EMERSION DESIGN

FUNDAMENTALS OF LABORATORY PLANNING

BY STEVE KIMBALL

Life Sciences Market Growth

The pandemic has fueled tremendous growth in the Life Sciences Market. Life Sciences IPOs doubled from 2019 to 2020 and hit a record high of $11.2 billion in 2021. The Global Life Sciences market is anticipated to continue considerable growth between 2022 and 2026.

Global Real Estate Giant CBRE's April 2022 Life Sciences Report summarizes the enormous demand in the market impacting the need for laboratory, research, and clinical space. The report indicates that under-construction projects in the top 12 U.S. life sciences markets increased by 44% in 2021. New construction increased by nearly 42% with laboratory and research & development conversions growth at 49%.

The cost to construct a new laboratory building in the top three U.S. life sciences markets of Boston / Cambridge, San Diego, and the San Francisco Bay Area, range from $675 to $1,200 per sq. ft. Laboratory fit-out costs can range from $300 to $650 per sq. ft.

Current Market Challenges for Life Sciences Projects

According to Cushman & Wakefield's (Cushman) Life Sciences Practice Group, challenges with project planning have been exacerbated by current market conditions. Cushman's recent market data indicates backlog and supply chain issues continue to cause delays with:

- Audiovisual & security systems
- HVAC equipment
- Light fixtures, electrical service, & distribution equipment
- Doors, frames, & hardware
- Elevators

Cushman summarizes the unique market conditions, placing an increased emphasis on the engagement of **"...project management partners early in the process to plan, project, and potentially revise critical timeline strategies and goals."**

Importance of a Laboratory Plan

The life sciences market growth and current market challenges demonstrates both the need for and the importance of comprehensive laboratory planning. Speed to market, cost, growth, and flexibility for the future all underscore the value of investing in a well-thought-out laboratory plan.

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The development of a laboratory facility requires a significant investment in time, talent, and capital. In particular, the investment in time and talent should not be overlooked.

It is important that key research leadership be engaged through a focused effort with clear tasks, objectives, and goals that maximize the utility of their engagement allowing efficient and effective use of their valuable time.

The development of a well-conceived laboratory plan is a critical step to creating an efficient, cost-effective facility that maximizes workflow, space economy, flexibility for future growth, and change. Pressure to move quickly (time is money) can result in an incomplete laboratory plan resulting in a less than optimum project result.

Needs Assessment

The basis for laboratory planning and programming should begin with a fundamental needs assessment. Key elements of a comprehensive, effective needs assessment process include:

- Identify key stakeholders
- Develop goals and objectives
- Prepare an organizational needs statement
- Identify current use requirements
- Identify future use requirements
- Prepare a gap analysis
- Conduct an existing conditions analysis (when applicable)

Laboratory Project Program

Development of a detailed program is essential to establish the basis for any successful project. The complexity of workflow, laboratory processes, laboratory equipment, flexibility, environmental considerations, hazardous chemical use, waste disposal, visibility / privacy, and security associated with a research facility increase the necessity for the development of a comprehensive *Project Program*.

The Project Program process should be grounded in the strategic plan for your facilities. It should consider long-range growth and flexibility while prioritizing facility requirements for capital investment and maintenance.

While the fundamental elements of any laboratory program are the same, it should be noted that different fields of life sciences have varying demands for bench configuration, containment devices, lab utilities, support space, equipment density, safety, and other criteria. An interactive process with research leadership (each laboratory discipline) is critical in identifying key project parameters. This interactive process also involves collecting sufficient data to ensure the process, needs, and requirements of the research laboratory have been understood, documented, and recorded.

***Typical deliverables of a Laboratory Project Program include**:*

- Facility Assessment Report / Audit (when applicable)
- Facility Assessment Report / Audit Appendices (when applicable)
- Building General Construction Requirements and Recommendations
- Building Engineering Systems Requirements and Recommendations
- Detailed Program Data Sheets
- Programming Excel Spreadsheet
- Laboratory Equipment Schedule
- Laboratory Equipment Product Data
- Laboratory Equipment Vendor List
- Hazardous Materials and Chemicals Inventory
- Project Correspondence
- Action Item List

Laboratory Project Concept Plan

The laboratory planning process utilizes *Project Program* data to develop well-organized and coordinated spatial concepts that successfully address goals, functional requirements, and project parameters.

Concept plan development as a natural outgrowth of the programming effort is created concurrent with the *Project Program* to provide a complete set of *Programming and Planning Documents* that will serve as the basis for establishing the project schedule, Order of Magnitude Cost, and design / construction scope. Adequate space should be provided to accommodate laboratory components including chemical fume hoods and / or biological safety cabinets, laboratory benches, equipment storage, and workplace requirements.

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Each laboratory has unique characteristics that should be considered when developing a working "laboratory module." Facilities are typically organized into a "laboratory zone" and "personnel support zone." The physical relationship of the "laboratory zone" to the "personnel support zone" is dependent on the need for visibility, interaction, and observation. Safety, flexibility, and growth are key considerations.

As noted, flexibility and adaptability are key elements of good laboratory planning and design. Equipment and bench mobility are important elements of a well-designed lab when developed consistent with the requirements of fixed equipment, such as fume hoods. Examples of planning concepts surrounding flexible design include modular design, open laboratory design, careful consideration of laboratory furnishings, and the selection of utility systems.

Unique design considerations when planning laboratory space include security, flexibility, HVAC systems, plumbing / piping requirements, floor load, vibration isolation, interstitial space, floor-to-floor height, emergency power, building code assessment, and zoning.

The planning process should include the creation and assessment of alternate concept plans to identify pros and cons of each option. Presented as a methodology, this plan ensures that we arrive at the most effective layout and achieve the stated goals and objectives.

Typical deliverables of a Laboratory Project Concept Plan include:

- Concept Floor Plans and Options (when applicable)
- Concept Equipment and Furniture Layout
- Concept HVAC, Plumbing, and Electrical Plans
- Code and Zoning Analysis
- Concept Order of Magnitude Construction Cost Estimate
- Phasing Plan (when applicable)
- Project Schedule
- Updated Project Program Documents
- Project Correspondence
- Action Item List

Outcome

A *Laboratory Plan* provides the necessary information for leadership to develop next steps and move forward with a capital plan complete with timeline, phasing requirements (when applicable), and budget considerations (construction, equipment, owner furnished items, and soft costs).

"If you don't know where you are going, you'll end up someplace else." *~Yogi Berra*

About the Author:

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Steve has over 40 years' experience with business leadership and project management. Prior to co-founding emersion DESIGN, he was the President and CEO for a 100-person architectural – engineering firm with offices in Ohio and Florida. He has an extensive 30-year history of managing projects such as campus master plans, office buildings, computer centers, research and testing facilities, healthcare facilities, labs, university academic buildings, and engineering centers. He has been the lead Project Manager and Principal for projects ranging from $100,000 to $250 million and has managed the design of over $1 billion in construction.

emersion DESIGN, located in Cincinnati, OH is a collaborative architecture, interior design, planning, structural engineering and sustainable design firm driven by a passion for exceptional designs that advance clients and society.

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