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## Commercial Building BAS Energy Retrofit Design-Build Project

This month's Facility File will focus on the B2B March test for the commercial building energy retrofit HVAC application. The project delivery method is design-build with a guaranteed turnkey cost, so the D-B firm will assign a project manager with an energy management background to the project, along with an in-house HVAC and BAS engineering, technicians, and estimator staff to be involved in the design and cost estimate in the initial phase. The scope of work will be a basis of design meeting the owner's HVAC and electrical system requirements, utility company's requirements, and the O&M requirements.

It would be very beneficial for the building owner and her owner representative to read *ASHRAE Handbook 2015 — Applications* and read chapters 3 (commercial and public buildings), chapter 41 (building energy monitoring), chapter 42 (supervisory control strategies and optimization), chapter 47 (design and application of controls), chapter 59 (HVAC security), and chapter 61 (codes and standards) to be knowledgeable of ASHRAE's guidelines when preparing to authorize a design-build (D-B) firm to upgrade the buildings BAS.

This information, combined with the owner's own knowledge of outsourcing the O&M for a commercial office building, will assist the D-B team in understanding the intricacies of owning, operating, and managing this type of HVAC application. It is also a requirement that the D-B team coordinate the basis of design document with the building owner's security manager to contribute to a safer building energy management design.

In the initial D-B phase of the project, the owner representative will begin the process of outsourcing the building's O&M by soliciting a request for proposal and receipt of bids that will be reviewed by owner, owner representative, and the D-B firm's project manager.

The owner will require the D-B firm to provide a one-year, full O&M of the new BAS installation including the monitoring, trending, and reporting on BAS performance to document project success, as well as to provide the necessary energy reporting submission to the utility company project representative. The D-B off-site operation shall be the parallel tracking of daily BAS performance, along with on-site BAS equipment/system calibration while providing quarterly training to the O&M staff in the first year.

In the startup and pre-commissioning phases, the outsourced O&M staff will begin their on-site maintenance management contract and will be proactive in following along with the D-B's BAS technicians to receive BAS equipment, system, and computer training using the O&M manuals and contract documents (that will eventually become the as-built drawings).

Once the startup has been completed, the BAS technicians and the O&M staff shall go through the BAS initial dry-run functional performance test (FPT) demonstration prior to the D-B team demonstrating the system to the owner representative's third-party commissioning consultant. The BAS subcontractor should also begin collecting system performance by trending pertinent HVAC systems and equipment data by trending the following:

- outdoor air dry bulb and wet bulb temperature
- indoor air dry bulb and wet bulb temperature
- energy meters
- control points at existing central heating and air-conditioning air handling units
- hot water heating supply and return temperature
- control points at existing hot water boilers
- alarms
- security points

Taking the same approach as the owner representative, the owner's O&M personnel should use a series of computer-generated touchscreen project checklists that allow his staff to confirm that the following facility data has 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 the outsourced O&M CMMS. Touchscreen O&M checklists should include:

- equipment shop drawings
- O&M manuals, parts list, and lubricants
- troubleshooting tips
- seasonal startup and shutdown instructions

The O&M staff should review the D-B firm's BAS system flow diagrams and associated terminal points, field equipment panels, and contract drawings and specification prior to fabrication. Touchscreen service checklists should include:

- control points, ATC valves, and dampers
- access to this equipment and control points.

The training process should include not only specific HVAC and BAS system and equipment training, but also emergency and security plan training due to the HVAC security (e.g., IAQ threats and responses). Training should also include the preventive maintenance work order system to routinely assure continuous IAQ for the public. This will require the D-B firm to provide the energy reports along with the associated system flow diagrams, noting set points versus actual and adjustment as part of the project closeout documents. Touchscreen training checklists should include:

- equipment
- system
- emergency plan
- automatic controls
- energy management