INDUSTRIAL FACILITY STANDBY EMERGENCY GENERATOR DESIGN-BUILD PROJECT DELIVERY

This month's B2B will focus on an industrial facility capital project to furnish and install an emergency generator within its own generator room. The application is described in the *2016 ASHRAE Handbook — HVAC Systems and Equipment*, chapter 7 (Combined Heat and Power Systems) and *2017 ASHRAE Handbook — Fundamentals*, chapter 16 (Ventilation and Infiltration).

The scope of work is to build a generator room adjacent to the existing electrical room and install a 500 kW diesel fuel electrical generator for emergency power and also peak electrical demand periods. The H&V design engineer is directed to the pre-purchased emergency generator manufacturers guidelines for installing an air-cooled generator with the radiator mounted on the engine skid.

Project delivery method shall be a single-source, design-build (D-B) approach with the D-B firm having in-house engineering and installation technicians. The industrial facility has its own in-house O&M staff. The company's vice president of support services shall have a 3rd-party owner representative to interact with the D-B firm and to provide a 3rd-party commissioning (Cx) and testing, adjusting, and balancing (TAB) consultant for this installation. The owner shall also retain a 3rd-party sound consultant to work with the D-B team project, beginning with pre-construction services through the entire design-build phases, documenting ambient outdoor sound levels before and after the generator project is completed to confirm the noise impact on the neighborhood.

The facility O&M manager will provide her own operating and maintenance staff assistance to the D-B's subcontractors and generator equipment manufacturers' technician at project startup. For this month's heating and ventilation design, the room will be thermostatically controlled with the outdoor air intake sized for the ventilation and radiator heat rejection air quantity. The air intake shall have a rain cap to minimize snow intake during the heating season as well as to prevent rainwater being introduced into the room. The radiator exhaust air will discharge into an exhaust air plenum with thermostatically controlled dampers to discharge directly to the outdoors. Also, a return air damper will recirculate this air directly overhead of the outdoor air intake for mixing and warming the outdoor air as needed based on the room thermostat set at 55°F. The D-B contractor shall also be responsible for the engine muffler installation and the discharge exhaust pipe terminating outdoors and away from any building air intakes.

Electrical shall be 480/3/60 with pre-wired electrical power to the existing switchgear, and the D-B electrical engineer will work with the facility's operation and maintenance group to assure automatic and safe transfer of electrical power from the new generator. The automatic controls for room heating and ventilation and generator ventilation shall be interlocked with the generator's own self-contained controls.

Design team shall include the H&V design engineer as the prime consultant with structural, plumbing, electrical, general construction, and estimating consultants. Prior to the completion of the concept documents, the industrial facility's 3rd-party consultant will have provided the D-B team with a building program and the Cx-TAB plan. Integral with the facility's standards will be the construction standards policy and procedure requirements when performing work on the building's infrastructure.

Once the concept scope of work is agreed to, the D-B team shall produce concept phase documents including a basis of design, system flow diagrams for H&V, electrical and automatic controls, and a guaranteed D-B cost including all soft costs (e.g., engineering) for owner review and approval. The owner, including owner representative/Cx-TAB consultant, sound consultant, and facility O&M manager will sign-off on these concept documents so that the D-B can begin this fast-track process.

In sync with the single-line drawings and associated sequences of operation, the CxTAB air balancer will produce a system flow diagram showing cfm and static pressure drops per sequence, e.g., 100% exhaust, 100% recirculation. This consultant's TAB plan shall be coordinated with the H&V design engineer to work in sync to produce an as-built TAB report.

The industrial facility manager shall have her O&M personnel review the documents and receive introduction training of the new equipment. This staff shall observe equipment startup, D-B contractor and subcontractors' punchlist, generator manufacturer's on-site performance test, and the commissioning system demonstration.

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

-Equipment submittals - Startup sheet - Troubleshooting sheets - generator performance testing process - O&M manuals, parts, and lubricants - ATC and electrical power management submittal including one complete ATC submittal integrating generator manufacturer's furnished ATC into an integrated overall ATC submittal.

The 3rd-party commissioning and testing, adjusting, and balancing (CxTAB) firm shall complete the following:

-TAB system flow diagram of entire ventilation system, with cfm and air static pressure indicated at each automatic damper, per sequence of operation.

-Commissioning functional performance test of the emergency generator, per sequence of operation.

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

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 H&V 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 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: (insert list) _____

HVAC CONTRACT SPECIFICATION CHECKLIST

☐ Division 1 Project Closeout ☐ Industrial Process Equipment ☐ Owner Furnished Equipment ☐ Structural ☐ Electrical ☐ Plumbing ☐ Fire Protection ☐ H&V ☐ Infection Control ☐ ATC ☐ Generator ☐ Pumps ☐ Chillers ☐ Fans ☐ Air Handlers ☐ Terminal Units ☐ Exhaust Piping System ☐ Sheet Metal System ☐ TAB ☐ Commissioning ☐ Others:_____

HVAC CONTRACT DRAWING INSTALLATION CHECKLIST

☐ Industrial Process Equipment ☐ Owner Furnished Equipment ☐ Structural ☐ Electrical ☐ Plumbing ☐ Fire Protection ☐ HVAC ☐ Infection Control ☐ ATC ☐ Generator ☐ Pumps ☐ Chillers ☐ Fans ☐ Air Handlers ☐ Terminal Units ☐ Heating & Ventilation System ☐ Exhaust Piping System ☐ Sheet Metal System ☐ Equipment Room ☐ Tel-Data ☐ Others:_____

HVAC STARTUP CHECKLIST

☐ Industrial Process Equipment ☐ Owner Furnished Equipment ☐ Structural ☐ Electrical ☐ Plumbing ☐ Fire Protection ☐ HVAC ☐ Infection Control ☐ ATC ☐ Generator ☐ Pumps ☐ Chillers ☐ Fans ☐ Air Handlers ☐ Heating & Ventilation System ☐ Terminal Units ☐ Exhaust Piping System ☐ Sheet Metal System ☐ Equipment Room ☐ Tel-Data ☐ Others:_____

COMMISSIONING FPT (Functional Performance Test)

☐ Industrial Process Equipment ☐ Owner Furnished Equipment ☐ Structural ☐ Electrical ☐ Plumbing ☐ Fire Protection ☐ HVAC System ☐ Infection Control System ☐ ATC System ☐ Central HVAC Air System ☐ Heating & Ventilation System ☐ Chilled Water System ☐ Generator ☐ Pumps ☐ Chillers ☐ Fans ☐ Air Handlers ☐ Terminal Units ☐ Piping System ☐ Sheet Metal System ☐ Equipment Room ☐ Tel-Data ☐ Others:_____