FEATURE

Educating laboratory users: Ensuring a better building outcome

An important contributor to the ultimate success of any lab construction project is the individual who will occupy and use the facility for many years to come. It is also important to choose a builder that specializes in lab projects and has learned the importance of thinking like a user throughout the project process.

Based on our extensive experience building numerous lab facilities throughout the US, we have recognized several core principles that support a user-centered approach to projects:

1. Engage maintenance staff in the design process.
2. Understand perceptions of cleanliness.
3. Recognize the importance of 'means and methods.'
4. Leverage the value of Building Information Modeling (BIM).
5. Support the concept of hoteling.
6. Access/clearance to maintenance zones.
7. Don't abandon the client.
8. Always look for new solutions.

Regardless of how steep their expectations may be, the ultimate aspiration of any lab project, of course, is to satisfy and serve the needs and preferences of all of its constituents. While virtually impossible to garner a 100 percent positive response from everyone who will interact with a completed project, we have found that users who understand these core principles are most likely to be satisfied with the outcome.

By Jim Contratto, Barry Sutherland

The design and construction of a new laboratory facility is, at its core, a highly collaborative process. A team of architects, engineers, builders and other consultants works closely with a client/owner over a period of many months to guide the project from planning and construction through occupancy and operation.

Beyond the formal project team, however, is another important contributor to the ultimate success of any laboratory construction project: the individuals who will occupy and use the facility for many years to come.

Although "users" do not typically play an active ongoing role in the planning, design or construction phases of a building project, their perspective is critical to guiding the process that will ultimately shape their work environment.

Builders that specialize in laboratory projects have learned the importance of thinking like a user throughout the project process. It is a fundamental part of our role to understand the values and priorities of those who will occupy a space, and to translate those aspirations into built form.

Conversely, we have also discovered that users who understand and are engaged in the building process are empowered to influence key decisions that directly impact their ultimate satisfaction with their completed facility. Because of their involvement, they also can explain and provide context for key decisions with their peers and staff after the project is completed.

While it is unlikely that a lead chemist, principal investigator or EH&S professional will have the time or inclination to spend large periods of time with a construction project team, making a commitment to learn about the process will help them understand – and influence – the factors that drive desired outcomes.

Ideally, users should be engaged at the earliest stages of the project, when primary goals are being established versus later in the process, when changes in priorities or direction will have a negative impact on cost and schedule.

Based on our extensive experience building numerous laboratory facilities throughout the US, we have recognized several core principles that support a user-centered approach to projects. When all project constituents understand and embrace these concepts, it helps drive a positive outcome for everyone:

ENGAGE MAINTENANCE STAFF IN THE DESIGN PROCESS

Understanding the processes and preferences of maintenance staff can

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have a profound impact on the quality of the space that users experience. For example, a lighting fixture perched 25 feet above floor level may be aesthetically pleasing and provide exceptional illumination to the space. The maintenance challenges of having to replace the light bulb on that fixture, however, may delay the activity, contributing to a negative user experience.

In another example, by engaging maintenance staff on a recent university laboratory project, we discovered that the university's standard cleaning solution discolored a sample of the handrail being considered for a corridor in the new building. Neglecting to conduct this test prior to purchasing and installing the handrail would have diminished long-term user satisfaction with the facility.

UNDERSTAND PERCEPTIONS OF CLEANLINESS

A laboratory will never be as clean as it is on its first day of operation. Bright, pristine white tile may look striking in a brand-new facility, but it will soon bear the blemishes of scuff marks, spills, and the repeated dragging of furniture and equipment. The selection of specific furniture and finishes should consider the long-term implications of those decisions, taking into account the day-to-day activities that will occur in the facility, as well as its public visibility and maintenance plan.

RECOGNIZE THE IMPORTANCE OF 'MEANS AND METHODS'

After the architect designs the space and specifies or recommends building materials, it is the builder's responsibility to identify the specific means and methods of construction.

For example, an architect might design a wall whose components include a masonry block adjacent to a concrete column. Alignment is key to the user's perceived quality of this wall system. However, because concrete and masonry each has different acceptable tolerances, alignment depends on a knowledgeable builder to recognize and make necessary adjustments to ensure the installation meets a user's aesthetic expectations.

Typically, we will invite the users to join us at design review meetings early in the project's life, where they have the ability to comment on the design from their perspective. We can then offer our viewpoint on constructability (or means and methods) issues.

LEVERAGE THE VALUE OF BIM

Progressive builders are embracing Building Information Modeling, or BIM, a process that is fundamentally reshaping the way buildings are designed and constructed. The collaborative BIM process uses a single system of three-dimensional computer models shared by the entire team throughout the project, instead of separate sets of two-dimensional computer-aided design (CAD) drawings.

Because BIM provides a digital representation of all physical and functional characteristics of a facility, it can improve overall accuracy, efficiency, communications and safety.

Specific examples of how BIM can benefit laboratory projects include:

Mechanical, Electrical and Plumbing (MEP) Prefabrication

BIM enables the offsite fabrication of the MEP system at the same time the foundation is being constructed, providing a higher quality, less expensive, faster and safer alternative to the traditional process of fabricating the MEP system onsite.

Clash Detection

The 3D nature of a BIM model enables the team to accurately identify unintentional interferences, such as pipes running into the HVAC system, so these issues can be resolved prior to construction. Given the complexity of a laboratory building, clash detection can dramatically reduce the number of controllable change orders, which can delay the project and increase costs.

Integrated Work Plans

BIM facilitates the creation of a single work plan to guide multiple members of the project team: architects, engineers, builders and sub consultants. As a result, quality control can be defined and managed by the professionals working in the field. At a window opening, for example (see Figure 1), an integrated work plan can guide the masonry contractor, sheet metal contractor and waterproofing contractor to ensure the numerous materials and systems that form the window function correctly and efficiently.

Although the primary benefit the laboratory user experiences when their contractor uses BIM is quicker access to the completed project, there are other ways in which BIM supports the user in the construction process, the most notable being visualization. By sharing the 3D model with the users, whether through real-time animations or still images, it allows them to visualize the various spaces and better understand how they will interact with them on a daily basis. Opportunities like these can help identify inefficiencies early, when minor changes can still be made to the layout of the space. It also allows us to better understand how the user plans on interacting with the space, knowledge we will use throughout the rest of the project.

SUPPORT THE CONCEPT OF FLEXIBILITY THROUGH HOTELING

Flexibility is one of the most desirable characteristics in a modern laboratory environment. As stated by Michael Reagan, vice president of architecture and engineering firm Stantec, in a recent *R&D Magazine* article, ''collaborative, interdisciplinary facilities that support and promote the sharing of equipment, technology, and resources are growing in popularity. Researchers want to modify their laboratories quickly, inexpensively, and without facilities personnel.''[1]

However, it should be noted that flexibility can be applied on both a micro and macro scale. At the micro or personal level, users can modify their space with flexible furniture systems. Flexibility at the macro scale includes redundancies in the MEP systems, moveable walls, readiness for building expansion