

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

This month's B2B will focus on 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.

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 design team shall produce conceptual drawings, design development (DD) drawings and specifications, and contract documents (CD) in sync with an estimating consultant providing budget estimates in the conceptual phase and DD phases. The O&M personnel shall review the documents during the design phase and receive introduction training of the new equipment and the standby cooling tower operation management. The O&M technicians shall observe equipment startup, TAB, the general contractor's subcontractor punchlist, tower performance certification by the cooling tower manufacturer, and the commissioning system demonstration.

Prior to the completion of the concept documents, the pharma's third-party CxTAB consultant will have provided the design team with a basis of design, commissioning specification, and TAB specification to be included in the DBB documents. Also to be included in the bid specifications will be the pharma mechanical and electrical building standards to be included in division 1 general requirements and supplementary conditions along with the construction standards policy and procedure requirements when performing work on the building's infrastructure.

The scope of work is to add a standby cooling tower adjacent to the existing 100-ton cooling tower that operates 24-7 year-round. The equipment selection is one modular, blow-thru cooling tower to serve the existing closed loop condenser water-to-process water system. This unit will be sized for 100-ton process heat rejection with an outdoor wet bulb temperature of 78°F. The process heating system transfers its heat rejection through a plate and frame heat exchanger to the condenser water side of the system. During the air conditioning season, the condenser water will be 95° CWS and 85° CWR at peak cooling/heat rejection. During the heating season, this condenser water will be 48° CWS and 58° CWR in sync with an existing plate and frame heat exchanger. This standby cooling tower unit will be connected to an existing city water make-up line at the tower sump and will be furnished with the necessary shut-off valves. The tower will be a variable-speed blower system with a 24-VAC control circuit and control panel.

Electrical shall be 480/3/60 with pre-wired electrical power to automatic controls and the fan motor furnished with the cooling tower. A remote, outdoor disconnect shall be installed at the tower located on the building's roof. The HVAC subcontractor's ATC subcontractor

and electrical subcontractor shall work together to rewire existing power wiring along with interface of the new cooling tower controls and existing BAS including the system's associated condenser water pumps. The standby sequence shall be programmed to alarm the facility operator who will manually switch over the existing tower and condenser pump to the standby tower and the existing standby pump when an unscheduled tower or pump failure occurs, shutting down the existing tower or associated pump. The existing standby pump shall be started in sync with the starting of the new standby tower. The operator shall open specific isolation valves and close other normally open isolation valves to allow the switch over to occur from one tower and pump to the other tower and pump.

The HVAC design engineer is directed to the *2015 ASHRAE Handbook — HVAC Applications*, chapter 18 (Clean Spaces) and chapters 36-43 (Building Operation and Management) for pertinent information and as a refresher course for the entire team. The design team and the owner's team will also review *2016 ASHRAE Handbook — HVAC System and Equipment Handbook*, chapter 14 (Condenser Water Systems) and chapter 40 (Cooling Towers) to reacquaint themselves with the design considerations for a standby cooling tower application. It is also recommended that the design team and the owner's team review the Cooling Technology Institute (CTI) cooling tower manual and the CTI certification.

## **The general contractor and associated subcontractors shall include the following shop drawing submittal data:**

- Pipe, valves, fittings, and hanger submittals - Cooling tower - Startup sheet - Troubleshooting sheets - Field coordinated drawings - Structural framing drawing - O&M manuals, parts, and lubricants
- ATC and energy management interface submittal including one complete ATC submittal integrating the new standby cooling tower system ATC with the existing cooling tower system ATC as-built submittal.

## **A third-party commissioning and TAB firm shall complete the following:**

- TAB system flow diagram of the existing condenser water system and new condenser water system with gpm and pump heads indicated at the existing pumps and the new circulator. The process water system side of the plate and frame heat exchanger shall not be part of this project.
- A commissioning functional performance test of the new cooling tower/condenser water system shall be performed in sync with the existing cooling tower/condenser water system.

Refer to The Facility File for additional information pertaining to completing the B2B test. **ES**



The design engineer shall check off the boxes from the list of the company’s standardized field observation checklists below that he will need to upload on to his tablet computer prior to heading out to the construction site to complete his final HVAC inspection and punchlist. These checklists will be touchscreen type. When the engineer returns to the office or he sends the completed

checklists via the internet to the office; the completed checklists shall be automatically downloaded to the company’s computer server and placed in the job folder’s “Project Closeout” section of the folder. The completed checklists, along with associated digital photographs taken at the time of the field visit, will automatically be electronically sent to the following individuals and departments.

**TEAM CORRESPONDENCE DIRECTORY CHECKLIST**

*(Check the appropriate boxes)*

- Project Consultants  Owner Representative  IPD Manager
- Construction Manager  General Contractor  Design-Build Contractor  Facility Manager  HVAC Subcontractor  ATC Subcontractor  State Energy Department  ASHRAE  Piping Subcontractor  Sheet Metal Subcontractor  Third-Party TAB Consultant  Third-Party Commissioning Consultant  Third-Party Commissioning and TAB Consultant  Equipment Manufacturers  Building Inspector  Others: *(insert list)* \_\_\_\_\_

**HVAC CONTRACT SPECIFICATION CHECKLIST**

- Division 1 Project Closeout  Office Equipment  Owner Furnished Equipment  Structural  Electrical  Plumbing  Fire Protection  HVAC  Infection Control  ATC  Cooling Tower  Pumps  Chillers  Fans  Air Handler  Piping System  Sheet Metal System  TAB  Commissioning  Others: \_\_\_\_\_

**HVAC CONTRACT DRAWING INSTALLATION CHECKLIST**

- Division 1 Project Closeout  Office Equipment  Owner Furnished Equipment  Structural  Electrical  Plumbing  Fire Protection  HVAC  Infection Control  ATC  Cooling Tower  Pumps  Chillers  Fans  Air Handler  Piping System  Sheet Metal System  TAB  Commissioning  Others: \_\_\_\_\_

**HVAC STARTUP CHECKLIST**

- Division 1 Project Closeout  Office Equipment  Owner Furnished Equipment  Structural  Electrical  Plumbing  Fire Protection  HVAC  Infection Control  ATC  Cooling Tower  Pumps  Chillers  Fans  Air Handler  Piping System  Sheet Metal System  TAB  Commissioning  Others: \_\_\_\_\_

**COMMISSIONING FPT (Functional Performance Test)**

- Basis of Design Document  Owner Furnished Equipment  Structural  Electrical  Plumbing  Fire Protection  HVAC System  Infection Control System  ATC System  H&V Air System  Condenser Water System  Air Conditioning System  Cooling Tower  Pumps  Chillers  Fans  Air Handlers  Terminal Units  Piping System  Sheet Metal System  Equipment Room  Others: \_\_\_\_\_