from aircraft hangar to advanced power and thermal research lab

BY: STEVE KIMBALL

Building 23 at Wright-Patterson Air Force Base was originally constructed in 1934 as an aircraft hangar and aircraft component test facility. While it had many uses over the years, it had languished and sat abandoned. But, the leaders at WPAFB had a vision to convert this historic structure into a 53,000 square foot modern laboratory facility, where state-of-the-art research could be conducted for energy, power, and thermal management to support current and future Air Force applications.

emersion DESIGN, as part of a design-build team with Messer Construction, was tasked to provide design services for the envisioned Advanced Power and Thermal Research Laboratory, which would provide spaces for materials processing, data acquisition, clean room operations, dry room operations, and fabrication facilities. The architectural design needed to maintain the historical nature of the existing building while constructing a new three-story facility within the existing brick shell. An enclosed bridge would provide additional access from the third floor of the new facility to the second floor of an existing building. All of this had to be accommodated, while also ensuring high levels of security access were designed throughout. An additional requirement was special acoustical and isolation design to address the nature of vibration sensitive equipment such as lasers and optics. emersion's engineering team was also engaged for HVAC, plumbing, steam, lighting and power distribution, communications and security, utilities, storm drainage, supporting spaces. The facility also includes mechanical rooms, electrical rooms, communications rooms and a passenger/service elevator that accommodates laboratory equipment.

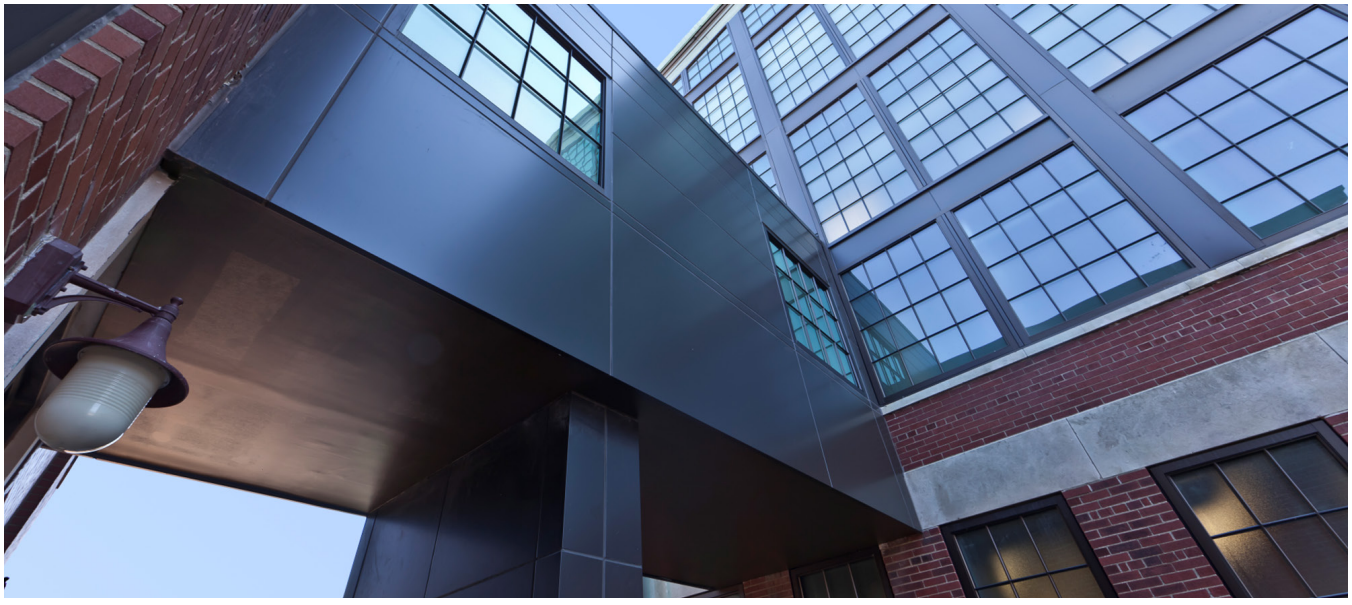
The architectural design needed to maintain the historical nature of the existing building while constructing a new three-story facility within the existing brick shell.

To meet the design for LEED® (Leadership in Energy and Environmental Design) Gold level certification, the building incorporates sustainable design including Brownfield Redevelopment (asbestos abatement), alternative transportation, water efficient landscaping (no irrigation), water use reduction to 40%, optimizing energy, enhanced commissioning and refrigerant management, construction waste management, recycled and regional materials, certified wood use, increased ventilation, construction IAQ management plans, low emitting materials, controllability of lighting systems, and thermal comfort design. The design/build was able to develop additional credits (at no cost to the government) to achieve a LEED Gold rating.

"We were humbled to help the future vision of Building 23 come to life," said Steve Kimball, principal and leader of the Science & Technology practice at emersion DESIGN. "Preserving this important piece of Wright-Patterson's history, while also creating a state of the art research laboratory was an incredible experience for our team. To think we helped contribute to the work happening there is incredibly gratifying."

The lab has already partnered with the University of Dayton Research Institute and Universal Energy Systems for research and development projects. The Army, Navy and the Defense Advanced Research and Projects Agency also now utilize the lab by sending scientists to solve power and thermal problems on everything from ships to Humvees.

The design of the Advanced Power and Thermal Research Laboratory has received numerous honors including the Federal Energy & Water Management Award as well as the USAF Design Award.



But, the laboratory advancements at Wright-Patterson were far from done. Shortly after completion of the Advanced Power and Thermal Lab, the decision was made to rehabilitate Building 19, another historic landmark. This renovation would create a new Systems Integration Laboratory to evaluate new technology of critical systems and components under flight conditions. And, the preservation of historic structures and transformation for new spaces continues.

To date, emersion DESIGN has supported both the renovation and/or construction of 67+ facilities at Wright-Patterson Air Force Base. "We are fortunate to possess a unique combination of skills," said Kimball. "From our deep understanding of the technologies driving the workspaces, to the stringent security requirements needed for the facilities, we've built the knowledge required to preserve the historic structures, while planning for and designing the new spaces. This long and respectful relationship we've developed with the leaders at Wright Patterson Air Force Base has created wonderful opportunities for our team not only to design exceptional buildings, but also show support for the military through our work every day."

about the author

steve kimball
PMP, LEED AP

Steve is a co-founder of emersion DESIGN and the Science & Technology Client Leader. He has managed over $1 Billion in construction projects with expertise in specialized facilities including laboratories, research and development, highly secure buildings, advanced manufacturing, and innovation district master plans. His leadership propels emersion to fulfill its mission — to advance clients who advance society.

Connect with Steve for any planning or design needs.

steve.kimball@emersiondesign.com