MEMORANDUM

To: Ahmad Tabana

From: Paul La Crosse, P.E., LEED AP

Cc: Thomas Lovetere

Date: 10/04/18

Reference: **Deanwood Recreation Center Pool Study**

Subject: Summary of Findings

Due to routine failures of the pool dehumidification unit at the Deanwood Recreation Center, Global Engineering Solutions of Washington DC (GES) was tasked with assessing the condition and design of the pool HVAC system. Over the course of 3 site visits GES surveyed the existing pool dehumidification unit and central plant configuration, pool dehumidification unit compressors and control hardware, and the Building Management System (BMS) controls. The following is a list of our findings.

- Cooling tower pumps are routinely operated manually in lieu of through the BMS. In manual control, the pumps are both activated, which could cause the cooling towers to overflow. This is a waste of water and energy.
- Exterior cooling tower piping insulation is crushed in multiple locations.
- Heat tracing for cooling tower piping is exposed in a few locations.
- Cooling tower piping on the exterior of the building does not have adequate warning labeling for the heat trace.
- The sand filter serving the cooling towers is not piped correctly.
- The VFD for condenser water loop pump P-1 is not operating properly or communicating with the BMS.
- Boiler plant controls are functioning properly or communicating with the BMS. This system is operated manually.
- The pool dehumidification unit was intended to provide 12,500 cfm of outdoor air during the summer. Based on selections made by a different manufacturer, it is unlikely that the existing unit has sufficient capacity to properly dehumidify this much outdoor air. We have not yet received the requested reselections from the manufacturer's representative.

- The original submittal for the pool dehumidification unit implies that the weather data used for selecting the unit was not appropriate for Washington D.C.
- Insulation on the hot water piping to the pool dehumidification unit is damaged.
- We believe that there is a condenser water flow deficiency to the pool dehumidification unit.
- There exists an air leak in the system. We believe that the leak is between the supply fan compartment and the controls compartment. Regardless of where the leak is, has caused corrosion to the refrigerant piping in the controls enclosure.
- The unit controller for the pool dehumidification unit is damaged and no longer communicates with the BMS. We were unable to review the system controls as a result of the failed controller/interface.
- Controls circuits and wiring have been substantially modified from the original unit wiring diagram. It is likely these modifications were made during repair of the unit.
- The refrigerant compressors for the unit look like they have been replaced recently, but one of the compressors was not wired properly. This compressor runs backwards when powered.
- Multiple controls issues are present in the BMS with regard to staging of pumps and cooling towers.

To remedy the above noted deficiencies and findings as well as improve pool occupant comfort, the following actions will be taken.

Phase I

- Complete sealing of the pool dehumidification unit seams and joints to ensure that pool air is not permitted to leak out of the unit.
- Refrigerant piping inside the pool dehumidification unit shall be leak-tested, and replaced as necessary
- Pool dehumidification unit controls shall be replaced and re-wired to factory standards.
- A Testing, Adjusting, and Balancing (TAB) contractor shall be retained to test, adjust, and rebalance the supply, return, exhaust, and outdoor airflows to the airflows for the pool dehumidification unit. Outdoor airflow and exhaust airflow will be modified to reduce the dehumidification load on the unit.
- Testing, adjusting, and balancing shall also be performed on the condenser water loop to ensure that the pool unit receives sufficient water flow for cooling.
- The VFD for pump P-1 shall be repaired/replaced as necessary to interface with the BMS and operate up to full speed.
- A new large-area ceiling fan system shall be designed to induce airflow over the pool water and pool deck to help reduce chloramine concentrations. It should be noted that structural engineering services will be required to ensure the proper support of the fans without damaging the roof and roof supports.

Phase II

- A new pool dehumidification unit shall be selected. It is anticipated that the new unit will be either a 60-ton unit or an 80-ton unit depending on the load due to ventilation. The new unit shall incorporate the latest technology and controls for optimal energy performance.
- Return ductwork for the pool dehumidification unit shall be re-designed to include both high and low return grilles for optimum chloramine removal.
- If the capacity of the pool dehumidification unit is increased, the capacity of the cooling towers, cooling tower pumps, condenser water pumps and heat exchanger will need to be assessed and adjusted if necessary.
- VFDs will be added to the cooling towers and cooling tower pumps and revisions will be made to the controls to provide greater energy efficiency. Cooling tower pumps will require new inverter duty rated motors.
- Budget permitting, a new, larger, and more effective heat exchanger shall be provided to reduce pumping power, and improve system thermal performance.
- An automated bypass around the heat exchanger will be added to the condenser water loop to reduce the pressure drop for the system during heating season.
- The boiler controller and BMS interface will be replaced/repaired as necessary to ensure proper automated operation.