

COST of Wisconsin Blends Art and Engineering to Help Create New Gilder Center at AMNH

By Martin Palicki and Jared Stanwyck

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Fig. 1: COST of Wisconsin used specialized shotcrete and rebar techniques to construct the interior and exterior walls of the Gilder Center at AMNH. All photos are courtesy of COST of Wisconsin.

It's rare that a building's design can become so immediately iconic – an attraction unto itself. Gaudi's Sagrada Família in Barcelona comes to mind. It is a visual feast – a sculpture that takes the shape of a building. Many architecture critics are already claiming the same for the newly opened Gilder Center at the American Museum of Natural History (AMNH) in New York City. Officially named the

Richard Gilder Center for Science, Education, and Innovation, the addition to AMNH is the icing on a very prestigious cake. AMNH boasted five million visitors in 2019 (the most recent year the TEA/AECOM Theme Index ranked museums). It is the ninth most-visited museum in the world, and in North America, it is second only to the Metropolitan Museum of Art (also in New York City).



Fig. 2: COST also prefabricated GFRC planters and benches for the Davis Family Butterfly Vivarium.



Fig. 3: Flowing, cavernous spaces inside the Gilder Center.

The Gilder Center is a 230,000 ft² (21,400 m²) addition that boasts 33 individual connections spanning four levels to 10 other buildings on the AMNH campus. In addition to helping unify the museum, Gilder houses impressive exhibits, including an insectarium, the Davis Family Butterfly Vivarium, new collection displays, and the immersive Invisible Worlds experience—a projection-mapped environment that

takes guests to scientific and natural realms nearly impossible to see under normal circumstances.

Also capturing much attention and fanfare is the building itself. Designed by Studio Gang, the building is curvaceous and flowing, or in architect-speak, it's nonrectilinear. The west-facing exterior features glass windows peeking out from undulating, smooth pink granite forms. The 80-ft-tall (24 m) interior atrium lobby, evocative of a canyon, is made from a material that coats nearly every surface, applied in novel ways. Openings into exhibit spaces and bridges spanning the atrium are amorphous – no shape is repeated in the design. The finish is off-white, and although the primary material is concrete, the effect is organic and almost like looking at bone on a microscopic level with its crevices and tendons stretching across the space.

THE SKILLS TO BUILD

Coming up with a design of this magnitude requires very specific talents, but figuring out how to build it is another skill entirely. Construction manager and general contractor AECOM Tishman turned to contractor COST of Wisconsin to help create the building – and the construction means and methods. They tasked COST's President Mike Schmuhl and VP Greg Marks with a unique, design-assist role. Instead of just taking plans and building them, COST played a critical part in the team determining – or assisting in – how the architect's vision would be achieved.

Based in Jackson, Wisconsin, with offices in Orlando, FL, and Berryville, AR, COST-Inc. has been providing theme and specialty construction services for projects around the world since 1957. Though their work can be seen in everything from commercial to recreational and residential environments, they are perhaps best known for their work

in themed attraction spaces. In fact, the company was founded to create realistic animal habitats at the Milwaukee County Zoo at a time when animal enclosures were being reimagined to be less like cages and more like natural environments. COST is known for attention to detail in its fabrication, and recent projects include work on Lost Island Theme Park, Meow Wolf Convergence Station (Denver), and the Cincinnati Zoo: Hippo Cove, home to the world-famous hippo Fiona.

Gilder provided an opportunity for COST to showcase their skills beyond decorative theming, bringing together design, engineering, fabrication, and artistry in new ways. “We were so excited to be part of the team creating this epic project that will be around for generations to come,” said Jeff Sheiber, VP of Sales for COST. “We are thankful that the American Museum of Natural History, AECOM Tishman, and Studio Gang trusted that we had the unique skillsets needed to achieve their vision.”

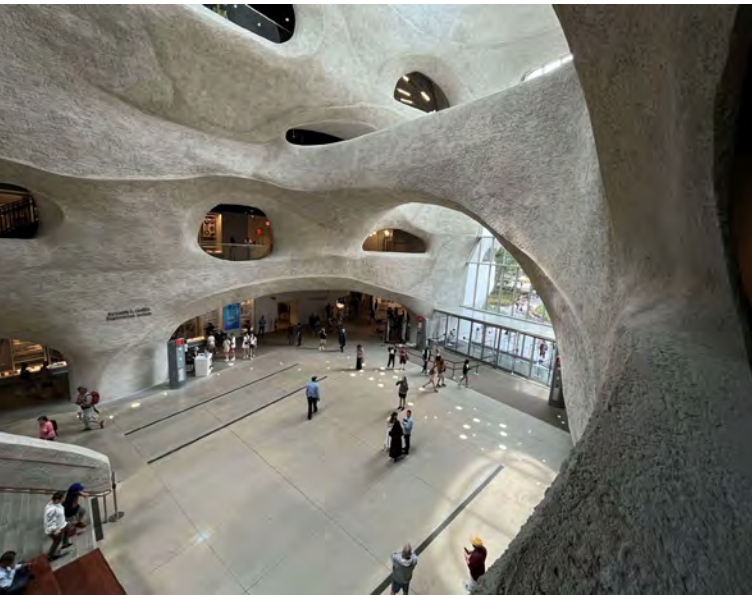


Fig. 4: The Gilder Center is a 230,000 ft² addition that boasts 33 individual connections across four levels to 10 other buildings on the AMNH campus.

FABRICATION INNOVATION

The vision and mandate were clear: create a building with minimal straight lines and right angles, and where no shapes are repeated. Oh, and no visible seams either.

“The museum and designers knew the shape of what they wanted for the building, but they weren’t exactly sure how it could be done,” said COST of Wisconsin senior project manager Sergio Castro. “It was a real collaboration of minds between the engineering group, the museum, the construction managers, and us at COST-Inc.”

The design team at COST, led by Design Director Kaleigh Warren with the support of Schmuhl, determined that traditional formwork would not be appropriate for the project. That method typically relies on concrete being poured into plywood forms, which are difficult to make into smooth, rounded shapes. The solution was to use wet-mix

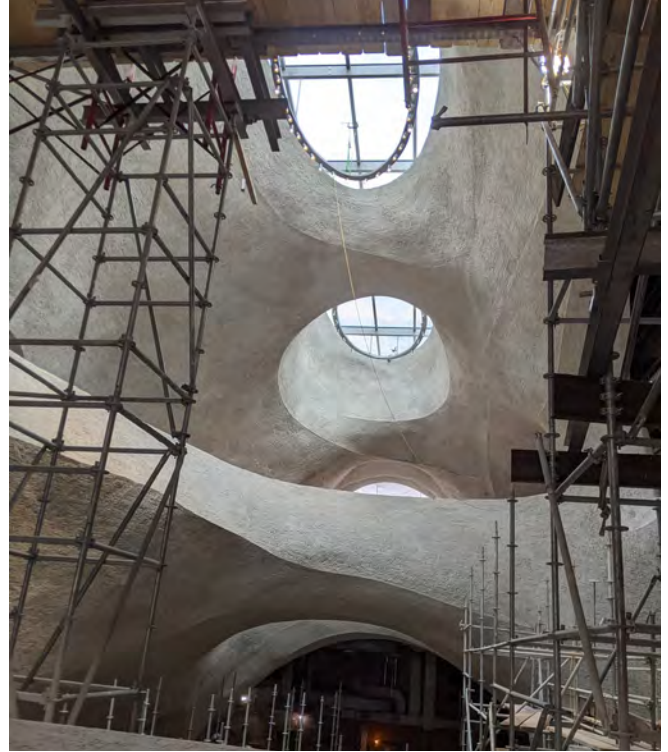


Fig. 5: Final touches on the finish work.



Fig. 6: Space restrictions were a serious issue that required immense planning.



Fig. 7: Average workspace when shooting the structural layer of shotcrete.

shotcrete, a well-established method of spraying a cementitious mixture onto a rebar cage. Shotcrete is commonly used for curved tunnel walls. It's also used for decorative rockwork, such as in theme parks or animal habitats. But the Gilder application had to function as a mix between the two. The shotcrete had to provide the structural support of a tunnel wall as well as the aesthetic style and finish of decorative rockwork. COST's extensive experience with shotcrete was the perfect fit for the project.

As a proof-of-concept, under the leadership of Schmuhl, COST fabricated a sample for the general contractor and Studio Gang to examine. "We created a section of the model at our shop to prove to the team that we were able to execute their vision," said Castro. "And it worked."

"We pride ourselves on being able to find new ways to approach problems and to look at the fabrication process in different ways," said Sheiber. "Gilder shows that with the right approach, you can effectively combine constructability, longevity, and aesthetics into one process."

AN ODYSSEY OF REBAR

To create the unique shapes of the structure, COST designed, fabricated, and installed custom pipe forms and rebar. The pipe formwork acted as a basic guide and

mounting point for rebar, which was then sprayed with shotcrete.

Under the leadership of COST Superintendents Bobby Lynch and Randy Ferguson, and supported by Director of Field Operations Corey Rabbitt, construction began on site with conventionally built concrete perimeter columns and floor slabs. Next, over 900 pipe forms were individually designed, fabricated in Wisconsin, identified, and shipped. Due to the existing service yard below, the structural design of the canyon walls required load paths at only six main touchdown points. The installation of these vertical pipe forms was the first major step in bringing the Gilder Center to life.

Each pipe form was meticulously surveyed into place and played a crucial role in the project. They supported every flat plate floor slab (which was held up by dynamic shoring) and also acted as a basic guide and mounting point for the rebar. The standoffs on the pipe forms were color-coded and tagged.

The need for 453 tons of rebar (also fabricated in Wisconsin under the leadership of Jamie Ehlike, Shop Director) was extracted from extensive 3D computer models; the rebar was tagged with identifying numbers that coincided with drawings created by COST's design team. Over 50



Fig. 8: After structural coat was set, shoring could be removed. This allowed for ample room to shoot the finish coat.



Fig. 9: Shoring.

semi-trucks traveled from Wisconsin to Brooklyn, where a staging yard was set up before pieces were brought on site for installation.

“Space on the site in the middle of Manhattan was extremely limited,” explained Castro. “The logistics behind bringing components to the site had to be precise. We didn’t have room on site to store materials, so items had to be brought from the staging yard in a coordinated fashion.”

The pipes were anchored to the slabs, and each individual rebar piece was attached to the pipes. Next, work began on the shotcrete application. Teams worked in sequence; as pipe and rebar sections were completed, shotcrete teams took over, and the process continued.

SHOTCRETE LIKE NEVER BEFORE

COST used two different shotcrete mixes for the Gilder Center. The first was a gray structure coat, which gave the building structural stability. It was applied as the first layer over all the rebar, as required by the engineer. The structure coat was followed by a white finish coat, which also produced additional structural qualities for the building but was not required for the building’s engineering.

Application was performed via a shotcrete pump sprayed by COST’s ACI-certified nozzle men Mike Tower and Steve Thomas in a preplanned shooting sequence. This was necessary to create the specific aesthetics of the building

as required by Studio Gang. Crews started spraying the gray coat from the base and worked their way up. Due to the amount of dynamic shoring in place, space was extremely limited until the structure coat was finished and able to support the load.

The thickness of the finish coat was checked prior to completion to ensure there was no additional unintended weight on the building. Once the correct thickness was confirmed, COST applied a rough trowel technique to the finish surface to achieve its final look. The white color was achieved through the addition of Type I white cement to the mix. No paint or stains were introduced to the surface.

The exterior of the building was handled a bit differently. There are no perimeter columns for the exterior west-facing wall. Instead, COST fabricated a series of premade rebar panels rather than individual pieces of rebar as was done



Fig. 10: Exterior work - 5 crews working in separate locations.

for the interior. The shotcrete was applied traditionally and can be seen exposed on the inside of the wall. The exterior surface is covered in granite panels and hung onto metal plates that are embedded into the shotcrete.

“The granite panels had an extremely small tolerance for variance. The prefab rebar panels we produced back in Wisconsin gave us more control over the geometry and allowed for easy hanging of the exterior granite by others,” explained Castro.

The completed building opened on May 4, 2023, and has already captivated museum guests and architecture aficionados alike.



Fig. 11: Gilder Center—completed exterior.



Fig. 12: The walls have a unique texture and pigmentation. The white cement was sourced locally from Lehigh, New York.

“The finished product shows that COST knows rebar and knows shotcrete, and we are able to do just about anything with them,” said Castro. “So often, theme park professionals look at these tools and just think of pretty rockwork – which of course they are great for! But the capabilities far exceed architectural theming and can be used in truly innovative ways to build the impossible.”

2023 OUTSTANDING ARCHITECTURE | NEW CONSTRUCTION PROJECT

Project
**American Museum of Natural History,
Gilder Center**

Project Location
New York, NY

Shotcrete Contractor
COST of Wisconsin Inc.

Materials Supplier
Tec-Crete Transit-Mix Corp

General Contractor
AECOM Tishman

Owner
American Museum of Natural History



Martin Palicki owns and publishes *InPark Magazine*. Started in 2004, *InPark Magazine* covers the themed entertainment industry, from the inside out, with a special focus on technology, storytelling, and the creative skills needed to bring interactive and immersive experiences to life. Martin lives in Milwaukee, Wisconsin and has been featured in *Time Magazine*, *CNN.com*, and *Folio*.



Jared Stanwyck is the Marketing Manager for *COST of Wisconsin Inc.*, a family owned theme and specialty construction company that started in 1957. Known for their work in theme parks, zoos, aquariums, museums, resorts, and other commercial applications, every job *COST* does is unique and one of a kind. Jared has experience in everything from fabrication, project management, estimating, and operations, along with gunite and cast work in his previous role at *Refractory Service Inc.* While his educational background is in Mechanical Engineering from *Valparaiso University* and Operations Management from *University of Wisconsin*, he loves being able to showcase the beautiful work *COST's* talented crews perform on a daily basis.