

# COOLING TOWER ADDITION AT PHARMACEUTICAL BUILDING DESIGN-BID-BUILD PROJECT

This month's Facility File will focus on the B2B November test for the addition of a 100-ton, year-round cooling tower addition as standby to an existing, older cooling tower serving a process cooling system in a pharmaceutical facility. It will be very beneficial for the pharma facility O&M manager to refresh her memory by reading *2015 ASHRAE Handbook — HVAC Application* chapter 18 (Clean Spaces), *2016 ASHRAE Handbook — HVAC Systems and Equipment*, and, more specifically, chapter 14 (Condenser Water Systems) and chapter 40 (Cooling Towers) to be knowledgeable of ASHRAE's latest guidelines when preparing to authorize the design of a cooling tower installation. It is also recommended that the design team and the owner's team review the Cooling Technology Institute (CTI) cooling tower manual and CTI certification.

The project delivery method shall be design-bid-build (DBB). The building owner outsources the O&M but will keep the on-site O&M technicians involved in the project delivery process. The design team shall include the HVAC, structural, plumbing, and electrical consultants with the HVAC consulting engineer being the prime choice for this infrastructure retrofit. The owner shall retain a third-party commissioning and testing, adjusting, and balancing (CxTAB) consultant.

The facility manager and the O&M group should also read chapters 36-43 of the 2015 handbook to assist in updating the condenser water/process water, cooling tower addition operation, and management design guidelines. This information combined with the owner's own knowledge of operating a condenser water/processing water plant will assist the design team in understanding the intricacies of owning, operating, and managing this retrofitted central plant.

The facility manager and O&M staff should review with the design team the needs to adjust their standard contract specifications pertaining to O&M, training, the preventive maintenance work order system, and the energy operating budget. In the conceptual phase of the project, the facility manager and her O&M staff will want to contribute information to the design team's writing of the contract specification and more specifically 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 (e.g., legionnaire concerns).

For a building program as well as a business plan to continue to successfully manage a central condenser water/process water plant with a plate and frame waterside economizer heat exchanger, it is imperative that the program includes an O&M budget in addition to the program's construction budget. The equipment life of a cooling tower is approximately 20 years, but it can last much longer if it's proactively maintained over the life of this central plant.

In the construction phase, the O&M staff will want to revisit the issues noted above during the design phase. Next comes the

startup, TAB, and commissioning phases, and the O&M staff will want to be proactive in following along with the DBB general contractor's mechanical/electrical coordinator and subcontractor's startup personnel and receive equipment training from the cooling tower manufacturer's startup technician and system training using the O&M manuals and contract drawings (that will eventually become the as-built drawings). The cooling tower technician shall verify the tower's performance in strict accordance with CTI. **ES**

Once the startup has been completed and the ATC subcontractor and third-party CxTAB consultant has completed the water 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 and cooling tower technician should also begin collecting system performance by trending pertinent HVAC system and equipment data including the following:

- Outdoor air dry bulb and wet bulb temperature
- Condenser water supply and return temperature
- Guidelines points in CTI thermal performance test
- Alarms
- Cooling tower control points

Taking the same closeout punch list approach as the design team, the owner's O&M personnel will use a series of computer-generated touchscreen project checklists that allow 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 the existing CMMS system. Touchscreen O&M checklists should include:

- Equipment shop drawings
- O&M manuals, parts list, and lubricants
- Troubleshooting tips
- Seasonal changeover procedures
- Startup and shutdown instructions

The O&M staff should review the D-B-produced piping and 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
- Standby switchover procedures

The training process should include specific HVAC system and equipment training but also emergency plan training due to the HVAC event. The water balancing of the process condenser water and cooling tower, along with the final TAB report, should be included in the preventive maintenance work order system to routinely assure continuous system performance. In addition, there is an existing hydraulic modeling of the entire system that will be updated after the final TAB report. This will require the TAB consultant 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



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