Cost Considerations in Lab Construction vs. Office Construction
As more emerging and expanding businesses find the need for research space, there is a great opportunity for developers to create leasable, flexible lab facilities in attractive markets that can appeal to various prospective tenants.

There are a number of key factors that drive the costs of these projects that are different, and sometimes more complex, than those for a traditional office facility. To achieve greatest value and highest quality, developers should consider the following cost drivers that make lab facility construction costs unique and more complex than office facilities.
Major cost driver #1: Heating, ventilation and air conditioning (HVAC) systems

HVAC cost drivers vary, depending on a lab’s purpose and what materials are handled there. Labs generally fall into two categories: wet and dry. Wet labs—most common in the life sciences industry—require specialty ventilation systems to ensure the safety of users and visitors. The majority of a wet lab’s programming cost consists of the volume, treatment and control of the air that gets moved through the lab space. While a significant amount of the air distributed through an office building can be returned and recirculated, this is not the case in a wet lab. Air must be fully exhausted to the outside. This significantly increases the air handling elements of the project, including supply and exhaust systems. Additionally, the risk of trace contaminants in the air require special filtration systems and floor-mounted fume hoods.

Lab exhaust systems are also typically ducted with high-grade metal products, such as stainless steel, instead of the traditionally used galvanized sheet metal. They also must be exhausted at a high velocity, which requires specialty dilution exhaust fans and exhaust stacks.

Other potential specialty HVAC systems required for labs include:

- Air control boxes
- Ventilation control systems
- Clean steam systems
- Sterilization equipment
- Specialty services for lab equipment cooling
- Separate chillers or exchangers

The size and type of air handler units needed is dependent on how much outside air needs to be introduced to the space to exhaust hazardous materials. Of course, as mechanical system requirements expand, the space needed to accommodate the equipment grows as well—not only in terms of floor space but also vertical shafts and above-ceiling space.

Mechanical systems are typically simpler in dry labs, since hazardous chemicals, biologicals or other potentially harmful liquids are not usually handled there.

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Major cost driver #2: Plumbing systems

Plumbing requirements for lab programs vary based on how chemicals, biologics and other hazardous materials are used within the space. These uses will drive decisions made on a number of various specialty plumbing systems.

Wet labs require a number of different specialty plumbing systems. One of the largest investments in wet labs is often a high purity water system, such as reverse osmosis water, de-ionized water or water for injection. These systems often must undergo a rigorous commissioning and validation process to meet quality standards set by agencies, such as the FDA.

Additionally, other water applications may be needed to meet the significantly increased usage point loads required by unique elements, including safety showers, eyewashes, lab bench sinks, fume hood cup sinks and autoclave systems.

Other specialty plumbing systems you won’t normally find in an office building include:

- Specialty lab gas distribution systems, such as nitrogen, argon and helium, among many others
- Liquefied bulk tank farms with an evaporator
- Compressors
- Vacuum pumps
- Nitrogen generators
- Filters and dryers, coupled with air compressors
• Waste treatment and collection equipment
• High-grade piping systems, such as stainless steel or polypropylene
• Tanks, pumps, ejectors, agitators, digester, etc.

HVAC and plumbing systems represent 14 percent of the total cost of developing an office building. With a wet lab building, that percentage jumps to 22 percent. A dry lab has few, if any, specialty plumbing systems, which typically lowers cost.

**Major cost driver #3: Electrical systems**

The cost of electrical systems in labs vary based on type and usage. For example:

• A dry computational lab has more intensive power and datacom requirements
• A complicated wet lab with extensive mechanical requirements and laboratory equipment has escalated power requirements
• Labs that perform studies that must remain uninterrupted require redundant power, detailed power monitoring and larger uninterruptible power sources
• Wet labs, vivariums and biosafety labs need raceways and other specialized equipment to meet more stringent requirements

Lab use and size drives electrical service and switchgear size, as well as the need for motor control centers and a greater distribution of medium and low voltage service panels and transformers throughout a facility. It is not uncommon for the load on a lab building to be two to three times that of a comparably sized office.

**MEP systems account for one third of the total cost of a greenfield lab project and up to two thirds of the fit-out cost.**

**Major cost driver #4: Lab architecture**

Unlike an office, where the architecture is typically focused on the building’s exterior expression and the efficiency of its interior core, a lab building’s exterior design can be simpler with more of an emphasis on efficient interior flow with optimal lab to office ratios.

• **The structure**: Labs typically need a stiffer, heavier structure to support the larger interior loads as well as to minimize vibration and movement. The structure also requires greater floor-to-floor height spans to accommodate above-ceiling, specialty MEP systems. If converting existing office space into lab space, structural framing will need to be reinforced to support new floor openings and slab infills for new vertical shafts and risers for MEP system upgrades. Additional steel and dunnage support may also needed for new MEP equipment.
Building envelope: In contrast to the structure, the envelope of a lab building is less costly than a traditional office building, since offices usually have a more expansive curtain wall area and attractive feature elements to improve the building’s marketability. Additionally, a lab’s hard surface-to-glass ratios improve due to the interior layout within the perimeter labs. However, labs often have a greater skin-to-floor ratio versus offices because of the expanded floor-to-floor heights. So, while the cost per square footage of a building envelope for a lab may be less than that of an office building, it is partly or fully offset due to its greater surface area.

When it comes to the roof, cost is often driven by the extent of roof-mounted equipment and the required pipe and equipment support flashing and penetration waterproofing. If the lab equipment is located in an enclosed mechanical penthouse, costs decrease. If the mechanical equipment is mounted on the exterior of the roof’s surface, costs can be much higher.

Interior construction and finishes: A lab space must have harder separations between adjacent spaces than an office building, leading to a higher density of partitions in a lab. These partitions are usually a mixture of drywall and glass, depending on the lab types and whether or not a clear view in and/or out of the lab is desired. Other interior cost drivers include impact and/or chemical-resistant doors; custom metal and millwork applications; high-grade, chemical and moisture-resistant flooring; water-resistant paint finishes; washable ceilings; and wall and ceiling finishes.

Some labs, such as vivariums or ultra clean spaces, require highly specialized equipment. These requirements can significantly drive up costs, sometimes by 30 percent or more.

Major cost driver #5: Lab equipment and casework

It is common for a lab’s construction budget to include equipment fit-out and both fixed and moveable casework. This isn’t always the case in an office building, where tenants are often left to establish and set their own furniture. Casework in labs can vary in price, depending on factors, such as countertop surface material or other improvements. Wet lab casework costs more due to the requirements of lab sinks and associated lab gas outlets, ceiling-mounted shelving, etc.

Labs are also equipped with specialty fume hoods or biosafety cabinets that allow the researcher to safely experiment with potentially hazardous compounds in a negative air environment. Hoods range in price, based on what they are designed to do but generally range from $12,000 to $20,000, furnished only. The number of hoods and cabinets needed in a lab space is driven by the lab’s function.

Some labs, such as vivariums or ultra clean spaces, require highly specialized equipment, including cages, cage wash systems, automated watering systems, sterilizing equipment and more. These special requirements can significantly drive up costs, sometimes by 30 percent or more.

Equipment and casework accounts for 6-17 percent of a lab project’s total cost versus just two percent for an office building project.

Lab Build-outs in Existing Buildings

As one of the largest life sciences builders in the United States, Skanska is often asked about the biggest differences between lab and office buildings and what factors must be considered when studying the feasibility of such a conversion.

We recognize that converting an office building to lab is not a one size fits all process. There are countless scenarios and types of lab spaces that have unique, specified requirements. Working with a partner like Skanska early to understand the complexities and key conversion points of a given building will help reduce stress and the potential for errors (which can be cost and time draining). Armed with this crucial knowledge around the key attributes of their buildings, developers can then market their spaces to maximize the potential of their facilities and attract the clients they hope to secure in any market.

See cost per square footage charts for labs and offices on the following page.
Lab Construction (Greenfield)
$/SF Range by Major Building System

% of Total Cost by Major Building System

Office Construction (Greenfield/Open Concept)
$/SF Range by Major Building System

% of Total Cost by Major Building System

Key
- Superstructure
- Building Envelope
- Interior Construction
- Mechanical and Plumbing Systems
- Electrical Systems
- Equipment/Casework (Excluding Furniture)
- Median (examples)

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Renovations: Basic Fit-out Costs with Add Ons

Building owners are increasingly interested in the possibilities of converting or repurposing the use of office space into lab space. By way of an overall example, the chart to the right characterizes the cost per square foot ranges that could likely be anticipated for such work. A basic lab fit-out cost can be two to four times the cost per square foot of an office fit-out, and can often be compounded by the need to invest more into the base building infrastructure to support the systems needs of a lab.

The demand for lab space has exceeded the current inventory of available labs, leading to building owners and developers exploring conversion options.

Developing Budget Certainty with Skanska Metriks™ Benchmarking

Traditionally, building costs evolve alongside the design. As a result, project teams are often forced to compromise the building’s appearance or functionality to remain on budget. We developed Skanska Metriks out of the need for a better roadmap to the design-to-budget process. Metriks™ empowers us to look beyond costs and dig down into the minutiae of your project’s design to ensure you’re maximizing your budget. Comparing your plans to 400 specific, quantified attributes harvested from similar science and research facilities in your region, we will evaluate the results and identify materials and systems that offer enhanced efficiency and the best possible value. With Skanska Metriks, we will help you make the most of your investment.