

Structural Condition Assessment

City of Bridgeport
RemGrit Shot Tower and Stack
889 Barnum Avenue
Bridgeport, CT 06608



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FUSS & O'NEILL

56 Quarry Road
Trumbull, CT 06611

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1 Introduction

Fuss & O'Neill, Inc. (F&O) was retained by the City of Bridgeport to perform a structural condition assessment of the abandoned shot tower structure and adjoining chimney stack at the RemGrit site at 889 Barnum Avenue. The building was reviewed previously and included in a study and report prepared by Simpson Gumpertz & Heger in July of 2016. The purpose of this condition assessment is to develop a general understanding of the current condition of the building and stack structures and identify damage, deterioration or other issues that represent immediate hazards to the integrity of the structures and may present dangers to personnel involved in the protection and stabilization of the structure, to ensure its structural integrity is maintained until a plan can be implemented for the redevelopment of the building. It is expected that complete repairs and rehabilitation will be conducted in conjunction with the building redevelopment at a later date.

1.1 Executive Summary

The purpose of this Condition Assessment was to observe and report on the physical condition of the Shot Tower and adjoining stack at the RemGrit site at 889 Barnum Avenue in Bridgeport, Connecticut and discuss the appropriate modifications to be made to prepare the building to be temporarily secured and protected until a full redevelopment is performed.

From our visual inspection, we determined that the condition of the building is comparable to that determined during the previous Simpson Gumpertz & Heger investigation of 2016, with some additional deterioration noted at exterior masonry walls, roof structures and window frames. Most of the floor and wall structures of the building remain intact and have potential for renovation and reuse. Generally, despite damage due to the partially collapsed stack and continued exposure to weather and vandalism, primary roof and wall structures remain in fair to good condition. There are localized areas where both roofs and walls have been severely damaged and will require reconstruction, but most can be reused with minor structural and cosmetic repairs. The building envelope (roofing, roof decks, windows and exterior walls) will require significant repair and/or replacement.

Approximately one third of the height of the stack has collapsed, and the remaining portion appears to be out of plumb by an undetermined amount. Loose bricks are evident at the top, and gaps and vertical cracks were noted in the upper portions. Further investigation of the chimney is warranted to ensure it does not present a hazard to neighbors, nearby property, passing pedestrians or vehicles, or workers involved in the stabilization, security and temporary repair of the building.

1.2 Scope of Services

This Condition Assessment consisted of visual inspections of the Shot Tower and remaining stack at the RemGrit site, including roof, floor and mezzanine structures, and exterior walls. The assessment was limited to evaluating the structural integrity of the referenced building and stack and did not include an evaluation of architectural, MEP and non-structural building or site elements, nor did it include a Code review of the buildings, site or inspected elements. No structural analysis was performed to assess original or remaining capacity of floor, roof or wall elements.

Photographs of typical conditions and conditions requiring remedial action have been included in Appendix A.

2 Observations

2.1 Building and Stack Description

The Shot Tower is a ten-story, rectangular structure with three setbacks, including a sloped roof section that transitions from a mezzanine at the sixth floor to the seventh floor. There is a large one-story section on the west side of the building that terminates above the second floor, and the roof steps back at the north and south faces at the fifth floor (see Photo #1 aerial axonometric for overall configuration). Floors and roofs are constructed with concrete slabs supported on structural steel framing and columns. Exterior walls are solid brick with stone, concrete and steel lintels at windows. The sloped roof at the sixth floor was constructed with reinforced concrete slabs placed over corrugated form deck. Relics of the building's industrial past are evident throughout, including process equipment and elevators and bins that extend through and between floors.

The building has a partial basement that extends under the two central bays (out of six) at roughly the southern half of the main tower building. The floor of the basement and first floor slab where there is no basement appear to be a conventional slab on grade, with several small pits and openings found.

The stack is a tapered brick monolith positioned at the southwest corner of the building, which originally extended to a height close to the height of the building (roughly 150 feet). The base of the stack is octagonal, but most of the height is circular. The upper portion of the stack collapsed several years ago, causing damage to adjacent sections of the low roofs of the building.

Specific observations and recommendations for the building and stack structures are noted below.

2.2 Observations

2.2.1 Building

1. Demolition debris, including bricks, presumably from the collapsed portion of the chimney, has fallen onto and through the low roof at the second floor level adjacent to the tower on the west side (see photo #2 7981), and also the western end of the low roof at the fifth floor on the south side (see photo #3 7870). The roof deck has been severely damaged in both areas, but the main roof framing appears to remain intact at the second floor level roof. Both damaged roof areas are also visible in photo #1.
2. A large percentage of the sloped roof deck between the sixth and seventh floors is severely damaged, particularly on the north side of the building, where a portion of the roof has collapsed (see photo #4 7850). Large holes were found in sections of the sloping roof on the north and south sides, with smaller holes on the west side (see photos #5 and 6 7797, 7835).
3. Much of the metal form deck at the underside of the sloped roof has severely rusted and sections have collapsed, particularly on the north side (see photo #7 7851).

4. Severe degradation was found throughout the underside of the upper roof slab. Spalled concrete left rusted reinforcing exposed, and significant section loss was found (see photo #8 7800). Similarly spalled concrete was also found at isolated locations throughout the building at the underside of the floor slabs, but generally this degradation was less severe than the roof slab (see photo #9 7974).
5. Most of the steel framing has surface rust due to exposure to the elements, but distress or excessive deflection were not noted. Severe section loss was limited to sections of the upper roof and lower levels of the building, particularly near masonry wall supports (see photo #7 and 10 7800, 8001).
6. Essentially all the windows in the building have at least partially broken window glazing. In addition, damage to window frames, sills, jambs and heads is widespread, particularly at the sixth floor and where damage from the collapsed stack occurred (see photo #11-13 7834, 7828, 7885).
7. An apparent shear failure was noted at a concrete lintel on the south face at the sixth floor (see photo #14 7859).
8. Severe spalling and exposed, rusted rebar was found at an adjacent concrete lintel at the sixth floor, at the southeast corner (see photo #15 7860).
9. All roofs of the building have failed, even in areas where no structural damage was found. Vegetation, damaged roofing, and occasional penetrations were found throughout the building at all roof levels (see photo #16 7796). Water infiltration was evident throughout, including at most floors. Vegetation was also found in many locations throughout the interiors.
10. An antenna mast on the upper roof is damaged and displaced, apparently due to impact or vandalism (see photo #17 7809).
11. Several holes were found at the upper slabs, including one at the base of a permanent ladder leading to the 8th floor. The underside of the slab in the vicinity of the opening has severe spalling, but no rust is evident (see photos #18 and 19 7838, 7846).
12. Significant damage was found on the exterior side of various concrete lintels throughout the building (see photos #20 and 21 7942, 8024)
13. At many locations, brick damage was noted at the exterior. In most cases, the brick damage was most severe adjacent to lintels (see photo #22 7952).
14. Roof drain bodies have been removed from the building by vandals, leaving gaping openings at drain locations (see photo #23 7905). Damaged roof decking was found at each of these locations.
15. Trash, broken glass and other debris was found at various locations throughout the building, particularly where damage from vandalism and falling brick and other materials have occurred.

2.2.2 Stack

1. The upper third of the height of the stack collapsed several years ago (see photo #24 7841), depositing brick debris onto the ground and low roofs of the adjacent shot tower building to the east. Debris and roof damage remain, as described in item 1 in the Building section above.
2. A large vertical crack was noted near the top of the stack. Steel bands have been added in the vicinity of the crack (see photo #25 7842), presumably to provide radial reinforcement, but it is not known whether the straps were added before or after the collapse of the portion above.
3. Dislodged bricks and gaps in joints were noted at the upper portion of the stack (see photo #25). Additional cracks and mortar loss was noted throughout the height, but the worst conditions were near the top.
4. The stack appears to be leaning slightly toward the northeast, but this was not verified through precise measurement. This is the same direction that the upper portion fell when it failed.

3 Discussion and Conclusions

The overall structure of the shot tower appears to be sound, but many aspects of the condition of the structure present hazards to personnel working in and around the building, as well as adjoining properties, its occupants, passing vehicles and pedestrians. The stack presents similar hazards, but the visual review alone is insufficient to determine the magnitude of the hazard it presents.

The most immediate hazard associated with both the building and stack is falling debris. Loose materials and attachments, especially face brick, can easily become dislodged due to wind, water infiltration or freeze-thaw action and fall onto surfaces below. Falling debris will most likely land within the protected perimeter of the property, but debris can easily deflect off surfaces of the building and land outside the perimeter. It is critical that all loose materials be removed from the exterior of the building as the first step in the process of repairing and securing the property.

There are isolated structural elements that should be reinforced or replaced in conjunction with securing the building. Specifically, failed lintels should be shored or replaced and failed sections of floors and roofs, including areas damaged by the collapsed stack and the deteriorated sloped roof decks, should be repaired or replaced prior to securing the building. Temporary structures, such as plywood on shored wood framing supported on the floors below, can be considered for deck replacement as a cost saving measure.

In order to secure the building, it is necessary to fasten new framing to the existing window openings. This will require repairs to be made to any damaged lintels, jambs, sills and heads prior to fastening new framing.

The building will ultimately require complete reroofing. At this stage, temporary protection can be provided to ensure water sheds appropriately following repair of roof decks. Since the nominally flat roofs all pitch to interior drains that have been removed, interior roof drains must be restored in order to ensure rainwater can be adequately routed out of the building. This will also require limited deck repair in the vicinity of the drains to ensure they are adequately fastened to the roof structures.

We recommend the following steps to protect the building from further damage, ensure the safety of workers on site and prepare the building to be secured until funding is in place for restoration:

1. Remove all loose masonry materials, including face brick and spalled concrete at lintels and trim, to minimize the hazard of falling debris.
2. Remove all disconnected and damaged roof structures, decking and appurtenances, as well as all debris suspended among the roof and floor framing.
3. Replace roof decking in areas where major damage has occurred, including the entire sloped roof section and low roof areas impacted by the collapsed stack. Provide new framing at the low roof at the second floor level damaged by the stack.
4. Cover all other, smaller opening in roofs and floors with plywood.
5. Provide a temporary roofing membrane over all roof areas.
6. Replace all interior drain pans and reconnect all drainage piping. Verify that interior drains are operational.

7. Repair severely damaged window openings, including lintels, jambs and sills, to permit installation of a temporary, secure, translucent protective panel system at each opening.
8. Remove all debris from the building and secure the property to prevent further vandalism.
9. Remove all loose brick from the stack. Patch and repair joints as appropriate to ensure a solid structure for the full remaining height.
10. Repair cracks in the chimney and install additional steel straps around the perimeter for the full height of the vertical cracks.
11. Perform further assessment of the stack, including a survey to determine how much out of plumb it is and photographic survey by drone. Depending on the plumbness, further repairs may be appropriate.

Repair documents are in process of being prepared to define the required steps to repair the building in a manner appropriate to secure it and ensure it is prepared and protected sufficiently for future development. Recommendations 1-8 above are being incorporated into the repair documents.

Appendix A

Photographs

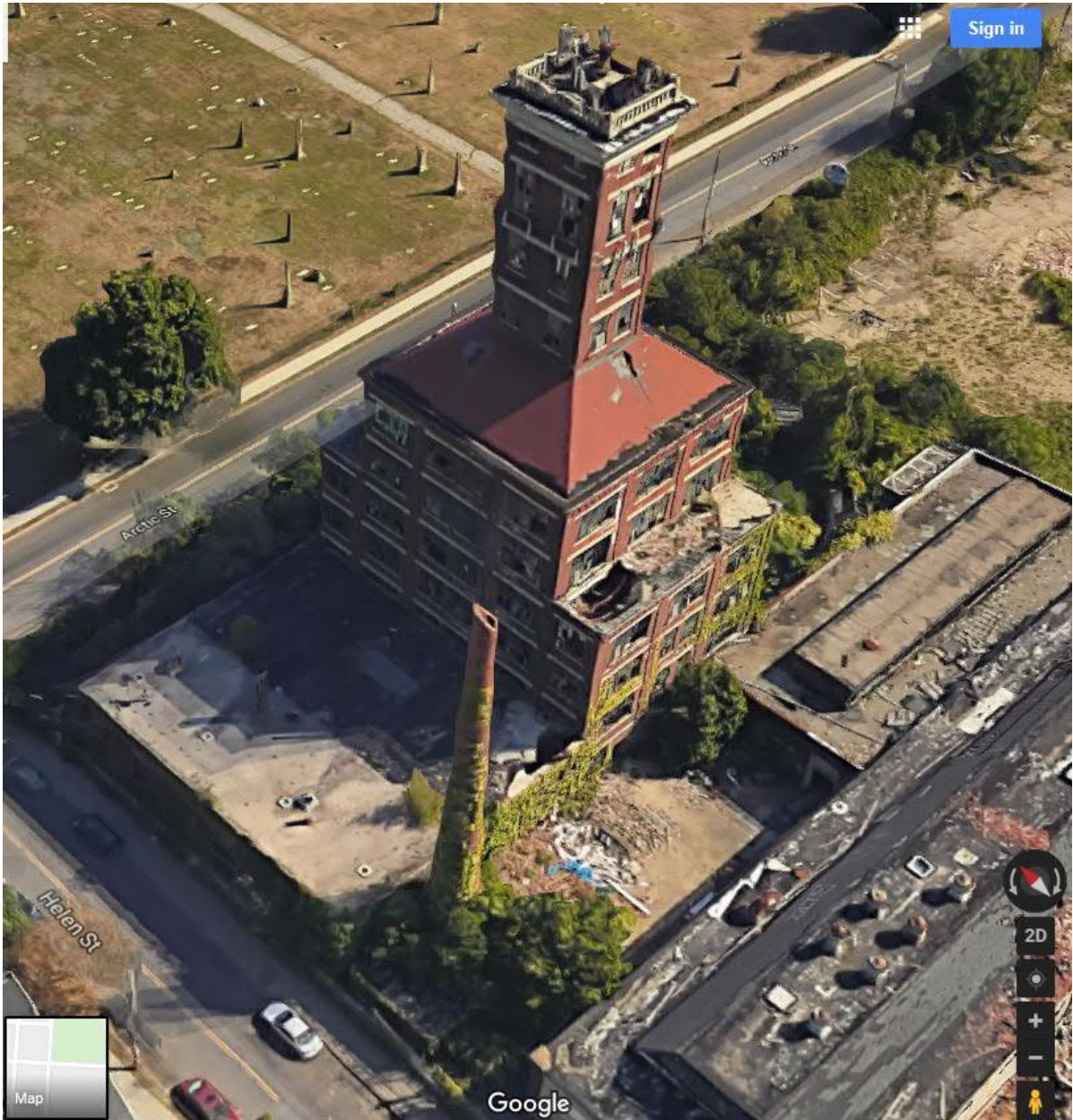


Photo #1 – Aerial Axonometric



Photo #2 – Failure at low roof deck at second floor level



Photo #3 – Failure at low roof at fifth floor level



Photo #4 – Failed sections of sloped roof at north side



Photo #5 – Hole in sloping roof deck on north side



Photo #6 – Hole in sloping roof deck on south side



Photo #7 – Failed metal deck and rusted framing on north side of sloping roof



Photo #8 – Spalling concrete roof deck and rusted framing at upper roof



Photo #9 – Concrete deck damage and rusted steel at second floor



Photo #10 – Rusted framing at first floor



Photo #11 – Cracked lintel at window head



Photo #12 – Damaged window sill and frame



Photo #13 – Damaged window frame, sill and jamb



Photo #14 – Failed concrete lintel



Photo #15 – Damaged concrete lintel



Photo #16 – Failed roofing at low roof



Photo #17 – Damaged antenna mast



Photo #18 – Hole in 7th floor slab



Photo #19 – Hole in 7th floor slab



Photo #20 – Damaged concrete lintel at south face



Photo #21 – Damaged concrete lintels at north face



Photo #22 – Damaged brick at east face



Photo #23 – Roof deck damage at removed drain pans



Photo #24 – Upper portion of stack



Photo #25 – Damage, loose bricks and steel bands at top of stack