odeh engineers, inc

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North Providence, Rhode Island 02904

LIMITED STRUCTURAL EVALUATION

162 MAIN STREET
WOONSOCKET, RHODE ISLAND

Prepared for:

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October 18, 2012

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INTRODUCTION

This limited structural evaluation of the exterior façade and superstructure of the former RI Hospital Trust Company building, located at 169 Main Street in Woonsocket, Rhode Island, was undertaken at the request of Ms. Sheila McGauvran, Director of Public Works.

The purpose of this structural evaluation was to identify visually apparent structural deficiencies or potential problem areas in both the superstructure of the building and in the exterior masonry facade of the building.

STANDARD OF CARE AND USE OF REPORT

Please note that the results of this structural evaluation are limited to visual observations of the interior of the building and the accessible exterior wall elevations of the building. While we have made our best efforts to investigate these areas, many of the structural conditions were concealed or were otherwise inaccessible, and therefore additional damage or other unforeseen conditions not included in this report may be present. The findings of this report therefore represent our best professional opinion based on the information available to us at this time.

We understand that this report is intended for use only by the City of Woonsocket to determine the current structural adequacy of the superstructure and the masonry façade of the building.

DOCUMENTS AVAILABLE

There were no drawings or documents of the existing 162 Main Street building made available to Odeh Engineers to assist in this structural evaluation:

KEY PLAN

Figure 1: This aerial photograph of the former RI Hospital Trust Company building located at 162 Main Street in Woonsocket, Rhode Island is oriented such that north is vertically up in this image.

ACTIONS TAKEN

Odeh Engineers, Inc. undertook the following actions to complete this Structural Investigation:

1. In late June 2012, Principal Engineer M. David Odeh, P.E. met with Mr. Chris Chianese, Building Official for the City of Woonsocket at the former RI Hospital Trust Company building. Accompanied by Mr. Chianese, the Engineer made a cursory visual examination of the existing condition of the exterior walls of this building from the surrounding streets and walkways.

2. On July 3, 2012 and September 26, 2012, Odeh Engineers' Field Engineer Paul Wilkinson visited the former RI Hospital Trust Company building and met with Mr. Chris Chianese. On those dates, access to the interior of building was not available. Therefore, the investigation of the building was limited to visual observations of the accessible portions of the exterior façade of the building made from the streets and parking areas surrounding the building. The Field Engineer visually examined, photographed and assessed the structural condition of the exterior façade of the building.

3. On October 9, 2012, Principal Engineer M. David Odeh and Field Engineer Paul Wilkinson revisited the former RI Hospital Trust Company building. On that date, the Engineers met with Mr. Chris Chianese, Building Official for the City of Woonsocket; Mr. Duarte Carreiro, Owner of the former RI Hospital Trust Company building; Mr. Howard Hager, Renewable Energy Design, and a representative of Duffy & Sweeney, Ltd. With the permission of the Owner of the building, this party made a cursory tour though the interior of the building and onto the roof of the 162 Main Street building. Odeh Engineers' Principal Engineer and Field Engineer visually examined, photographed, and assessed the structural condition of the building revealed from the inside of the structure and from the roof.

4. Odeh Engineers has prepared this written summary of findings for all potential or existing structural deficiencies that were observed by our representatives during the site visits.

DESCRIPTION OF EXISTING STRUCTURE

The former RI Hospital Trust Company building located at 162 Main Street in Woonsocket, Rhode Island is a six-story structure with a lower two-story building surrounding the north, northeast, and northwest sides of the higher building. **(Please refer to Photo #1 in Appendix A: Photographs.)** There is a below-grade basement below the entirety of the footprint of the building.

The foundation walls of the building appear to be mainly cast-in-place concrete, with brick masonry foundations at some locations. The basement floor is a concrete slab-on-grade.

The superstructure of the building appears to be a structural steel framing system with steel columns supporting steel girders and steel beams at all floor and roof levels. Based on the cursory tour of the building, the floors and roofs of the building are constructed with reinforced concrete joists (pan system) spanning between the floor and roof beams supporting the concrete floor/roof slabs. **(Please refer to Photo #2 in Appendix A: Photographs.)**

The exterior facade of the building is constructed with what appears to be a limestone masonry veneer along the southeast (Main Street) elevation, and a brick masonry veneer with occasional limestone accent bands along the remaining exterior elevations. **(Please refer to Photos #3 and #4 in Appendix A: Photographs.)** The limestone or brick veneer facings are bonded, or attached to, the composite wall back-up walls. The composite back-up walls are typically constructed with structural clay tiles, or brick masonry. **(Please refer to Photo #5 in Appendix A: Photographs.)**

The parapet walls surrounding the southeast end of the six-story tower extend several feet above the roof of this portion of the building. **(Please refer to Photo #6 in Appendix A: Photographs.)**

The roofing system on the building is typically a built-up tar and gravel roofing system, with a rubber roofing membrane installed on an emergency basis at one isolate location.

EXISTING STRUCTURAL DEFICIENCIES AND POTENTIAL PROBLEM AREAS

The following structural deficiencies and potential problem areas were observed by Odeh Engineers, Inc. during the investigation of the former RI Hospital Trust Company building located at 162 Main Street in Woonsocket, RI. Each observation is accompanied by comments on the cause and impact of the deficiency. Please refer to the Photographs in Appendix A for additional information.

- The brick veneer on all elevations of the elevator machine room penthouse tower is severely cracked. Lateral displacements of the brick were observed on the north and south elevations of the tower. **(Please refer to Photos #7 through #10)**.
    - **Comment:** The vertical cracks in the brick veneer on all elevations of the elevator penthouse machine room tower are likely caused by the lack of control joints that would allow the bricks to freely expand and contract due to changes in temperature and humidity. The lateral displacements of the brick may be caused by this lack of freedom of movement; from the effects of freeze/thaw cycles from water that infiltrates into the wall cavity behind the brick veneer; or, possibly from expansive corrosion of the structural steel members due to long-term moisture infiltration through the walls and into the building envelope.
- The parapet walls surrounding the south end of the six-story tower are severely deteriorated. **(Please refer to Photos #11 through #14)**.

- **Comment:** Apparently, the wall coverings that protected the inside face (back-up walls of the composite wall system) from the elements has been removed. The loss of the protective inboard wall coverings has exposed the clay tiles, bricks and mortar of the back-up wall to the weather, causing the deterioration of these wall components. In addition, the loss of the wall coverings has allowed water to infiltrate into the building envelope as a result of damage to the flashings and counterflashings at the interface with the roofing system. The parapet walls represent an unsafe condition that could fail, particularly under certain wind or seismic loadings.

- At numerous and varied locations on all sides of the exterior façade, including both the ornate limestone veneer on the southeast (Main Street) side of the six-story tower, and the brick veneer found elsewhere, the veneer is cracked, spalled, displaced, and exuding efflorescence. **(Please refer to Photos #15 through #27)**.
  - **Comment:** The initial cause of the cracking, spalling, and displacements of both the limestone and brick veneers is likely caused by the lack of control joints to allow the veneers to freely expand and contract due to changes in ambient air temperature and changes in the moisture content of the veneers. The cracking, spalling and displacements of the veneers provide openings for water to infiltrate into the composite wall system. The infiltrating water can deteriorate the mortar, back-up wall members, and the veneer itself. In addition, water trapped in the cavity between the veneer and the back-up wall can freeze, expanding and displacing the masonry, thereby creating additional space to trap water, and repeat the cycle. Furthermore, the infiltrating water can cause expansive corrosion of the steel angle lintels over the masonry openings and possibly expansive corrosion of the structural steel members.
- At several locations there has been long-term infiltration of water into the building envelope. The effects of long-term water infiltration were particularly evident along the east side of the southern end of the six-story tower; at the southwest corner of the southern end of the six-story tower; at the northeast corners of both the six-story tower and the two-story portion of the building; and at isolated locations through the roofs of the building. **(Please refer to Photos #28 through #33)**.
  - **Comment:** Long-term water infiltration will not only damage the interior architectural finishes, but can cause deterioration of the structural steel framing members and the exterior wall components. Although there was no visible evidence of deterioration of the structural steel framing members caused by the water infiltration, Odeh Engineers would recommend that a careful examination of the steel framing members be conducted at all locations where long-term water infiltration occurred in order to be certain that the steel framing members have not been structurally compromised.

CONCLUSIONS AND RECOMMENDATIONS

Based on Odeh Engineers limited observations of the former RI Hospital Trust Company building described heretofore, the structural frame of the building superstructure appears to be in a structurally sound condition. However, some corrosion of the structural steel framing members is possible at those locations where long-term water infiltration has penetrated the building envelope.

The exterior masonry walls of the building are exhibiting signs of severe deterioration. Cracking and spalling of the exterior masonry walls was observed on all sides of the building. The deterioration of the exterior walls is most severe at the high parapet walls located at the southeast end of the six-story tower portion of the building.

Further deterioration of the exterior masonry walls will continue if these existing conditions are not addressed.

We trust that this report meets your needs at this time. Should you have any questions, or require any additional information, please do not hesitate to contact this office.

Sincerely,

M. David Odeh, P.E.
Principal

Paul Wilkinson
Field Engineer

APPENDIX A: PHOTOGRAPHS

Photo #1

This photo, looking east, shows the lower two-story plaza level structure of the former RI Hospital Trust Company building surrounding the north, northeast, and northwest sides of the six-story tower.

Photo #2

This photo shows the concrete joist pan system that appears to be used typically throughtout the building for the construction of the floor and roof slabs. The concrete joists span between the structural steel framing girders and beams at the floor and roof levels.

Photo #3

This photo shows a portion of the ornate limestone veneer façade on the southeast elevation of the former RI Hospital Trust Company building.

Photo #4

This photo shows the brick veneer façade typically found along all elevations of the building, with the exception of the southeast elevation.

Photo #5

This photo shows the combination of clay tiles and bricks that were used for the construction of the back-up walls for the exterior façade composite walls. The red terracotta tiles in the middle of the photo enclose the presumed structural steel column at the southeast corner of the six-story tower of the building.

Photo #6

This aerial photo, looking south, shows the high parapet walls surrounding the southeast side of the six-story tower that extend several feet above the roof.

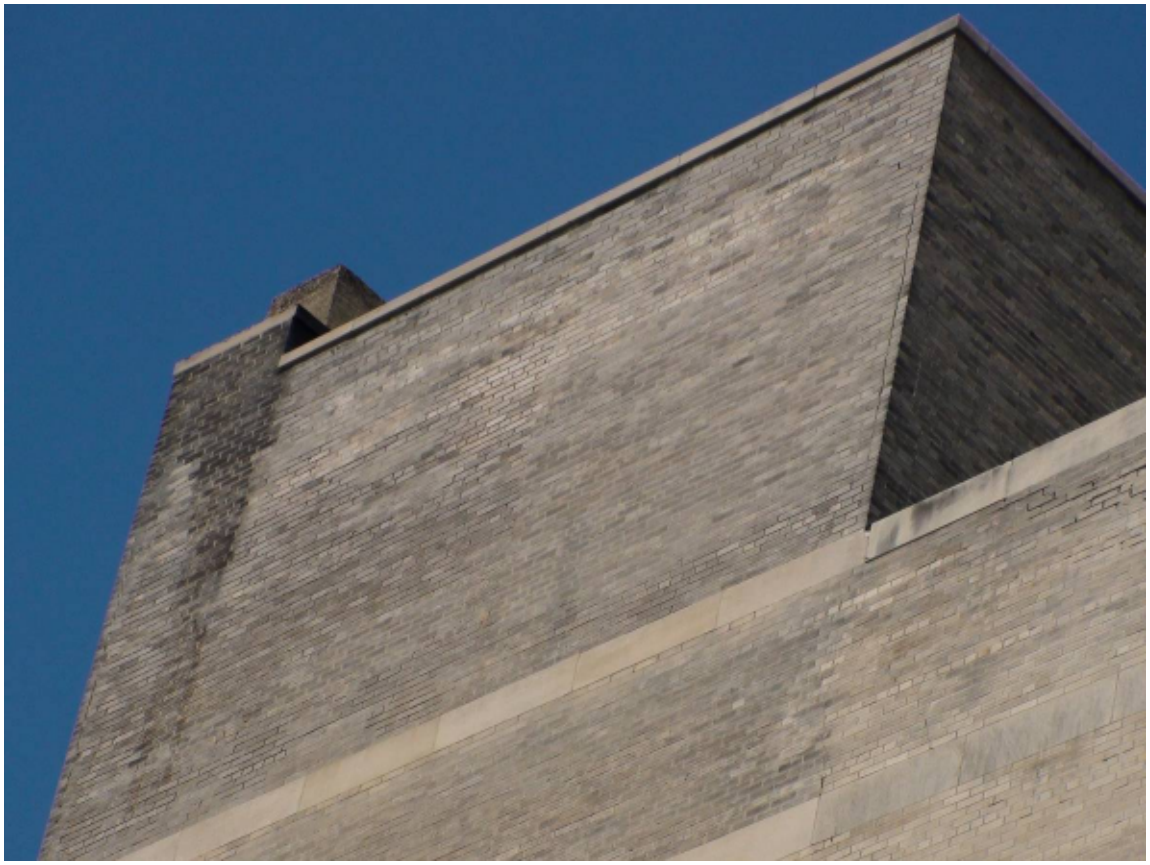

Photo #7

This photo, taken from street level, shows the vertical cracking of the brick veneer at each corner of the west elevation of the elevator machine room penthouse/chimney tower.

Photo #8

This photo shows the vertical cracking of the brick veneer and the lateral displacement causing the horizontal crack in the brick on the north face of the elevator machine room penthouse tower.

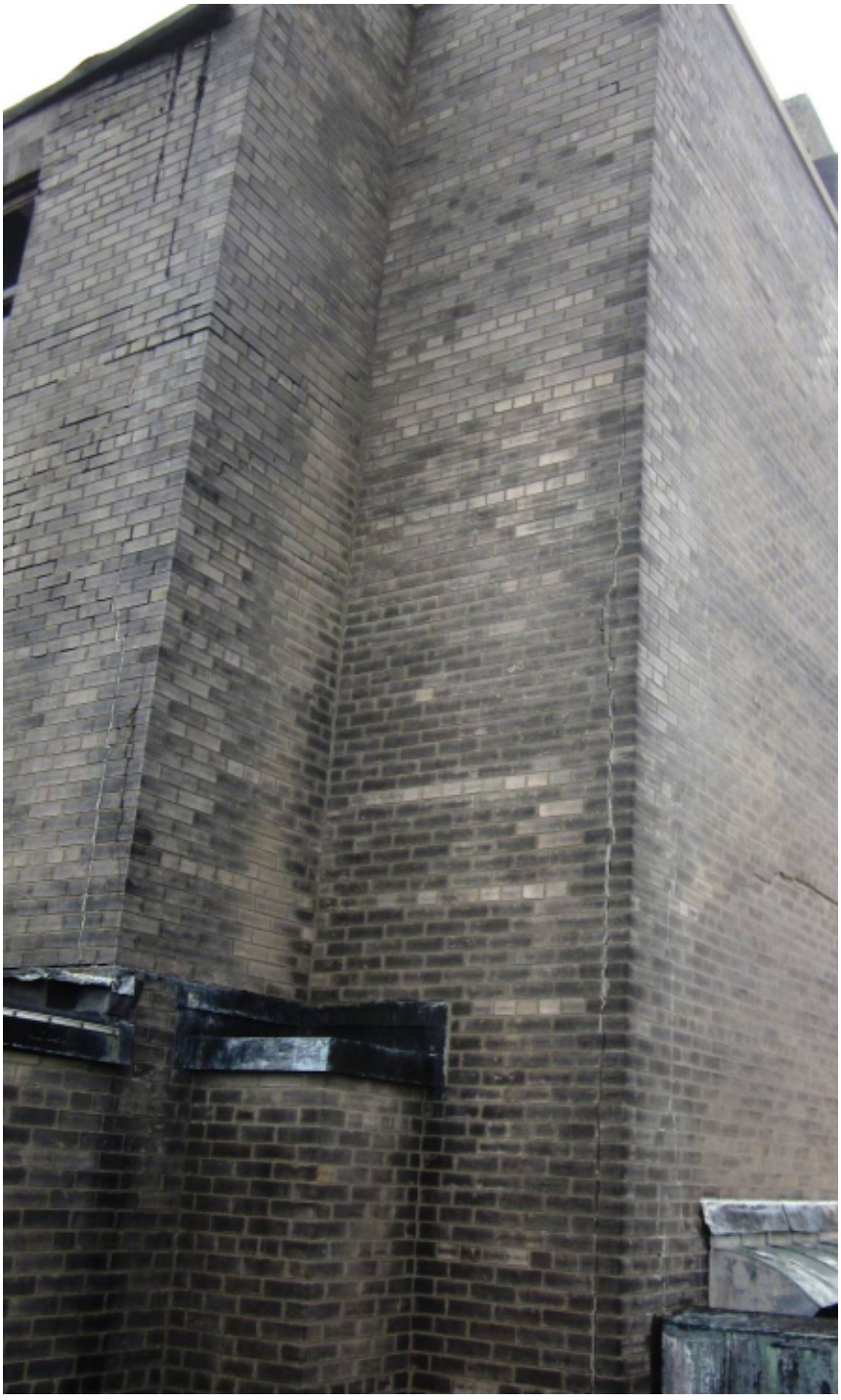

Photo #9

This photo shows the vertical cracking of the brick veneer on the east face of the elevator machine room penthouse tower.

Photo #10

This photo shows some of the vertical cracks in the brick veneer, and displacement of the bricks, on the south face of the elevator machine room penthouse tower.

Photo #11

This photo shows the deteriorated condition of the back side of the parapet wall located on the northeast side of the southeast end of the six-story tower.

Photo #12

This photo shows exposed and deteriorated condition of the back-up wall of the parapet wall located along the southeast (Main Street) side of the southeast end of the six-story tower.

Photo #13

This photo shows the deteriorated condition of the back-up wall for the parapet wall located along the southwest side of the southeast end of the six-story tower.

Photo #14

This photo shows a close-up view of the severity of the deterioration of the back-up wall for the parapet wall located on the southwest side of the southeast end of the six-story tower. Note that there is no positive closure between the inside face of the parapet wall and the installed rubber roofing membrane system.

Photo #15

This photo shows the evidence of water and efflorescence exuding from the limestone veneer at the southeast corner of the six-story tower.

Photo #16

This photo shows another example of water and efflorescene escaping for the limestone veneer below the parapet on the southeast side of the six-story tower.

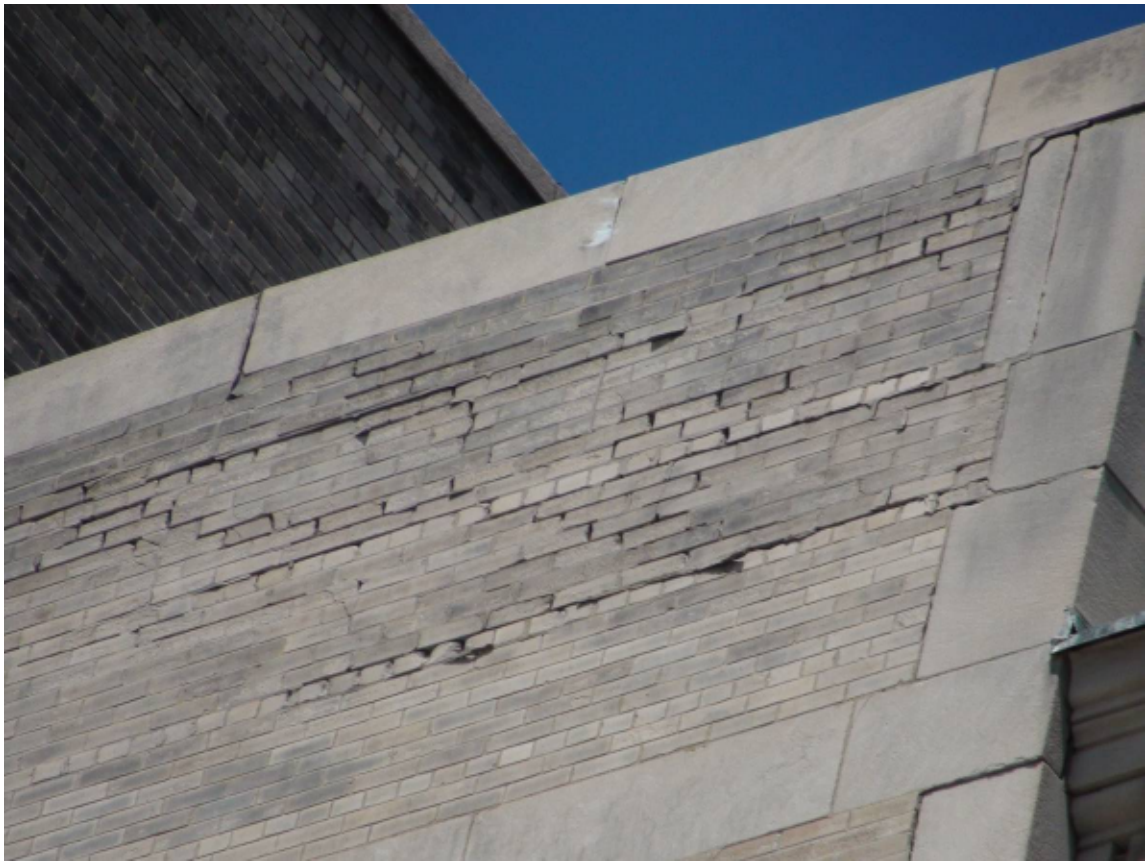

Photo #17

This photo shows the deterioration of the mortar from joints between the veneer bricks on the parapet wall located on the southwest side of the southeast end of the six-story tower.

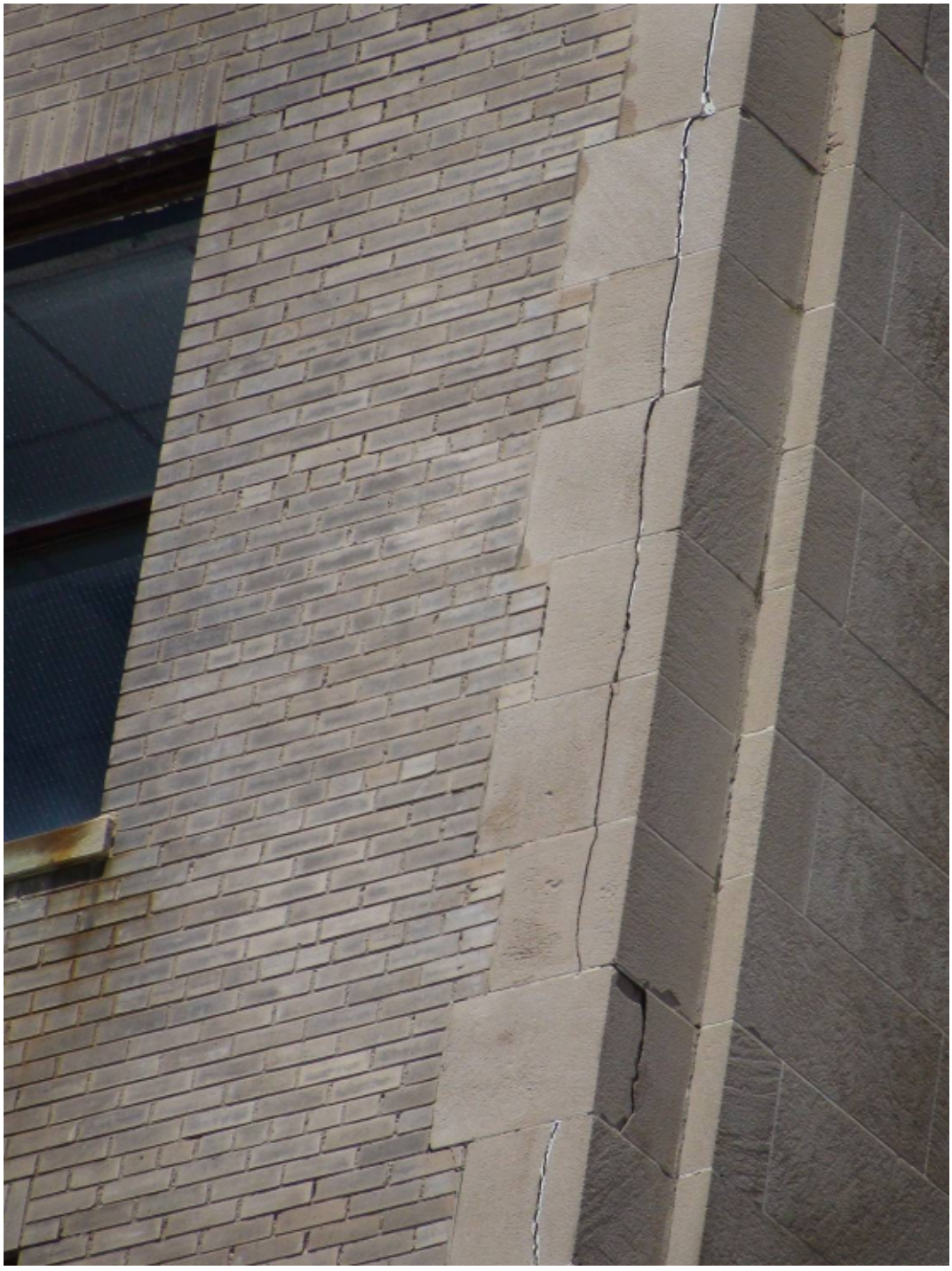

Photo #18

This photo shows the cracking of the limestone quoins located at the southwest corner of the six-story tower.

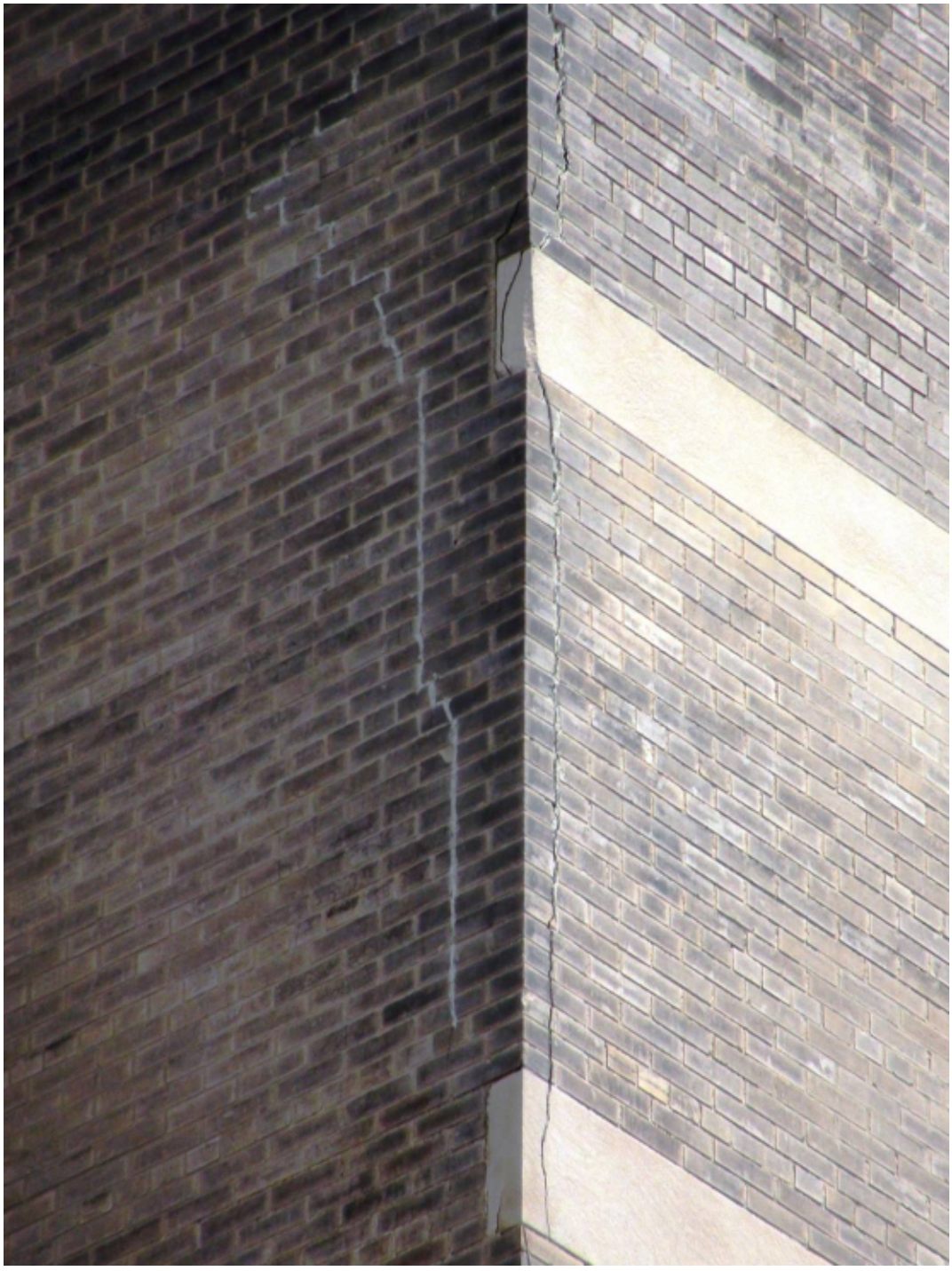

Photo #19

This photo shows the vertical cracking of both the brick veneer and limestone bands at the northwest corner of the southeast end of the six-story tower.

Photo #20

This photo shows the vertical cracking, diagonal cracking, and lateral displacement of the brick veneer at the northwest corner of the six-story tower.

Photo #21

This photo shows the vertical cracks, diagonal cracks and step cracks in the brick veneer located at the western end of the north wall of the six-story tower.

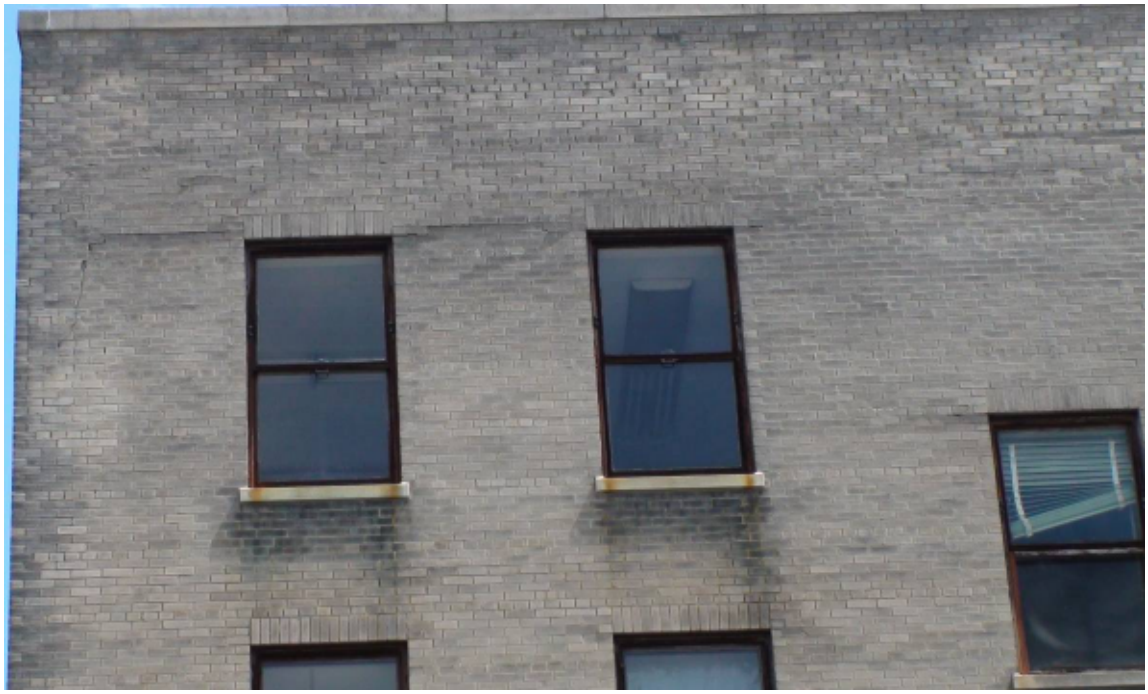

Photo #22

This photo shows the cracking and displacement of the brick veneer at the northeast corner of the six-story tower.

Photo #23

This photo shows the cracking and displacement of the brick veneer at the northeast corner of the two-story portion of the building.

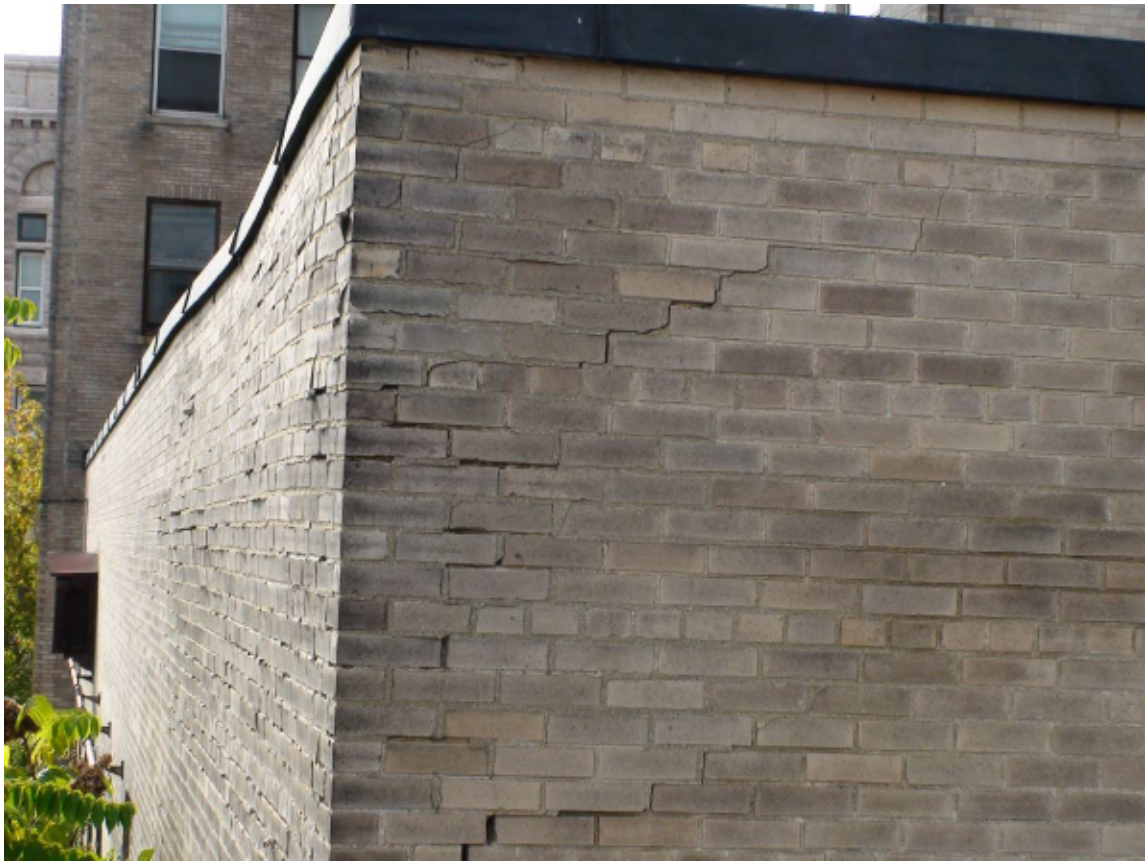

Photo #24

This photo show closer view of the cracking and displacement of the brick at the northeast corner of the two-story building. Note the outward bowing of the brick at the northern end of the east wall.

Photo #25

This photo shows the vertical cracking of the brick veneer and the efflorescence leaching out of the wall at the southern end of the east wall of the building.

Photo #26

This photo shows the cracking and spalling of the brick veneer on the east side of the southern end of the six-story tower. The cracking and spalling of the brick appears to be the result of expansive corrosion of the steel angle lintel above the window opening.

Photo #27

This photo shows water that is trapped behind the limestone veneer on the southeast side of the six-story tower. This water can deteriorated the masonry wall components and may cause displacement of the veneer during winter freeze/thaw cycles.

Photo #28

This photo shows the visible effects of long-term moisture infiltation at the southeast corner at the southeast end of the six-story tower.

Photo #29

This photo shows the visible effects of long-term water infiltration at the southwest corner at the southeast end of the six-story tower.

Photo #30

This photo shows the visible effect of water infiltration into the building envelope at the northeast corner of the six-story tower.

Photo #31

This photo shows the visible effects of long-term moisture infiltration at the northwest corner of the two-story portion of the building.

Photo #32

This photo shows the visible effects of moisture infiltration through the roof at the northern end of the two-story portion of the building.

Photo #33

This photo shows the visible water infiltration through the roof at the southern end of the two-story portion of the building.