

MAINTAINING CONSTRUCTION SPACE NEGATIVE PRESSURE

DESIGN-BUILD PROJECT

This month's B2B will focus on an existing emergency space renovation and is based on chapter 8 (Health-Care Facilities) in the *2015 ASHRAE Handbook — HVAC Applications*. The Back2Basics test is focused on the HEPA filter systems installed within the construction space to maintain a negative pressure in this space. The design intent is to keep the construction site under a negative pressure so that construction dust does not infiltrate into the occupied hospital areas adjacent to this renovation.

To select the optimum air filters for this application, the design-build (D-B) team is directed to *2015 ASHRAE Handbook*, chapter 8, and the *2016 ASHRAE Handbook — HVAC Systems and Equipment*, chapter 29 (Air Cleaners for Particulate Contaminants.) In addition, the D-B design engineer will also go online to research renting the number of temporary air filter/fan units needed to maintain a negative pressure within the 2,000-sq-ft /30,000-cubic-ft renovation space.

Project delivery method shall be a single-source, D-B approach with the D-B firm having in-house engineering and installation technicians. The health care facility has its own in-house O&M staff. The hospital's vice president of support services shall have a 3rd-party owner representative to interact with the D-B firm and to provide commissioning (Cx) and TAB of the installation. The hospital shall also retain a 3rd-party infection control (IC) consultant to commission the D-B project beginning with pre-construction services through the entire design-build phase, utilizing an IC commissioning plan. This IC consultant shall provide magnehelic gage readings daily along with particle counts to assure the renovated space is continuously achieving the temporary HEPA filter design intent. This consultant shall report daily to the hospital's in-house IC manager.

This month's equipment/system selection is three fan-powered HEPA filter units, with one standby unit should any of the other three units fail. Each fan-filter unit will have a MERV rated 8 (35% efficient) prefilter and a MERV 20 (99.99% efficient) laminar flow supply air using a VSD fan motor to continuously exhaust 2,000 cfm as the filters load up (increase in static pressure from dust). The blower motor shall be energy-efficient with backward curved fan impeller. Electrical shall be 120/1/60 voltage, single phase, and permanent split capacitor type motor blower assembly with thermal overload protection.

Each unit shall be furnished with a pressure-sensitive indicator light to signal filter replacement. Refer to the Facility Files for the proactive filter replacement plan.

The design engineer has sized the filter quantity based on 12 air changes within the renovation space, taking into account the area without a ceiling. The negative pressure design intent will be to achieve 0.05 in static pressure, but this setpoint will be dependent on the space being as tight as possible, taking into account pipe and conduit openings in walls, floor, and underside of floor above. A 12-in rigid flexible

exhaust duct shall discharge the air to the outdoors and not into the occupied hospital space.

Once the concept documents are agreed upon, the D-B team shall produce a concept phase scope of work including a basis of design; system flow diagrams for HVAC, electrical, and infection control; and guaranteed D-B cost including all soft costs (e.g., engineering) for owner review and approval. Part of the soft costs will be the renting of the HEPA temporary filters, associated sheet metal work, and filter replacement costs during the nine-month emergency space renovation project.

Prior to the completion of the concept documents, the hospital will have provided the D-B team with a building program, Cx-TAB plan, and IC plan. The hospital, including owner representative/Cx-TAB consultant, IC consultant, facility manager, and the hospital's infection control manager will sign-off on the concept documents so that the D-B can begin this fast-track process. Integral with the hospital standards will be the hospital's temporary air filtration policy and procedure requirements when renovating a room, area, and/or performing work above ceilings.

The D-B shall include the following during the shop drawing submittal phase:

- Equipment submittals - Startup sheets - Troubleshooting sheets - O&M manuals, parts, and lubricants - ATC submittal - Temporary filter unit specifications and installation detail drawings - HVAC subcontractor shall include sheet metal and piping fabrication drawings and specifications.

The D-B team's owner representative shall provide 3rd-party Cx and TAB services as follows:

- TAB system flow diagram of temporary space negative pressure design, as well as the project's entire new central air system flow diagram with cmf and static pressure, and finishing with a TAB final report.

- Cx functional performance test of HVAC system beginning at the renovation project's central air unit based on the Cx documents and finishing with a Cx final report.

- IC functional performance shall begin with basis of design compliance; include updating of IC policy and procedures for the construction phase and after owner occupancy pertaining to visitors, health care workers, and maintenance personnel, and continuous monitoring; and finish with an IC final report.

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



The D-B engineer shall check off the boxes from the list of the 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 office or she 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 of the folder. 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)

- Project Architect Owner Representative IPD Manager Construction Manager General Contractor Design-Build Contractor Facility Manager HVAC Subcontractor BAS Subcontractor State Energy Department ASHRAE Piping Subcontractor Sheet Metal Subcontractor 3rd-Party IC Commissioning Consultant 3rd-Party Commissioning & TAB Consultant Equipment Manufacturers Building Inspector Others:_____

HVAC CONTRACT SPECIFICATION CHECKLIST

- Division 1 Project Closeout Telecommunication Equipment Hospital Furnished Equipment Structural Electrical Plumbing Fire Protection HVAC Infection Control ATC Fan-Powered HEPA Filter Units Pumps Chillers Fans Air Handlers Terminal Units Piping System Sheet Metal System TAB Commissioning Others:_____

HVAC CONTRACT DRAWING INSTALLATION CHECKLIST

- Hospital Equipment Structural Electrical Plumbing Fire Protection HVAC Infection Control ATC Fan-Powered HEPA Filter Units Pumps Chillers Fans Air Handlers Terminal Units Piping System Sheet Metal System Equipment Room Tel-Data Others:_____

HVAC STARTUP CHECKLIST

- Hospital Equipment Structural Electrical Plumbing Fire Protection HVAC Infection Control ATC Fan-Powered HEPA Filter Units Pumps Chillers Fans TAB Air System Terminal Units Piping System Sheet Metal System Equipment Room Tel-Data Others:_____

COMMISSIONING FPT - Functional Performance Test

- Hospital Equipment Structural Electrical Plumbing Fire Protection HVAC System Infection Control System ATC System Fan-Powered HEPA Filter Units Central HVAC Air System Heating System Air Conditioning System Boilers Pumps Chillers Fans Air Handlers Terminal Units Piping System Sheet Metal System Equipment Room Tel-Data Others:_____