

WINTER CHILLER ALTERNATIVE PROJECT USING INTEGRATED PROJECT DELIVERY

This month's B2B will focus on a new, high-efficiency, air-cooled chiller to interface with the existing chiller plant at a mid-sized hospital in New England. The existing chilled water plant operates from spring through the fall but is shutdown for the heating season. During this heating season, the hospital struggles to provide adequate air conditioning to the operating rooms (ORs) and ancillary areas, such as recovery rooms, when the weather turns unexpectedly warm (60°F and warmer). During these Indian Summer periods, when temperatures are in the unusually warm 60's in December, January, and February, these hospital rooms become uncomfortable.

The hospital's facility management developed a building program to add a 100-ton, air-cooled chiller with propylene glycol and connect it to the chilled water supply and returns for the OR air conditioning (a/c) unit and a second a/c unit serving the OR support areas.

The project delivery method was agreed to be integrated project delivery (IPD), referencing 2019 ASHRAE Handbook – HVAC Applications, Chapter 59, "Integrated Building Design." The IPD team shall include the facility manager; owner representative; third-party commissioning and air and water balancing (CxTAB) consultant; HVAC consultant engineer, who will serve as the design team leader; the structural, plumbing, and electrical consulting engineers; and the general contractor and HVAC subcontractor. The facility manager and her operating and maintenance (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. A sound consultant was added to the IPD team at the start of the drafting of the project design intent document.

The design engineer, as well as the IPD team, is directed to 2016 ASHRAE Handbook, Chapter 43, "Liquid-Chilling Systems," as well as 2019 ASHRAE Handbook – HVAC Applications, Chapters 37-44, "Building Operation and Management," and Chapter 60, "HVAC Security," for additional design intent considerations.

The IPD team will complete a feasibility study of this heating season chiller application with its automatic control isolation valves to separate the new unit, associated pumps, and pipe distribution from the central chilled water system. The design intent also included an emergency option to this new system to provide chilled water to the two central air-handling units that would also be on emergency power during a loss of electricity. The IPD team created a strategic installation plan to ensure indoor air quality (IAQ) within the construction space under the direction of the IC consultant, who created the IC basis of design, which was an integral part of the project. The IC consultant shall work with the other IPD members through the design, construction, and IC commissioning initiative and will commission the final installation.

The new air-cooled chiller shall be installed on a structural steel frame on the roof directly adjacent to the OR suite, where access for servicing shall be through an existing door to this lower roof. The existing two air-handling units are located in the equipment room directly below the new chiller. A sound consultant recorded ambient

noise levels on the roof for 24 hours before the project proceeded and then successfully recorded the air-cooled chiller noise levels for 24 hours after the system was installed and commissioned.

The IPD team shall begin to come together at Phase 2 Project Initiative and include the facility manager, owner representative, design team, third-party consultants, 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 existing chilled water system and come back and complete a hydraulic model of the new isolated chilled water system as well as a hydraulic model of the two systems operating in parallel to collect operational data, system performance, and increased system capacity, although no additional capacity is required at this time.

The O&M personnel shall review the documents beginning with the concept development phase and observe equipment startup, water balancing, commissioning system demonstration, commissioning of infection control policy and procedure, and sound consulting performance data.

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

- Equipment submittals - Building information modeling (BIM) 3D project drawings - BIM access drawings - BIM piping field fabrication drawings - A startup sheet - Troubleshooting sheets - O&M manuals, parts, and lubricants - ATC and energy management submittals, 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, and balancing (CxTAB) services are as follow:

- TAB system flow diagram of existing supply and return water system with gpm and head pressure readings
- TAB system flow diagram of new chilled water system with gpm and head pressure readings
- TAB system flow diagram of the entire chilled water system with gpm and head pressure readings
- A commissioning functional performance test (FPT) of central and new chilled water system, central OR suite air systems, and existing associated 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 HVAC inspection and punch list. 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 Sound Consultant 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 Pre-Purchased Equipment
- Owner-Furnished Equipment Structural Electrical
- Plumbing Fire Protection HVAC Infection Control
- ATC Air-Cooled Chiller Pumps Fans Existing Air Handlers Terminal Units Piping System Sheet Metal System
- Access & Safety Drawing TAB Commissioning
- Others: _____

HVAC CONTRACT DRAWING INSTALLATION CHECKLIST

- Division 1 Project Closeout Pre-Purchased Equipment

- Owner-Furnished Equipment Structural Electrical
- Plumbing Fire Protection HVAC Infection Control ATC
- Air-Cooled Chiller Pumps Fans Existing Air Handlers
- Terminal Units Piping System Sheet Metal System
- Access & Safety Drawing TAB Commissioning
- Others: _____

HVAC STARTUP CHECKLIST

- Division 1 Project Closeout Pre-Purchased Equipment
- Owner-Furnished Equipment Structural Electrical
- Plumbing Fire Protection HVAC Infection Control ATC
- Air-Cooled Chiller Pumps Fans Existing Air Handlers
- Terminal Units Piping System Sheet Metal System
- Access & Safety Drawing TAB Commissioning
- Others: _____

COMMISSIONING FPT (Functional Performance Test)

- Division 1 Project Closeout Pre-Purchased Equipment
- Owner-Furnished Equipment Structural Electrical
- Plumbing Fire Protection HVAC Infection Control
- ATC Air-Cooled Chiller Pumps Heating System Chilled Water System Condenser Water System Fans Existing Air Handlers Terminal Units Piping System Sheet Metal System
- Equipment Room Others: _____