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August 30, 2023

King County Housing Authority
700 Andover Park West, Suite C
Seattle, WA 98188

ATTN: Heath MacCoy

RE: *Structural Evaluation – Wayland Arms Apartments – Auburn, Washington*

Dear Heath:

SCOPE OF SERVICES

We were asked to go out on site to observe slab settlement at the south end of the four-story building. We were accompanied on site by you and your colleagues. We were provided the original existing drawings and a renovation of some foundation work that occurred at the north end of the building. We were provided with a geotechnical report of this portion of the building as well.

Our scope is limited to the southern portion of the building to review the settlement of the slab, the cracks in the masonry walls at the mechanical room and cracks in the sheet rock walls. Our scope was to identify structural concerns and highlight next steps and recommendations for mitigation. Solutions and repairs are beyond the scope of this letter and will be addressed after further discussion.

Comments about electrical, plumbing, civil, architecture and geotechnical are outside our expertise and thus not included. Our comments hereon are based on our experience constructed during this era and our engineering judgement.

DESCRIPTION OF BUILDING

Vertical Load Resisting System:

The existing four-story building was constructed in 1967. The floors are constructed with steel open web joists with metal deck and concrete topping. The roof is constructed with metal deck and open web steel joists. The building is supported by concrete grade beams and pile caps with timber piles that extend approximately 40-feet below finish grade. The exterior walls and interior walls are constructed with predominantly with light gage non-bearing metal studs.

Lateral Force Resisting System:

The building is constructed with steel moment frames. The steel columns are orientated in both the strong and weak axis for the frames.

FOR WAYLAND ARMS SLAB REPAIR & SEISMIC UPGRADE RFQ

King County Housing Authority
Heath MacCoy
Structural Evaluation – Wayland Arms Apartments – Auburn, Washington

OBSERVATIONS

The following is a summary of our observations:

- We observed settlement in the concrete slab on grade throughout the south portion of the building. We observed waviness in the slab at the corridors with settlement of over 1" in the slab in numerous locations in distances as short as 4-feet.
- We observed that the non-bearing metal studs had separated from the concrete slab on grade. There was an approximate gap of 1" between the wall and the concrete slab on grade. The powder actuated fasteners that were used to attach the metal stud track to the concrete were spalled out of the concrete. We observed cracking in the sheet rock for the light gage non-bearing metal stud wall.
- The 6" nonbearing masonry walls at the mechanical walls had vertical and diagonal cracks in the walls. The slab on grade at this area had settlement of 2" in some locations.
- The exterior of the building is cladded with masonry veneer. We did not observe significant signs of settlement or cracks in the veneer.
- The upper floors of the building appeared to be level and we did not observe significant signs of deflection, settlement or signs of distress.
- At the north portion of the building, a retro fit was done in 2013 to repair the slab on grade and the sanitary sewer. Similar conditions that are being exhibited at the south wing occurred at the north wing. A repair was made to slab on grade with new 2" diameter steel pin piles that were drove approximately 50-feet below finish grade.
- The settlement at the southern end of the building has reportedly gotten worse. The building is located near the Sound Transit train tracks and Highway 18. The settlement was reportedly worsening and causing issues with the sewer pipes at the north end during the construction of the highway and the train tracks. The train will also cause vibrations to the building which consequently has caused some of the soil to consolidate and settle.
- The concrete slab on grade is not tied to the concrete grade beams and timber piles. A 4" rigid insulation buffer was added below the slab over the piles and the grade beams.
- The exterior patio on the west face of the south building had been replaced during the recent renovation.
- Based on our review observation, the southern wing appears to have settled more since the last renovation in 2013 and appears to be worsening. Without a survey of the building pile caps, it is unclear if the piles are also settling. We did not see significant signs of distress or settlement to the main infrastructure nor the foundation. The settlement in the slabs, the nonbearing light gage walls and masonry walls have been affected by the soil consolidating and hence settling. The settlement seems active and the owner expressed concern that the settlement has been more noticeable. The offsite vibrations from the train, past construction projects and the freeway has worsened the existing conditions particularly over the last few years.
- Based on these comments and our observations, it appears that the soil appears to be actively consolidating and causing settlement. We would expect more non-structural damage to continue to occur.

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Structural Evaluation – Wayland Arms Apartments – Auburn, Washington

RECOMMENDATIONS

Per our conversations with you, we are reviewing the following options from least expensive/intrusive to most expensive and intrusive:

1. Leave the area as is. We would recommend surveying and monitoring the movement of the slabs. A future fix could be done at a later point and an assessment could be made to determine if the settlement is active.
2. The slab could be selectively jacked up or a top coating could be added. This option doesn't fix the soil issue, but it does buy time for when a more permanent solution can be made.
3. The entire slab could be removed and a new slab could be installed with pin piles and a 6" concrete slab similar to the work that was done on the North side of the building. A cost to benefit analysis should be performed on the repair. Where repairs cost more than 50% of the estimated building value, a building replacement should be considered.

We would recommend shimming metal stud walls that have pulled apart from the slab on grade to limit further damage to the sheet rock.

A voluntary seismic upgrade should be considered if a major renovation is going to be considered. Steel moment frame buildings constructed during this era have historically had damage at the joints and are less ductile than originally thought due to poor detailing. Adding steel brace frames or proprietary stiffeners could be done in areas of renovation to improve the seismic performance of the building.


CONCLUSION

Overall, the slab settling, the displacement of the stud walls from the slab on grade and the cracks in the masonry and non-bearing metal stud walls doesn't pose a significant life safety risk, but we do recommend making next steps to mitigate the issue at hand. The metal stud walls should be shimmed as soon as possible and re-anchored to the foundation.

We would recommend a sit-down meeting to further discuss options. Thank-you for your time and we look forward to further discussions.

Very truly yours,

PCS STRUCTURAL SOLUTIONS



Luke Heath, S.E.
Associate Principal

LAHmap
23-638

Enclosure: Photos

FOR WAYLAND ARMS SLAB REPAIR & SEISMIC UPGRADE RFQ

**WAYLAND ARMS APARTMENTS
AUBURN, WASHINGTON
APPENDIX – PHOTOGRAPHS**



Photo 1. Typical cracks at masonry wall – Mechanical Room



Photo 2. Metal Stud Wall separated from the concrete slab on grade approximately $\frac{3}{4}$ ".



Photo 3. Typical cracks at dry wall