LaboratoryDesign Utilities

A 10-year journey

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Figure 1: The traditional model of DNA processing organized in a linear flow. Image: HERA Lab Planners

The Midwest can boast of a new 60,000-sf crime lab (which shall remain unnamed). Designed by Crime Lab Design (CLD), this facility has been a long time coming, and is a good reminder of the virtue of patience. Even in good economic times, the facility would've faced two significant challenges to begin with: First, justifying the project to a wary state government; and second, securing funding from that government. Those goals were successfully met—just in time to face the Great Recession of '08, which led to the project being delayed for several years. A project of this size would typically have a two-to-three-year design and construction timeline. Because of the economic issues, however, it extended over 10 years.

This article briefly looks at the 10-year process and some of the challenges faced by the design team. We'll review some of the lessons learned from "picking up right where we left off" after the project lay dormant for years. Although some of the circumstances were unique, themes common to most projects—such as providing flexibility for future growth and changes in technology, energy efficiency and the growing importance of materials selection—were present as well.

Milestones

Needs assessments are typically conducted well in advance of programming and design to determine ideal lab size(s), functional aspects of the labs, an appropriate cost of construction and a strategy to fund construction. For forensic projects, completing the needs assessment prior to starting the design process gives a better sense of the magnitude of current deficiencies; appropriate strategies for how to address them; and justification for the level of funding needed when seeking legislative approval for the project.

The choice in this case to combine the needs assessment with programming and design was unusual, especially for publicly funded projects—of more than 100 crime labs in CLD's portfolio, less than 10% were done without a separate needs assessment. It's more typical for the jurisdiction to have already made its case to the funding agencies and received their approval before starting the programming and design process.

Nevertheless, our journey started in 2004 with the needs assessment, programming and planning for the new facility. This pre-design work segued quickly into design and documentation, and funding was approved in 2007. However, as the recession deepened, the state elected to place all non-essential construction projects on hold, regardless of where they were in the design and construction process. It took more than three years for the project to be reinstated, with the intent of continuing the design phase from where it left off, at 50% complete. When the project restarted, the only changes made were updates to meet current building codes. The design was approved and put out to bid in early 2011, but a contentious bidding process led to additional delays. Ground breaking occurred in 2012, and the facility opened in 2014.

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Figure 2: The new model of DNA processing. Image: HERA Lab Planners

Lessons learned

Every project faces challenges and is presented with lessons learned. For this particular project, the recurring theme was how much and how quickly technology and "state-of-the-art" had changed while the project was on hold. It became clear during the final documentation phase that technological changes had resulted in new processes the building would have to accommodate.

1. One of the core departments in the new facility is DNA, a process which is constantly benefiting from new technologies.

The traditional model of DNA processing was organized in a linear flow, with a unique space for each stage. An investigator would work one sample through all stages of processing (Figure 1).

However, workflows have changed to improve efficiency and allow more samples to be processed in a day. The new model focuses each investigator on a particular stage of the examination process (Figure 2). Samples are passed to them, and then passed on to the next investigator for the next stage. The linear model has been replaced by a more efficient design, demonstrating that evolving processes impact design.

The new lab was designed for the traditional process, but processing is done using the new model. Redesign based on the new process wasn't possible, but additional biovestibules would've allowed the linear design of the traditional process to more easily accommodate the new process by providing for easier transportation of the samples between stages.

2. Collaborative research labs are introducing a number of new ideas into traditional forensic lab design.

The most widespread change is a shift away from fixed casework in favor of mobile casework systems and flexible equipment space (Figure 3). Equipment needs change as technology progresses, and mobile systems provide the ability to easily adjust, relocate or even remove benches as needs change faster and more economically than fixed benching. Mobile exam tables are especially helpful in a forensic facility, as evidence varies significantly in size and type, and a number of different analytical methods are used, requiring a highly adaptable environment.

Flexible equipment space allows equipment to be grouped by function, environmental requirements, security needs and more. Mobile tables can be part of this space, enhancing its usability by providing space for smaller equipment, as well as large, floor-mounted equipment.

While fixed casework offers easier installation of lab services at bench height, modifying it is a much more involved process when it’s time to renovate the lab. Mobile benches can be served by overhead service carriers, which allow for simpler retrofit of services when needed, although, as Figure 3 shows, access to the services may not be quite so simple.

Mobile systems make it easier to design with future changes in mind. However, mobile systems are more expensive than fixed casework, and funding limitations caused this project to use much more fixed casework than mobile.

3. Even as energy standards have steadily grown more stringent, the need for good lighting in labs remains constant.
Today, occupancy-based lighting systems allow occupants to turn the lights on manually, and the system will turn them off automatically. While the users can turn the lights off manually at any time, sensors will also turn them off once a room is unoccupied for a preset period of time, or when daylight levels in the room reach a certain level. Most current codes require automated control of light fixtures in lab buildings, whether through use of occupancy detectors, programmed schedules or both.

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Figure 3: Flexible research lab with mobile casework systems and flexible equipment space. Image: Patrick Coulie photo copyright Crime Lab Design

Energy efficiency is always a good thing, but automated systems make it easier to realize potential savings. This project's use of manually controlled, high-efficiency fixtures had a positive impact on energy use. Beyond a certain point, though, the best energy savings are achieved just by turning lights off.

4. Countertops are a critical element of lab casework systems.
Countertops can be exposed to damaging situations that may stain, gouge or chip them. Cleanliness for user safety and prevention of evidence contamination is a constant concern. For years, black epoxy has been the standard for lab countertops, but other colors have become more popular in recent years. While there's usually an initial cost savings in choosing black countertops—and the primary driver for using it on this project—other factors are increasingly in play. Black can be specifically requested to better facilitate certain lab functions, but it's no longer the default standard.

Many researchers prefer lighter colors, as they enhance light reflectivity within the space and offer better visual acuity, making for a more efficient work environment and enhancing productivity. Dark countertops absorb ambient light in the space, requiring higher lighting levels to make up for the loss of light, using more electricity in the process. Also, lighter countertop colors offer more aesthetic options in designing the lab environment, whether for functional reasons or purely to make a design statement.

Gray is the new black when it comes to countertops, with four of CLD's five most recent labs selecting the lighter color (Figure 4).

Material selections matter. Not only does the harsh lab environment require materials to resist chemical spills, physical abuse, extreme heat or cold and so on, but material choices can also affect operating costs, productivity and quality of the work being done.

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Figure 4: Material selections. Image: Michael Robinson photo copyright Crime Lab Design

Reflections
The past 10 years have seen a number of changes. Among those changes, the economy declined, and has since recovered; forensic processes have rapidly evolved, and will continue to do so; and forensic lab design has evolved to accommodate both new processes and those still to come.

Science technology is always moving quickly. As designers, we understand planning and designing for flexibility in the lab environment is essential to keep up with progress. However, higher initial costs for flexible systems require us to balance the initial costs with the longer-term benefits.

Energy efficiency can be achieved in many ways, and every bit helps. Advances in building automation technology are making ever-more significant savings possible while simultaneously reducing dependence on user involvement, discipline and actions in realizing those savings. Even where not specifically required by code, we should encourage our clients to take advantage of these advances.

Lab material selections are no longer just about durability. Carefully considered finishes can also improve the quality and productivity of the lab environment, simultaneously enhancing energy efficiency.

Take the time to reflect on your design decisions, to understand the importance of those decisions and the impact they will have on the occupants and the environment. Although this facility had already “aged” before its opening day, it’s successful in many ways and stands as a testament to the 10-year journey it took on its way to becoming a high-quality, productive forensic facility.

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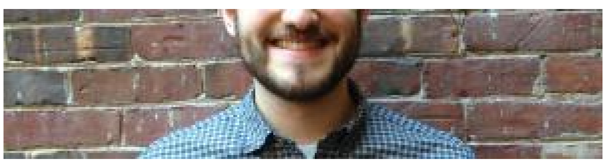

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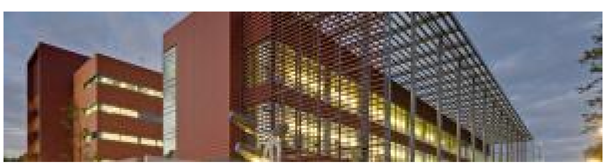

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