# NEW BOILER SYSTEM

## TO REPLACE DISTRICT STEAM FOR EXISTING DORMITORY USING INTEGRATED PROJECT DELIVERY

This month's B2B will focus on a college construction management department taking a dormitory heating system off the campus high-pressure steam system and replacing it with a high-efficiency condensing hot water boiler. The demolition will valve and cap the steam supply pipe coming in and the pumped condensate return pipe exiting the dormitory. It will also include removing the steam PRV stations, condensate pump and receiver set, and steam-to-hot water convertor. In its place will be a new 1,200 MBH output, gas-fired hot water boiler that will be tied into the existing hot water heating system.

The equipment selection will be a 3-modular condensing boiler with each boiler unit featuring a 400 MBH output, 95% thermal efficiency, Energy Star compliance, natural gas, and capability to modulate down to 20% of rate input. Hot water shall be 160°F HWS and 130°F HWR at peak heating and 110°F HWS and 80°F HWR at low load. The boilers shall be furnished and installed with gas train, 4-in pressure, and required gas relief vent(s). Boiler fans shall be variable speed blower system, 24 VAC control circuit and control panel, temperature and pressure gages, automatic HWS shutoff valve, temperature sensors (HWS, HWR, flue, and outdoor air), low-water flow protection, and water pressure relief valve piped to funnel floor drain adjacent to each boiler. Boilers shall operate using controls capable of variable speed boiler pumping to maintain constant Delta T along with staging on and off of units. Boiler venting shall be sidewall and not to exceed 24 ft. A new combustion makeup air design shall be from within room via direct outdoor duct terminating at the boiler.

Pumping shall be a new primary-secondary with in-line circulators at each boiler. Secondary pumps shall also be new vertical, floor-mounted type with VFD motors and configured for lead-lag automatic control sequence. Each boiler shall be piped to include shutoff valves, strainer with blow-off valve, and 2-position ATC valve. Each pump shall be piped to include shutoff valves, strainer with blow-off valve, 2-position ATC valve, circulator, and balancing valve for fine-tuning flow. One pressure gage shall be used with individual connection and associated petcocks at pump inlet, pump outlet, and immediately after balancing valve. An air separator shall be located at each boiler, along with an in-line separator and automatic water makeup connection located between the boilers and the secondary pumps. There will be one city water backflow preventer to serve the entire heating system.

The boiler-furnished automatic controls shall be a computerized system utilizing wireless technology integrated with the building's control. This system will also interface with the office building's security system managed by the owner's security manager.

To select the optimum boiler equipment for the application, the designer is directed to 2016 *ASHRAE Handbook*, chapter 32 on boilers. The designer engineer is also directed to 2015 A*SHRAE Handbook – HVAC Applications,* chapter 7 (Educational Facilities), chapters 36 through 43 (Building Operation and Management), and chapter 59 (HVAC Security) for design guidelines.

Project delivery method shall be integrated project delivery (IPD) based on 2015 *ASHRAE Handbook — HVAC Applications*, chapter 58 on integrated building design. The IPD team shall include the campus construction operations manager, a project manager from the school's construction department, O&M department, and an owner representative who will also provide 3rd-party commissioning and air and water-balancing. The design team is an engineer-architectural contract with the HVAC consultant engineer as the team leader, architect, electrical, plumbing, structural consultants, acoustic consultant, and security sub-consultants. An experienced general contractor and the HVAC, electrical, and plumbing sub-contractors make up the rest of the IPD team. This team will participate in the IPD process beginning at the conceptual phase.

Electrical shall be 480/3/60 electrical power to unit pre-wired automatic controls, pumps, and other heating equipment. A factory installed control logic panel with remote access for troubleshooting, energy management, and response to alarms and safety signal shall be included within the design.

The IPD team shall produce concept documents and design documents (drawings and specifications). The Phase 5 (Construction Preparation), Phase 6 (Construction), Phase 7 (Owner Acceptance), and Phase 8 (Use, Operate, and Maintain) shall follow. The O&M personnel shall review the documents (beginning with the concept development phase) and observe equipment startup, air and water balancing, and commissioning system demonstration.

**The IPD team's general contractor shall include the following during the shop drawing submittal phase:**

- Equipment submittals - Pump curves - Startup sheet - Troubleshooting sheets - O&M manuals, parts, and lubricants - ATC and energy management submittal, including one complete ATC submittal integrating boiler manufacturer's furnished ATC into an integrated overall ATC submittal – Field coordination drawings (piping & sheet metal).

**The IPD owner representative shall provide 3rd-party commissioning and testing, adjusting, and balancing (CxTAB) services as follows:**

- TAB system flow diagram of entire hot water heating system with various gpm and pump heads indicated at each piece of equipment.
- Commissioning functional performance test of heating system (individual boiler sequences of operation, boiler-hot water heating system sequence of operation, and other heating systems such as makeup air).

Refer to The Facility Files for additional information pertaining to completing the B2B test.


The design engineer shall check off the boxes from the list of 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. 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)*

☐ College President ☐ Campus Construction Manager ☐ Project manager ☐ O&M Manager ☐ Owner Representative ☐ IPD Lead Engineer ☐ Construction Manager ☐ General Contractor ☐ Design-Build Contractor ☐ Structural ☐ HVAC Subcontractor ☐ ATC Subcontractor ☐ Electrical Subcontractor ☐ Plumbing Subcontractor ☐ Acoustic Consultant ☐ Telecommunication Subcontractor ☐ Architect ☐ State Energy Department ☐ Soils Consultant ☐ Security Consultant ☐ ASHRAE ☐ Piping Subcontractor ☐ Sheet Metal Subcontractor ☐ 3rd-Party Cx Consultant ☐ 3rd-Party TAB Consultant ☐ Equipment Manufacturers ☐ Building Inspector ☐ Others:_____

## HVAC CONTRACT SPECIFICATION CHECKLIST

☐ Division 1 Project Closeout ☐ Telecommunication Equipment ☐ Owner Furnished Equipment ☐ Structural ☐ Electrical ☐ Plumbing ☐ Fire Protection ☐ HVAC ☐ Infection Control ☐ ATC ☐ Boilers ☐ Pumps ☐ Chillers ☐ Fans ☐ Air Handlers ☐ Terminal Units ☐ Piping System ☐ Sheet Metal System ☐ TAB ☐ Commissioning ☐ Others:_____

## HVAC CONTRACT DRAWING INSTALLATION CHECKLIST

☐ Telecommunication Equipment ☐ Owner Furnished Equipment ☐ Structural ☐ Electrical ☐ Plumbing ☐ Fire Protection ☐ HVAC ☐ Infection Control ☐ ATC ☐ Boilers ☐ Pumps ☐ Chillers ☐ Fans ☐ Air Handlers ☐ Terminal Units ☐ Piping System ☐ Sheet Metal System ☐ TAB ☐ Commissioning ☐ Others:_____

## HVAC STARTUP CHECKLIST

☐ Telecommunication Equipment ☐ Owner Furnished Equipment ☐ Structural ☐ Electrical ☐ Plumbing ☐ Fire Protection ☐ HVAC ☐ Infection Control ☐ ATC ☐ Boilers ☐ Pumps ☐ Chillers ☐ Fans ☐ Air Handlers ☐ Terminal Units ☐ Piping System ☐ Sheet Metal System ☐ TAB ☐ Commissioning ☐ Others:_____

## COMMISSIONING FPT - *Functional Performance Test*

☐ Telecommunication Equipment ☐ Owner Furnished Equipment ☐ Structural ☐ Electrical ☐ Plumbing ☐ Fire Protection ☐ HVAC ☐ Infection Control ☐ ATC ☐ Boilers ☐ Pumps ☐ Chillers ☐ Fans ☐ Air Handlers ☐ Terminal Units ☐ Piping System ☐ Sheet Metal System ☐ TAB ☐ Commissioning ☐ Others:_____