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Preserving U.S. History One Laser Point at a Time

D.C.'s 220-year-old Octagon now lives forever in the cloud thanks to an elite preservation team

True Design Services captured the historic Octagon in Washington, D.C., using a FARO® laser scanner.

Situation

The Octagon stands a stone's throw from the White House, nestled in the sheltering embrace of the towering American Institute of Architects national headquarters that surrounds it. The 220-year-old three-story brick structure scarcely hints at the history its walls have witnessed.

Like that six-month period back in 1814 when it served as the temporary White House, after British troops torched the real one. Or, just a few months later, when it hosted President James Madison in the historic signing of the Treaty of Ghent, ending the War of 1812. Nearly a century later the AIA purchased it as their headquarters, and the organization occupied it for more than 70 years.

Today it's the headquarters of the Architects Foundation, the philanthropic arm of the AIA. The glass and steel giants surrounding it now dwarf its once commanding presence in our nation's capital. The shadow this modest brick structure casts over U.S. history and architecture is a vast one and recognized as such as a U.S. National Historic Landmark.

Helping keep the Octagon operating in top condition into its third century and beyond is a team headed by Marci Reed, executive director of the Architects Foundation. "We're trying to keep the building vital in ways that one, demonstrate the value of architecture to culture, and two, tie the design spirit of the Octagon to future generations of architects and the significant spaces and places they'll create for society."

Challenge

The task of preserving this architectural treasure is a worthy one. William Thornton, a major presence in the life of the young republic, designed the building. His commanding imprint alone assures the Octagon's enduring architectural significance. Among Thornton's many accomplishments include the design of the U.S. Capitol and his leadership as the first Architect of the Capitol and Superintendent of the U.S. Patent Office.

The history and institutional service demonstrate why the Octagon's preservation remains a high public priority.

The difficulty for preservationists is an obvious one: Melding the construction techniques of today with building materials and design intent over two centuries old. That starts with an exacting, comprehensive understanding of the structure as it exists today: every nail, brick, and beam.

"We do have drawings at the Library of Congress," Reed explains. "They're quite old and may not reflect alterations that may have been made over the years. We absolutely have to make sure we know what the conditions are today. We can use that understanding to move forward on any decisions we make about updates and maintenance."

Supporting Reed and the Octagon initiative is an elite team of skilled investigators, including:

- **Ashley Wilson, AIA, ASID**, Graham Gund Architect, National Trust for Historic Preservation

Scan data will allow the Architects Foundation to activate the 220-year-old building.

- **Constance Lai**, licensed architect, LEED AP BD+C, historic preservation manager for Grunley Construction and Architects Foundation board member
- **Brian Giraud**, founder and president, True Design Services

Lai sums up the challenge, "The frustrating thing about working on existing buildings is that they're never built the way the architect drew them. You always find unforeseen conditions during construction."

Wilson says capturing actual, as-built conditions in historic structures is called heritage documentation. "The point of heritage documentation is to create a permanent record that architects can look at many years from now and do needed repairs. You can't attempt next steps until you understand what's there," Wilson says.

Solution

Today 'understanding what's there' means laser scanning the entire structure, a specialty of Giraud's firm. As the name suggests, the Octagon is an unconventionally-shaped building, a necessity Thornton arrived at because of lot location and size. Architectural features of the Federalist design style also required an image capture process with high resolution and precision. "The great thing about laser scanning is we can accurately document every single dimension and object in the building," observes Lai.

The heart of the scanning process is the laser scanner itself. It's not new technology—Giraud has scanned buildings for more than 16 years. What has changed over time is the level of precision and scanner mobility. In the early years, the devices were a 60-pound device that defied easy transport from jobsite to jobsite, especially if air travel was involved.

Today it's a different story. "You can literally hold up the device with one hand and move it around the building like a large camera," Giraud says, who donated his expertise to the project on a pro bono basis. He especially likes FARO® 3D laser scanning technology. "It allows us to harvest point cloud data (used to form the image of the external surface) for intricate detail like the moulding and fireplace trim," Giraud says. "All that detail can now get modeled."

By modeled, Giraud is referring to a software process that uses the point cloud data the laser scanner captures to render hyper-realistic 3D images and even animations. Let Giraud describe that modeling process:

"We process the data we capture from laser scanning the Octagon through software called FARO SCENE. FARO SCENE allows us to assemble an assortment of individual scans into one large point cloud. We export that consolidated point cloud into a popular modeling software like Autodesk® Revit® or AutoCAD®, which we call harvesting the point cloud. The modeling software is able to create 3D images that architects and contractors can use to understand the building with enormous confidence."

The accuracy of those models? Within a single millimeter. The laser scanner manufacturer FARO, a long supporter of historical preservation and restoration, donated their latest laser scanner, the FARO Focus S 350. "FARO is humbled to assist in this effort with our scanning technology. It's extremely important we all do our part to help preserve and protect the stories of our past," says Jerry Hardy, FARO product marketing manager—construction-BIM.

Results

For Architects Foundation director Reed, the immediate goal isn't about the Octagon itself … it's about a public that deserves to experience this architectural embodiment of U.S. history.

"This is about enabling visitors that can't move throughout the building, whether by distance or disability, to experience it. It's about accessibility.

"What Brian and FARO have allowed us to do is amazing," she continues. "Because the Octagon has been in the AIA family for so long, it may be a forgotten treasure to some. This opportunity to give it a renewed digital life is like waking up to Christmas morning."

Wilson, as a leading preservationist, understands that excitement. "Our architectural legacy should be enjoyed by everyone. Thanks to laser scanning, we can create accurate virtual experiences of walking through a building. Our most prized buildings can now get out into the world," she says.

For More Information

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