From Data to Design

Corcoran Modernization Relies on "Data Ecosystem"

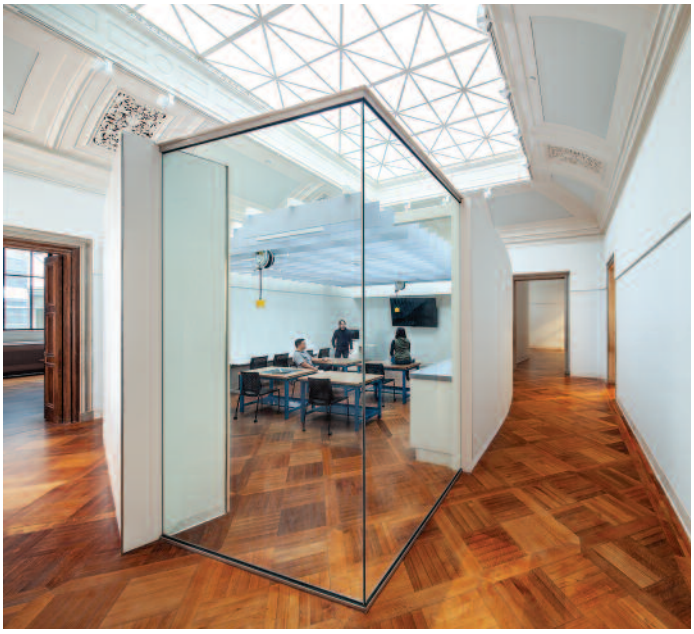
by Steven Gillis and Karen Schulte

A challenging renovation recently transformed George Washington University's Corcoran School of the Arts & Design into a vibrant, modern educational and exhibition setting for the arts. The historical Beaux-Arts building, originally constructed in 1897, now features renovated classrooms and studios, fabrication and exhibition space, new HVAC and plumbing systems, updated fire-suppression and life-safety systems, and accessible ramps, restrooms, and elevators.

Located across from the White House, the Corcoran building has long served as a Washington, D.C., architectural landmark. Ernest Flagg designed the building in the classical tradition of grand European galleries, with a large central atrium, or colonnade, featuring arrays of Doric and Ionic columns and elegant Neoclassical details. The building was placed on the National Register of Historic Places in 1971, with many of its interior spaces landmarked in 2015.

George Washington University purchased the building in 2014, recognizing that the 169,600-gross-square-foot facility, which had never undergone a major renovation, would require significant rehabilitation to meet modern code, the *Americans with Disabilities Act* (ADA) of 1990, and educational programming requirements. The modernization would also need to meet stringent standards for light quality, temperature, and humidity control from the National Gallery of Art, which would continue to host exhibitions within the historical galleries.

RON BLUNT PHOTOGRAPHY



The Corcoran School of the Arts & Design now features light-filled, contemporary spaces for instruction, as well as expansive galleries for displaying works of art.

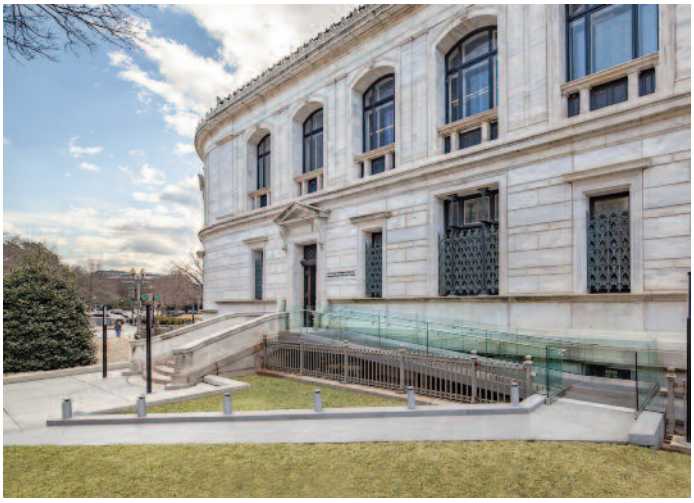
Revealing Layers of Building History

The university selected the architecture firm of LEO A DALY to lead the renovation design, with Mueller Associates for mechanical, electrical, and plumbing engineering; Davis Buckley Architects for historical preservation; GHD for the design of fire-suppression and life-safety systems; and Silman for structural engineering. The Whiting-Turner Contracting Company served as the construction manager.

When the modernization project commenced in early 2015, the design team immediately faced a significant dilemma: a complete lack of records regarding the building's original design and construction. With no original or as-built drawings available, the team would be challenged to incorporate large mechanical systems and devise plans to modernize and reconfigure spaces to realize the university's vision for contemporary education and events.

Under the design leadership of LEO A DALY and Mueller, the team viewed the challenge as an opportunity to create a detailed "data ecosystem" that would address many of the building's mysteries and guide the renovation, preservation, and modernization design. Five data-collection methods—reflecting the latest technology in building analysis—informed the development of a comprehensive 3D building information model:

- Laser-scanning and point-cloud-model assembly to create a comprehensive picture of the building's interior construction
- Hygrothermal wall analysis to measure the effectiveness of the wall material as an insulator (U-value)



RON BLUNT PHOTOGRAPHY

Built in 1897, the historical Beaux-Arts building was in need of a major modernization to enhance systems, improve accessibility, and create state-of-the-art classrooms, studios and galleries.

- Computational fluid dynamics modeling to aid in the design of the mechanical systems
- CCT camera surveying within pipe interiors to assist in locating and determining the condition of the existing below-slab piping for the plumbing systems
- Ground-penetrating radar (GPR) scanning for the floors, to assist in locating the main structural components and identifying locations for additional supports

Incorporating New Systems: Solving the Spatial Puzzle

Solving the puzzle of how to fit the new, larger mechanical equipment into the minimal space available within the building was central to successfully installing the new systems to meet current energy codes. Space was extremely restricted in the attic, and equipment placed there could not be allowed to block natural daylight into the galleries, or create shadows that would affect the viewing of art in the exhibition areas. Equipment was carefully threaded through the attic in the limited places that are outside the view planes of the original lay lights and skylights in the historical structure.

In addition to the attic constraints, a sightline easement prevented the installation of a large mechanical penthouse on the roof. Mueller's solution was to infill a three-story courtyard with a multi-level equipment platform to house multiple air-handling units, a generator, and an egress stair tower that allows access for maintenance. Below the elevated platform, outdoor units associated with a variable refrigerant flow system with heat recovery serve the basement studios and classrooms, along with outdoor dust-collection units for the sub-basement metal and wood shops.

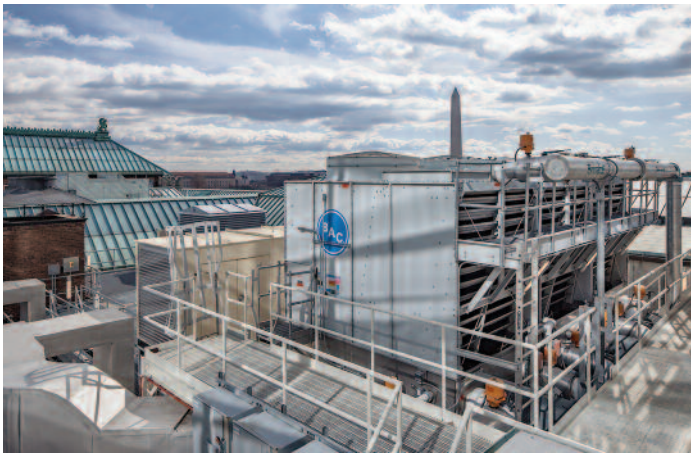
The first elevated platform level accommodates three air-handling units with exhaust-air energy recovery, also serving the basement and sub-basement academic and shop spaces. At the second elevated platform level, a large VAV-type air-handling unit with exhaust-air energy recovery serves the first-floor academic and atrium spaces, which include an auditorium, seminar rooms, galleries, and additional studios. The top elevated platform level accommodates a gas-fired emergency generator and provisions for future air-handling units.

Another challenge the team confronted involved maintenance of the building's existing power, as it remained occupied while new electrical systems were installed. To solve this piece of the puzzle, a new main switchboard was installed adjacent to the existing main switchboard in the sub-basement. Existing electrical service entrance conductors were removed, and new conductors extended to the new switchboard.

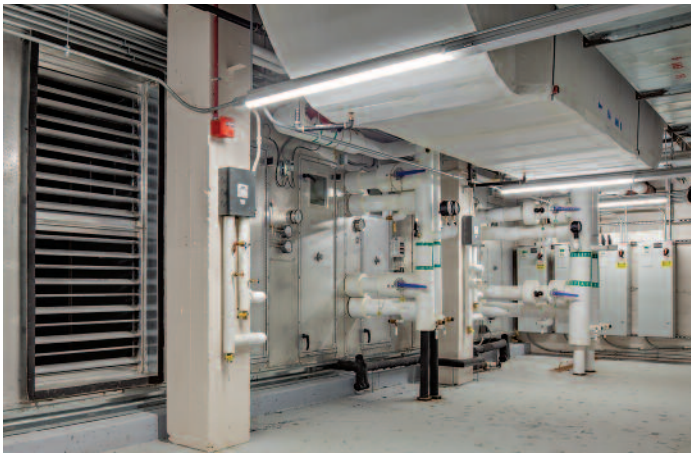
The existing switchboard was temporarily supplied from the new one and, as portions of the building were renovated and associated power-distribution systems replaced, the existing feeders from the old switchboard were removed. Ultimately, the old switchboard was no longer required, and was removed. All existing power-distribution equipment was removed and replaced as the various areas of the building were renovated. Two dedicated electrical closets are located on each floor. A new direct-digital building-automation system for control and monitoring of the new and existing HVAC systems was also provided, and was integrated into the campus supervisory control and data acquisition system.

An additional challenge involved the building's century-old plumbing system. With limited existing documentation, the Mueller team conducted a series of extensive pipe-camera surveys of the interiors of the building's pipes. From the results, the design team could better understand the location and condition of the existing piping. Most critically, these surveys assisted the team in determining the piping's distance below the building's slab, preventing unnecessary—and potentially destructive—construction to the building's historical fabric.

RON BLUNT PHOTOGRAPHY



The top elevated platform (left of the roof-mounted cooling tower) accommodates a gas-fired emergency generator, a common outside-air louvered penthouse, and spatial provisions for future air-handling units.



RON BLUNT PHOTOGRAPHY

An enlarged sub-basement mechanical room accommodates a custom 30,000 CFM air-handling unit with a remote energy-recovery ventilator (not shown).

Reimagining an Iconic Building for a New Era

The renovated historical galleries and spaces within the Corcoran now serve as active learning areas, specialized studio environments, labs and classrooms, while expansive gallery space for works of art also continues throughout the building's main interior. In preserving this iconic architectural landmark, the modernization has prepared the building for a new era of use, engaging students and visitors in the Corcoran's ongoing legacy of art instruction, enjoyment, and patronage.

"The success of the Corcoran project is a great example of teamwork between the client, contractor, and design team to make the right project decisions," says Andrew Graham, AIA, senior architect with LEO A DALY. "The competing complexities of schedule, cost and historical fabric meant that no one entity could always make the best decision. The decision-making was a careful, iterative process, with open communication, to make sure that we accomplished the right goals moving forward. This process of collaboration is great example of design thinking." 🏛

Steve Gillis, PE, is a vice-president and project manager with Mueller Associates. He can be reached at sgillis@muellerassoc.com
Karen Schulte, PE, CPD, is a mechanical engineer specializing in plumbing systems with Mueller. She can be reached at kschulte@muellerassoc.com.