



DRAFT

15 April 2020

Aicha Woods
City Of New Haven - Bureau Of Purchases
200 Orange Street
Room 301
New Haven, CT 06510

Reference: 198 River Street - Updated Conditions Assessment

Dear Aicha:

We visited 198 River Street in New Haven, CT on 2 February 2020 to perform a structural conditions assessment of the five structures remaining on the site. We present our findings from the visit in the following report. For the purposes of this study, River Street is considered to run in the east-west direction, with the buildings facing north.

Observations were made visually from both the ground as well as from a ladder truck provided by the New Haven Fire Department; however, the upper floors of Buildings 2 and 3 were not accessible at the time of the visit. This report is an update to the previous study and report prepared in 2011 by Spiegel Zamecnik & Shah, Inc.

Executive Summary

Five street fronting brick masonry and timber frame historic factory buildings remain on the 198 River Street site following the most recent removal of five additional buildings to the rear of these taken down circa 2011. All are considered contributing resources to the River Street National Historic District and date from 1873-1889.

The buildings have all been vacant for some time and suffer from significant deferred maintenance and water infiltration.

The three buildings in the middle, Buildings 2, 3 and 4, have all experienced roof breaches and the resulting deterioration of framing, with Building 4 being the worst. Buildings 1 and 5 are not currently experiencing active roof leaks, but both are compromised by open or temporary walls.

The 2011 study by Spiegel Zamecnik & Shah, Inc. recommended the demolition of Buildings 3, 4 and 5; however, this work was deferred (with the exception of the rear portion of Building 5, and deteriorated floor framing and decking in Building 4).

It is the author's opinion, based on experience with past similar buildings, that all remaining buildings are repairable given access to the appropriate funds. This determination was made based on the residual soundness of the majority of the exterior walls that define the structural perimeters of the buildings as well as their historic

character. Repair scopes would include partial or complete repair or replacement of damaged interior framing, the degree of which is proportional to the level of framing deterioration within each building. Currently Building 4 has sustained the most damage, and its roof and upper portions of the exterior walls are at risk of collapse without short-term stabilization and replacement of the roof framing and roofing. Buildings 2 and 3 would will become unstable without short-term measures to stop water infiltration and slow the rate of deterioration of framing.

While the masonry is mostly in sound condition, water has infiltrated some areas triggering the need for future localized rebuilding in addition to deferred maintenance work on the masonry such as cutting and pointing. All roofs have reached the end of their lifespan and require replacement. Buildings 1 and 5 require the introduction of new permanent walls where adjacent abutting structures have been removed.

The buildings are in the flood zone. Requirements in the New Haven Flood Damage Prevention Ordinance may limit the use of the ground floors to parking of vehicles, building access or storage; however, due to the property's status as a contributing resource to the River Street National Historic District, a variance may be sought to preserve the historic character of the buildings or to preclude exceptional hardship.

General Description

The five remaining contiguous buildings currently identified as 198 River Street were constructed between 1873 and 1889 as part of the much larger H. B. Bigelow and Company complex. Since the site became unoccupied, many of the structures have been demolished including the five rear buildings identified as Buildings 6 through 11 circa 2011 after the publication of the Spiegel Zamecnik & Shah, Inc report for which this report updates.

All five buildings are designated as contributing resources in the River Street National Historic District nomination, which was prepared in 1988. The H. B. Bigelow and Company manufactured steam engines and boilers on this site beginning in 1869. The following general descriptions of the buildings in this study are excerpted from the nomination:

- Building 1 (identified as Building C in NRN): Brick erecting building, 1886, high 1-story, near-flat roof, rectangular window openings filled with concrete-block and glass brick, small ell to north with a single large, tapered opening for passage of completed boilers; originally used for assembly of plate-iron boiler cases. [Note: the taller south part of Bldg 1 was demolished prior to 2011 leaving the shorter north wing].
- Building 2 (identified as Building A in NRN). Brick factory, 1873, 3-story, near-flat roof, corbeled cornice with dentils, segmental-arched window openings; originally used for plate-fabricating on the first floor and machine shop on the second. The north elevation, facing River Street, has five large, round-arched openings that may have accommodated the passage of boilers and other large products.
- Building 3 (identified as Building B in NRN): Brick factory, 1873, 2-story, near-flat roof, corbeled cornice with dentils, segmental-arched windows on the end bays of the first floor, large central freight opening in the second floor, and rectangular windows elsewhere; originally used as the pattern and layout shop.
- Buildings 4 and 5 (identified as Building D in NRN): Brick factory, 1889, 2-story portion with near-flat roof (Bldg 4) connected to 1-story shed-roofed portion (Bldg 5), corbeled cornice with dentils, mix of rectangular and segmental-arched windows

including segmental-arched transoms stacked over flat-arched windows near the junction of the two portions; originally used as machine shops. [Note: the south part of Bldg 5 demolished circa 2011 leaving only the street-facing portion].



Street Facing Aerial of Buildings with Number Designations, image courtesy Google Earth



Rear Facing Aerial of Buildings with Number Designations, image courtesy Google Earth

Noted Conditions

The following section describes each building's framing, observed conditions and individual recommendations. The findings from the 2011 report by Spiegel Zamecnik & Shah, Inc. are excerpted for reference, and updated per 2020 conditions and recommendations by this office.

Building 1

Current Condition: Observations of the condition of the roof framing are in line with those from 2011 (see below). No apparent roof leaks are currently visible; however, the south side is open to the elements. In addition, the masonry at the eaves along the west wall appears to be compromised in a few areas. The cracking in the masonry noted in 2011 appears to have been caused in part by corrosion of steel embedments into the masonry at the truss bearings.

Current Recommendations: Due to the apparent ability of the roof to shed water; the condition of the framing in this building is generally better than the others. The most vulnerable weakness of Building 1 is the absence of a wall on its south side to protect the framing from moisture and damaging wind. It is our opinion that repair for adaptive re-use is possible with appropriate funding. The "core and shell" scope for repair and adaptive re-use would entail the introduction of a building enclosure on the

south wall together with new support for the roof purlins if the high truss “parapet” is to be removed, replacement or sistering of damaged roof framing and decking, inspection and remediation of corroded hardware at truss ends, cutting / pointing masonry, and crack repair of masonry. Installation of a temporary south wall in the short-term would slow the rate of deterioration and protect the roof framing from wind uplift forces.

Relevant Excerpts from 2011 Report:

<p><i>2011 Description: "Building 1 fronts on River Street and is located at the west property line. It is single story structure with walls at the north and west sides; the rear wall is open as the abutting building was recently demolished. The single-story portion of the building is constructed utilizing load-bearing unreinforced brick masonry walls. The roof is supported by timber trusses spanning in the east-west direction and timber [purlins] spanning between the trusses in the north-south direction. Wood [common rafters] spaced at approximately 24 inches on-center span between the wood [purlins]."</i></p> <p><i>2011 Condition: "The existing brick masonry load bearing walls exhibit multiple diagonal cracking in various locations, mainly concentrated over existing door and window openings. Loss of mortar at brick joints as well as general deterioration of the masonry walls is visible. Masonry wall reconditioning is not considered as part remedial recommendations in this report and is assumed to be addressed during a possible future renovation of the structure.</i></p> <p><i>Due to the recent demolition of the adjacent building, the south face of the single-story portion of the building is left without an exterior wall enclosure. At the rear of Building 1, the north wall of the recently demolished building remains above the roof. The wall was left in place because a timber truss at the top of the wall supports the lower roof of Building 1 at the south side, by utilizing hanger rods to hang the timber [purlins] of the low roof. The masonry wall extending above</i></p>	<p><i>continued....</i></p> <p><i>the roof is presently unbraced and the remaining masonry at the corner is not adequate to brace the high wall against the wind pressure. Potential loss of the high wall and timber truss that supports the rear of the low roof will lead to the loss of the low roof and could lead to the collapse of the remaining masonry walls of the structure.</i></p> <p><i>The lack of exterior wall on the south side of Building 1 significantly increases the risk of damage to the structure in an event of high wind forces because of higher internal wind pressures on the walls and roof of the structure.</i></p> <p><i>The existing roof wood planking was observed to be rotted in many areas due to moisture infiltration, and the wood planking was not sound to support the inspector recently walking on the roof and is not anticipated to be able to withstand significant snow loads in the future. As a temporary measure, plywood can be installed on the underside of the roof joists to prevent someone on the roof from falling through if an upper deck board gives way. Reuse of the building would require removal of roofing and re-decking and checking the rafters for damage."</i></p> <p><i>2011 Recommendation: Building 1 was one of two buildings not recommended for demolition.</i></p>
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Building 1 Photos:

Top: Street-facing view showing taller wall at rear of structure and damaged masonry at east eaves.

Middle: Rear-facing view showing higher end-truss in wall of former abutting building.



Bottom Left: Interior view showing typical roof framing arrangement.

Bottom Right: Cracks in masonry at truss ends due to corroding hardware.



Building 2

Current Condition: The 2011 recommendation to demolish the building in its entirety was not carried out. Observations of the condition of the floor and roof framing are in line with those from 2011 (see below). The roof was observed from the ladder truck, and some areas of the roofing are completely breached and appear to correspond with leaking and deterioration of framing below. An estimated 25% of the floor and roof framing is compromised. The street and rear facing brick masonry appears to be in sound condition except for below the eaves and at the rear where weathering has occurred at former interior portions that became exposed to the elements when the rear structures were removed. In these locations, the softer brick, not intended to sustain environmental exposure have become weathered.

Current Recommendations: While certain areas of the framing have been compromised, the intact majority is providing stability for the building as a whole. It is our opinion that repair for adaptive re-use is possible with appropriate funding. The "core and shell" repair scope would entail replacement or sistering of damaged framing and decking, replacement of damaged rafters, sheathing and roofing, cutting / pointing masonry, and crack repair of masonry. Because the roof is currently allowing water into the building and causing ongoing progression of framing deterioration, short-term measures to stop water infiltration would slow the rate of deterioration while a longer-term plan is put into place. Newly exposed portions of the brick on the rear wall that have weathered will require heavy pointing and some local rebuilding.

Relevant Excerpts from 2011 Report:

<p><i>2011 Description: "Building 2 is the largest structure fronting on River Street. The three-story building uses back masonry load bearing walls to support timber trusses at the roof level, supporting a roof structure of wood beams and timber roof decking. Each roof truss also supports the third floor by two iron rod hangers down to the wood girders of the third floor. It was observed there is heavy water leakage a potential deterioration along the north and south edges of the roof.</i></p> <p><i>At the third-floor level, wood joists span between the beams running north-south suspended from the roof. The floor surface is quite uneven and warped, due to the leakage from the roof spilling water onto the floor.</i></p> <p><i>At the second-floor level, the wood floor girders at the east and west ends of the building are suspended from rod hangers up to the third floor, which means they are suspended in from the roof. The girders at the center portion of the building are now supported by steel Heavy</i></p>	<p><i>continued....</i></p> <p><i>columns at the midpoint of the building, and wood joists span between the girders.</i></p> <p><i>2011 Condition: "The masonry walls of Building 2 show distress to the masonry, especially at the east and west sides. Displacement and cracking of the brick walls at the southwest corner of the two-story building was observed to have been previously patched. This appears to have resulted from foundation settlement from the erection of the now demolished addition at the south side of the structure, and not the result of demolition activity. There is a wide crack in the masonry on the west side, extending down from the roof, the splits around a window opening that was previously filled. The masonry at the upper floor at the northeast corner also shows cracks that appear to have been pointed, indicating movement of the walls has occurred for some time."</i></p>
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water damage from the leakage was observed. The first-floor level appears to be a slab on grade."

2011 Recommendation: Building 2 was one of two buildings not recommended for demolition.



Building 2 Photos:

Top: Street-facing view.

Bottom: Rear-facing view showing outline of former building with the previously interior protected brick now exposed.





Building 2 Photos, continued:

Top: Masonry crack, 3rd floor, east wall.

Middle Left: Roof breach along north eave.

Middle Right: Roof plane modified at eave to be flat; this may have the effect of trapping water along the eave.



Bottom: Interior view of first floor.

Building 3

Current Condition: The 2011 recommendation to demolish the building in its entirety was not carried out. Observations of the condition of the floor and roof framing are in line with those from 2011 (see below). The roof was observed from the ladder truck. In addition to the open skylight observed in 2011, an open roof hatch and breaches in roofing are also contributing to water infiltration. **An estimated 40% of the floor and roof framing is compromised.** The street facing brick masonry appears to be in sound condition. The brick on the rear, formerly an interior wall, has experienced water infiltration at the top of the wall which has caused some debonding of the brick wythes.

Current Recommendations: While certain areas of the framing have been compromised, the intact majority is providing stability for the building as a whole. It is our opinion that repair for adaptive re-use is possible with appropriate funding. The "core and shell" repair scope would entail replacement or sistering of damaged framing and decking, replacement of damaged rafters, sheathing and roofing, cutting / pointing masonry, and retrofit wall ties and local rebuilding of the rear wall. Because the roof is currently allowing water into the building and causing ongoing progression of framing deterioration, **short-term measures to stop water infiltration would slow the rate of deterioration while a longer-term plan is put into place.**

Relevant Excerpts from 2011 Report:

<p><i>2011 Description: "Building 3 fronts on River Street and is a two-story structure that is the same width as Building 2 and uses the east wall of Building 2 for support of the roof and the second floor. The roof is at approximately the same elevation as the third floor of Building 2. The roof is constructed with rafters spanning north-south to central wood girders, which are supported by three timber columns.</i></p> <p><i>The second floor is framed with wood beams spanning north south to the columns, and timber planking spans east-west to form the floor surface.</i></p> <p><i>The first floor appears to be a slab on grade.</i></p>	<p><i>continued....</i></p> <p><i>Two door openings at the west side connect the first floor to Building 2, and at the east side, the space is open to Building 3, as a steel beam supports the east masonry wall which starts at the second floor and rises to become the common wall between Building 2 and Building 3 from the second level to the roof."</i></p> <p><i>2011 Condition: "The roof is suffering from widespread and heavy damage. A skylight at the rear is broken out and opens to the elements. The floor structure is very wet and has suffered extensive warping and water damage; rotting is expected in the wooden elements in the building."</i></p> <p><i>2011 Recommendation: Building 3 was recommended for demolition.</i></p>
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Building 3 Photos:

Top Left: Street-facing view.

Top Right: Rear-facing view showing compromised brick.

Middle: Roof view showing openings and breaches.

Bottom: Interior view showing framing and deterioration.

Building 4

Current Condition: The 2011 recommendation to demolish the building in its entirety was not carried out; however, a post-2011 stabilization campaign included removal of 2nd floor and attic decking and common joists while retaining primary structural beam and column members. Observations of the condition of the roof framing are in line with those from 2011 (see below). The roof was observed from the ladder truck. Most areas of the roofing are completely breached, and roof framing at rafter tails appears unstable in places. Brick masonry at the eaves of the roof is also severely compromised. The condition of the brick masonry below the eave areas and on the gable walls (north and south) is generally sound. The top of the chimney on the rear elevation is in poor shape and crumbling.

Current Recommendations: Building 4 is in the worst shape of all of the buildings, and the roof framing is at risk of collapse if not stabilized soon. Without roof framing to brace the upper portions of the exterior masonry walls, these are also at risk of instability following a potential roof collapse. It is our opinion that repair for adaptive re-use is possible with appropriate funding due to the generally stable condition of most of the exterior walls; however, “core and shell” repairs would be extensive and would include re-framing for most of the building including the roof, rebuilding the portion of brick masonry below the eaves and cutting / pointing the rest of the masonry. Because of the severe condition of the roof framing, re-framing and re-roofing must be prioritized in order to keep the building stable. Because the eave masonry supporting the roof framing is compromised in areas, additional eave support would have to be addressed, perhaps by introducing a timber top plate that could be supported from below or by locally rebuilding the brick.

Relevant Excerpts from 2011 Report:

<p><i>2011 Description: "Building 4 fronts on River Street and is has a pitched roof that slopes down to the east and west, spilling water onto the adjacent structures. It is a two-story structure; the roof uses a steel center beam running north-south with steel post supporting it at midspan and wood trusses above spanning east to west."</i></p> <p><i>2011 Condition: "The wood roof deck is badly water damaged, showing no effective roofing. Similar to building 3, the second floor is framed with wood beams spanning north south to the columns, and, timber planking spans east-west to form the floor surface."</i></p>	<p><i>continued...</i></p> <p><i>The floor structure is very wet and has suffered extensive warping and water damage; severe rotting is observed, and the floor is unsafe to walk on. Similar deterioration is expected at the wooden elements in the building roof, but we could not access it for safety reasons. The first floor appears to have a slab on grade. At the first floor, the space is open with Building 3 at the west and Building 5 at the east, with a steel beam supporting the masonry wall at the east and west that rise to the roof above the second-floor level."</i></p> <p><i>2011 Recommendation: Building 4 was recommended for demolition.</i></p>
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Building 4 Photos:
Top: Street-facing view.



*Middle: Rear-facing view
showing crumbling masonry
chimney.*

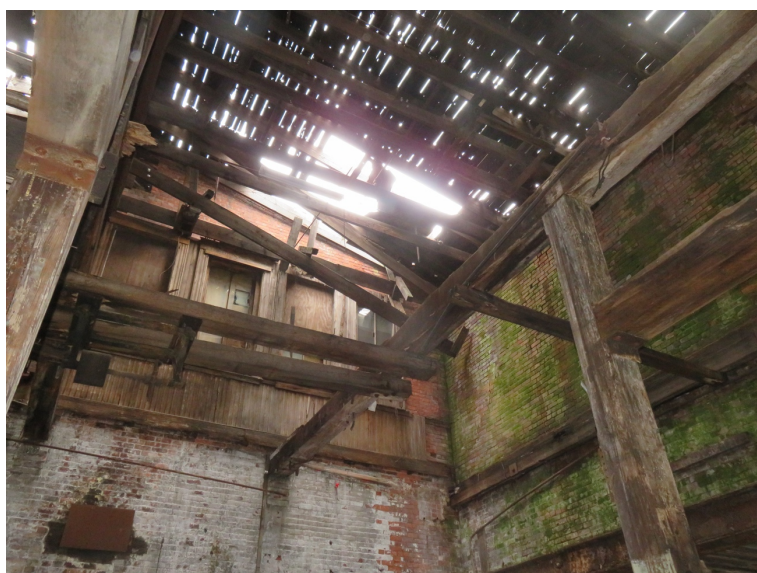


*Bottom: East eave showing
masonry deterioration.*



Building 4 Photos, continued:

Top: Roof view showing breaches and condition of masonry at eaves.



Middle: Interior view showing removal of 2nd floor framing and daylight through roof.



Bottom: Interior view of deteriorated masonry at eave and dropped rafter tails.

Building 5

Current Condition: The 2011 recommendation to demolish the building in its entirety was partially carried out; however, the north-facing street-fronting portion of Building 5 was retained, and a temporary wall was constructed on the south and east sides (where the Building 6 wall which supported the Building 5 rafters was removed). The removal of the south side of the building appears to have remediated all roof leaking observed in 2011 with the exception of water infiltrating the temporary south and east walls at the eaves. Other than the need to provide more permanent walls at the south and east sides, Building 5 is in relatively sound condition.

Current Recommendations: It is our opinion that repair for adaptive re-use is possible with appropriate funding. The "core and shell" repair scope would entail the introduction of a building enclosure on the south and east walls together with repairs to the east girder and posts if found to be damaged and cutting / pointing masonry on the front elevation.

Relevant Excerpts from 2011 Report:

2011 Description: "Building 5 fronts on River Street and is a single-story structure that is approximately twice as wide as buildings 1 thru 4 and 6 and 7. The roof is at the second floor level of buildings 4 and 6. The roof is entirely wood framed, with 16 timber columns supporting timber girders running north-south. Wood [rafters] span between the girders."

2011 Condition: "The roof is leaking throughout and there is a large open hole in the roof that shows some fire damage."

2011 Building 5 was recommended for demolition.



Building 5 Photos:

Top: Street-facing view.



Building 5 Photos, continued:

Top: Rear view showing temporary south wall.



Bottom: Interior view of temporary east wall showing daylight between the rafters and water on the floor after a storm.

Flood Hazard Area

The Connecticut State Building Code notes that Flood Hazard Areas and regulations are stipulated by local municipalities. The City of New Haven establishes flood design requirements in Technical Ordinance "Title IV – Flood Damage Prevention" (NHFDP), from which the following relevant excerpts were extracted:

- Areas of Special Flood Hazard and Flood Insurance Rate Maps (FIRM) identified by the Federal Emergency Management Agency (FEMA) are included as part of NHFDP. [Section 3.2]

The 198 River Street site is identified in the FIRM as a Type AE Flood Zone Category with a Base Flood Elevation (BFE) of 11 feet. It is estimated that the upper levels of the multi-story buildings are above the BFE.

- New construction and substantial improvement work shall be constructed with materials resistant to flood damage, using methods and practices that minimize flood damage, and with electrical, heating, ventilation, plumbing, air conditioning equipment, and other service facilities located so as to prevent water from entering or accumulating within components during flooding conditions. [Section 5.1.2-4]

- For Type AE Flood Zone Category sites, new construction and substantial improvement projects shall have the lowest floor elevated to at least one foot above the Base Flood Elevation [5.3.1]. Definition of Lowest Floor: The lowest floor of the lowest enclosed area is an unfinished or flood-resistant enclosure, usable solely for parking of vehicles, building access or storage, in an area other than a basement area is not considered a building's lowest floor. These areas must be designed in accordance with the definition of "elevated building" and Section 5.3.2. [Section 2.1.25]
- *Fully enclosed areas below base flood elevation.* New construction or substantial improvements of buildings that include fully-enclosed areas formed by foundation and other exterior walls below the base flood elevation shall be designed to preclude finished living space and designed to allow for the automatic entry and exit of flood waters to equalize hydrostatic flood forces on exterior walls. [Section 5.3.2]
- *Buildings on the historic register.* Flood Damage Prevention (FDP) variances may be issued for the reconstruction, rehabilitation or restoration of structures listed on the National Register of Historic Places or the State Inventory of Historic Places without regard to the procedures set forth in the remainder of this section, except for section 7.5.3.1—7.5.3.4 and provided the proposed reconstruction, rehabilitation or restoration will not result in the structure losing its historical character. [Section 7.4.1]
- *Conditions for variances: [Section 5.5.3 including the following conditions]*
 - ⇒ FDP variances shall only be issued upon a determination that the variance is the minimum necessary, considering the flood hazard, to afford relief, and in the instance of a historical building, a determination that the FDP variance is the minimum necessary as not to destroy the historic character and design of the building;
 - ⇒ FDP variances shall only be issued upon a showing of good and sufficient cause, a determination that failure to grant the variance would result in exceptional hardship, and a determination that the granting of a variance will not result in increased flood heights, additional threats to public safety, extraordinary public expense, create a nuisance, cause fraud on or victimization of the public, or conflict with existing local laws or ordinances.
 - ⇒ Any applicant to whom a FDP variance is granted shall be given a written notice specifying the difference between the base flood elevation and the elevation to which the structure is to be built and stating that the cost of flood insurance will be commensurate with the increased risk resulting from the reduced lowest floor elevation up to amounts as high as \$25 for \$100 of insurance coverage.

In summary, the buildings on the property fall into the Type AE Flood Zone Category with a Base Flood Elevation of 11'. Per the New Haven Flood Damage Prevention Ordinance, the ground floors, which are below the BFE, are usable solely for parking of vehicles, building access or storage. Other uses (residential, commercial, etc.) are permitted on the upper floors of Buildings 2, 3 and 4. A variance may be sought to preserve the historic character of the buildings or to preclude exceptional hardship if applicable on the grounds of the property contributing to the River Street National Historic District.

Closing

It has been a pleasure to perform this assessment. If you have any questions regarding this report, please do not hesitate to contact this office.

Respectfully Yours,

Cirrus Structural Engineering, LLC

A handwritten signature in black ink, appearing to read 'E. Acly', is written over a light gray rectangular background.

Elizabeth Acly, PE
Principal