

The Architect of the Capitol (AOC) has undertaken a program to fully restore the U. S. Capitol Dome and preserve its iconic image. The first phase of this program was the restoration of the Dome Skirt which was completed in fall 2012. The next phase is the restoration of the Dome, scheduled to begin in fall 2013.

The U.S. Capitol Dome is one of the most recognizable structures in the world, designed by Thomas U. Walter and constructed from 1855-1866 with 8,909,200 pounds of cast iron bolted together in a masterpiece of American will and ingenuity. The last exterior restoration of the Dome occurred in the 1960s, more than 50 years ago. Without the proper maintenance and repair, the exterior of the Dome continues to slowly deteriorate as it ages and is exposed to the effects of weather. Moisture generated rust is entering the surface, creating hundreds of cracks and causing deterioration of the structure and its ornamentation. The repair and restoration work involves correcting a number of age and weather induced deficiencies identified for exterior repair including pitting, cast-iron cracking, spalling and breakage.

During the design, multiple repair methods were prescribed for the repair and restoration. One of these methods included mechanical repair for cracks. The standard pin typically used in a mechanical repair system is a single tooth thread that when screwed into the cast iron surface draws the separated surfaces of the crack tightly together. During the design process; however, it was discovered that due to the inconsistent grade of the cast iron used on the Dome (Civil War-era construction), this device caused breakage of the surrounding contact surface. The AOC recognized the incompatibility of the standard pin and proactively employed a whole system design approach (“integrated design”) to solve this problem by partnering with the designer and the mechanical repair manufacturer Lock-N-Stitch. The AOC assisted in the design and overhaul of the pin system which determined that a “Double Hook Pin” increased the wall surface contact area and added strength to the overall closure system without creating the stress points that the typical standard pin created. This method proved to be highly successful and was a first-ever design for the Lock-N-Stitch company. Additionally, the metallurgical composition of the new pin was formulated in a way that was more compatible with the metal of the existing cast iron in the Dome.

Brazing and welding also was identified as a repair technique for certain deficiencies. During the course of construction, a problem with the brazing was identified, as it was difficult to uniformly heat the area to be repaired. As a result, the fragile nature of the existing cast iron caused additional peripheral spider cracking and lateral cracking. Once again, the AOC partnered with Lock-N-Stitch, the construction contractor and other technical experts and determined that the “Double Hook Thread Pin” could be employed as a repair technique in locations where brazing and welding was specified. Utilizing this new device for repairs that typically required brazing kept the project on schedule, under budget, and on-time. This also prevented the potential loss of additional historic fabric due to the additional cracking that brazing would have caused. The successful employment of the new “Double Hook Thread Pin” is expected to be a key repair method for the next and final phase of Dome Restoration Project.

These inspired technological innovations resulted from applying a whole system design strategy. Leveraging creativity and harnessing the energy of highly skilled and collaborative teams resulted in new methods and processes for addressing cast iron. This pilot repair mitigated cost and schedule risk to the project, bringing significant value to the AOC. This application has been documented and the knowledge shared with other State Capitol’s undergoing cast iron dome restoration.

