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Heat Pump System For New College Classrooms Using Integrated Project Delivery

This month's Facility File will focus on the B2B June test for an HVAC application on a college campus with a building program to construct a new 12-classroom facility. The project delivery method is integrated project delivery (IPD).

As a rule, college and university support services are very knowledgeable about the HVAC infrastructure that is required to assure the correct space environment. Still, it would be very beneficial for these individuals, along with the rest of the IPD team, to read *ASHRAE 2015 Application Handbook*, chapter 7 (Educational Facilities) to refresh their knowledge of ASHRAE's guidelines when preparing to authorize the designing classrooms. In addition, chapter 34 of the handbook discusses geothermal energy in preparation of designing and constructing a water ground source heat pump (GSHP) system. The owner's facility management group should also read chapters 36 through 43 of the 2015 Handbook to assist in preparing for operating and maintaining a GSHP system. This information combined with the owner's own knowledge of operating this type of room will assist the IPD team in understanding intricacies of owning, operating, and managing geothermal installations. It is also recommended that the owner-design team read chapter 59 of the same ASHRAE handbook titled HVAC Security.

The IPD team will consist of the college president, campus operations manager, project manager from the school's construction management group, owner representative who will also provide third-party commissioning and air and water-balancing, HVAC consultant engineer as the team leader, architect, electrical and plumbing consultants, acoustic consultant, environmental/soils consultant, security subconsultants, general contractor, and HVAC/electrical/plumbing subcontractors.

With all these design guidelines from ASHRAE, the IPD team will meet with the college's O&M staff to discuss specific building standards that need to be applied to this project. For this project, the facility operation is an in-house staff and not an outsourced group, and they will want to be assured that adequate contract specification requirements include pertinent O&M, training, preventive maintenance work order system, and energy operating budget elements.

In the Phase 3 Concept Development of the IPD project, the campus operations manager and her O&M staff will want to contribute information to the design team member's writing of the contract specification, and more specifically, regarding the following activities: service contracts, parts inventory, and as-built drawings requirements. Reviewing the design documents, this O&M staff will want to be assured that equipment serviceability is adequate and safe and that there is a clear understanding of how geothermal applications work throughout the year.

For the June B2B IPD test, the team will work closely together with owner-designer-builder, based on a building program construction budget so the general contractor and his in-house engineering and estimator (along with the prime subcontractors) will be involved in the design phase and be able to contribute collectively to the contract documents. In the construction phase, the O&M staff will want to revisit the issues noted above during the design phase. Next comes the startup and commissioning phases.

Once the startup has been completed and the ATC subcontractor and owner representative/third-party commissioning and testing, adjusting, and balancing (OR/Cx/TAB) consultant have completed the 2-GSHP outdoor wells and GSHP air distribution balancing installation, the HVAC subcontractor shall go through an ATC initial dry-run demonstration prior to the IPD/general contractor and his subcontractors demonstrating the system to the OR/Cx/TAB consultant. The ATC subcontractor should also begin collecting system performance by trending pertinent HVAC and geothermal system and equipment data by trending the following:

- room dry bulb and wet bulb temperature
- supply air and return air dry bulb and wet bulb temperatures
- geothermal water supply and return temperature
- alarms
- GSHP control points
- campus BAS points and trends
- offsite GSHP manufacturer's interface.

The owner's O&M personnel should use a series of computer-generated touchscreen project checklists that allows her staff to confirm that the following facility files have been collected. This process should start at the beginning of construction and not at project closeout, so that the facility files can be inputted into a CMMS system. Touchscreen O&M checklists should include:

- equipment shop drawings
- O&M manuals, parts list, and lubricants
- troubleshooting tips
- remote monitoring instructions

The O&M staff should review the contractor-produced piping and sheet metal field fabrication/field coordination drawings prior to fabrication. Touchscreen service checklists should include:

- location of shutoff valves, ATC valves, and balancing valves
- strainers
- equipment and control devices
- access for servicing equipment.

The training process should include not only specific HVAC system and equipment training but also emergency response plans training due to security concerns (e.g., internet access). The hydraulic modeling of the entire system should be updated after the final TAB report. This will require the TAB subcontractor to provide the water balancing reports along with the associated system flow diagrams, noting quantities and pressures for rebalancing if necessary as part of the project closeout documents. Touchscreen training checklists should include:

- equipment
- system
- emergency plan
- automatic controls
- energy management and trending