

By Amanda Parolise

Parolise is project manager consultant with BuildingSmart Software LLC. Reach her at [amckew@yahoo.com](mailto:amckew@yahoo.com).



## Commercial Building Chiller Retrofit Using Integrated Project Delivery

This month's Facility File will focus on the B2B October test for an HVAC application within an 80,000-sq-ft existing commercial office building in need of replacing its two air-cooled chillers. Quiet often, commercial office building facility management is outsourced, but for this application, the owner owns several office buildings and has his own in-house operation and O&M staff to manage all the buildings. A single technician is assigned to each building. A local service contractor firm performs the annual startup and shutdown of the air-cooled chillers, as well as the condensing boiler/heating system.

At the recommendation of the design team leader, the HVAC consulting engineer, the building owner has chosen the project delivery method to be IPD (integrated project delivery). The method of project delivery is based on ASHRAE 2015 *HVAC Applications Handbook*, chapter 58, Integrated Building Design. An IPD team meeting was coordinated so that the owner, facility manager, design team, general contractor, and subcontractors — along with a 3rd-party commissioning and air and water balancing consultant — reviewed together ASHRAE chapters 36 through 46 (Building Operations and Management), as well as 2016 *HVAC Systems and Equipment*, chapter 43, Liquid-Chilling Systems. This information, combined with the owner's own knowledge of operating commercial office buildings, will assist the IPD team in understanding intricacies owning, operating, and managing this building.

With all these design guidelines from ASHRAE, the IPD team discussed specific building standards that need to be applied to this project, as well as a project scheduling/timeline. For this project, with no outsourced group, the in-house facility operations and facility staff will want to confirm adequate contract specification requirements pertaining to O&M, training, PM workorder system, and energy operating budget.

In the Phase 3 Concept Development of the IPD project, the facility manager and a few of her O&M technicians will want to contribute information to the design team member's writing of the contract specification — more specifically, regarding the following activities: service contracts, parts inventory, and as-built drawings requirements. Reviewing the design documents these O&M personnel assigned to this project will want to be assured that equipment serviceability is adequate and safe and that there will be a five-year annual startup and shutdown service contract in place.

For this October B2B, the IPD team will work together with the owner-designer-builder based on a building program construction budget by the general contractor and his in-house estimator. The prime subcontractors will be involved in the design phase and be able to contribute to the contract documents. In the construction phase, the O&M technicians will want to revisit the issues noted above during the design phase. Next comes the startup and commissioning phases, and the O&M staff will want to be proactive in following along with the IPD team's mechanical-electrical in-house coordinator and the subcontractor's startup personnel. They should receive equipment training from the new air-cooled chiller unit startup technician plus system training using the O&M manuals and contract drawings (that will eventually become the as-built drawings).

Once the startup has been completed and the ATC subcontractor and owner representative/3rd-party commissioning and testing, adjusting, and balancing (CxTAB) consultant have completed the chilled water and existing central AHU cooling coil balancing work, the HVAC subcontractor shall go through an automatic control system initial dry-run demonstration prior to the general contractor and his subcontractors demonstrating the system to the CxTAB consultant. The ATC subcontractor should also begin collecting system performance by trending the following pertinent data:

- outdoor air dry bulb and wet bulb temperature
- random room dry bulb and wet bulb temperature
- supply air and return air dry bulb and wet bulb temperatures
- chilled water supply and return temperature
- alarms
- ACC unit control points
- offsite internet computer control interface.

Taking the same approach as the design engineer, the facility manager's personnel should use a series of 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 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 plan training due to unexpected equipment failure concerns (e.g., internet access). A hydraulic modeling of the entire system should be completed and as-built conditions 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