TORELLO ENGINEERS
DESIGN - INVESTIGATION - INSPECTION

215 Essex Plaza
Essex, CT 06426
Phone: 860-767-7075

July 9, 2021

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xxxxxx, CT

RE: Foundation Evaluation - xx xxxxx St., Mystic, CT

Mr. xxx,

On July 7, 2021, we visited the above referenced location to inspect the foundation of the existing commercial structure for signs of deteriorations, failure or distress - This inspection was limited to areas of the structure visible at the time of inspection. Please note: this is a condition study and evaluation only. No analysis of the of the structure for load carrying capacity or code compliance was conducted or is implied. The following are our findings:

OBSERVATIONS

GENERAL

The structure is a late 1880's built, approximately 33,030 SF mixed use building with a stone and brick foundation, timber framing, and pitched roofs. The foundation and building footprint is approximately 9,131 SF. The foundation walls are primarily constructed of a stone lower half and brick upper half, except in the utility building which had brick below grade with a slab on grade floor (no basement). The main building had a crawl space basement with approximately 5' of headroom. The building is supported at the perimeter on the brick foundation wall and to the interior by a series of timber beams atop timber columns. (See attached Key Plan).

EXTERIOR AND SITE GRADING

In many areas the grading around this structure is not ideal, low spots exist that may lead water to the foundation. In at least 2 locations downspouts discharge roof runoff extremely close to the foundation. The south side of the building had a notable lack of gutters and roof runoff again is deposited directly adjacent to the building foundation. (Key Plan Observation Item #15)

MAIN BUILDING FOUNDATION

The foundation for the main building is an approximate 7,800 SF stone lower half and brick upper half foundation wall system. Subsequent renovations have added interior concrete block walls. Four substantial cast in place concrete buttresses were added at each of the four interior corners of the foundation to reinforce the foundation at these corners.

Dampness and evidence of moisture/water entry were observed throughout the foundation. A large sump pit exists in the center of the basement, however the pump was not functioning and appears to have been abandoned for quite some time. (Key Plan Observation Item #17)

The initial significant observation upon entering the crawl space is that **the floor is a sand/gravel mixture that appears to have been added recently and surrounds each of the wood columns which disappear below grade** (Key Plan Observation Item #13). Further excavation revealed that approximately 24" or more of this sand and gravel have been added to the entire basement, perhaps in an attempt to raise the floor level to correct a moister/water infiltration problem. The wooden columns below grade have been sprayed with a spray-foam insulation prior to backfilling with sand and gravel. Sampled portions of the foam insulation below grade were saturated with water. **This is highly unusual and will undoubtedly lead to rapid deterioration of the columns. The sprayed on insulation is not an appropriate or effective protection against water and moisture. This added sand and gravel also precluded inspection of the lower portion of the foundation walls.**

A number of cracks were observed in this foundation, their locations noted on our attached Key Plan (Key Plan Observation Items #1 and #5).

Generally, two types of cracks are found in stone foundation walls; minor cracks due to local disruption of the stonework or mortar deterioration, and prominent cracks indicating some type of structural distress. Settlement cracks generally appear as larger vertical cracks, or cracks that are tighter at the top and wider at the bottom, or vice versa. Soil pressure can also cause this type of crack, heavily saturated soils can exert pressure at the top of the grade causing a horizontal cracking indicating a sever failure of the wall.

Multiple minor cracks, and four significant horizontal cracks were identified.

Minor vertical and stair-step cracks were noted (Key Plan Observation Item #1). These were all in areas of either local disruption of the stonework and/or mortar deterioration, or appear to be historical minor settlement cracks. These cracks, while needing repair, do not constitute a significant structural concern are a much lesser concern than observed horizontal cracks.

A number of horizontal cracks were noted and recorded. (Key Plan Observation Item #1) These horizontal cracks were likely caused by the weight of saturated soils against the foundation walls which have been further weakened by excessive moisture and age. Site grading leads water directly to this foundation wall, and moisture was noted along the base of the foundation wall in many locations. Without anywhere to drain this water sits in the soils surrounding the structure, deteriorating the mortar and brick and adding pressure to the foundation.

In addition to the horizontal cracks, **in at least 5 areas the brick portion of the foundation was observed to be bowing inward.** This almost always coincides with horizontal cracking. These are localized foundation wall failures due to deterioration and saturated soil pressure. (Key Plan Observation Item #2)

A number of small localized areas of disrupted/displaced stonework and brick were observed. (Key Plan Observation Item #8). These are areas with missing or deteriorated mortar and have observable displacement of the bricks or stones. In some areas the bricks are badly deteriorated and/or falling out of the wall.

A section of the west end of the foundation has been replaced with concrete block (CMU) and that block section is not in contact with, and is not supporting the building sill as it should. (Key Plan Observation Item #19)

UTILITY BUILDING FOUNDATION

The visible foundation (and walls) of the utility building are brick both above and below grade. **There is a significant amount of brick deterioration and a number of areas of disrupted/displaced brick at the base of the walls and top of foundation** in this part of the structure. (Key Plan Observation Item #8)

A “pass-thru” opening between the utility building and the main building has been created to allow the passage of utilities. This opening was created by removing a section of brick and no support for the brick above was provided. As could be expected the brick wall above this opening is beginning to fail. (Key Plan Observation Item #12)

Within the East section of the utility building the underside of a floor system could be observed supported to the East and West on ledger boards attached to the brick and supported on wood posts. The West ledger is poorly supported on a single 2x4 at the access opening to this space.

OTHER MISCELLANEOUS FOUNDATION ITEMS

On the south face of the building two small entryway stairs and decks are supported by wood columns and concrete footings. Earth and landscaping mulch is either close to or in contact with the wood posts. This can lead to rapid deterioration of the columns. (Key Plan Observation Item #14)

FOUNDATION COLUMNS

The first floor - floor framing is supported at the perimeter on the foundation walls to the interior atop timber columns. As discussed above, The wooden columns below grade have been sprayed with a spray-foam insulation and backfilled with 24” +/- of sand and gravel. **This is highly unusual and will undoubtedly lead to rapid deterioration of the columns.**

One column was noted to be significantly out of plumb (Key Plan Observation Item #6).

A small number of columns lacked any positive connection to the beams which they support (Key Plan Observation Item #7).

A number of columns are topped by a larger haunch which tops the columns. The purpose of these haunches is to distributed the load onto a larger surface at the top of the column to

prevent crushing of the beam at that location. Some of these haunches were cracked or otherwise noticeably distressed (Key Plan Observation Item #9).

In one location the base of a wooden column was beginning to show signs of rot from moisture (Key Plan Observation Item #10).

A steel column which disappears below the added soil is severely corroded due to contact with wet soils (Key Plan Observation Item #20).

FIRST FLOOR – FLOOR FRAMING (MAIN BUILDING)

Visible portions of the first floor – floor framing were inspected from the basement level. The underside of the first floor has been sprayed with a thick layer of insulating foam limiting our observations of the original beams.

This framing consists of original timber 8”x10” beams on the even numbered column lines and original 6” x 10” beams on odd numbered column lines. All of the 6” beams on the odd numbered column lines have been sistered with an additional 1.75” laminated member.

Two rows of columns exist along lines C and D and an original column occurs along these lines at each 8” beam. Additionally, glulam (laminated timber) beams have been added throughout spanning between columns (with a few exceptions) to add support to the original 6” beams on the odd numbered column lines. In two cases these added support beams have been removed (Key Plan Observation Item #16).

FIRST FLOOR – FLOOR FRAMING (UTILITY BUILDING)

In the east portion of the utility building we could observe the underside of a floor system supported on ledgers attached to the brick and supported on posts. Immediately adjacent to the opening to this space the ledger is inadequately supported on a single 2x4.

RECOMMENDATIONS

EXTERIOR AND SITE DRAINAGE

All installed drainage systems should be inspected and their functionality verified. Gutters and downspouts should be cleaned on a regular basis to ensure proper flow.

Site grading should direct rain water away from the house or structure. The landscape surrounding a house or structure should have a minimum of 5 ft. of “positive,” or downhill, drainage away from the foundation, at a minimum of 5% slope. Modifications to grading will reduce the amount of water arriving at foundation walls, and reduce efflorescence.

FOUNDATION

Far and above any other recommendation contained herein, we recommend the immediate correction of the added sand and gravel against the wood columns in the crawl space.

Either the gravel should be immediately removed allowing access for inspection and maintenance or, if this proves impractical, the below grade portion of each column be replaced by a more suitable material. One such way to accomplish this is to excavate around each column and build a CMU pier surrounding the wood column to above the new grade. The upper portion of the column can then be secured to the top of the new pier, allowing the lower portion to be abandoned ion place. **We cannot state strongly enough the danger of leaving this unattended. Unchecked, this condition will undoubtedly lead to deterioration of the columns which support the floors above and eventual collapse. This should be corrected within the next year.**

Minor foundation cracks should be chipped or routed out and repointed by a qualified mason.

Horizontally cracked masonry and bulging brick walls should be either; excavated from the exterior to relieve pressure and then be rebuilt, or where that is not practical, have an interior concrete buttress installed to withstand the soil pressure.

Moist deteriorated brick can be dried out by improving drainage and then be repointed by a qualified mason.

Poor beam bearing conditions should be improved by the addition of an appropriate framing connector or proper hardwood shims.

The out of plumb column can be corrected during corrections to the sand/gravel around the columns.

Columns lacking attachment to the overhead beams should be corrected by installing an appropriate galvanized column to beam connector plate.

Deteriorated brick and brick mortar joints should be repaired by a combination of replacement of disrupted areas and repointing of the surrounding areas.

Cracked haunches at the top of a small number of columns should be replaced with an appropriate timber. In lieu of this it is possible that some type of in-place reinforcement might be designed.

The one column showing early signs of rot can be salvaged by removing the sand and gravel against it and drying it out. At this stage only the very surface has been effected.

The corroded steel column should be excavated and either the lower section be encased in a reinforced concrete pier or replaced entirely.

The unframed opening between the utility building and the main building should have an appropriate header installed and the failed brick replaced and repointed.

Soil against the entry platform columns should be graded to allow these posts to remain dry.

The abandoned sump pump should be restored or additional sump pits/pumps be installed throughout the space once other corrections have been made. Additionally, a vapor barrier or new slab at the floor level should be considered once the sand/gravel is removed, or installed atop of it if it is to remain. If this is insufficient to control the high humidity, a dehumidifier is suggested.

The improperly supported ledger in the east section of the utility building should be re-supported on appropriately sized pressure treated posts.

OPINION OF PROBABLE CONSTRUCTION COSTS

It is our opinion that the construction cost to rectify the conditions noted in this report would be in the range of $180,000 – $250,000.

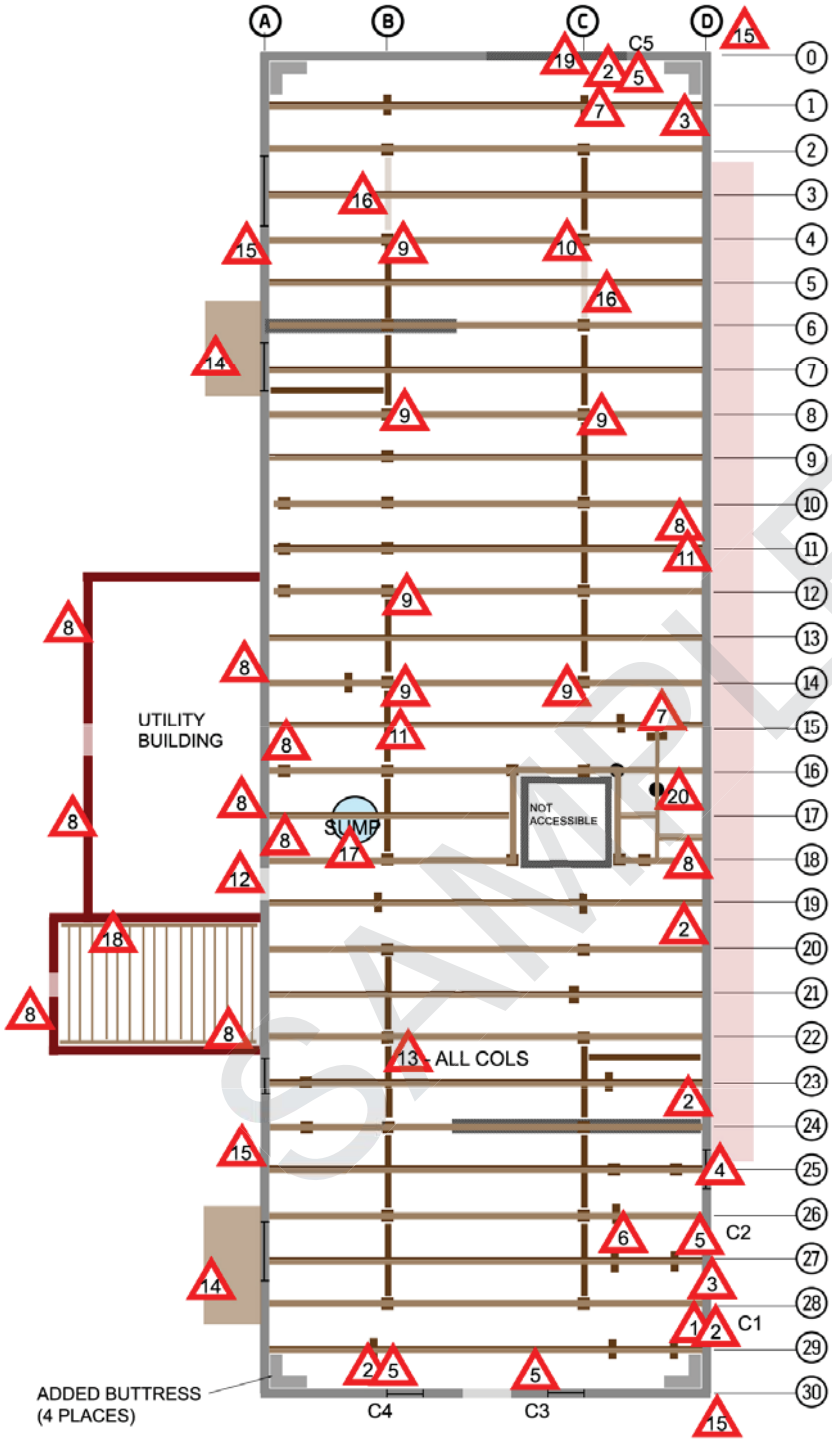
CONCLUSION

While this evaluation has noted a number of significant items that will need to be addressed in order to assure the long term structural integrity of the structure, we did not note any indications of imminent structural collapse or danger. That said, a program of repairs should be begun immediately to avoid potential future failures.

If you have any questions, or need assistance in the design of these repairs, please give us a call.

Respectfully Submitted,

Anthony Torello, CCI
Construction Inspector



MYSTIC, CT

NOT TO SCALE

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LEGEND

- OBSERVATION ITEM
- STEEL PIPE COLUMN
- FOUNDATION
- TIMBER BEAM / FRAMING
- ADDED FRAMING
- TIMBER COLUMNS
- BRICK FOUNDATION / WALL

OBSERVATION ITEMS

1. FOUNDATION CRACK
2. WALL BOWED INWARD
3. WET DETERIORATED BRICK
4. POOR BM TO HEADER CONNECTION
5. HORIZ FOUNDATION CRACK
6. OUT OF PLUMB COLUMN
7. NO COL TO BEAM ATTACHMENT
8. DISRUPTED BRICK / MISSING MORTAR
9. CRACKED COL TOP HAUNCH
10. ROTTED COLUMN BASE
11. INADEQUATE BEAM BEARING
12. UNFRAMED BRICK OPENING
13. SOIL FILL AROUND WOOD COLS
14. FILL TOO CLOSE TO PORCH POSTS
15. ROOF DRAINS NEAR FOUNDATION
16. BEAM MISSING/REMOVED
17. ABANDONED SUMP PUMP
18. IMPROPERLY SUPPORTED LEDGER
19. SILL NOT SUPPORTED ON CMU BLOCK
20. CORRODING STEEL COLUMN

KEY PLAN

PHOTO REMOVED

Added fill covers approximately 2’ of the basement and surrounds the timber columns.

Excavation at the columns reveals 2’ to the bottom of the original column.
Spray applied insulation was wet below grade.

Some areas of the upper brick foundation walls were bulged inward due to soil pressure against deteriorated brickwork.

Wood haunches atop the timber columns were cracked in some locations.

Other haunches were severely deformed due to compressive loads.

An added section of concrete block does not properly support the sill.

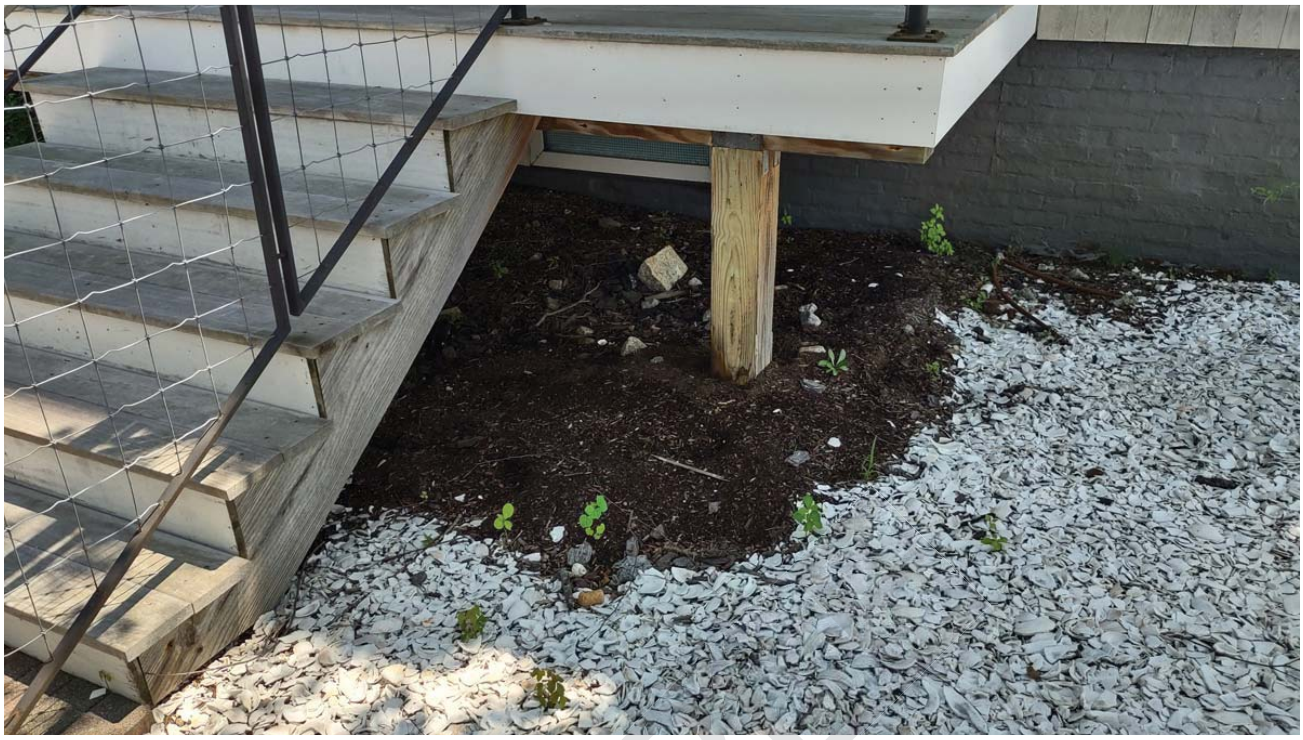
Steel column is corroding due to its contact with damp soil.

Sump pit receives drain water from above. Pump abandoned and non-functioning.

Utility building floor system inadequately supported by 2x4 post.

Interior of Utility Building foundation has extensive deterioration to the brick and mortar.

Exterior of Utility Building shows signs of severe mortar and brick deterioration at the foundation and further up the walls.



Entry porch posts in contact with wet soil.

Poor roof drainage and downspouts lead runoff water directly to the foundation.