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Infusing new energy into aging industrial facilities

by Jeff Willis in conversation with Jennifer Wegner

Transforming century-old chemical plants with modern design solutions revitalizes infrastructure for efficiency, safety, and a sustainable future.

Years of planning and design underpin the delivery of heavy industrial chemical and process plants. Ideally, this due diligence translates into sites that will stay active for many decades. Through the years, owners will update plant infrastructure and technology to improve their efficiency and output, but these efforts likewise require enormous effort and capital. A more attainable, but still meaningful, improvement opportunity lies in updating a plant's vertical construction. These structures, which can include offices, control buildings, laboratories, clinics, maintenance facilities, and security areas, are occupied by essential personnel.

As an owner, you can modernize these elements to commercial or corporate building standards by contracting the work out separately from the industrial retrofits or by asking your engineering, procurement, and construction (EPC) contractor to subcontract the vertical construction scope. Either delivery approach can offer a quick and cost-effective win for you and a more comfortable and productive space for your workers. Instead of overdesigning these facilities to an industrial standard, an architecture firm can provide the robust blast resistance needed while achieving a commercial standard that uses finishes and furnishings suitable for heavy traffic and exposure to harsh materials, such as oil and dirt. According to Page principal and Mission Critical Sector leader Jeffrey S. Willis, PE, CCP, LEED AP, "your facility should help attract, retain, and support the brains of the facility—namely the personnel overseeing plant operations. It should also emulate the sustainability and energy efficiency values of the company."

Why the rules matter

At the start of any renovation or new construction project, you and your architect must establish objectives and performance requirements. "We'll typically conduct a site or facilities assessment with an eye on energy efficiency and resilience to environmental factors, such as coastal storms and flooding," Willis says. "We're also familiar with American Petroleum Institute (API) standards for industrial sites and personnel protection and safety, such as the API Recommended Practice 752: Management of Hazards Associated With Location of Process Plant Permanent Buildings."[1]

But at the end of the day, vertical construction must follow current building codes and standards. These include the Americans with Disabilities Act (ADA) and the International Codes (I-Codes), which cover structural, mechanical, electrical, plumbing, and life safety systems.[2] Though industrial plants and authorities having jurisdictions (AHJ) may have in place a formal or informal agreement that plant maintenance and repairs are exempt from code review and inspections, you must still comply with your jurisdiction's regulations. Additionally, licensed architects and engineers are ethically and legally

bound to conform to building codes regardless of whether a site is industrial exempt. “Despite what an owner may think or if it adds a little inconvenience to the project,” Willis says, “we still have to design to those regulatory standards.”

These standards are critical to ensuring the health, safety, and welfare of building occupants. Though your workforce might currently comprise individuals without visible disabilities, one in four Americans will experience a disability before retirement; you may also have visitors, such as inspectors or investors, who need accommodations.[3] “Complying with regulations is relatively inexpensive at the front end of construction,” Willis says, “but they are certainly expensive to do after the fact—and even more so if lawsuits are involved.”

How design quality pays off

Codes and best practices for commercial construction are largely conservative in their prescriptive requirements, calling for proven, commercially available building technologies. For example, the infrastructure of decades-old plants often use motor control centers. Updating these systems to meet code is straightforward because the technology has vastly improved over time in the form of modular electronics systems and variable speed drives. “The technology is going to be something that everyday maintenance and operations folks can maintain on a routine basis,” Willis says.

Your updated facilities will also provide the appropriate interior air quality and lighting conditions for different program areas. “For laboratory and analytical operations, you may want consistent and controlled lighting,” Willis says. “In control rooms, you may want circadian lighting to keep third-shift workers alert.”

For corporations with sustainability targets, architects and engineers can identify opportunities for reducing the embodied carbon of construction materials, such as using cement substitutes or steel with a high recycled content.

Case in point

When a refinery reached out to Page to update its aging laboratory facility, the firm made a creative recommendation. “The laboratory needed to be blast protected, but at that point, it lacked any rating,” Willis says. Its infrastructure was so old that personnel could not confidently isolate or shut off pipelines transporting different process gases in emergency situations.

Willis and his team proposed building a new laboratory at the site perimeter. “Because of the additional distance away from the refinery,” Willis says, “the blast resistance requirement for the facility was much lower, which saved significant money in construction.”

The new laboratory met corporate design standards and solved a “pack-ratting” issue that had filled the old facility with underutilized equipment and shelves of expired chemicals. “These facilities were

created before some of the National Fire Protection Association's laboratory standards were written," Willis says.[4] By helping personnel track and control the amount of chemicals stored on-site, "the new facility creates a much safer environment for personnel," he says. "They can focus more on the work that's in front of them."

Cost transparency

The additional coordination required to bring a project team and construction workers on to critical infrastructure, high-security sites can translate to a 25% to 35% project premium. However, the end result can prove the investment worthwhile. Willis describes a site with significant intellectual property restrictions that resulted in personnel spending their workdays locked inside individual offices. "This hurt collaboration and their ability to communicate effectively," he says.

In its renovation design, Page introduced finishes and fixtures that warmed and enlivened the facility, drawing people out into common areas. "It was a drastic improvement from the 1970s setting to a 2025 environment," Willis says. "The transformation made them proud to be in their facility."

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