TH Engineering

STRUCTURAL ASSESSMENT

West Appliance Building

327 Main Street

Delta, Colorado

November 17, 2018

Prepared by:

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SUMMARY

This report is prepared for the City of Delta, Colorado. The report is part of the City of Delta's Blight Remediation Project, for the West Appliance building located at 327 Main Street, Delta, Colorado.

The City of Delta has requested a pre-remediation structural review of the West Appliance building to ascertain the structural integrity of the building.

This report responds to the request and outlines areas of structural stability concerns within the building. The assessment is based on visual observations and intermittent investigation and does not constitute a full and complete structural assessment or analysis. This report does not provide design or calculations for shoring or other protective measures required for safe removal of contaminants. The intent of the report is to draw attention to areas of stability concern, such that contractors are aware of the building's condition.

The structural assessment is based on visual site observations performed on October 22nd and 29th of 2018. Due to the advanced decay of the structure, stability conditions can change rapidly.

INTRODUCTION

The overall intent of the City of Delta's West Appliance Blight Remediation Project is to remove the existing buildings and infill the lot with a community park, pavilion or other type of community enhancement. The design and construction of the enhancement will occur in future project phases and conceptual designs are not available at the time of this report.

The current phase of the project is to mitigation the existing asbestos and lead through removal and disposal. Once the remediation and removal of the contaminants is completed, demolition of the structure can commence.

BUILDING DESCRIPTION

The West Appliance building is comprised of two buildings contained on lots 6 and 7, block 15 in Delta. (Horn, 2018) Lot 6, based on the City GIS data base appears to the most northernly of the two lots. The current address of the West Appliance building is 327 Main Street. The total floor space of the building is approximately 9000, with 1000 square foot (sf) basement, 6000 sf main floor and 2000 sf second floor. The building has approximately 6000 sf of roof. The buildings have undergone several iterations of remodels and expansion. The order in which these structural changes occurred is indistinguishable without further investigation and review of historical construction documents and permits. The evaluation report by J. Horn, April 2017 provides a general description and historical record of the building.

The buildings are comprised of masonry exterior bearing walls. Both brick and concrete masonry units were used as construction materials. Floors and roof supporting elements are comprised of wood framing and wood trusses. Through remodel, the middle wall of the two buildings was removed to create a single main floor. The building located on lot 6 appears to have had a main floor expansion southward. Additionally, steel beams were added under the second floor of the building located on lot 6. The foundation of the buildings appears to be comprised of stone foundation and remodels appear to have utilized concrete footers cast over or around the previous stone foundation.

SITE OBSERVATIONS

Site observations were conducted on October 22nd and 29th of 2018. The intent of the observations was to visually ascertain the structural stability of the building. The observations were performed by Mr. Timothy A. Hayashi, P.E., State of Colorado Licensed Professional Engineer Number: 38881. Mr. Mike Konn, City of Delta, Project Manager accompanied and assisted Mr. Hayashi during both site visits.

Methodology

Initial External Review - An external review of the building is conducted looking for major structural significance or elements that require further observations. The intent of the initial external review is to familiarizes the observer with the perceived structural layout and locate areas for closer evaluation.

Initial Internal Review – An Internal review of the building is conducted looking for major structural significance or elements that require further observations. The intent of the initial internal review is to confirm the hypothesized structural layout and locate areas for closer evaluation. If areas within structure do not agree with the surmised structural layout assessment a secondary external review is completed.

Foundation Review – Upon a gaining a general understanding of the structural layout and noting areas of concern a crawl space observation is undertaken. The crawl space observations begin that the point of greatest significance based on the initial external and initial internal review. The intent of the crawl space observation is to confirm the surmised structural layout, provide a review the foundation system based on findings above and observe areas of structural significance.

Final Internal Review – Upon completion of foundation review, the interior of the structure is walked. Areas of the internal structure directly above or structurally related to areas of foundation concern are further assessed.

Final External Review - Upon completion of final internal review, a final exterior review of the of the structure is taken. Areas of the external structure related to areas of foundation concern are reviewed for conformity with surmised structural opinions.

External Review Comments

North Exterior Wall:

The initial review of the north exterior wall along, gridline 1, indicates that the outer bearing wall of the building is comprised of brick masonry units. The wall is a two-story wall with a parapet and extend from gridline C to D. The brick masonry is showing signs of cracking and tension ties are visible at the

intersection of gridlines 1 and C at the second level. There is a first-floor addition comprised of concrete masonry units extending from gridline A to C along the north exterior wall and the addition's concrete masonry units and mortar joints shows signs of minor cracking.

East Exterior Wall:

The east external wall, gridline D, is covered with a façade and not visible for assessment. The visual observations indicate that the wall is near straight and true with no significant signs of rotation.

South Exterior Wall:

The south wall along gridline 6 is a single-story brick masonry wall, extending from gridline A to D. The brick and mortar joints show signs of cracking, but no significant signs of rotation were observed.

West Exterior Wall:

The west end of the building, along gridline A, is comprised of concrete masonry units between gridlines 1 and 3 and brick between gridlines 3 and 6. The west wall between gridlines 1 and 6 is covered with a gray paint. No significant signs of structural distress were observed along the west end wall. The wall is near straight and true with no significant signs of rotation.

Internal Review Comments

Basement (Area B1):

The only found basement is in the south west corner of the building on lot 7. The basement is accessed by a stairway located just to the right upon entering the back doors. The basement is divided into two cells by a middle running concrete wall, along gridline 5. The basement walls appear to be cast in place concrete foundation walls. The foundation below these walls are not visible. No signs of rotation or stabilization concerns were noticed in the basement. Sounding of the walls indicate that the concrete is generally solid. However, the bottom of the walls and other isolated areas are showing signs of concrete decay with delamination and spalling occurring.

Two access doorways have been created in the basement middle wall, along gridline 5. The opening to the west, nearest gridline A, appears to have been created at the time of the basement wall construction. The opening to the east, nearest gridline B, appears to have been "knocked" out later. The floor joist above the openings are supported by wooden beams. However, these beams do not appear to have satisfactory end bearing.

There is a crawl space access along the gridline B basement wall. The access is located to the south of the intersection of gridline B and 5. It is recommended that entry into the crawl space be prohibited.

Basement (Area B1) Shoring Recommendation:

It is recommended, that the main floor system above the two openings be shored to provide support. It is recommended that “Do Not Enter” tape or other warning signs be placed across the crawlspace access or the crawl space access blocked. Additionally, it is recommended that periodically review the basement walls and floor joist for movement or structural destabilization occur during the remediation of the structure.

Main Floor-Lot 7 (Area M1):

The main floor for the building contained on lot 7 is defined by the area outlined by gridline A, D, 3 and 6 and is denoted as area M1. This area appears to have undergone significant water damage. The floor system is wooden joist and decking. While not visible, indications are that the floor members structural capacity has decreased. Walls on the main floor system of the M1 area is covered but appear to be stable. The roof system in this area is comprised of hand-built trusses and wood bracing. The roof in the M1 area appears to have undergone significant water damage. The web members of the trusses are bowing, which may be due to overstressing or lack of bracing. Preliminary indications are that the roof system in the M1 area is not adequate to support the roof and roof loading.

Main Floor- Lot 7 (Area M1) Shoring Recommendation:

It is recommended that the roof system be shored prior to allowing removal of any material from the roof or inside of the building. As punching through the floor system is a concern, roof shoring may not bear on the floor system unless adequate bearing can be verified. As removal of material may result in unloading of the walls, bracing is recommended as a preventative measure. As with the roof system, it is advisable that wall bracing not to bear on the floor system unless the bearing can be verified.

Main Floor-Lot 6 Original (Area M2):

The main floor for the original building contained on lot 6, is defined by the area outlined by gridlines C, D, 1 and 3. The floor system in this area has seen significant water damage. The flooring is buckling due to moisture swell. Observations indicate that the floor joists in this area have experienced both fire and water/moisture damage and thus have undergone a reduction in structural capacity. The north and east sides of the M2 area are covered but appear to be stable. The ceiling and 2nd floor system is supported by both a steel beam (Beam A) centered on gridline 2 and wood. The ceiling and 2nd floor system is supported at the ends by the masonry exterior wall along gridline 1 and a steel beam (Beam B) centered

on gridline 3. The Beam B appears to have been installed when the masonry wall separating Lot 6 from Lot 7 was removed. Both Beams A & B appear to be intact and show no signs of structural distress. Both beams are supported by steel columns. The supporting steel columns for Beam A bear on concrete footings constructed upon the subgrade material in the crawl space. The supporting steel columns for Beam B bear on concrete leveling pad placed/formed over the stone foundation. The concrete for the all columns is deteriorating and it is not possible to determine if the concrete is reinforced.

Main Floor-Lot 6 Original (Area M2) Shoring Recommendation:

While the ceiling-2nd floor above the main floor, lot 6 original, appear to be stable, indications are that the wood contained within the 2nd floor system has seen water damage and thus a reduction in structural capacity is likely. It is recommended that the walls and steel beams (Beam A & B) be braced and that due to significant water damage, the bracing not bear on the main floor system. Additionally, localized areas of destabilized in the ceiling and 2nd floor system may become apparent during remediation and if identified, shoring installed and previous.

Note: The western end of this area contains a concrete slab. Sounding of the concrete slab indicates that the slab is solid. The shoring in this area may bear on the slab. However, the concrete may have undergone deterioration and it is advisable that an assumed compressive strength of less than 2,500 pounds per square inch be utilized, unless the strength is otherwise verified by testing.

Main Floor-Lot 6 Addition (Area M3):

The area added to the original building is defined by gridlines A, C, 1 and 3. The floor system in this area appears to be a concrete slab. Sounding of the slab indicates that the slab is solid. However, based on the overall structural integrity of the building, deterioration of the slab may have occurred. The bearing walls along gridlines A, 1 are covered but appear to be stable. However, note that at the intersection of gridlines C and 1, the brick is deteriorating. The ceiling and roof in this area has seen significant structural damage and is comprised of several broken wooden members.

Main Floor-Lot 6 Addition (Area M3) Shoring Recommendation:

<u>It is recommended that the M3 ceiling area as described above be fully shored prior to beginning any removal or shoring activities within the entirety of the project.</u> It is recommended that steel shoring be utilized and that the shoring bear on the concrete slab. However, the concrete may have undergone deterioration and it is advisable that an assumed compressive strength of less than 2,500 pounds per square inch be utilized, unless the strength is otherwise verified by testing. In addition to the ceiling/roof shoring, it is recommended that the 2nd floor wall that runs along gridline C also be shored utilizing a steel frame system. In addition to shoring the ceiling/roof and 2nd floor wall, the exterior walls, it is advisable

that the walls be braced. Bracing may be attached to the concrete floor with the same limitations to the compressive strength as previously discussed.

Second Floor – Lot 6 (Area S1):

The second-floor area of the building contained on lot 6 is described as the 2nd floor area outlined by gridlines C, D, 1 and 3. This area generally appears to be stable. The floor system as seen from area M2, below, is comprised of wooden and steel members. The floor system appears to be stable, however, signs of water damage may indicate a reduced structural capacity. The walls appear to be stable with no significant signs of rotation. However, tension ties have been placed along gridline C and indicate possible past movement or instability within the wall. The ceiling and roof in the S1 area appears to be stable and adequate to carry the existing loads. However, water damage is evident and as such unseen members or areas may have reduced structural capacities due to water damage.

Second Floor – Lot 6 (Area S1) Shoring Recommendation:

The S1 area appears to be stable for removal of material. Shoring is recommended in localized or areas of instability discovered. The bearing for the shoring may have to extend though the M2 area below and be founded on suitable subgrade in the crawlspace. The walls contained within the M2 area may require bracing as instabilities become apparent.

Roof Area Shoring Recommendation:

In general, the roof system for the building in its entirety has likely undergone significant water damage and as such decking and support members may have undergone significant decrease in structural capacity. It is recommended that shoring be provided from below as necessary along with a stable working platform. Care needs to be taken not to overload the existing roof system and shoring support have a direct load path to the crawl space subgrade. Bearing shoring on any floors or floor systems is not advisable, unless within the area of concrete slab or adequate bearing can be verified.

CONCLUSION

The West Appliance building located at 327 Main Street, Delta, Colorado has undergone structural decay and reduced structural capacity due to water damage, and general deterioration. It is advisable that proper shoring be provided for any remediation. Shoring may not bear on existing members or systems unless the adequacy of the bearing can be verified. It is recommended that all walls be braced for additional lateral support. Additionally, it is recommended that periodic review of the existing structural system be conducted during remediation. Extreme caution is advised during periods where the structure is loaded with snow, ice or during prolonged high wind loads.

Figure 1 - Main Floor Shoring Recommendations

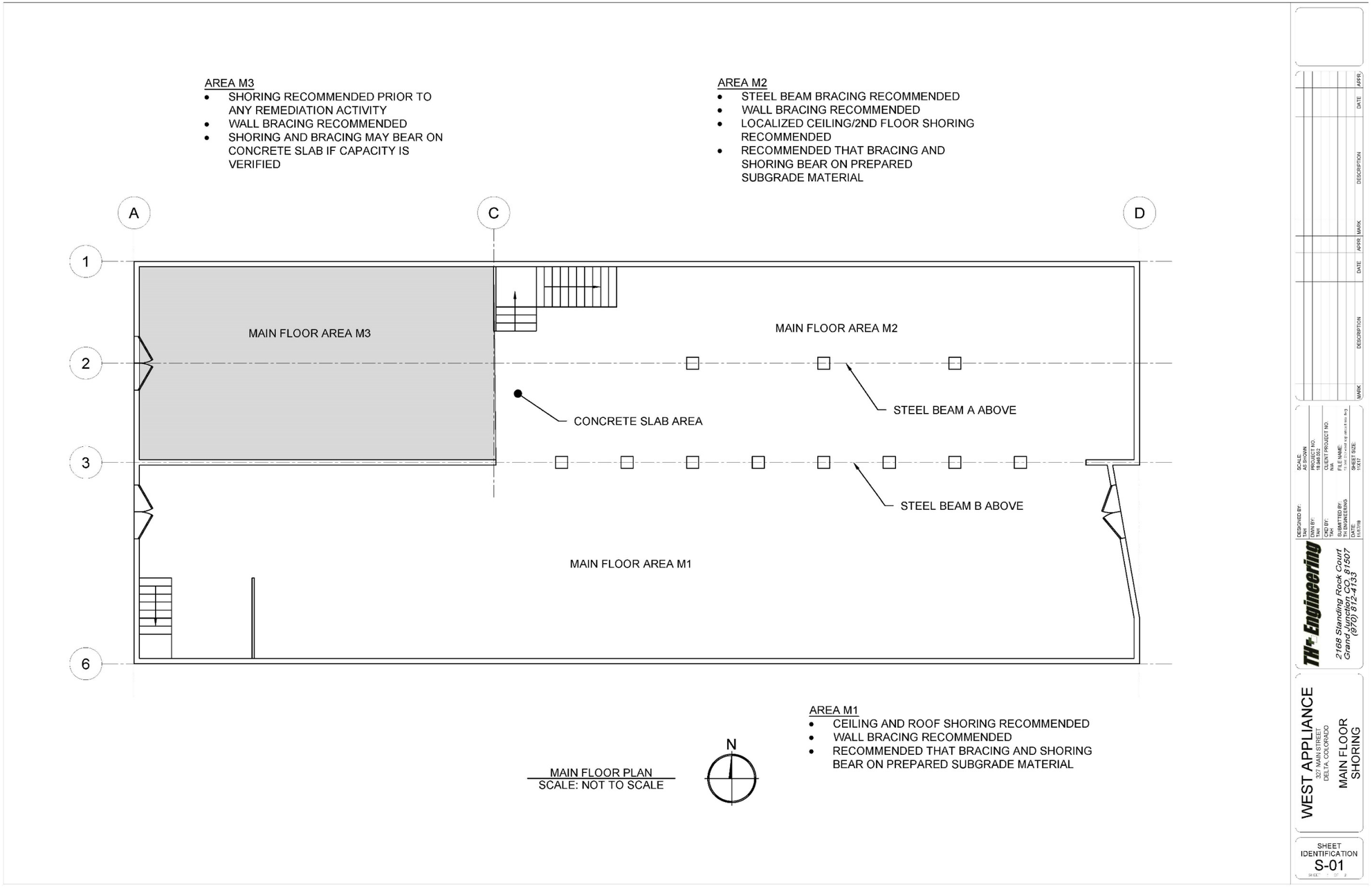
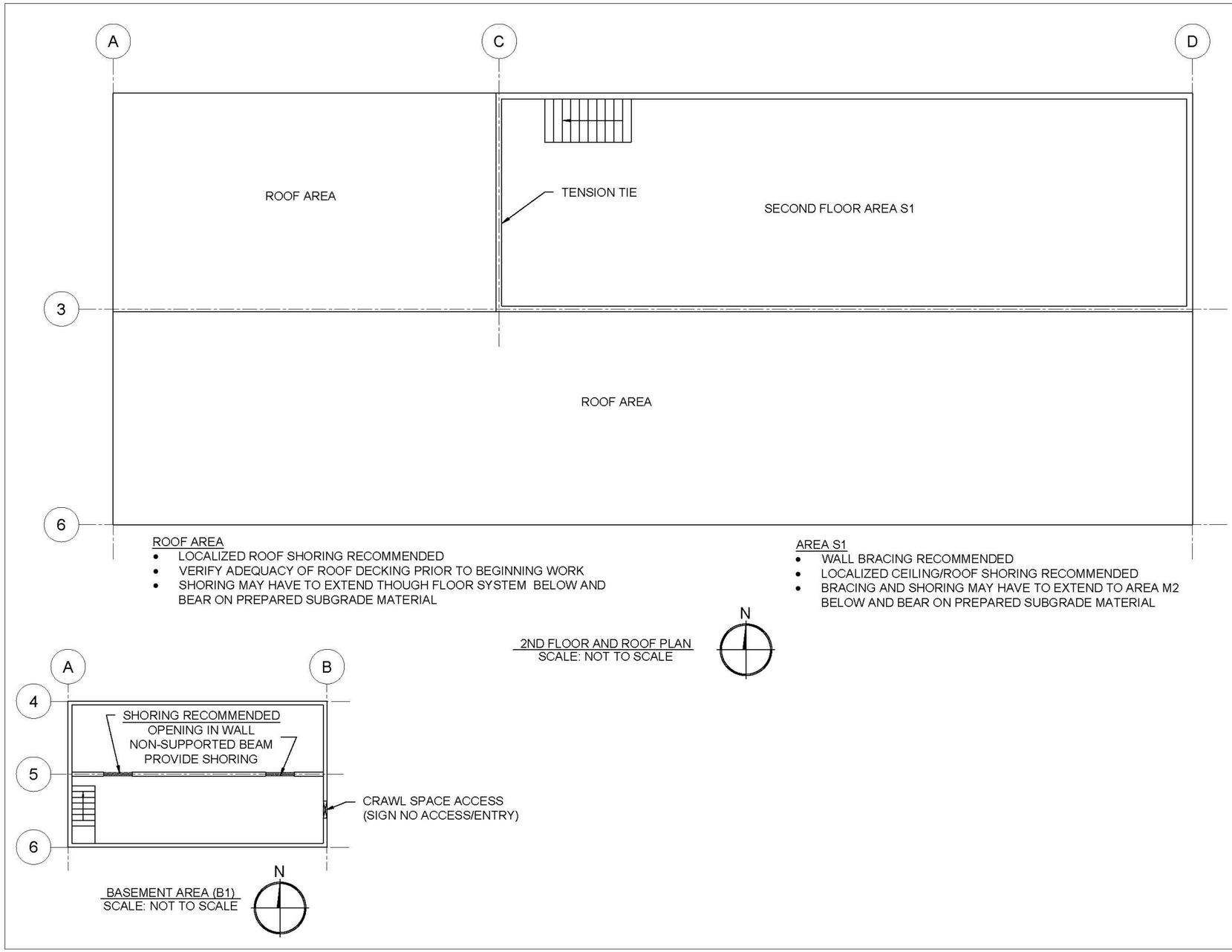


Figure 2 - Basement and 2nd Floor Shoring Recommendations



ROOF AREA
- LOCALIZED ROOF SHORING RECOMMENDED
- VERIFY ADEQUACY OF ROOF DECKING PRIOR TO BEGINNING WORK
- SHORING MAY HAVE TO EXTEND THOUGH FLOOR SYSTEM BELOW AND BEAR ON PREPARED SUBGRADE MATERIAL

AREA S1
- WALL BRACING RECOMMENDED
- LOCALIZED CEILING/ROOF SHORING RECOMMENDED
- BRACING AND SHORING MAY HAVE TO EXTEND TO AREA M2 BELOW AND BEAR ON PREPARED SUBGRADE MATERIAL

2ND FLOOR AND ROOF PLAN
SCALE: NOT TO SCALE

BASEMENT AREA (B1)
SCALE: NOT TO SCALE

MARK | DESCRIPTION | DATE | APPR.

DESIGNED BY: TJM
DRAWN BY: TJM
CHKD BY: TJM
SUBMITTED BY: TH ENGINEERING
DATE: 11/17/18
SCALE: AS SHOWN
PROJECT NO: 18.046.062
CLIENT PROJECT NO:
FILE NAME: TH-ENG-Unit Appliance Barn.dwg
SHEET SIZE: 11X17

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WEST APPLIANCE
327 MAIN STREET
DELTA, COLORADO

2ND FLOOR & BASEMENT SHORING

SHEET IDENTIFICATION
S-02
SHEET 2 OF 2

Photo 3 - Basement Opening

Photo 4 - Basement Wall Deterioration

Photo 5 - Truss Bowing Area M1

Photo 6 - Steel Beam A & Wood Framing

Photo 7 - Steel Beam B & Wood Framing

Photo 8 - Concrete Footing Below Beam A

Photo 9 - Stone Foundation Below Beam B

Photo 10 - Water Damaged Floor Joist Area M2

Photo 11 - Broken Structural Member Area M3

Photo 12 - Damaged Support Below Masonry Wall Above Gridline C

Photo 13 - Deteriorating Masonry At Gridline C

Photo 14 - Water Damage Area S1

Photo 15 - Tension Ties Intersection Gridline 1 & C

Photo 16 - Tension Tie In Wall Along Gridline C

Photo 17 - Ceiling & Roof Water Damage Area S1

REFERENCES

Horn, J. C. (2018). *REcordation and Evaluation of Five Buildings in the City of Delta, Delta County, Colorado.* Montrose.