

Groton Heights School – Structural Evaluation

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Tighe & Bond conducted a site visit to the former Groton Heights School, located at 244 Monument Street, Groton, Connecticut on Monday December 14, 2015. The building has been unoccupied since approximately 2007. The building's utility services are mostly still active and the structure has had periodic maintenance since the time the school vacated the building. Below are our observations of the current conditions of the building.

1. Building Construction

At the time of our site visit, no record drawings were available for the building. Therefore, our findings are based only on our visual observations and do not include detailed dimensions, structural calculations, or review of existing drawings.

Several previous Asbestos Inspection Reports had been completed on the building by Mystic Air Quality Consultants, Inc. between 1990 and 2002. These reports provided some information on the presumed date of construction for the building and approximate floor plan area as well as schematic room layouts.

According to information provided, the main building was constructed in 1912 and there was an addition to the building (likely the Gymnasium section) built in 1962. The main building has three levels, two above ground and the lower level is partially below grade (**Photo 01**). The main exterior supporting elements are multi-width unreinforced brick masonry bearing walls. The interior supporting systems appeared to be wood framing with a combination of masonry walls and steel, or possibly cast iron based on the age of the building, columns. The interior framing could not be verified everywhere as there were gypsum ceilings and wall finishes throughout the building.

The Gymnasium building is two stories high and is constructed on a sloped portion of the site (**Photo 02**). The exterior support for the building is a combination of brick masonry pilasters with CMU block infill walls between the pilasters. The roof framing is long span metal trusses with a metal roof deck (**Photo 03**).

The roofing system of both buildings, as well as the connection structure, all appear to be ballasted Built up Roof systems (BUR).

2. Existing Conditions

Throughout this technical memorandum the overall conditions of the building as well as specific areas or systems within the building will be classified as “Good”, “Fair” or “Poor”. As these descriptions are generally open for interpretation, below is what Tighe & Bond has determined as definitions for these condition assessments:

- **Good:** Represents elements that are performing well, are sound, adequate or show minimal deterioration. Repairs are generally not required at this time and these items can be expected to remain useful and functioning for greater than 10 years with regular maintenance.
- **FAIR:** Represents items that have minor deficiencies, but are currently performing adequately. Elements are generally sound but some areas exhibit deterioration. These items generally can be repaired and / or restored to good condition with varying degrees of required modifications. If not repaired or restored, these elements should remain useful for approximately 5 to 8 years with regular maintenance, however they should be observed for further deterioration.
- **POOR:** Represents items that have significant deficiencies, are not performing well or are failing. Elements show advanced deterioration or appear to be inadequate. Generally these items will require substantial repairs or replacement of the element in question to remain in service. These items will require immediate repairs and have an expected remaining useful life of less than 3 years.

2.1 Building Exterior

Main Building - The exterior of the main building appeared to be in good condition, with some isolated areas of deterioration in fair condition. Overall the brick work on the building’s exterior was sound and without significant cracks or spalls. The mortar was in place and had not deteriorated and generally the brick units were not displaced (**Photo 04**).

The wood roof eave appeared from the ground to be in at least fair to good condition. Some isolated areas of peeled paint were noted, but no widespread significant rot or damaged portions were apparent at the time of our review. There was one location on the east face of the building that appeared to have damaged wood eave. The brick below currently did not show signs of water damaged, but if the opening in the wood is left unattended, the brick will begin to deteriorate as water penetrates the building envelope.

Several of the roof downspouts have been dislodged from the underground drain connection and water deterioration is beginning to develop on the surrounding brick.

Overall the entrance stairs on the south and west sides of the building are in good condition. The stone stairs appear sound and without significant cracks or spalls. The doors at each of these locations however, are in fair condition. Each leaf of the doors has peeling paint and the wood is beginning to deteriorate. Each entry door appeared operational at the time of our review, but continued exposure to the elements without protection for the wood will likely result in damaged or inoperable doors.

Gymnasium - The Gymnasium and small connector structure appeared to be in fair condition. Water damage to the brick was apparent in several locations, but does not appear to be affecting the structural integrity of the walls at this time. A clearly identifiable line in the gymnasium wall shows the elevation of the floor slab inside (**Photo 05**). The brick below this elevation likely has water trapped behind the wall and is slowly penetrating through the wall to the exterior. The mortar in this location is soft and there are isolated displaced brick units. This condition exists along the north side of the gymnasium and to a lesser degree the east and west side walls as well.

There are three exterior exits from the gymnasium and each has some level of deterioration. The exit stairs on the west side appear to be in the worst condition. Overall the stairs are in fair condition, with one location in poor condition where there are several large spalls along the horizontal construction joint. The stair railing has some peeling paint and surface rust, but appeared to be stable. The north side stairs are also in fair condition and show the early stages of the spalls apparent in the west side stair concrete, however the north stair's concrete has not yet advanced to the same level of deterioration. The exit stair on the east side of the gym is again in fair condition. This stair has only two risers, but each has some concrete spalling. In addition, the railings at this exit appear to have been impacted at some point as the posts and rails are bent in several locations.

2.2 Roof

The roofs of the buildings are a stone ballasted Built up Roof (BUR) system. Access to the roof was through a small hatch at the top of the main stair towers. The Gymnasium and connecting structure's roof could be visually reviewed from the roof of the main building (**Photo 06**).

Overall the Gymnasium roof appeared to be in fair to poor condition. There were several wet locations noted on the gymnasium roof, mostly along the north edge of the roof. Generally the stone ballast appeared to be in place, with some areas of exposed membrane around the roof. No significant vegetation growth on the roof was noted, which typically indicates areas of ponding water and sediment build up. There was a large section of the Gymnasium roof in the northwest corner where it appeared the stone has been removed and the membrane is currently exposed; there was heavy moisture in this area noted during the review of the gymnasium interior. The roof of the small connector building was in similar condition to the gymnasium.

The roof of the main building was similar construction as the gymnasium with a stone ballast BUR system. The majority of the main building's roof was in fair condition, with a large section that was compromised in the south east portion of the roof. An aerial view of the building clearly shows the area of the roof where the system has failed (**Photo 07**). This deteriorated portion of the roof was confirmed from the interior review of the building, where there was heavy water damage noted.

2.3 Second Floor

The interior of the main building is laid out with six classroom spaces, three each on the east and west sides of the building. The classrooms are separated by a central hallway with stairwells

at the north and south ends of the building; the classrooms are labeled as rooms 6 to 11 (**Appendix B**).

Overall the second floor of the building is in fair condition, however room 6, located in the south east section of the building is in poor condition. Room 6 has heavy water damage and portions of the finished ceiling have failed (**Photo 08**). The location of the ceiling failure appeared to be in the general area of the compromised roof covering as noted in the roof portion of the report. At the time of our inspection, it did not appear that the structural roof framing has significantly deteriorated, however based on the extent of water damage noted there is likely some damage to the wood roof framing.

The floor of room 6 has also sustained heavy water damage, with the finished hardwood floor buckled and deteriorated. Overall the walls have some water damage, but not to the extent of the ceiling or floor. The heavy damaged area of room 6 is generally contained to the portion directly surrounding the roof leak; the far south end of the room (away from the roof leak) has significantly reduced damage.

The remaining five rooms on the second floor are all generally in fair condition, with varying levels of apparent water penetration. Currently peeling paint appeared to be the most significant deficiency noted, however there is an indication of water penetration on the ceiling of room 8 and water staining on the carpet below. This condition appears to be the beginning stage of a similar condition to room 6. There were spots of the roofing that appeared to have been patched in this area, the water damage could have been prior to the patches, or the patches are failing.

2.4 First Floor

The first floor of the main building is laid out similar to the second floor with classroom buildings along the east and west sides and a central hallway. There are three classrooms on the east side of the building and two on the west with the main entrance to the school on the west side as well.

Overall the first floor of the building is in at least fair condition, with the majority of the floor in good condition. Room 1, which is in the south east portion of the building, directly below room 6, has heavy water damage to the ceiling and minor water damage to the floor (**Photo 09**). At this time the ceiling finishes have not failed, however it appears imminent that this will occur soon. There is a significantly wet area adjacent to the east wall where mold appears to be beginning to form. Mold abatement will likely be required prior to or during building renovations. Abatement may include removal of select flooring components.

The remaining areas of the first floor show little to no signs of water damage or deterioration. There is one location in room 3 where peeling paint is apparent and is likely an indication of moisture. This room is directly below room 8 from the second floor, the other room on that floor that showed signs of significant water penetration. The area is isolated to the far north east corner of the room, and no apparent signs of structural deficiencies were noted.

2.5 Lower Level / Basement

The lower level of the building has two classroom spaces, the remaining sections of this level are comprised of storage rooms, bathrooms and the boiler / mechanical room for the building. Overall this level is in fair condition, there are sections that appear to be in good condition and there are portions that have significant deterioration and may degrade to poor in the near future.

The girl's bathroom is located in the south east portion of the lower level, water penetration is apparent from peeling paint on the ceiling and portions of the walls. The moisture from the ceiling is likely a result of the water penetrating down from the roof and through the classrooms above. The peeling paint on the walls is widespread throughout the lower level and is likely due to a breakdown, or lack of, an adequate water barrier on the exterior of the below grade portions of the wall.

Room 12, located in the south west corner of the lower level, has the heaviest amount of moisture on the walls. The west exterior wall has peeling paint throughout the length and height of the wall and there are isolated portions of the masonry that appeared to be softening (**Photo 10**). In addition, the south side wall also has widespread peeling paint. The ceiling in this room appeared intact without water damage.

The other portions of the lower level are all in fair to good condition, with minimal deterioration or moisture penetration.

2.6 Gymnasium and Connector

The connection between the main building and the gymnasium occurs midway between the first floor and the lower level from the north stair shaft. The connector building is a small structure with CMU block walls supporting structural steel roof beams and a metal deck. There are several doors and stairs connecting the main building to the gym, as well as the exterior on both the east and west side of the building. Overall the connector building appeared to be in good condition. There was little to no water penetration apparent, no rust was noted on the steel roof structure and there was only one isolated area of peeling paint at the time of our review.

The gymnasium structure has heavy moisture and water damage throughout the building (**Photo 11**). The roof has areas of rust and the walls have widespread paint peeling and water staining. The stage has been significantly impacted by water damage. Structurally the gymnasium is in fair condition, although the water damage is widespread, it does not appear to have significantly affected the building's structural systems at this time. It is apparent that deterioration of the brick masonry and areas of rusting roof members are advancing and if left unchecked will eventually reach poor condition and ultimately begin to fail; however at this time the structural integrity of the building does not appear to be an issue (**Photo 12**).

The roof of the gymnasium appeared to have several areas where the envelope had been compromised and it is apparent that the likely source of the moisture penetration originates from the roof. A condition that could not be verified from the interior is the potential deterioration of the brick masonry below the slab elevation. As noted from the exterior, there is a definite horizontal line along the outside wall at approximately the slab elevation. This condition occurs

along the north wall, which is also the side of the building with the heaviest interior water damage.

3. Potential Building Reuse

Currently the State of Connecticut has adopted the 2003 International Existing Building Code (IEBC) as the code governing the renovations and modifications of existing buildings. It is likely that at some point in 2016, the 2012 IEBC will be adopted by Connecticut, but for the purposes of this report we have based our recommendations on the 2003 IEBC.

Since the Groton Heights School building has been unoccupied for several years, any reuse of the building would be considered a Change of Occupancy in the provisions of the building code. Change of Occupancy within buildings will require nearly full compliance with current provisions of the 2003 International Building Code (the currently adopted building code for Connecticut). This would include potential modifications for Fire Protection, Means of Egress, Accessibility, Structural, M.E.P and potentially other required modifications. In addition, the building's height and area limits will need to be verified for the new occupancy proposed.

In the event that there are significant code compliance modifications required for the building which would preclude re-use options, Chapter 12, of the IEBC is intended to maintain or increase the degree of public safety, health, and general welfare in existing buildings while permitting repairs, alterations, or change of occupancy without requiring full compliance with the IBC.

We have reviewed the 2003 IEBC, including the Connecticut Supplements, in an attempt to determine what structural requirements may apply to the proposed redevelopment of the building.

As mentioned, re-use of the building will result in a change of occupancy or use and the "work area" for proposed building alterations will likely exceed 50% of the area of the building. Therefore, the requirements of IEBC Level 3 alterations will be applicable to this project. For purposes of this evaluation, we have presumed a Use Group "B" for future occupancy of the building.

- Some of the key requirements within IEBC Level 3 Alterations are as follows:
 1. Section 703 – Building Elements and Materials: All newly installed finishes and equipment shall comply with the requirements of the 2003 IBC.
 2. Section 704 – Fire Protection: The building currently has an automatic sprinkler system. Therefore, we would not anticipate significant upgrades required to the system. For more detailed information on the existing system, please refer to the Mechanical Systems Evaluation portion of our report.
 3. Section 705 – Means of Egress: The size, locations and capacity of the existing stairs and doorways will need to be evaluated for the new occupancy load. From an initial review, it appears the building has ample egress capacity, however this will need to be verified.
 4. Section 706 – Accessibility: Modifications for existing buildings are not required to meet accessibility provisions of Chapter 10 of the IBC; however there are provisions in the IEBC that will need to be met.

5. Section 707 – Structural: Evaluations, analysis and detailed inspections will be required on the building’s structural components as listed below.
- If alteration work includes installation of new equipment that is structurally supported by the building; or if the building’s space is reconfigured a structural evaluation and analysis shall be completed to verify the building can support the revised loading.
 - If more than 30 percent of the total floor and roof area of the building is proposed to be structurally altered, a structural evaluation and analysis shall demonstrate that the altered building will comply with the International Building Code.
 - The floor and roof diaphragms must be anchored to the exterior masonry walls using a positive (non frictional) connection. These connections must be designed to transfer lateral loads from the diaphragms to the exterior walls.
 - Roof diaphragms and connections that are part of the main wind-force resisting system must comply with the 2003 IBC requirements. The diaphragm and connections must be replaced or strengthened if they do not meet the 2003 IBC requirements
 - Check the existing masonry wall height to thickness ratios to verify that they fall within the IEBC allowable limits. The walls that exceed the code allowable must be strengthened in accordance with the IEBC.

4. Conclusions and Recommendations

Structurally, the Groton Heights School building is overall in at least fair condition, with large portions of the building in good condition and a few isolated areas in poor condition. The majority of the building modifications that would be needed would be architectural in nature. Building envelope modifications or repairs are the most urgent items to address.

A new roof for both the main building and the gymnasium will significantly reduce the advancement of the deterioration in both buildings. Currently it does not appear that the masonry bearing walls have deteriorated to a point where their capacities would be reduced. However, water and moisture infiltration into a building of this type of construction, significantly accelerates the deterioration process.

Due to the finished ceilings we could not visually verify the floor framing conditions or materials in the main building. Although no signs of deficiencies or overstress were apparent; a more invasive investigation should be done to confirm the structural systems of the building.

The gymnasium building has very high humidity and mold presence, and these conditions make occupancy of the space unlikely. However with what appears to be only minor rust; the structural capacity of the space does not appear to be significantly affected. There is some apparent deterioration of the north masonry wall below the floor slab elevation, which should be investigated and repaired. There were not global deficiencies or signs of future failures noted at the time of our review. Similar to the main building, the roof should be investigated to be replaced to slow the deterioration of the masonry walls and steel roof trusses.

While the final use of the building has not been determined, if the building is to be considered for re-use, we recommend that the building envelope deficiencies be addressed as soon as practical. A new roof for both the main building and the gymnasium is needed to stop, or at least slow down, the moisture damage inside the buildings. Generally the doors and windows appeared to be weathertight, however verification that all building openings are sealed, should be completed. To re-use the building, provisions outlined in section 3 of this report will be required.

As part of this conditions assessment, we have included our opinion of the probable construction costs associated with two options (**Appendix C**). The first option is to simply stabilize the building to prevent significant future deterioration of the building, while re-use options are reviewed. This option includes minimum exterior repairs to the building envelope and does not include any potential interior repairs.

The second cost option reviewed was to potentially occupy the building essentially “as is”. Exterior modifications would include some additional repairs to doors and windows as well as the roof eave and roof drain leaders. This option would also include basic interior repairs, but no upgrades to the building. Replacement of damaged materials throughout the building’s interior is included. Since under this scenario, materials will be repaired or replaced in-kind, the building modifications would be considered a “repair” in the IEBC and not subject to all code compliance upgrade requirements. If the building is “altered”, i.e. materials or systems within the building are upgraded, then compliance with the IEBC requirements outlined in section 3 of this report will be necessary.

Appendix A

Photos



Photo 1: Front Elevation of Groton Heights School



Photo 2: North Side of Gymnasium Building



Photo 3: Gymnasium Roof Framing



Photo 4: Typical Exterior Masonry Conditions



Photo 5: Deteriorated Brick Masonry



Photo 6: Roof of Gymnasium



Photo 7: Overall Roof Plan of Groton Heights School (note failure of roof covering)



Photo 8: Water Damage in Second Floor Classroom



Photo 9: Continuation of Water Penetration in First Floor Classroom



Photo 10: Moisture Damage to Brick in Basement Level Classroom



Photo 11: Heavy Moisture / Mold Apparent in Gymnasium



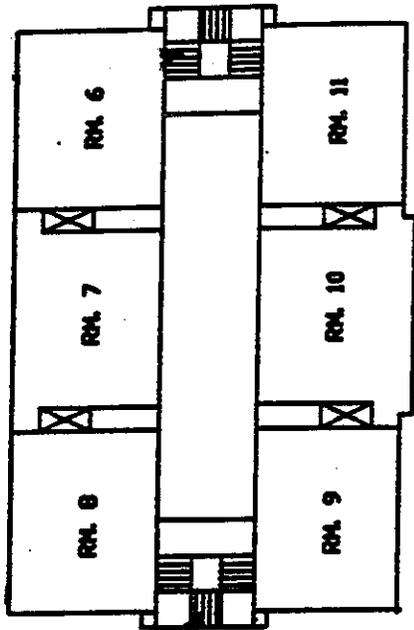
Photo 12: Rusted Roof Deck in Gymnasium

Appendix B

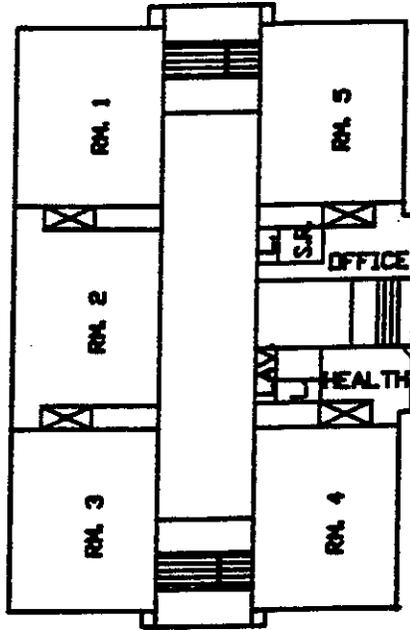
Overall Floor Plan

GROTON HEIGHTS SCHOOL

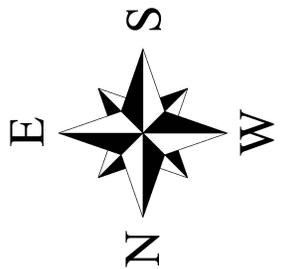
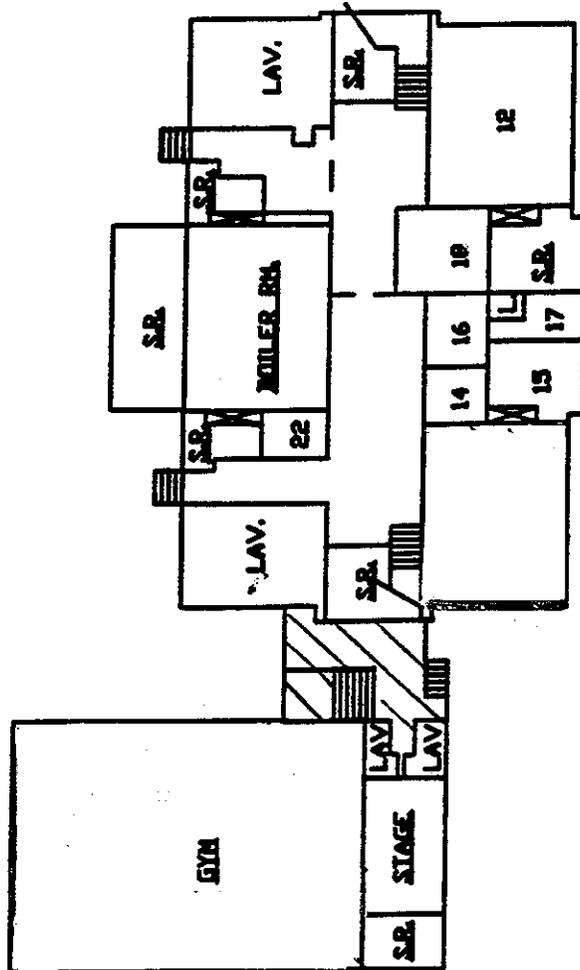
NOT TO SCALE



SECOND FLOOR



FIRST FLOOR



Appendix C

Opinion of Probable Construction Costs

**Estimate of Probbable Construction Cost
Groton Heights School - Groton, CT
Building Stabilization**

ITEM	DESCRIPTION	UNITS	QTY	UNIT PRICE	TOTAL
1.	General Conditions				
	Mobilization/Demobilization	LS	5%	\$21,800	\$21,800
	Contractors OH & P	LS	15%	\$65,400	\$65,400
2.	Exterior Modifications				
	Replace Roof of Main Building	SF	10750	\$25	\$268,750
	Replace Roof of Gymnasium & Connector	SF	6000	\$25	\$150,000
	Repair / Weatherproof Doors & Windows	EA	5	\$2,000	\$10,000
	Repair / Repoint Brick	LS	1	\$8,000	\$8,000
					\$436,750
				SUBTOTAL \$	523,950
	Engineering Fees 10%				\$52,400
	Contingency 25%				\$131,000
				TOTAL PROJECT COST \$	707,400

Estimate of Probable Construction Cost
Groton Heights School - Groton, CT
Occupy Building - "As Is"

ITEM	DESCRIPTION	UNITS	QTY	UNIT PRICE	TOTAL
1.	General Conditions				
	Mobilization/Demobilization	LS	5%	\$37,900	\$37,900
	Contractors OH & P	LS	15%	\$113,700	\$113,700
2.	Exterior Modifications				
	Replace Roof of Main Building	SF	10750	\$25	\$268,750
	Replace Roof of Gymnasium & Connector	SF	6000	\$25	\$150,000
	Repair Roof Eave	LS	1	\$7,500	\$7,500
	Repair Damaged Roof Deck & Members	LS	1	\$12,500	\$12,500
	Replace Damaged Doors	EA	8	\$4,000	\$32,000
	Replace Damaged Windows (Small)	EA	9	\$1,500	\$13,500
	Replace Damaged Windows (Large)	EA	1	\$4,500	\$4,500
	Repair Downspouts	LS	1	\$4,000	\$4,000
	Repair / Repoint Brick	LS	1	\$8,000	\$8,000
					\$500,750
3.	Interior Modifications				
	Remove & Replace Existing Ceilings	SF	6700	\$12.00	\$80,400
	Remove & Replace Existing Hardwood Floors	SF	4000	\$17.00	\$68,000
	Remove & Replace Existing Carpets	SF	7200	\$3.50	\$25,200
	Clean & Prime Walls	SF	18000	\$1.25	\$22,500
	Repair / Replace Window Lintels	EA	4	\$1,500	\$6,000
	Verify / Modify Structural Diaphragm Connections	LS	1	\$50,000	\$50,000
	Brick Repair in Room # 12	LS	1	\$5,000	\$5,000
					\$257,100
				SUBTOTAL \$	\$ 909,450
	Engineering Fees 10%				\$91,000
	Contingency 25%				\$227,400
				TOTAL PROJECT COST \$	1,227,900