

# ENGINEERED SMOKE CONTROL IN A METRO TUNNEL RENOVATION USING CONSTRUCTION MANAGEMENT PROJECT DELIVERY

This month's Facility Files will focus on the Back2Basics test addressing the renovation of an existing Metro station with the addition of a new smoke evacuation system located within the building and within the subway's inbound and outbound tunnels. The associated ADA-compliant elevator will have its own stand-alone, engineered, smoke control, 100 percent outside air fan to a positive-pressurized elevator shaft system.

At the recommendation of the design team leader, the building owner has chosen the project delivery method to be construction management (CM) in accordance with Construction Management Association of America (CMAA).

A design team-CM team meeting will be coordinated so that the transportation system management and their independent owner's representative, the transportation system facility manager, the information technology (IT) engineer at the transportation system remote control center, the design team, the CM's project manager, and the CM's estimator along with a third-party commissioning and air and water balancing (CxTAB) consultant will review the design team's building program and the basis of design.

The team will review the *2015 ASHRAE Handbook — HVAC Applications*, chapter 11 (Mass Transit), chapters 36-43 (Building Operation and Management), chapter 53 (Fire and Smoke Control), and chapter 59 (HVAC Security). They should also read National Fire Protection Association (NFPA) 92-Standard for Smoke Control Systems for a complete understanding of ventilation, air pressure, and direction of airflow for this application. This information combined with the owner's own knowledge of operating mass transit facilities and the associated rail and bus systems will assist the team in understanding intricacies of owning, operating, and managing this building.

With all these design guidelines from ASHRAE, the owner's representative shall lead the discussion pertaining to specific building standards that need to be applied to this project as well as project scheduling/timeline. For the facility operation, with in-house staff and not an outsourced group, the staff will want to be assured there is adequate contract specification requirements included pertaining O&M, training, preventive maintenance work order system, and energy operating budget.

At the end of the Conceptual Design Phase CM project, the facility manager and a few of her O&M technicians, including the IT transportation system remote control center automation system operator, will want to contribute information to the design team member's writing of the contract specification. More specifically, the following activities should be included: training, service contracts, parts inventory, and as-built drawings requirements.

For the January B2B, the design-CM team working together as owner-designer-builder, based on a building program construction budget, the CM estimator will be involved in the design phase and be able to contribute to the contract documents to stay within budget

and on schedule. In the construction phase, the O&M technicians will want to revisit the issues noted earlier that were in the design phase.

Next comes the startup and commissioning phases, and the O&M staff will want to be proactive in following along with the CM team's mechanical-electrical in-house coordinator and the subcontractor's startup personnel and receive equipment and system training using the O&M manuals and contract drawings (that will eventually become the as-built drawings). **ES**

Once the startup has been completed, the automatic subcontractor, the owner representative, transportation IT personnel, and CxTAB consultant will complete the air balancing of the new supply air - exhaust air system. The HVAC/ventilation subcontractor shall go through an automatic control system initial dry-run demonstration prior to the CM project manager and job superintendent and their subcontractors demonstrating the HVAC system to the CxTAB consultant and O&M staff. The automatic subcontractor along with the IT personnel at the transportation remote control center will begin collecting system performance by trending pertinent space system and equipment data, including the following:

- Inbound and outbound tunnel space pressure
- Entrance and platform space pressure
- Outdoor air quantity
- Exhaust air quantity
- Pressure differential between affected smoke area and upper building entrance
- Alarms
- Offsite internet computer control interface
- Remote transportation system control center interface

Taking the same approach as the design engineering, the facility manager's personnel will use a series of computer-generated touchscreen project checklists that allows her staff to confirm that the following facility files have been collected. This process should start at the beginning of construction and not at project closeout so that the facility files can be inputted into a CMMS system. Touchscreen O&M checklists should include:

- Equipment shop drawings
- O&M manuals, parts list, and lubricants
- Troubleshooting tips
- Remote monitoring instructions
- Preventive maintenance work orders

The O&M staff should review the contractor-produced sheet metal field fabrication/field coordination drawings prior to fabrication. Touchscreen service checklists should include:

- Location of automatic dampers and volume dampers
- Fan motors
- Equipment and control devices
- Access for servicing equipment

The training process should include specific system ventilation and automation control training including the emergency plan training based on the commissioning plan basis of design document e.g., smoke condition alarm/scenario 1, scenario 2, etc. An air balancing report will be completed and as-built conditions updated after the final TAB report. This will require the TAB subcontractor to provide the air-balancing reports along with the associated system flow diagrams noting quantities and pressures for rebalancing if necessary as part of the project closeout documents. Touchscreen training checklists should include:

- Equipment
- System normal operation
- Each emergency operation
- Automatic controls
- Remote monitoring



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