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GLENWOOD MIDDLE SCHOOL: ENGINEERING EVALUATION OF HVAC SYSTEMS

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Prepared by: Building Dynamics, LLC

Prepared for: Howard County Public School System

In October, 2015, Howard County Public School System (HCPSS) requested Building Dynamics, LLC (BDL) to evaluate Glenwood Middle School (GMS) with respect to mold growth and humidity control. BDL's initial report, dated December 1, 2015, verified that mold had been remediated. BDL also found that relative humidity was sufficiently controlled at that time to prevent new mold growth, but that negative pressurization had to be resolved to control infiltration of humid air during cooling seasons. To complete this study, BDL conducted an engineering review of HVAC systems, including the planned replacement of equipment in non-classroom areas scheduled for this summer (Phase 2).

In summary, completion and verification of HVAC modifications scheduled for summer 2016 will provide state-of-the-art humidity control. Continued attention to operation and maintenance of these systems will prevent humidity-related mold growth at GMS.

Updated BDL findings and recommendations are as follows:

1. Restoring Positive Building Pressurization versus the Outside.

- Classroom pressurization within the A-, B- & C-wings as well as the music, art, and industrial arts classrooms located in the E-wing appears to have been corrected with the implementation of new HVAC equipment installed during the summer of 2015. However, smoke tube evaluation by BDL found that the overall building continued to be under negative pressure due to the operation of original HVAC equipment in non-classroom areas.
- Phase 2 replacement and control modifications are calculated to restore positive building pressurization.

Recommendation:

Conduct a comprehensive Test and Balancing at completion of Phase 2 and then confirm overall positive pressurization (air flows out of exterior doors).

2. Chiller Capacity

- During the summer of 2013, the chiller failed and contributed to moisture and mold issues throughout the building. The failed chiller was subsequently replaced in-kind with a chiller capable of handling the chilled water load requirements at that time. Removing the classroom conditioning load from the chiller plant in

2015 significantly reduced the load required to be offset by the chiller. Phase 2 will eliminate the need for a chiller.

3. Seasonal Testing of New Dedicated Outdoor Air System Controls

- New dedicated outdoor air systems serving the classroom areas paired with variable refrigerant flow systems for comfort conditioning were installed during the summer of 2015. Provided that the newly installed systems and associated controls are operating together as intended, they are adequately designed to maintain proper space conditions for comfort and mitigation of moisture related issues. Substantial system installation and controls implementation was completed at the end of the 2015 peak cooling season.

Recommendation:

Perform a functional test of controls during the cooling season in order to verify proper performance under design conditions.

4. Crawl Space

- Pipe tunnels underlying most GMS areas (“crawl space”) were remediated in 2014 and penetrations up to occupied space sealed. At that time, exhaust fans were also added to make the crawl space negative to the building. BDL’s inspection found that, although the crawl space was free of mold growth and isolated from occupied space, the soil floor was an ongoing source of moisture and that condensation of humid air drawn into the crawl space was condensing on cooler surfaces.

Recommendations:

(a) Discontinue operation of crawl space exhaust fans.

(b) Cover floor with a plastic vapor barrier.

5. Building operation during Phase 2 construction.

- GMS will be unoccupied during the summer of 2016 for HVAC replacement. Classroom systems will be off initially for pipe demolition, and systems in non-classroom areas will be off for most of the summer. BDL will monitor humidity in the building and make recommendations, as needed, to prevent humidity-related mold growth.

Recommendations:

- Ensure average relative humidity does not exceed 80% on a weekly basis.
- Implement immediate corrective measures if damp conditions develop.

6. Energy Recovery Wheel Odor

- Outside air systems installed for classrooms in 2015 have produced an occasional chalky-type odor on damp days. HCPSS investigation found that the odor originated from the energy recovery wheel and was not hazardous. It was also determined that the intermittent odor could be eliminated by modifying the control sequence.

Recommendation:

Implement outside air unit controls modification to prevent odor.