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Reference: Conjunct geotechnical and structural site review in heritage building at 352 Somerset Street West, Ottawa, ON, conducted on June 03, 2016.

Subject: Conjunct preliminary discussions regarding geotechnical issues and foundation alternatives.

The site is presented in the sketch in figure 1 below. At this site soil conditions have been investigated previously.

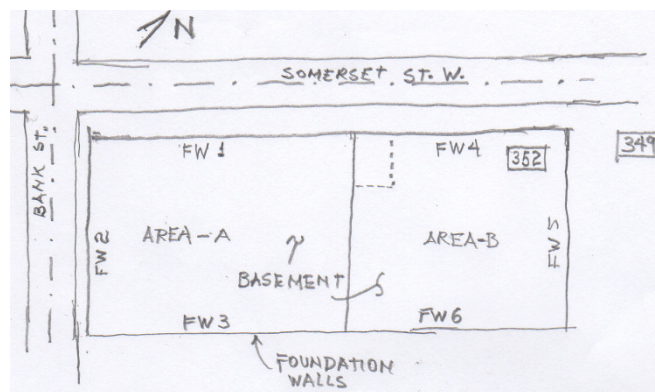


Figure 1. Basement Sketch

The building was originally built more than a 100 years ago. Area A lays at approximately (~) 3.3 m below the level of the perimeter sidewalk. The west side of area B lies about the same level and the reminding area B is covered by debris and fill. These areas have been subject to excavations exceeding the depth of the existing foundations by ~ 0.6 m with the purpose of underpinning a number of years ago. The underpinning work was never finished. The building portions in area B collapsed and were removed so that presently are exposed to weather conditions. Verbal information indicate that the basement in area A has been kept heated during winter, however there have been no formal monitoring of the temperatures as the building has been vacant since failure occurred.

The following geotechnical issues were noted regarding the existing condition:

- Foundation walls are made of stone blocks. The stability and service of such walls rely on the presence of floors above which restrain the top as a diaphragm and the soils below which restrain the bottom. On the perimeter of area B, such restrain has been removed years before so that it is likely that reasonable service limits (horizontal displacement) have been breached. This problem is apparent along Foundation Wall 5 (FW5) which can be seen to be severely deformed. Note also that soils in area B may have been disturbed by freeze thaw cycles so that the existing walls should no longer be considered to bear in acceptable soil conditions.

- Excavations for underpinning were completed years ago in area A. Partial underpinning consisting of reinforced concrete pads have been completed along FW2 and FW3. Underpinning along FW1 does not appear to have been properly constructed and so have been suggested on site. Excavation was completed and concrete cover is observed on the vertical surface under the original founding level. There is no significant lateral restraint at the bottom of FW1 which is noticeable in more pronounced inclination and outward (towards the inside of the basement) lateral displacement at the base of FW1. Deformations along FW1 are likely to have exceeded reasonable service limits for the same reasons noted for area B. It is not feasible to determine the magnitude of the deformations along FW3 and the time lag between excavation and completion of the partial underpinning is unknown, however, this area should be considered sensitive as there are building loads on abutting property and removal of the floor at ground level will severely decrease the stability.

Generally speaking, the above noted issues are indicative that the service limits for the foundation walls have been exceeded and that their stability is compromised for the majority of the perimeter of 352 Somerset. Future changes or construction work removing lateral restraint or soil support are of high risk from the stability and safety stand point.

With regard to vertical building loads for restoration, bearing capacity for spread footings have been provided previously by other consultants. Alternatively, bearing support can be provided with pushed steel piers driven to refusal. Push steel piers driven to suitable strata ranging in diameter from 73 to 115 mm are rated at 130 to 310 kN of maximum load capacity. Borehole data is indicative of approximately 11m from the bottom of the stone walls to suitable bearing strata. Even in low resistivity soils, the durability of piers is very high, however, maximum zinc coat protection is recommended for the type of structure.

With regard to lateral restraint from the geotechnical stand point, at the toe level, engineered back fill may be used to restore the level of the original structure (before excavation for underpinning). For lateral restraint along the height of the walls, helical soil anchors can be considered. The geotechnical resistance of helical anchors depend greatly on the configuration and dimensions along with the soil conditions. Further analysis can be completed for this alternative. Additional alternatives are also available in the market which could be analysed for potential use.

Note that silty clay soils encountered at this site are not susceptible to liquefaction.

During construction and until the existing foundation walls are secured, it is recommended to monitor the vibrations.

Do not hesitate to contact us if you have any questions,

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