

CRITICAL CENTRAL AIR-HANDLING STANDBY UNIT

OWNER IN-HOUSE PROJECT MANAGEMENT

This month's B2B will focus on a large pharmaceutical building that chose to invest in a standby secondary AHU (AH-6) to be ready in parallel with five other secondary central AHUs serving a 6,000-sq-ft Class 1,000 cleanroom space. Each existing unit is 40,000 cfm, and the new standby unit will be identical in configuration and size and serve to provide standby capacity should any one of the existing five units fail during operation. It will also serve when any of the other five units is scheduled for planned maintenance.

An existing 100% outdoor air unit, which conditions the outdoor air (temperature, humidity, and air filtration), delivers air to each of the five existing secondary AHUs and will now also provide conditioned outdoor air to this new AH-6.

The pharmaceutical company's facility and construction management departments have chosen to draft a building program approach to design and build a standby central AHU that will provide backup reliability to the HVAC system serving this specific cleanroom. The new unit will be furnished and installed within the same interstitial space located directly over the cleanroom the units served.

The revised/updated basis of design incorporates an identical sixth unit alongside the existing units that all discharged their supply air into a common supply air sheet metal manifold, where this pressurized air will travel to numerous 99.999% HEPA filter units in the cleanroom ceiling. The return air also has a similar common return air plenum.

Chilled water and hot water piping shall be from existing valve and capped connections. The new standby unit shall receive chilled water supply and return piping to the associated cooling/dehumidification coil similar to existing units with shutoff valves, strainer, balancing valve, P/T plugs, and ATC valve. A similar piping configuration will be installed at the unit's hot water reheat coil using the facility's hot water supply and return system distribution. The chilled water shall be 42°F CHWS and 56°F CHWR.

The existing building central hot water plant is adequate to accommodate the chilled water demand and heating demand because these utility loads are standby requirements and not additional loads to the central heating and cooling plants. The building automation shall be configured and programmed to automatically start this standby unit should a signal be sent that indicates one of the other five units has failed. This alarm signal to the central control room will indicate unit failure. A workorder will be automatically produced and printed out, indicating the initial steps to be taken.

While drafting this building program design intent, the in-house engineer shall refresh her memory of original HVAC cleanroom design by reading the previous project final commissioning report's design intent. In addition, this design engineer will review 2015 ASHRAE *Handbook — HVAC Applications*, Clean Spaces and Building Operation

(chapter 18) and Management (chapters 36 through 43). Unfortunately, this chapter/handbook does not have a chapter that addresses standby HVAC design, operation, and management, so the facility and construction departments will count on their own experience and knowledge of the building support services. The building's facility and construction departments have experience in this approach from past projects.

The standby AHU project delivery method will be the in-house group of professions working closely with the cleanroom staff, along with an air handling equipment manufacturer. A commissioning engineer with a TAB sub-contractor will provide 3rd-party review and design intent compliance verification. This management team will draw upon the 2015 *ASHRAE Handbook — HVAC Applications*, Integrated Building Design (chapter 58), as a guide to interface with all team members and to document as-builts.

For this month's HVAC application, the equipment selection is a 40,000 cfm central AHU with intake plenum, prefilter at 60% efficient, cooling coil, reheat coil, supply air fan, discharge plenum, final filter at 95%, and discharge air plenum. Unit packaged automatic controls shall be BACnet-compliant with interface hookup connections to the pharmaceutical building's BAS computer. The new controls to the existing BAS shall include all internal unit controls, safeties, alarm, flow switch, and emergency changeover management features. Electrical shall be 480/3/60 electrical power with emergency power backup. There is no steam humidification required for this application.

General Contractor shall include shop drawing submittal data:

- AH-6 unit submittal – Filter submittals – Startup sheet – Troubleshooting sheets – O&M manuals, parts, and lubricants – ATC and emergency management submittal including one complete ATC submittal integrating AH-6 AHU furnished ATC with overall ATC – BAS as-built submittal.

A 3rd-party CxTAB firm shall complete the following:

- TAB system flow diagram of this cleanroom zoned (AH-1 through AH-6) chilled water and hot water system with GPMs and pump heads indicated at each coil.
- TAB system flow diagram of entire cleanroom outdoor air, supply, return, and exhaust air systems with cfms and static pressure at each air-handler, HEPA filter unit, and at major branch runouts associated with cleanroom air systems.
- Commissioning functional performance test of central air systems associated with the cleanroom space.

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



The pharmaceutical in-house design engineer shall check off the boxes from the list of company's standardized field observation checklists below that she will need to upload on to her tablet computer prior to heading out to the construction site to complete her final HVAC inspection and punchlist. These checklists will be touchscreen type. When the engineer returns to the main office she will electronically

file the completed checklists. The completed checklists shall be automatically downloaded to the company's computer server and placed in the job folder's "Project Closeout" section of the folder. The completed checklists, along with associated digital photographs taken at the time of the infrastructure visit, will automatically be electronically sent to the following individuals and departments:

TEAM CORRESPONDENCE DIRECTORY CHECKLIST

(Check the appropriate boxes)

- Facility Manager Construction Manager In-House Design Engineer Clean Room Director General Contractor
- Design-Build Contractor HVAC Subcontractor
- In-House ATC/BAS Technician Electrical Subcontractor
- Plumbing Subcontractor Fire Protection Subcontractor
- Telecommunication Subcontractor Architect Building Inspector ASHRAE Piping Subcontractor Sheet Metal Subcontractor 3rd-Party Cx Consultant 3rd-Party TAB Subcontractor 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 Filters Pumps Chillers Fans Air Handler
- Terminal Units Piping System Sheet Metal System TAB
- Commissioning Clean Room Certification
- Others: _____

HVAC CONTRACT DRAWING INSTALLATION CHECKLIST

- Telecommunication Equipment Owner Furnished Equipment
- Structural Electrical Plumbing Fire Protection HVAC

- Infection Control ATC Filters Pumps Chillers Fans
- Air Handler Terminal Units Piping System Sheet Metal System TAB Commissioning Clean Room Certification
- Others: _____

HVAC STARTUP CHECKLIST

- Telecommunication Equipment Owner Furnished Equipment
- Structural Electrical Plumbing Fire Protection HVAC Infection Control ATC Filters Pumps Chillers
- Fans Air Handler Terminal Units Piping System
- Sheet Metal System TAB Commissioning Interface with Other Air Handlers Interface with Existing BAS Clean Room Certification Others: _____

COMMISSIONING FPT - Functional Performance Test

- Telecommunication Equipment Owner Furnished Equipment
- Structural Electrical Plumbing Fire Protection HVAC
- Infection Control Clean Room Certification ATC BAS Interface Air Handling System Heating System Chilled Water System Pumps Chillers Fans Air Handlers
- Terminal Units Piping System Sheet Metal System
- Equipment Room Others: _____