STRUCTURAL EVALUATION REPORT

Chimney at 415 W. Washington Ann Arbor, Michigan

Submitted to:

DiClemente Siegel Design Inc.
28105 Greenfield Road
Southfield, MI 48076
Phone: (248) 569-1430

Submitted by:

Desai/Nasr Consulting Engineers, Inc.
6765 Daly Rd
West Bloomfield, Michigan 48322
Phone: 248-932-2010
Fax: 248-932-3088
www.desainasr.com

DNCE Project No. : 18-1339

Date Submitted: November 20, 2018

TABLE OF CONTENTS

1.0 EXECUTIVE SUMMARY – Page 3

2.0 INTRODUCTION – Page 3

3.0 GENERAL DESCRIPTION – Page 3

4.0 CONDITION ASSESSMENT – CHIMNEY EXTERIOR – Page 4

5.0 STRUCTURAL EVALUATION – Pages 4-6

6.0 CONCLUSIONS AND RECOMMENDATIONS – Page 6

7.0 APPENDIX A – Page 7

1.0 EXECUTIVE SUMMARY

DiClemente Siegel Design Inc. authorized Desai/Nasr Consulting Engineers to perform an evaluation of the chimney connected to the building located at 415 W. Washington St, Ann Arbor, MI 48103.

A two-story building at the address indicated above has been vacant for several years and is planned to be fully demolished. A chimney is connected to the south face of the building (at the east side) with a concrete beam acting as a flue. As desired by the owner, the chimney is proposed to remain after the demolition of the adjacent building.

Original Construction Drawings were not available at the time of the condition assessment; therefore, the findings of this report are based on visual inspection of exposed structural elements and experience with buildings of similar construction and era. No destructive or non-destructive testing was performed. As such, although this condition assessment is useful for detecting gross issues, it may not detect every issue, especially subtle or hidden conditions.

Buried elements such as foundations were observed to the extents possible, but with limited results due to the visual nature of the inspection.

2.0 INTRODUCTION

A walk-through style visual inspection of the above captioned property was conducted on Thursday, November 1st, 2018 by Alaa Chehab of Desai/Nasr Consulting Engineers, Inc., and Doug Forsyth of the City of Ann Arbor. The walk-through inspection was limited to observation of elements that were readily accessible and visible. The inspection was limited to the exterior of the chimney and to the inside of the adjacent building to check how the concrete flue is attached to the building frame from the inside. Based on the observations and pictures taken (see APPENDIX A) during the site visit, conclusions and recommendations are made and presented in section 6.0 of the present report.

3.0 GENERAL DESCRIPTION

The chimney is approximately 48 ft tall with plan dimensions of approximately 5.5 ft x 5.5 ft, constructed from clay bricks and supported on a reinforced concrete base (Figure 1). The concrete base of the chimney is connected to the adjacent building through a concrete beam that is approximately 6 ft long, 2.75 ft x 2.75 ft in section, and 8 ft above ground level. There is also a 7 ft high masonry wall connecting the chimney (at the north-west corner) to the adjacent building wall (Photoset 3). Due to the lack of Existing Structural Drawings and the visual nature of the inspection, the chimney foundation layout is assumed to be isolated from the adjacent building foundation.

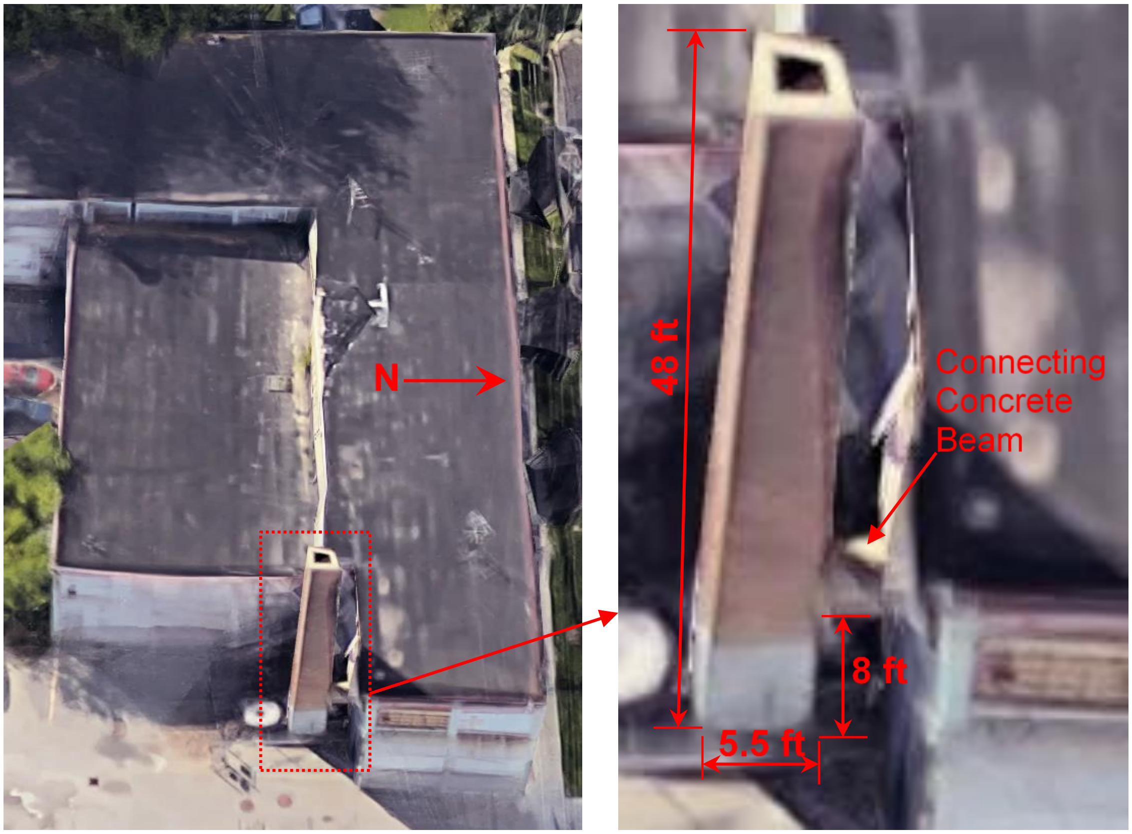


Figure 1. Chimney configuration and attachment to adjacent building.

4.0 CONDITION ASSESSMENT – CHIMNEY EXTERIOR

Based on the visual inspection of the chimney exterior and the attached flue, deteriorations in brick and concrete were observed. Photos of areas where deteriorations were found are provided in APPENDIX A of this report, and summarized as follows:

- Loose bricks and lack of mortar between bricks at top of chimney (Photoset 1).
- The concrete base of the chimney has vertical cracks at the south side, east and west sides (Photoset 2).
- Major crack in bricks extending from the west to the south side of the chimney, above the concrete base (Photoset 3).
- Cracks in the concrete beam (Photoset 4).
- Sever horizontal crack in the existing building concrete frame near the beam attachment point (Photoset 4).

5.0 STRUCTURAL EVALUATION

The lack of availability of original construction drawings requires a load evaluation to be performed. Based on the dimensions, and estimated material type/grade of the existing structural elements, load capacity can be assessed using the current ASCE-7 and BIA design guidelines and standards.

In order to examine the effect of removing the existing concrete beam (flue) connecting the chimney to the adjacent building, two models for the chimney structure have been analyzed (Figure 2). In both models, distributed lateral wind forces along the entire height of the chimney structure were applied in the north-south direction. The first model (a) is based on the existing conditions, while the second model (b) is based on the scenario where the beam is completely removed and the chimney is acting as a "stand-alone" structure. As shown in Figure 2, the resulted flexural moment at the base of the chimney after removing the beam (case b) became much larger, compared to the case where the beam is connected to the chimney, by approximately 4 times. However, this difference in the moment at the bottom is based on the assumption that the connecting beam is supporting the chimney in the horizontal direction, 8 ft above ground, and transferring lateral forces from the chimney to the existing building frame (presented by the reaction at point A).

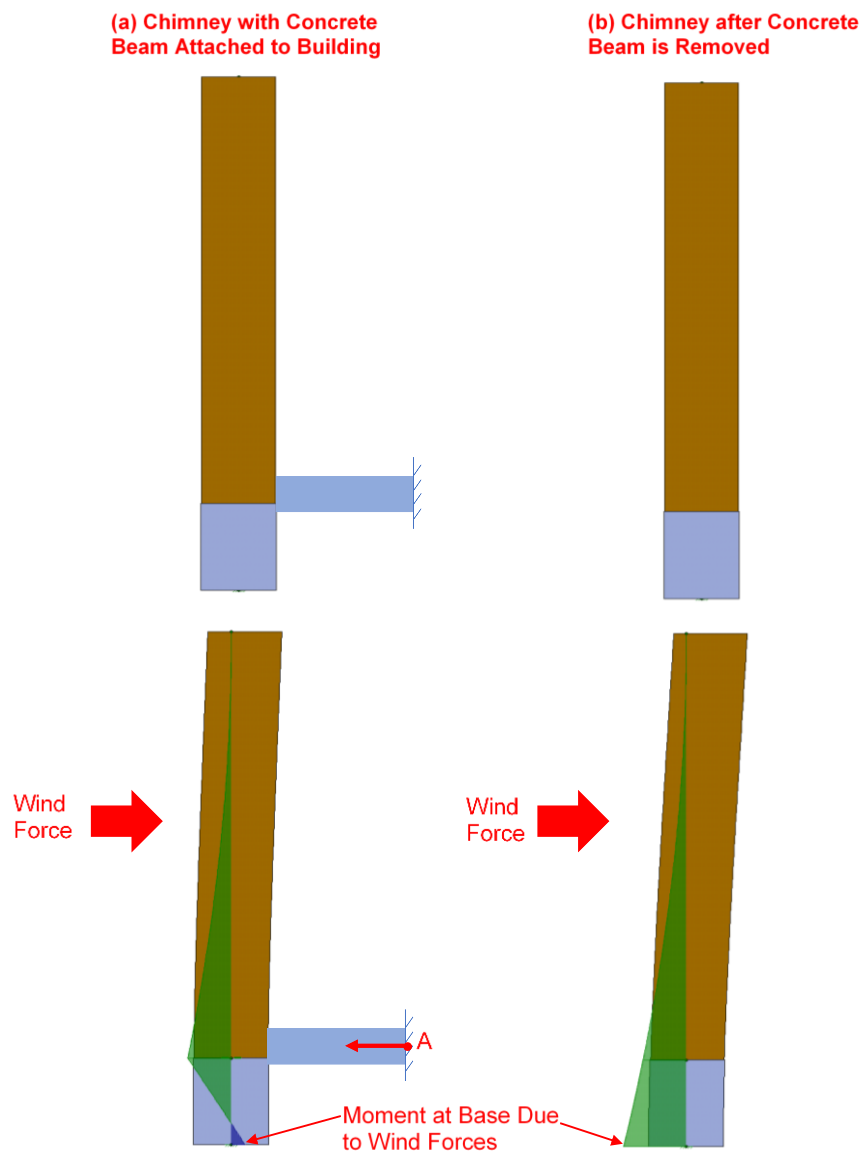


Figure 2. Concrete beam attachment to chimney and the adjacent building.

Furthermore, the analysis results showed significant lateral forces at point A, and thus for such large lateral force to be supported at that point, the beam must be connected to the building frame. This connection to the building frame was not visible from the inside of the building as shown in Photoset 5 where the beam is mainly passing through and supported by the existing wall, but not attached to the frame above.

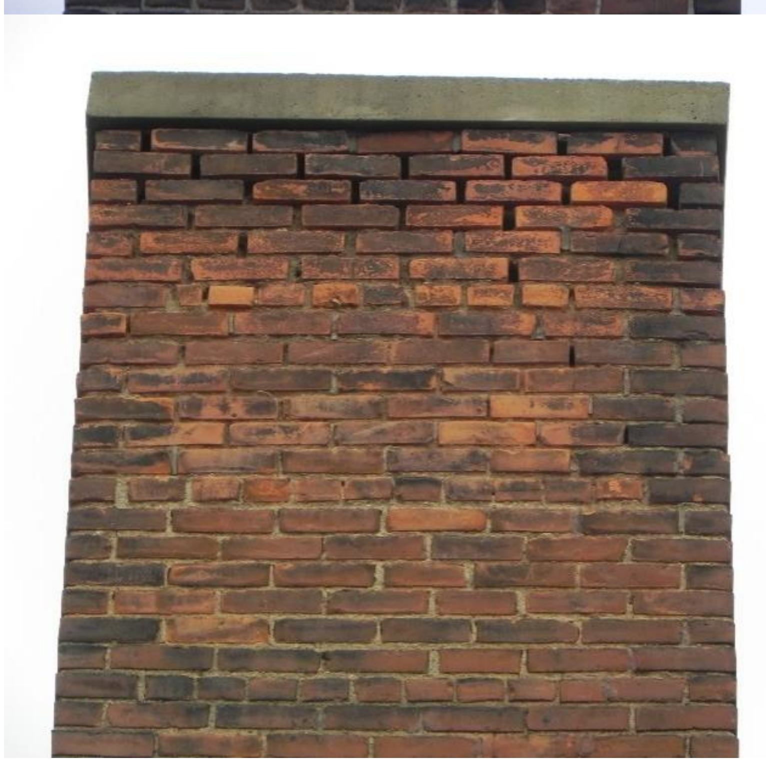
6.0 CONCLUSIONS AND RECOMMENDATIONS

In general, the chimney structure is in a fair to good condition. There are no signs of settlement of the existing chimney base, but a few areas of cracking and loose brick as listed above (section 4.0). However, it should be noted that these areas require major repairs to be made acceptable by current building code requirements. It is recommended to repoint loose brick with new mortar, especially at the top of the chimney, as soon as possible to avoid further deterioration that could potentially become severe and risk falling.

Since no structural connection between the concrete beam and the existing building frame was visible, it is assumed that the beam was not designed as a main lateral support member to the chimney structure. Therefore, removing this beam should not affect the lateral stability of the chimney as a stand-alone structure, assuming that the chimney is supported on an isolated foundation. Thus, if the final decision is to keep the chimney, isolating the chimney foundation against vibration and soil movement during demolition and construction is highly recommended. Temporary shoring is advised during demolition of the adjacent building, and until the new construction is completed.

Appendix A

Chimney Top



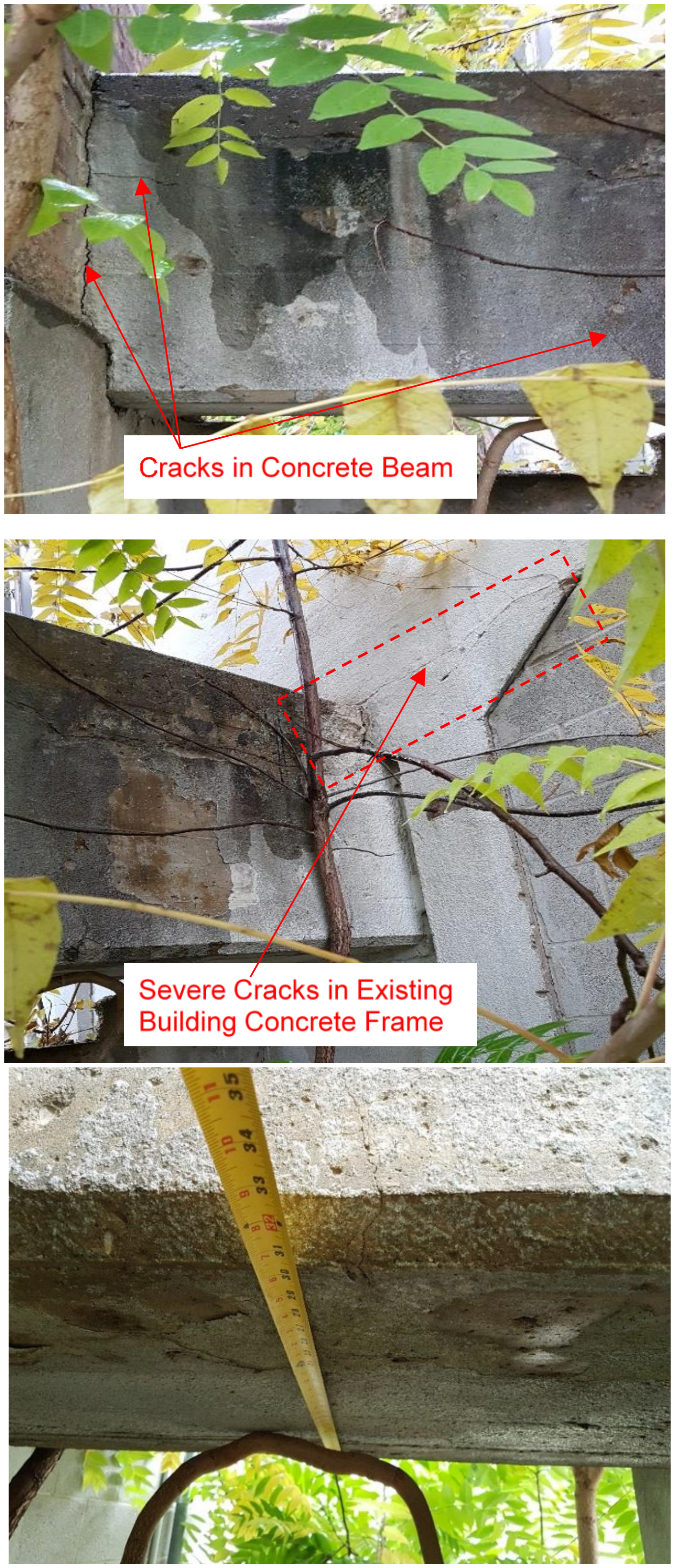
Photoset 1: Loose bricks and lack of mortar joints at top of chimney.

Chimney Base

Photoset 2: Major vertical cracks along the south and east sides of the base.

Photoset 3: Major horizontal cracks in brick above the concrete base along south and west sides.

Connecting Concrete Beam



Photoset 4: Cracks in concrete beam and the adjacent building frame.

Photoset 5: Extension of the concrete beam end to the inside of the adjacent building.