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Memorandum

To: Adam Fercho, Park Planner & Landscape Architect, City of Ann Arbor

From: Hubbell, Roth & Clark, Inc.
Jim Yates, Ph.D., P.E., *Senior Project Engineer*
& Adrianna Melchior, AIA, LEED AP, *Associate*

Date: July 26, 2023

Subject: Farmer's Market Building: CMU Investigation HRC Job No. 20230292.02

General:

As requested by the City of Ann Arbor Parks and Recreation Department, Hubbell, Roth & Clark, Inc. (HRC) has performed two site investigations to review conditions at the existing Farmer's Market Building located at 315 Detroit Street. The City was concerned because of observed settlement of the perimeter sidewalk adjacent to the building, masonry cracks that have developed, and the apparent lack of support of the northwest corner wing wall. The City is aware the perimeter sidewalk needs to be replaced to an ADA compliant condition and wants to repair the cracked masonry units (CMU) but also wants to address the underlying cause of both the sidewalk settlement and the masonry cracks.

The building was constructed in 1984 – here is a photo from the Ann Arbor News archive from May 1984 when it opened (the settlement in question is at the north wall which is at the right edge of the photo):



Building Construction:

The Farmer's Market Building walls appear to be load bearing masonry construction, with brick masonry units starting at 40" above the floor elevation and extending to the roof line, and split face masonry units with two 4" accent bands of matte glazed CMU below the brick. It is not known if the walls are reinforced, but none was observed, and original construction documents could not be located. The bottom of the split face masonry units is roughly at the sidewalk elevation. Below the split face units (below grade) are three courses (24" high total) of plain CMU that were ungrouted. At the underside of this CMU is a cast-in-place concrete footing extending to approximately 5' below the sidewalk elevation. The footing is 3"-4" wider than the masonry wall along the north elevation.

Investigations:

HRC performed an initial investigation on June 22, 2023, to review existing conditions. HRC (Adrianna Melchior and Jim Yates) met with the City (Scott Spooner) to review the wall cracks/voids and witness the televising of the storm drain lines below the building, as performed by the City's DPW staff.

- The existing perimeter sidewalks on the east, north and west sides have experienced various amounts of settlement and are not ADA compliant except for directly in front of the east and west side building doors that are likely supported by frost footings and do not appear to have settled at all.
- No cracks were observed at the brick masonry units or their respective grout joints.
- Numerous cracks were noted in the split face CMU units and the 4" CMU accent bands, as well as cracks in the grout joints for these units.
- In the four building corners, the downspouts from the gutters connect to PVC drainpipe. It was thought that if the drainpipe was discontinuous or broken below ground, this could be responsible for the sidewalk settlement and CMU cracking. HRC suggested the drainpipes be video investigated to determine if there were any breaks of open joints that could allow soil material to wash in.
- HRC witnessed a City crew put a video camera down the drainpipe lines in the northeast and northwest corners out to the catch basin in the parking lot to the north of the building. The pipes were observed to be in particularly good condition, with tight joints, no cracks and no sign of earth infiltration or root intrusion. This eliminated the storm lines as a source of the settlement.

A second investigation was performed on July 17, 2023, to review the excavation of the north side foundation walls, also performed by DPW staff. HRC (Jim Yates) met with the City (Jason Nealis) to witness the exposing of the northwest corner below grade building and foundation wall.

- In discussions with City personnel, there was a theory proposed that *if* the building had perimeter foundation drain tile lines that connect to the sanitary sewer, soil material may be washed away through the joints of the tile, which could be causing the settlement issues. HRC suggested the sidewalk be removed in the northwest corner and the foundation exposed to see if there was a perimeter drain tile and to investigate the condition of the CMU foundation wall below the split face CMU courses as well as to observe the construction and condition of the concrete foundations.
- Prior to the excavation, at the northeast and northwest corner wing walls (short sections of wall that project past the face of the rest of the main north wall), the CMU appeared to be cantilevered out over the main wall foundation, as no foundation wall was visible below grade and nothing solid could be detected by poking a short probe into the dirt.
- During the 2nd investigation, HRC observed the City crew excavating the north foundation wall at the western corner. Just prior to this visit, City personnel had removed the existing sidewalk in both directions in the northwest corner. During investigations, it was found that the northwest corner wing wall is now missing its CMU wall footing (which it did have at one time) and is completely unsupported. This short section of wall was only supported by the wall it connects to above grade and the soil below.
- At the west corner of the north wall, the three courses of plain CMU above the concrete foundation were either missing or disintegrating. The condition improved toward the east in a stepped fashion and at approximately 48" from the corner the majority of the below grade CMU was intact with only the uppermost face shell having a hole. The hollow cores of the lower courses were filled with soil material and broken pieces of CMU.
- On the north wall, the excavation exposed the concrete foundation below the plain CMU so the condition, width and depth could be verified. The concrete foundation appeared sound, was 3"-4" wider than the CMU to the north and extended to approximately 5' below the sidewalk/floor elevation.
- As the excavation process continued around the corner to the west side, excavations were halted when it was noted that the northwest corner wing wall was actively sagging off the building. A horizontal crack opened up between the top of the split face and the bottom of the brick masonry and vertical cracks opened approximately 3' in each direction

from the corner. At this point, a manual hydraulic jack and piece of 4x4 timber were placed on the existing concrete foundation to stabilize the wing wall and raise it back into position, tight to the underside of the brick masonry.

Analysis and Recommendations:

- The underlying cause of the CMU distress is long term heavy salt use in the winter for safety. Chlorides in salt can speed up the rate of concrete deterioration and decrease its overall durability. The salt water from the melting ice and snow infiltrates the joint between the sidewalk and building wall, around the roof downspout drains and accumulates against the corner wing walls. Eventually the CMU face shell deteriorated to the point of a hole forming, which allows soil material to wash into the voids of the ungrouted cores of the masonry over time and causes the sidewalk to settle. Over time, the deterioration of the foundation wall units has accelerated and become more pronounced, leading to cracks forming in the split face CMU above as the supporting units below become progressively worse.
- HRC recommends a comprehensive foundation wall rehabilitation and repair be undertaken along with reconstruction of the perimeter sidewalks to an ADA compliant condition. Around the entire building perimeter, the face shells of the below grade plain CMU units (under the split face) would be opened so the sub-grade wall can be grouted solid, eliminating the voids. Admixtures can be added to the grout to improve the performance against chloride effects. In the northwest and northeast corners, the plain CMU units will have to be replaced as some are badly damaged and some are completely missing. New replacement CMU will be specified with an integral water repellant, and mortar and grout will be specified with the appropriate admixtures to enhance the long-term performance. New sidewalk details will be developed to promote drainage away from the building as opposed to parallel to it, with a more robust joint between the building and walk. Steps will also be taken to prevent downward infiltration at the downspout piping and to prevent accumulation of water at the protruding wings.
- Rehabilitation work would be accomplished in stages, working along the façade in approximately 4' sections to remove and replace CMU in order to minimize further damage to the building and prevent the need for extreme shoring.
- The concrete foundations all appeared to still be intact, so these should be able to remain as-is during the reconstruction efforts.

Temporary Supports and Shoring:

- In order to temporarily stabilize the condition at the northwest corner of the building, HRC instructed City staff to install solid concrete block (manhole units) between the top of the existing concrete footing and the underside of the split face CMU below the wing wall and shim these blocks in tight so the hydraulic jack and 4x4 beam can be removed.
- HRC also instructed City staff to backfill the hole with 21AA gravel.
- Once these two repairs have been implemented, the City can replace the area of missing sidewalk and reopen the facility to the public as the next steps in the repair and rehabilitation are contemplated, proposed, and approved. It should be noted that this is a temporary fix and that a full repair of the CMU (both below grade and above grade) will be needed in order to fully resolve the issues.
- The northeast wing wall did not appear to be as distressed as the northwest corner, so if the restoration recommendations are implemented within the next year, it should be able to remain as is for the time being with careful monitoring. If it is anticipated the repairs will take place farther down the road in the future, the northeast corner should also be excavated, and solid block placed under the wing to stabilize it for a longer period. Care should also be taken over the winter to carefully clear sidewalks and minimize salt use to only what is necessary to maintain safe conditions.

Photos of Significance:



Photo 1: North Foundation Wall Missing CMU Elements



Photo 2: North Foundation Wall CMU Cores with Debris



Photo 3: North Wing Wall 3 Courses of CMU Missing

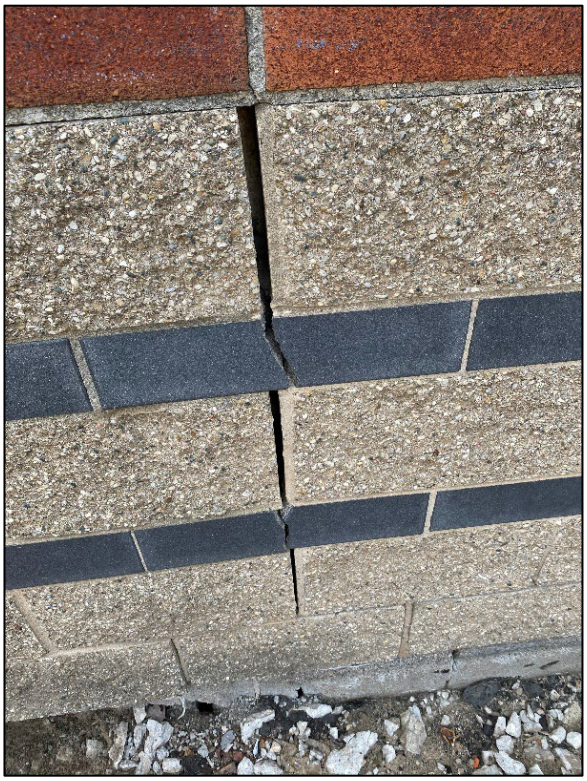

Photo 4: West Wall Crack Through Units



Photo 5: Northwest Wing Wall Crack (Widening During Excavations)

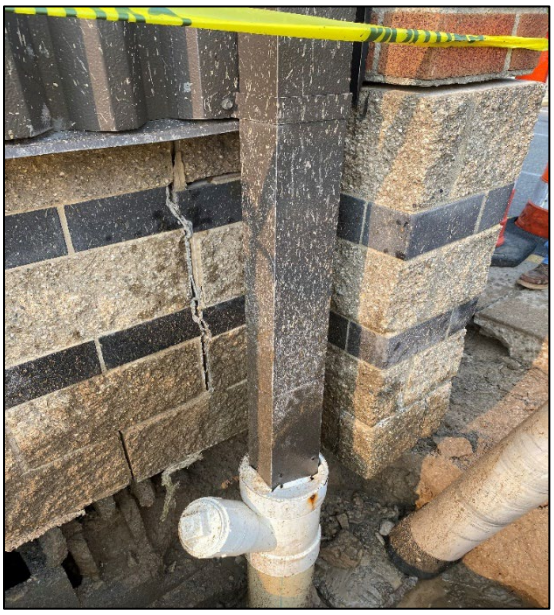

Photo 6: North Wall and Northwest Wing Wall Cracks



Photo 7: West Wing Foundation Wall with Missing CMU Units



Photo 8: West Wall Cracks



Photo 9: Concrete Foundation Below Plain CMU



Photo 10: Hydraulic Jack and 4x4 On Concrete Foundation



Photo 11: West Foundation Wall Disintegrating CMU



Photo 12: Sidewalk Removal Area.