

FEDERAL OFFICE BUILDING BOILER REPLACEMENT PERFORMANCE CONTRACT PROJECT

This month's B2B and Facility Files will focus on the retrofit of a federal office building hot water boiler system. The existing system receives an energy retrofit performance contract to redesign, build, and take over operation and maintenance of the heating system based on a performance lease agreement to span the agreed upon boiler useful life cycle of 20 years. The building owner (federal agency) shall hire an owner representative to work with this design-build-operate-maintain Performance Provider (PP).

The scope of this building program is to remove the existing 30-year-old boiler and replace it with new high-efficiency condensing boilers and remove the oversized hot water pumps with primary-secondary, VSD pumps. The BAS shall also be replaced with new computerized data collection energy management software, internet access management, and cyber-protection software.

It will be very beneficial for the PP and the owner's O&M personnel to refresh their memory by reading chapter 3 (Commercial and Public Buildings) in the *2015 ASHRAE Handbook — HVAC Application* to be knowledgeable of ASHRAE's latest guidelines. In addition, and based on the performance contract, the PP-Owner O&M team is directed to chapter 61 (Smart Building Systems) along with chapter 32 (Boilers) in the *2016 Handbook*. The PP O&M personnel shall also read chapters 36 through 43 of the *2015 Handbook* to familiarize themselves and the staff with building operation and management.

With all these design guidelines from ASHRAE, the PP engineer shall meet with the owner's O&M staff to discuss O&M, training, preventive maintenance work order system, and energy operating budget.

In the design phase of the project, the PP-Owner's O&M team will want to contribute information to service contracts, parts inventory, and as-built drawing requirements. Reviewing the design documents, this O&M team will want to be assured that equipment serviceability is adequate and safe (e.g., boiler room ventilation and gas code ventilation).

For this energy retrofit performance contract program as well as for a business plan to continue to successfully manage the building central hot water heating system, the PP's energy engineer shall calculate an O&M budget in addition to the program's construction budget. The equipment 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 February B2B, the project delivery method is based on the building owner agreeing to this design-build-operate-maintain Performance Provider (PP) and their energy retrofit performance contract. This PP team shall include their own in-house commissioning and testing, adjusting, and balancing engineers (CxTAB). The PP firm shall subcontract out the energy and retrofit design professionals, subcontract the HVAC contractor, and place on-site the boiler room O&M operators along with remote energy monitoring/management and the planned maintenance work order system.

Next comes the startup, testing, adjusting, and balancing — the commissioning phases where the O&M team will want to be proactive in following along with the PP'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 and energy management program initial dry-run demonstration prior to the final functional performance test, owner acceptance of the project, and the beginning of system trending, monitoring, and measuring of the heating system that will be benchmarks to the original energy management plan. The PP's energy engineer and the boiler manufacturer's technician shall also begin collecting system performance by trending pertinent HVAC system and equipment data, such as:

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 PP's design engineering, the PP's O&M personnel shall 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 shall begin at the start of construction and not at project closeout, so that the facility files can be inputted into the PP's off-site 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 shut-down instructions

The PP's O&M personnel shall review the contractor-produced piping and field fabrication/field coordination drawings prior to fabrication. Touchscreen service checklists shall include:

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

The training process shall include specific heating 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, shall be included in the preventive maintenance work order system to routinely assure continuous system performance.

In addition, the hydraulic modeling of the entire system shall be updated after the final TAB report. This will require the TAB engineer 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 shall include:

equipment system emergency plan automatic controls energy management



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