Restoring the U.S. Capitol Dome

While the cast iron Capitol Dome is being repaired onsite in D.C., several ornamental pieces are being replaced with new castings produced at an art casting facility in Utah. SHANNON WETZEL, SENIOR EDITOR

More than 150 years old, the U.S. Capitol Dome in Washington, D.C., was in need of repair. Weather and age had contributed to more than 1,300 cracks and deficiencies, according to Architect of the Capitol Stephen Ayers. In 2013, a project dedicated to the complete restoration began. The last time the Dome was restored was in 1959-1960.

“As stewards of the Capitol for the Congress and the American people, we must conduct this critical work to save the Dome,” Ayers said. “From a distance, the Dome looks magnificent, thanks to the hard-work of our employees. On closer look, under the paint, age and weather have taken its toll.”

The Dome, constructed 1.1 million lbs. of scaffolding was erected around the U.S. Capitol Dome to restore the cast iron structure. The last restoration was conducted in 1959-1960.
between 1855 and 1866, was built with nearly 9 million lbs. of cast iron pieces bolted together at a final cost of $1,047,291. But the Dome’s ironwork consists of more than its architectural structure. The Dome is surrounded with detailed cast iron ornamental work barely visible to a person viewing the building from the ground. Many of these pieces also required repair or replacement.

“What I find most fascinating is the amount of detail that went into crafting the ornaments,” said Joe Abriatis, construction manager of the Dome Restoration project. “It is incredible to see the intricacy and to realize that these decorations were created at the time of the Civil War. There are little lines and indentations the size of your pinky fingernail that cannot be seen from the ground and that have been obscured under a dozen layers of paint. It is astonishing to know that we are seeing these details for the first time since the last restoration in the 1960s.”

The Architect of the Capitol has enlisted Historical Arts and Casting, West Jordan, Utah, to recast the missing or badly damaged decorative pieces of the Dome. These pieces include scrolls, acorn finials, acorn pendants, flowers, and acanthus leaves that adorn the famous building.

The replaced castings range in size from 5 inches for ornamental pieces to more than 11-ft. long for cast iron gutters. Approximately 75-100 pieces will be recast, according to Abriatas, including gutters, rail caps, ornamental pieces and a majority of the Tholos balustrade section of the Capitol Dome.

The process of replacing the iron pieces begins with selecting a cast iron feature in good condition to develop a pattern to cast a replacement. The feature in good condition is removed from the Dome and shipped to the metalcasting facility, where it is used to make a pattern.

Two pattern methods are used for the Dome Restoration project.

“Either a rubber mold of the part is made and a positive is made in a
plastic resin, or if shrinkage of the recasted pieces is considered to be a risk, a 3-D scan is made of the piece to create a model on a computer,” Abriata said. “Patterns can then be printed or cut on a computer numerical control machine.”

Before the pattern can be made, more than 10 layers of paint must be removed to reveal the original details on the 150-year-old casting.

Each cast iron part is made in a nobake sand mold. The original iron from the damaged castings is reclaimed and remelted to produce the new pieces.

“Pieces that can’t be repaired will be melted, re-alloyed and poured into the new castings, so the original pieces will remain part of the
Dome’s historic fabric,” Abriata said.

Once completed, the parts are shipped back to D.C. to be reinstalled on the Dome.

Among the Capitol Domes cast iron features are 288 balusters in the boiler plate balcony, 72 80-lb. decorative acorns, and 36 grape clusters. Structurally, the Dome features 36 hollow cast iron columns set 10 degrees apart around the 360-degree circle and 12 iron columns in the “Tholos” section. Fourteen overlapping cast-iron plates make up one section of the curved cupola of the Dome.

For the cracked cast iron plates, workers are using “Dutchman” and “lock-and-stitch” techniques to repair on-site. More than 12,800 in. of cracked iron will be repaired. In the lock-and-stitch technique, workers drill the cracks and install special pins and a locking mechanism. As the pins are tightened, the cast iron plates are pulled—or stitched—together. In the Dutchman technique, damaged areas are removed and filled in with new material.

Before any repairs were made, workers removed up to 14 layers of paint—some of which was lead-based. After the repairs are complete, 1,215 gallons of paint will be used to repaint the Dome. The final top coat color is “Dome White.”

Restoration of the Dome’s exterior is scheduled to be completed this winter and should provide another 50 years of protection from the elements.