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May 15, 2015

Julie Bastin, P.E., M-Arch
Milwaukee County DAS
Architecture, Engineering & Environmental Services
633 West Wisconsin Ave, Suite 1000
Milwaukee, WI 53203

SUBJECT: Mitchell Park Domes – Falling of Small Debris

Dear Julie:

Per your request, a site observation was made today at the Mitchell Park Domes to view a collection of fallen debris and discuss the material was collected by Milwaukee County Parks personnel. A sample of the fallen debris was observed with the largest pieces being roughly 1-inch diameter by 1/2-inch thickness. Some of the pieces were stained by soil and appeared to be from the sounding process during the investigation performed by GRAEF in 2013 and 2014. Other pieces appeared to have fractured recently because there was no staining evident. Parks personnel provided a floor plan of the Desert Dome that logged the location and quantity for the pieces of debris. It was reported that the Tropical and Show Domes had similar debris found in them, but debris was not discovered on any of the pedestrian walkways.

The original impetus for the Mitchell Park Dome inspection project by GRAEF was based on reports of large golf ball-sized pieces of concrete debris found on the ground of the domes. This prompted the need for a visual inspection of the reinforced concrete structure for the domes, which was the suspected source of the fallen debris. In the course of the study performed, the primary source of spalls was found to be from thin pieces of concrete that surround the sides of metal connector plates. These embedded plates in the concrete provide anchorage for the window supports. One goal of the inspection project was to remove loose concrete in these areas to reduce the frequency of falling hazards.

The concrete shell frame structure and window frame system is over 50 years old. With continued age and exposure to water on the concrete surfaces, spalls of concrete are expected to continue, which will result in more falling debris. The weather in the past few weeks has been fluctuating greatly, with temperatures in the 80's one day, followed the next day with freezing temperatures. The dome is made up of uninsulated glass, so the window frames and the concrete structure will expand and contract with changes in temperature. Direct sunlight will also heat up saturated concrete surfaces, causing expansion and loosening of concrete elements. The window frames are not air-tight, so some wind pressure can enter the dome and create air currents indoors. Likewise, strong winds can cause racking and slight horizontal movements of the dome structure



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that can dislodge loose concrete. These are all likely reasons why concrete debris on the dome floor has been observed this spring.

Therefore, it is our recommendation that the domes continue to be monitored. Discovery of segments of debris that are larger than a quarter should be logged by taking a photo and recording the location on a floor plan. If larger debris pieces are observed, then an action plan may need to be instituted to protect people and property inside the domes. It is advisable that both a short term and long term plan be developed that will prevent or capture falling debris. At this time, based on the evidence presented, it does not appear that the dome structure presents an imminent threat or poses a danger to the general public or Milwaukee County Parks Department workers.

Sincerely,

Jason L. Gross, PE, SE
Structural Engineer, Project Manager

