

# NEW CENTRAL PLANT AND ASSOCIATED SAFETY DESIGN PROJECT USING INTEGRATED PROJECT DELIVERY

This month's B2B will focus on a new central, high-efficiency, hot water boiler plant to replace an antiquated remote high-pressure steam boiler plant serving a campus setting. The entire heating system will be removed following the installation and commissioning of a new central heating boiler plant located on an existing 45-building campus setting. This month's test will address the design intent of providing employee safety and accessibility to the equipment, the shut-off valves, etc. necessary to effectively operate and maintain this new structure based on the owner's building program.

The project delivery method shall be integrated project delivery (IPD) referenced in the *2015 ASHRAE Handbook — HVAC Applications*, chapter 58 (Integrated Building Design). The IPD team shall include the campus executive board/owner; building facility manager; owner representative; third-party commissioning and air and water balancing (CxTAB) consultant; HVAC consultant engineer as the design team leader; the architectural, structural, plumbing, and electrical consulting engineers; and along with the general contractor and HVAC subcontractor. The building's facility manager and her O&M staff will also participate in the IPD process beginning at the conceptual phase along with a third-party infection control (IC) commissioning consultant.

The design engineer, as well as the IPD team, is directed to *2015 ASHRAE Handbook — HVAC Applications*, chapters 36 through 43 (Building Operation and Management) and chapter 59 (HVAC Security). Other safety and accessibility checklists will be located and downloaded from the internet and will be referenced by the IPD team as part of the basis of design directed toward plant and employee safety.

The IPD team will complete a study of the new building design pertaining to proposed locations of air intakes, air exhausts, chimney stacks, plumbing vents, and safety relief vents as well as the proposed loading dock and parking area where motor vehicle engine exhaust could be drawn into the air intakes. Local railway tracks and the potential for a train accident as well as idle train engine exhaust will also be considered. Design considerations will also include potential for flooding in the vicinity of the new boiler plant and the location of associated electrical generators serving emergency backup power and waste heat recovery.

The bottom of each outdoor air intake will be located at a minimum of 12 feet above-grade for security as well as air quality and a minimum of 4 feet above the roof based on anticipated snow drifting. Consideration for snow entrainment will also be a design consideration by the new air intakes. The new building will have no below-grade space to avoid potential flooding of rooms, equipment, or inventory.

The proposed exhaust fans will be on the roof with top angular discharge into 10-foot-high air discharge ducts secured with guide wires. Prevailing winds, adjacent buildings, and discharge velocities must be taken into account based on chapter 24 of the *2017 ASHRAE Handbook — Fundamentals* to avoid short-circuiting of exhaust air into air intakes.

As an integral part of this ventilation focus, the IPD team will work with the IC consultant to incorporate the HVAC basis of design and to prevent the potential for Legionnaires' disease in accordance with this IC commissioning initiative and will commission the final installation.

The basis of design will include a separate series of 3-D building information modeling (BIM) drawings showing safe access around the central plant, safe access around equipment, the ability to remove equipment and remove equipment parts e.g., lengthy shafts, and the ability to clean and remove heat exchanger tubes. The 3-D drawing will show sections through this power plant and its mezzanine and third-level platform showing unobstructed access, a.k.a. employee headroom from pipes, valves, and miscellaneous equipment.

The IPD team shall begin to come together at Phase 2 Project Initiative and include with the owner, facility manager, owner representative, design team, third-party consultants, IC consultant, and general contractor. The remaining IPD team members will be brought on board at Phase 3 Concept Development e.g., HVAC subcontractor.

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 IPD team shall complete a hydraulic modeling of the primary-secondary hot water system, including the system distribution up to the entrance of hot water supply and return at each of the 45 buildings.

The O&M personnel shall review the documents beginning with the concept development phase and observe equipment start-up, water balancing, commissioning system demonstration, and commissioning of infection control policy and procedure.

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

- Equipment submittals - 3-D safety drawings - 3-D access drawings
- Sheet metal field fabrication drawings - Piping field fabrication drawings - Start-up sheet - Troubleshooting sheets - O&M manuals, parts, and lubricants - ATC and energy management submittal, including one complete ATC submittal integrating manufacturer's equipment units furnished ATC into an integrated overall ATC submittal.

## **The IPD third-party commissioning and testing, adjusting, & balancing (CxTAB) services as following:**

- TAB system flow diagram of entire supply and return water system with GPM and head pressure readings - TAB system flow diagram of entire ventilation and exhaust air systems with cfm and static pressure readings - Commissioning functional performance test of central air and exhaust air systems.

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 heating 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)*

- Owner  Owner Representative  IPD Lead Engineer
- Construction Manager  General Contractor  Design-Build Contractor  Owner’s Facility Manager  HVAC Subcontractor
- ATC Subcontractor  Electrical Subcontractor  Plumbing Subcontractor  Fire Protection Subcontractor  ATC Subcontractor  Architect  State Energy Department  ASHRAE
- Piping Subcontractor  Sheet Metal Subcontractor  Third-Party CxTAB Consultant  Third-Party Infection Control Consultant
- Equipment Manufacturers  Building Inspector
- Others: *(insert list)* \_\_\_\_\_

**HVAC CONTRACT SPECIFICATION CHECKLIST**

- Division 1 Project Closeout  Telecommunication Equipment
- Owner Furnished Equipment  Structural  Electrical
- Plumbing  Fire Protection  HVAC  Infection Control
- ATC  Boiler Units  Pumps  Fans  Air Handlers
- Terminal Units  Piping System  Sheet Metal System
- Access & Safety Diagrams  TAB  Commissioning
- Others: \_\_\_\_\_

**HVAC CONTRACT DRAWING INSTALLATION CHECKLIST**

- Division 1 Project Closeout  Telecommunication Equipment
- Owner Furnished Equipment  Structural  Electrical

- Plumbing  Fire Protection  HVAC  Infection Control
- ATC  Boiler Units  Pumps  Fans  Air Handlers
- Terminal Units  Piping System  Sheet Metal System
- Access & Safety Diagrams  TAB  Commissioning
- Others: \_\_\_\_\_

**HVAC STARTUP CHECKLIST**

- Division 1 Project Closeout  Telecommunication Equipment
- Owner Furnished Equipment  Structural  Electrical
- Plumbing  Fire Protection  HVAC  Infection Control
- ATC  Boiler Units  Pumps  Fans  Air Handlers
- Terminal Units  Piping System  Sheet Metal System
- Access & Safety Diagrams  TAB  Commissioning
- Others: \_\_\_\_\_

**COMMISSIONING FPT (Functional Performance Test)**

- Division 1 Project Closeout  Telecommunication Equipment
- Owner Furnished Equipment  Structural  Electrical
- Plumbing  Fire Protection  HVAC  Infection Control
- ATC  Boiler Units  Pumps  Heating System  Chilled Water System  Condenser Water System  Fans  Air Handlers
- Terminal Units  Piping System  Sheet Metal System
- Equipment Room  Others: \_\_\_\_\_