

CORPORATE BUILDING BOILER REPLACEMENT

Design-Bid-Build Project

This month's Facility File will focus on the B2B August test for the retrofit of an iconic 1950s building's steam-to-hot water heating system. The existing system receives its high-pressure steam from a district heating system serving several downtown commercial buildings. This steam is reduced to low-pressure steam to serve steam-to-hot water convertors within this building.

The scope of this building program is to remove the utility steam system within the building and cap the supply and pumped condensate return pipes at the entrance/exit of the building. The energy retrofit building program is to furnish and install a series of high-efficiency, hot water condensing boilers and remove the steam-to-hot water heat exchangers and condensate pump and receiver sets.

It would be very beneficial for the facility manager to refresh her memory by reading chapter 3 (Commercial and Public Buildings) in the *2015 ASHRAE Handbook — HVAC Application* to be knowledgeable of ASHRAE's latest guidelines along with chapter 32 (Boilers) in the 2016 handbook when preparing to authorize the designing of a district heating conversion to condenser boilers replacement. The owner's facility management group should also read chapters 36 through 43 of the 2015 handbook to familiarize herself and her staff with Building Operation and Management.

With all these design guidelines from ASHRAE, the engineer should meet with the O&M staff to discuss specific building standards that need to be applied to this project. In particular, the facility manager should review with the design team needs to adjust their standard contract specifications pertaining to O&M, training, PM workorder system, and energy operating budget.

In the design phase of the project the facility manager and his 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., appropriate boiler room ventilation).

For a building program as well as a business plan to continue to successfully manage the building central hot water heating system, it is imperative that the program includes an O&M budget in addition to the program's construction budget. The life of a boiler is approximately 20 years, but it can last much longer if proactively maintained over the life of this heating plant.

For this August B2B, the project delivery method is design-bid-build (DBB) and the project design team is led by the HVAC consulting engineering firm working in partnership with an owner's representative. The building owner has chosen to retain the consulting services of a 3rd-party commissioning (Cx) and TAB firm. In

the construction phase, the O&M staff will want to revisit the issues noted 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 DBB general contractor's mechanical-electrical coordinator and the subcontractor's startup personnel and receive equipment training from the boiler manufacturer's startup technician and system training using the O&M manuals and contract drawings (that will eventually become the as-built drawings). **ES**

Once the startup has been completed and the ATC subcontractor and 3rd-party Cx and TAB consultant have 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 Cx and TAB consultant. The ATC subcontractor and the boiler manufacturer's technician should also begin collecting system performance by trending pertinent HVAC system and equipment data by trending the following:

- outdoor air dry bulb and wet bulb temperature
- primary heating water supply and return temperature
- secondary heating water supply and return temperature
- alarms and safeties
- boiler control points

Taking the same approach as the design engineer, 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
- seasonal change-over procedures
- startup and shutdown instructions

The training process should include not only specific HVAC system and equipment training but also emergency plan training due to the HVAC event. The water balancing of the primary-secondary water system (new and existing equipment), along with the final TAB report, should be included in the preventive maintenance work order system to routinely assure continuous system performance. In addition, the hydraulic modeling of the entire system should 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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