

June 15, 2021

Mr. John Doe

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RE: **Limited Structural Evaluation**
Philadelphia, Pennsylvania

Dear Mr. Doe,

Partner Engineering and Science, Inc. (Partner) is pleased to submit this letter report regarding the subject property listed above.

OBJECTIVES

The focus of this limited structural evaluation and review of the building was to answer the following questions posed by the client:

1. Review and evaluate the superstructures and foundations of the Amenity Building and residential apartment buildings for signs of structural deficiencies and provide recommendations for correction and repair, if required.
2. Document the condition of visible structural elements, noting any regions appearing deteriorated, distressed, or otherwise compromised since the original construction and/or renovations.
3. Review all client provided documentation as applicable to this engagement, including the original construction drawings, relevant renovation drawings, geotechnical reports, post-earthquake repairs or seismic retrofit drawings, and prior structural inspection reports/property condition assessment reports relevant to this engagement, if any.

DOCUMENT REVIEW

- Architectural Drawings – Construction Set for Amenity Building – Prepared by xxxx and dated xxxx
- Structural Drawings – Construction Set for Amenity Building – Prepared by xxxx and dated xxxx
- Existing Resources and Site Analysis (ERSA) Civil Drawings – Permit Set for Amenity Building – Prepared by xxxx and dated xxxx
- Architectural Drawings – Permit Set for Existing Conditions at Residential Apartment Buildings – Prepared by xxxx and dated xxxx
- Architectural Drawings – Final Bid Set for Ground Floor Retail Spaces – Prepared by xxxx. and dated xxxx
- Structural Drawings – Final Bid Set for Ground Floor Retail – Prepared by xxxx and dated xxxx

SITE INVESTIGATION

A site investigation of the subject property was performed by Mr. Adam Redmond, E.I.T. of Partner Engineering on Wednesday, June 2, 2021. The site visit included a property tour. No destructive investigations were performed. The report is based on visual observations and review of safely accessible areas in the building.

Site Escort: Redacted

Weather: Sunny, 75 degrees F.

USER RELIANCE

Partner was engaged by xxxx (Client), or their authorized representative, to perform this assessment. The engagement agreement specifically states the scope and purpose of the assessment, as well as the contractual obligations and limitations of both parties. This report and the information therein, are for the exclusive use of the Client. This report has no other purpose and may not be relied upon, or used, by any other person or entity without the written consent of Partner. Third parties that obtain this report, or the information therein, shall have no rights of recourse or recovery against Partner, its officers, employees, vendors, successors or assigns. Any such unauthorized user shall be responsible to protect, indemnify and hold Partner, the Client and their respective officers, employees, vendors, successors and assigns harmless from any and all claims, damages, losses, liabilities, expenses (including reasonable attorneys' fees) and costs attributable to such use. Unauthorized use of this report shall constitute acceptance of, and commitment to, these responsibilities, which shall be irrevocable and shall apply regardless of the cause of action or legal theory pled or asserted.

This report has been completed under specific Terms and Conditions relating to scope, relying parties, limitations of liability, indemnification, dispute resolution, and other factors relevant to any reliance on this report. Any parties relying on this report do so having accepted the Terms and Conditions for which this report was completed. A copy of Partner's standard Terms and Conditions can be found at <http://www.partneresi.com/terms-and-conditions.php>

BUILDING DESCRIPTION

AMENITY BUILDING:

The amenity building is a three-story structure consisting of a curtainwall, architectural split-faced block masonry façade, and a perforated structural aluminum veil constructed between 2017-2018. Gravity loads from the aluminum veil are supported by a galvanized steel subframe that is tied into the curtainwall lateral and vertical supports. Other gravity loads are supported by a primary framing system consisting of structural cold-formed metal framing (CFMF) braced to the rear masonry façade and exposed hollow structural section (HSS) steel posts and wide-flange beams supporting the second level composite floor deck and roof deck. Construction documents indicated that the building has a 6" concrete slab-on-grade foundation with synthetic macro fiber reinforcement throughout. The building is constructed with a shallow foundation system consisting of reinforced perimeter concrete walls and wall footings, interior reinforced concrete spread footings, and reinforced concrete piers. According to the structural construction set, the building was designed using the following parameters and loading conditions:

- Designed to the 2009 International Building Code (IBC).
- The foundations were designed and the footing elevations established from the results of a geotechnical investigation and report conducted by xxx and dated xxxx. Major findings were incorporated in the structural plan set, but the complete geotechnical report was not available for review.

- Terrace design live load is 100 psf.
- Terrace dead loads are 130 psf at the second and third floor paver areas, 420 psf at the second-floor planter box area, and 160 psf at the third-floor mechanical area.
- Gym and fitness area design live load is 100 psf.
- Exterior steel stair design live load is 100 psf.
- Pool deck dead load is 470 psf.
- Structural concrete compressive strength: $f'_c = 4,000$ psi for interior slabs on grade and light fill over composite steel decking, $f'_c = 5,000$ psi (with 6% air entrainment) for foundation walls, footings, and all exterior concrete, and $f'_c = 2,500$ psi for backfill below footings.
- The soil minimum bearing capacity for the footings is 2,000 psf and 1,000 psf for the slab-on-grade. The drainage fill under the slab-on-grade is specified as AASHTO #57 crushed stone aggregate with a 4" minimum thickness.
- Structural steel yield strength: $F_y = 65$ ksi.

RESIDENTIAL APARTMENT BUILDINGS (Buildings A, B, C, D, E, F, J, H, and K):

The residential apartment buildings were reportedly built in 1901 as a luxury hotel and converted into student housing in the 1970s. They are comprised of brick masonry façades with decorative stonework on Buildings B and E. The buildings also are equipped with steel party-wall egress balconies that are anchored to the exterior brick masonry. Buildings A and K are constructed with concrete Juliet balconies underneath the second story bay windows facing Chestnut Street. Buildings A and K are both seven-story buildings and the remaining apartment buildings are typically four-story buildings. Buildings A and K are reportedly subject to the Philadelphia Façade Ordinance PM-315, which requires inspection of the exterior walls and appurtenances of buildings six stories or taller. A request was made to the site escort for the most recent façade report, but it was not available for review at the time of this assessment.

Buildings A, K, H, and G were renovated during 2017-2018 to add retail spaces to the ground floors. The structural bid set prepared by xxx indicated substantial structural improvements to these buildings, including the following below. Note that these improvements were added in conjunction with the original substructures and superstructures discussed later in this section.

- Building K: addition of new reinforced concrete footings and concrete masonry unit (CMU) foundation walls in the basement, new reinforced concrete slabs at the west stairs, new CMU walls in stairwells on the first floor, new wood joists sistered with existing wood joists on the first floor, and new stud walls added with existing wood joists cut back to bear on the stud walls on the first floor.
- Building A: addition of new reinforced concrete footings and CMU foundation walls, and a new reinforced concrete slab at the retail entrance.
- Buildings G and H (basement area): addition of a new 4" reinforced concrete slab-on-grade over granular fill and reinforcement of existing wood columns with concrete encasement.

The original construction of these buildings supported gravity loads by means of load-bearing, multi-wythe brick masonry walls, heavy timber framing consisting of columns, girder beams, and joists, and stone foundation walls. The existing foundations' extent, conditions, and components are largely unknown due to their age and lack of records. It is presumed that the apartment buildings utilized shallow stone foundations without footings, which is prevalent in historic buildings within Philadelphia. As the foundations are considered a hidden condition, the foundation types could not be confirmed. Construction documents for the unrenovated apartment buildings (B, C, D, E, F, and J) were not available, thus the design codes, loading conditions, and material parameters are

unknown. However, a final bid set for the renovated buildings (A, G, H, and K) was available for review. According to the provided structural set, the renovation was designed using the following parameters and loading conditions:

- The renovation was designed to the 2009 IBC.
- The design live loads for the first-floor retail spaces are 100 psf and design live loads on all other floors are 40 psf.
- The presumptive minimum soil bearing capacity for the foundations is 2,000 psf and the minimum soil bearing capacity for the footings is not provided. *It is not clear whether a geotechnical investigation and report was completed prior to issuance of the structural bid set.*
- Structural concrete compressive strength: $f'_c = 3,000$ psi for footings, $f'_c = 4,000$ psi for piers and grade beams, and $f'_c = 3,500$ for slabs. All concrete subject to exterior exposure is specified with 6% air entrainment.
- Structural wood used in joists, headers, beams, built-up posts, and bearing wall studs: $F_b = 850$ psi, $F_t = 525$ psi, $F_c = 405$ psi (perpendicular to grain), $F_c = 1,300$ psi (parallel to grain), $F_v = 150$ psi, and $E = 1,300,000$ psi.
- Structural wood subject to exterior exposure or in contact with masonry or concrete: $F_b = 1,050$ psi, $F_c = 565$ psi (perpendicular to grain), $F_v = 175$ psi, and $E = 1,600,000$ psi.

SITE OBSERVATIONS

AMENITY BUILDING:

- The foundation in the Amenity Building appeared to be functional and stable in the areas observed with no indication of visible settlement. Cracking was also not observed at the pool/spa deck and terrace areas.
- A crack was observed in the concrete floor slab in the Amenity Building pool/spa mechanical room. The crack was linear and appeared to be due to shrinkage of the concrete over time. It did not appear to be indicative of significant structural distress.

RESIDENTIAL APARTMENT BUILDINGS:

- The residential apartment buildings were observed to be unreinforced masonry structures. The Amenity Building had a lateral force resisting system (LFRS) consisting of welded steel moment framing and steel braced beams.
- The unrenovated apartment buildings are considered pre-code since it was constructed prior to 1927. Building codes require that wood framing be adequately anchored to a stable foundation and that the foundation and anchors be designed to meet code prescribed forces. Under current building codes, friction is not allowed to be considered for the anchorage of the wood framing to the foundation. Also, foundations are required to be constructed either with reinforced concrete and or reinforced masonry. Unreinforced masonry is not allowed in the design of new foundations for structures.
- Stair-stepped cracking was observed at several points on Building B, primarily located near the cantilevered egress balconies along the rear façade. Stair-stepped cracks are typically indicative of differential foundation settling as the brick mortar joints crack and separate while the walls settle unevenly. A geotechnical investigation was not conducted during the retail remodel in 2017 – 2018, so the extent and condition of the stone foundation is unknown; however, it is presumed that the foundation does not include reinforced concrete footings for support.

- Several units in Buildings B, C, G, and K were observed to have sloping floors, particularly at the intersection between the living room, kitchen, and bathroom from the main entry way. Floor sloping is typically due to failing or distressed floor joists beneath the flooring materials, which sag as the joists lose structural integrity from rotting or wood-destroying insect (WDO) damage. While the joists were not visible in these observed units, the condition of similar joists and pervasive moisture intrusion issues observed elsewhere in the property implied that the floor sloping occurred due to failed or distressed floor joists exhibiting sagging due to significant dry rot. Other instances of rotten joists were observed in other apartment buildings and are discussed further in the report.
- The brick masonry exterior walls throughout the subject property exhibited signs of distress including open mortar joints and spalling. This condition was noted most frequently at Buildings A, B, C, D, F, and G. It is believed that the spalling occurred after successive freeze/thaw cycles during the winter months. Water likely intruded into small cracks within the brick and mortar and subsequently froze, which caused the bricks and mortar joints to crumble and fall away from the structure. The decorative stonework on the east façades of Buildings B and E exhibited a similar manner of deterioration, with extensive cracking and spalling found under the archways and decorative figure busts in the east courtyard. The site escort indicated that there is not currently an ongoing façade maintenance program in place at the subject property.
- Parging was observed on Building A's exposed foundation walls on the east and south sides of the structure. The parging appeared to be a cement-based mortar and was applied evenly over the exposed walls. A large section was observed to have spalled near the landscaping in the east courtyard and some minor hairline cracking was observed throughout.
- Significant deterioration of the structural elements serving Buildings G and H was observed, particularly in the basement mechanical room and adjacent areas. The source of the decay could not be determined at the time of the site visit but appeared to have occurred in relation to water intrusion through the foundation walls. This also could have occurred from soil that was not sufficiently compacted, which permitted significant water adsorption that leached into the foundation. The following deficiencies were observed:
 - Distressed load-bearing masonry walls with large diagonal cracks and significant brick spalling in the mechanical areas adjacent to the boiler room.
 - Extensive damage to wood joists, plank flooring, and structural posts including a heavy timber girder exhibiting severe termite damage and several floor joists with significant dry rot.
 - It should be noted that some areas included further structural supplementation done with pressure-treated lumber, including sistering failing wood floor joists and retrofitting new wood columns and wood cross bracing for additional support. A number of these modifications are not shown on the structural bid set provided by the site contact.
- Similar conditions were observed in the Building D basement. The following deficiencies were observed:
 - A hairline crack was noted in the basement concrete floor slab. The crack appeared to be jagged and less than 1/8" wide at the thickest point, with some spalled sections adjacent to the crack. The isolated crack appeared to be related to concrete shrinkage and was not indicative of a foundation settling.
 - Significant rot was observed on the wood floor joists and heavy timber girder beams.
 - Standing water was observed throughout the basement, notably in the abandoned apartment. The basement did not appear to have sumps or any systems to evacuate moisture from the basement.
- All residential apartment buildings were provided with cantilevered party-wall egress balconies that lead to an emergency egress stairwell. The egress balconies and stairwells appeared to be original to the initial construction. Several deficiencies were observed, including the following.

- All balconies observed were encumbered by significant corrosion in the platform, handrails, cross bracing, and masonry anchors.
- The anchors securing the cross bracing to the exterior walls were observed to be pulling out from the brick masonry in Buildings B and C. In these instances, the attachment hardware was displaced to the point that it was easily visible from large voids in the exterior wall.
- Temporary shoring was observed in the emergency egress stairwell in Building F between F201 and F101. The purpose of the shoring was not clear, and the site escort did not provide any additional information.
- Moisture intrusion was an overall concern throughout the subject property. The residential apartment buildings had several potential points for water entry with the extensive masonry spalling, unprotected wood window framing, deterioration of the bay window frames, and poor window seals. High moisture in the apartment units was observed through yellowing of the walls around windows and high moisture readings at the exposed brick wall. The high moisture levels at the brick wall (which faces the exterior) indicated that the masonry walls are not waterproofed.
- Vertical cracks were observed in the brick spandrels on the apartment buildings and on the window lintels on Building A, which showed evidence of an epoxy injection repair. The vertical cracks in the spandrels were observed to cut through bricks rather than concentrate within the mortar joints. Such cracking is indicative of thermal expansion of the masonry due the lack of a thermal expansion joint. The cracking observed on the lintels appeared to have been sufficiently repaired and the cause could not be conclusively identified in the assessment.

RECOMENDATIONS AND CONCLUSIONS

- A qualified exterminator should be contracted to evaluate the extent of termite damage in the heavy timber framing underneath Buildings G and H and assess the property for any signs of WDOs. The exterminator should then treat the subject property to eliminate all active infestations. An estimated cost for this scope of work is \$25,000.
- All rotting floor joists observed to sag in Buildings B, C, G, and K should be either sistered or replaced with an identical pressure-treated lumber member with additional Fitch plate reinforcement depending on the severity of the damage. Pedestrian access to each area should be securely blocked and each area should be adequately shored until remediation is complete. Additional screw floor jacking may be required depending on the severity of the joist sagging. A licensed structural engineer should be consulted to determine the scope and recommended remediations prior to the commencement of any repairs. An allowance for the cost of this work is \$150,000. If any areas are deemed not for use and do not require repairs, all access to such areas should be securely cordoned off to prevent any immediate life-safety concerns.
- A qualified mason should be contracted to repair the damage to the exterior brick masonry walls throughout the subject property to maintain structural integrity and reduce potential for water intrusion. The open masonry joints should be repointed with a cement-based mortar and all spalled brickwork should be chiseled out and replaced with new bricks. All repairs should be conducted in a manner that matches the surrounding masonry. An estimated opinion of cost and detailed repairs for this work is addressed in the Building Envelope Report.
- The spalled and cracked parging on the east and south elevations of Building A should be replaced with a similar cement-based mortar. All repairs should be conducted in a manner that matches the surrounding masonry.

- **The damaged structural elements in the basement areas of Buildings D, G, and H should repaired in the short term due to the extensive deterioration observed.** The following repairs should be completed. An allowance for this complete scope is \$350,000:
 - Rotting floor joists should be sistered or replaced as described above.
 - Deteriorated load-bearing masonry walls should be repaired by a qualified stone mason in accordance with the Building Envelope Report.
 - Rotting structural posts should be sufficiently shored, removed and replaced with equivalent pressure-treated lumber. Shoring posts with a hydraulic jack should be utilized to provide temporary support to the structure while repairs are underway.
 - The hairline crack observed in the Building D basement floor slab should be filled with an epoxy crack sealer injection and monitored for further shrinkage cracking.
 - A pedestal sump pump should be installed in the Building D basement to eliminate the standing water observed in the basement. The sump pump should evacuate water that enters the basement and discharge into the Philadelphia municipal stormwater system. The sump pump should be equipped with battery backup, and visual/audible alarms. The pump should be installed by a qualified plumber and the installation should conform to the 2018 Philadelphia Plumbing Code.
- The hairline shrinkage crack observed in the Amenity Building pool/spa mechanical room should be filled with an epoxy crack sealer injection. The concrete slab should be monitored for additional shrinkage cracks and repaired as required.
- The emergency egress balconies were observed to be in poor condition and require immediate repair as a life-safety issue. The following repairs should be completed; an opinion of cost for the total scope of work is \$55,000.
 - The rust encumbering the balconies should be scraped down to the bare metal with a wire brush and cleaned with a solvent. The balconies should be coated with a rust-inhibitive primer and enamel-based paint. If the existing paint has not been tested for lead or asbestos, an environmental firm should be engaged to determine if such materials are present. If so, the hazard should be abated, and the paint should be removed with an OSHA approved wet-based removal method.
 - The deteriorated support angles and masonry attachment hardware should be reinforced (welded steel plates and/or auxiliary steel angles) and the deteriorated brickwork surrounding these areas should be replaced in a similar manner to the spalling brickwork found elsewhere in the subject property. An estimated opinion of cost and detailed repairs for this brickwork is addressed in the Building Envelope Report. A qualified contractor and a structural engineer should be engaged to confirm the scope of the repairs and inspect the refurbished fire escape for deficiencies.
- The purpose of the temporary shoring in the Building F emergency egress stairwell could not be confirmed. Based on the observed condition of the stairs and the shoring, the stairs should be removed and re-built with new wooden stair framing and adequate railing. An opinion of cost for this scope of work is \$12,000. As the stairs in Building E were not observed, an allowance of \$10,000 is included for repair work if the stairs are in similar condition to the stairs observed in Building F.
- Exterior waterproofing should be applied to all exterior masonry walls and exposed foundation walls to prevent moisture intrusion into the buildings, which compromises the integrity of the wooden structural elements. Exposed wood blocking near window frames and doorways should be finished with waterproofed material and match the finished window frames and doorways found elsewhere on the subject property. An estimated opinion of cost and detailed repairs for this work is addressed in the Building Envelope Report.

- The vertical cracking found on the masonry exterior, particularly around the spandrels should be sealed with a flexible sealant caulk. Any repaired masonry areas should incorporate expansion joints where applicable to redirect future thermal expansion within the brick to the joints rather than the brickwork. An estimated opinion of cost and detailed repairs for this work is addressed in the Building Envelope Report.
- The owner should locate a copy of the as-built sets of drawings by contacting the Philadelphia Building Department.

CLOSING

We appreciate the opportunity to provide structural engineering consulting services to [REDACTED]. If you have any questions about the content of this document or if we can assist you in any other matters, please do not hesitate to contact us.

Sincerely Yours,

DRAFT FOR CLIENT REVIEW

Adam Redmond, E.I.T. (NY)
Associate Engineer

DRAFT FOR CLIENT REVIEW

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Attachments:

Appendix – A Site Plan

Appendix – B Site Photographs