Ways to Keep HVAC Projects on Track

Facility managers who know why complications arise with HVAC upgrades are in the best position to prevent problems

by Robert Austin

Major HVAC projects in existing facilities are noisy, disruptive, and notoriously challenging to deliver due to the added complexity of having to avoid disruption to existing occupants. In one extreme example, a hospital had recently taken over an existing property and hired a contractor to renovate mechanical systems to bring them up to code. This work was being done in phases, and the hospital occupied the facility after each phase was complete. Near the end of the project, the commissioning agent was on site to test the new systems.

One task involved verifying the operation of the disconnect at an air handler. The agent shut off the unit for a few moments, and then moved on to the next unit. Unbeknownst to the commissioning team, the unit they were testing served an operating room that was in use. At the same time that they shut down the unit providing air to the OR, the humidity sensor in the room indicated low humidity. This engaged the supply duct humidifiers. With no air movement in the supply duct, this resulted in a dense fog pouring out of the supply diffusers. The doctors conducting the procedure mistook this to be smoke, sounded an alarm, and removed the patient to another area of the hospital.

A worst case? Maybe. But there’s plenty of possible fallout that can occur when HVAC projects in existing facilities are not properly executed. To understand the common issues that cause these projects to jump off track, it’s important to identify the underlying causes and understand ways to mitigate or avoid them altogether.

Despite the challenges presented in completing HVAC projects in existing buildings successfully, these nine strategies can prevent problems, or mitigate the impact of problems that do occur.

1. Communicate with building occupants. In existing building HVAC projects, occupants may be impacted and are therefore stakeholders. Make sure that occupants are aware of the scope of work and the potential for disruption, and how to communicate quickly should any issues arise. This allows people to plan around potentially disruptive activities. Don’t assume that just because the team has worked to avoid an unplanned disruption of HVAC service, such a disruption won’t happen accidentally. It’s best to inform the occupants, even when it is unlikely they will be disrupted.

2. Insist on a realistic schedule using the critical path method in the proposal from contractors. Requiring contractors to submit a schedule up front with their bid will provide a sense of how well the contractor grasps the logistics that need to be navigated to complete the work. Also require contractors to provide a work plan with their bid, outlining the required resources and how those resources will be leveled across each task. Contractors that are unable to provide this are likely ill-prepared and have not given enough consideration to how they will keep the project on track. Reasonable float should always be incorporated in the schedule. Almost no existing building HVAC project goes as planned, and it is best to recognize and account for this up front. When a schedule is prepared, identify all work items that have the potential to cause disruption (intended or unintended). Whenever these activities occur, require the contractor to provide a written plan with specific means and methods for how these disruptions will be avoided. Review this with the project superintendent each day that potentially disruptive activities are expected to occur.

3. Obtain proper plans and specifications for the project. Remember: If it isn’t specified, the final equipment installed may not meet expectations, so it is essential to communicate with the contractor exactly what must be done for the project. Consider hiring an engineer to provide the plans and specifications. At a minimum, require the contractor to provide submittals for the equipment to be installed along with any pertinent sketches as part of their bid.

4. Develop a list of current facility requirements prior to a major upgrade project. The needs of any facility evolve over time. An area may have originally been designed to serve as a research space, but is now being used as an office (or vice versa). Upgrading a system provides a prime opportunity
When HVAC Projects Fail to Deliver

The most challenging HVAC projects tend to be the small to mid-size projects. Common issues:

**Occupants Are Adversely Impacted by Unplanned Disruptions.** Disruptions can take many forms. A tenant becomes irate because the air conditioning went down during an important customer presentation. Or a school is evacuated due to a “chemical smell” coming from the air conditioning vents. These represent nightmare scenarios that are caused by poor planning and communication.

**Project Fails to Meet the Schedule.** The most common issues include:

- Site access constraints and occupant interruptions were not properly built into the schedule. Most contractors build schedules assuming free, uninterrupted access throughout the facility. This is often unrealistic in existing facilities, time should be built in to account for delays.

- Job logistics and space constraints turn out to be much more onerous than anticipated. A contractor may plan a schedule assuming multiple crews working simultaneously. But the site may not be able to support that many crews without disrupting operations.

- Lack of coordination between trades. Most HVAC projects involve three contractors: mechanical, electrical, and controls. Facility managers will often opt to hire each contractor directly and act as the overall project manager without hiring a single prime or general contractor. This is usually to save cost. The disadvantage is that the facility manager may not have time to manage all aspects of the project every day, resulting in lapses in communication with the construction team that lead to delays.

**Scope and Specifications Are Not Adequate.** HVAC projects in existing buildings are often completed without formal design documents or submittal requirements. A scope may be written by a facility manager that expresses the intended outcome of the project, such as “replace air handler X.” The contractor is then left to interpret the intent and determine means and methods for completing the project. The result is often new equipment or controls that fail to meet the facility manager’s requirements. In most cases, this requires change orders to resolve. Similarly, key logistical parameters specific to the facility operation are not communicated to the contractor in the scope documents. Examples of logistical considerations that should always be discussed before a contract is signed for the project include:

- Contractor will only have access to specific areas during certain hours.
- Work deemed disruptive to facility operation must be completed after hours.
- Contractor is required to maintain comfort throughout the facility during normal business hours.

**New System Fails to Perform as Intended.** This issue is common in HVAC controls upgrades. If a facility manager is not experienced or trained on implementing a controls project, the result may be inadequate specifications, generic controls sequences, and poor system selection. The result is a system that doesn’t live up to the performance standard that the facility manager had in mind.

Sometimes a failure of a system to perform post-retrofit is caused by the dysfunctional systems that remain in place.

— Robert Austin

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to ensure that the newly installed equipment conforms to the needs of the facility as it exists today. This can also be a strategy for reducing cost if equipment can be downsized, which is another reason to hire an engineer for preliminary design.

5 Avoid “partial” upgrades wherever possible. Upgrading individual pieces of equipment, such as a fan inside an air handler, or doing a partial controls upgrade, can cause headaches for both the facility manager and contractor. If the economics of the project dictate that only certain work can be performed, be realistic with the expectations of how the system will perform post-retrofit. expecting the entire system to perform “like new” is not reasonable.

6 Specify any and all access and work restrictions in the scope of work. All requirements for accessing the mechanical spaces, as well as the mechanical systems that reside in occupied spaces (such as ducts and terminal units) should be specified clearly in the scope documents. Any requirements for equipment uptime and restrictions around maintaining comfort should also be spelled out. For example, if the system serves a data center that can’t go down during the work, the contractor needs to be aware that temporary self-contained cooling will have to be provided as part of the project. If it isn’t specified, the contractor assumes the facility manager will provide it. Specify what level of disruptive work would require after-hours completion.

7 Wherever practical, hire a third-party commissioning agent. This is especially true of controls upgrades. Commissioning is a quality control process that assures the contractor delivers a system that meets expectations, in accordance with the scope of work. The purpose of the commissioning team isn’t to cast blame, but to work collaboratively with the contractors and facility manager and ensure the project is successful.

8 Manage cutovers to the shortest period of time possible. The most critical stage of any HVAC project in an existing building is when the new systems will be brought online to replace the old systems, or the “cutover.” This is most common in controls projects. The best strategy is to have the contractor complete all staging, preparatory, and rough-in work for all the systems, and then consolidate the cutovers into a single period. This compresses the potential occurrences for disruption into a shorter period, rather than having them spread across the whole project.

9 Use “mock-ups” and bench testing wherever possible. When an installation involves typical fixtures that are to be replicated throughout the facility (such as terminal units being upgraded, or new controllers for all air handlers), it is advisable to complete one unit start-to-finish before moving on to the rest. This allows the team to work through issues in a manner that can be replicated at the outset for the remaining installations. Similarly, bench testing commonly occurs in controls projects, where a new controls program can be put through its paces in a simulated environment prior to being loaded into a new air handler or chiller controller. This is extremely helpful for avoiding unexpected issues that would otherwise occur immediately after cutover.

The theme that runs through these tips is that timely and consistent communication is the most beneficial means of avoiding issues in HVAC projects in existing buildings. Most issues can be avoided by having the facility manager and contractor work as a team at the beginning of a project to address potential issues, and ensure everyone’s expectations are consistent and all requirements will be met.

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