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September 10, 2013

Ms. Julie Bastin, P.E.
Milwaukee County
Department of Public Works
2711 West Wells Street
Milwaukee, WI 53208

SUBJECT: Mitchell Park Domes
Phase 1 Concrete Frame Evaluation Report

Dear Ms. Bastin:

Per your request, GRAEF has performed a partial close-up inspection of the concrete frame inside the Tropical Dome at the Mitchell Park Horticultural Conservatory. The immediate goal was to identify, document, and remove deteriorated concrete, in the limited study area, that could pose a hazard to employees and the general public. A very limited partial close-up inspection of the concrete frames in the Show Dome and the Arid Dome was also completed to identify, document, and remove deteriorated concrete that could pose a hazard to employees and the general public inside those domes.

A team of two GRAEF Engineers used a 40 foot maximum height hydraulic work platform lift to perform the close-up inspections of the concrete, reaching as much of the concrete frame as possible. Engineers were able to reach only about 50% of the concrete frame in the Tropical Dome, up to heights of approximately 30 to 35 feet, due to several obstacles including:

- the distances of the paved paths from the perimeter wall of the dome limiting the reach of the lift to the concrete frame,
- the slopes of the paved paths which exceeded the allowable pitch of the platform lift base unit, and
- the extreme density of plant materials in the Tropical Dome.

The accessible concrete frame members were each visually inspected for cracks, spalls (missing concrete), and other deterioration. A light hammer was used to tap the concrete to identify areas with delaminated concrete. Delaminated concrete is where a piece of concrete has debonded from the main structural member via a crack, and has generally occurred due to rusting of a steel component within the concrete. In this structure, the embedded steel is reinforcing bars and steel connection plates. Where the delaminations were severe, the hammer was used to remove the loose pieces of concrete which appeared to be imminently ready to fall off the structure. Numerous delaminations were minor and the concrete pieces were still firmly attached to the concrete beams, so these concrete pieces were not removed. (The concrete spalls that were removed in the Show Dome and Arid Dome were generally firmly attached but were tested and removed, using significant force, to verify that condition).

The delaminations and spalls are generally occurring adjacent to the locations where the aluminum glazing supports are connected to the concrete frame. The aluminum glazing supports connect to the concrete frame via stainless steel posts which are welded to steel plates cast into the concrete at the mid span of each beam and at the locations where the beams are joined. There are approximately 1,703 stainless steel post locations in each dome. Following is a summary of GRAEF's findings during the week of August 26, 2013:

Tropical Dome:

- 455 post locations were reviewed close-up (27% of all post locations)
- 179 of these post locations had delaminations or spalls (39% of total reviewed)
- 48 of these post locations had delaminations (10%)
- 131 of these post locations had spalls (29%)
- 100 of these spalls were removed by GRAEF Engineers (76%)

Show Dome:

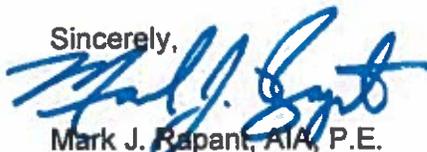
- 105 post locations were reviewed close-up (6% of all post locations)
- 37 of these post locations had delaminations or spalls (35% of total reviewed)
- 32 of these post locations had delaminations (30%)
- 5 of these post locations had spalls (5%)
- 5 of these spalls were removed by GRAEF Engineers (100%)

Arid Dome:

- 29 post locations were reviewed close-up (2% of all post locations)
- 24 of these post locations had delaminations or spalls (83% of total reviewed)
- 22 of these post locations had delaminations (76%)
- 2 of these post locations had spalls (7%)
- 2 of these spalls were removed by GRAEF Engineers (100%)

Based on these results, GRAEF recommends that additional inspections be completed in all domes to determine the extent and types of repairs required to make the domes safe for employee and visitor occupancy. Please feel free to contact me with any questions or further clarifications regarding this information. We look forward to continuing this evaluation with you and Milwaukee County.

Sincerely,



Mark J. Rapant, AIA, P.E.
Project Manager/Associate

cc: John Goetter – GRAEF
Ken Grebe - GRAEF