loads result from snow, wind and dead load applied to the roof structure.

Another loading element and the much larger concern is the sand storage influence on these walls. The retaining walls were designed for full sand load with an interior piling effect against these walls. Without the functional interior rebar matt, the wall resistance to outward rotation of the wall stem extension above the footing is severely compromised.

While on site, we discussed the temporary positioning of large concrete blocks up tight to and on the exterior side of the exposed foundation wall along this wall length as a temporary measure to offer resistance to the developed lateral loads. These would be stacked approximately 6' high at the middle two thirds of the long interior wall run and single height at the remaining wall lengths. This is a temporary patch to a condition that should be further studied prior to developing a formal interior wall repair. We believe this temporary setup will allow the use of the facility through the 2018/19 winter months.

This repair is not a permanent fix and we recommend that when spring arrives, and the full length of the wall can be exposed, that an investigation be made to determine the extent of the rebar compromise. This will require removal of all stored materials from in front of this length of wall and for both of the short overhead door wall lengths. This will require the assistance of a contractor to demo as much of the loose and separated 2-3 inches of concrete along the inside face of the wall in order to identify the extent of the rebar damage. Based on the findings of that investigation a repair can be determined and subsequently applied.

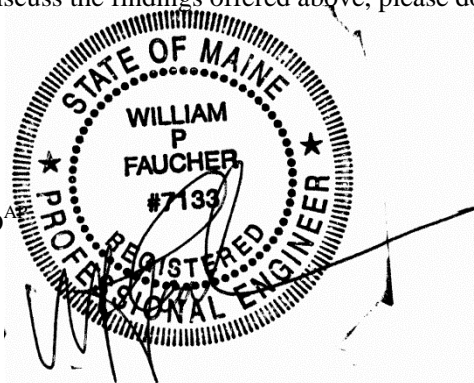
In Appendix A we have included the base plan from the original foundation plans AEI prepared back in 1999. The wall length in question is highlighted and the identified wall sections are provided.

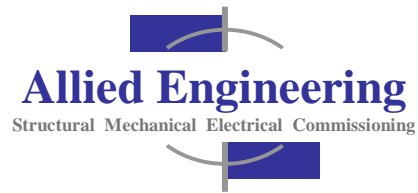
Should you have questions or wish to discuss the findings offered above, please do not hesitate to contact me.

Regards,

Allied Engineering, Inc.

William P. Faucher, P.E., SECB, LEED AP
Registered Roof Consultant
Principal





Appendix A
Existing Sand/Salt Building
Foundation Plan/Sections

