

2014 ACE Awards
Best Building Project—General Contractor (10-40 million)

GH Phipps Shines in Covering the Capitol

In the mid 1800's, long before steel was invented, a state capitol building boom began. From the Nations' Capitol to many state capitols, architectural drawings used the hottest new product: cast iron, which introduced the *mass production of identical pieces easily assembled at a construction site that mimic ornate carved stone structures.*

This new product development made tall stately dome projects possible. Invented in China 2,000 years ago, cast iron needed an 1850's breakthrough in furnace technology to make entire structures affordable. The Colorado state capitol entrance hall -measuring 180' in height and already supported by a 16 foot thick foundation -would not have been possible without this lighter weight member. **But** one day several years ago a weakness in this miracle product was uncovered, as a nearly 10 pound piece of the dome fell 100' to the Capitol grounds. The result of hidden rusting, an inspection team declared:

“The potential loss of strength as a result of deterioration is a significant hazard to the building and its occupants.”

GH Phipps Construction Companies' ability to address this issue at the state's busiest, most important and iconic building; keep the building open for business; and complete it within a tight budget is why the team was selected, and why this project is **ACE worthy**.

Solutions of special projects:

The immediate and high profile danger required a quick and effective response. Assessing thousands of individual cast iron pieces with hidden anchors would be too slow, and fencing the ground would be unsightly. Within 6 weeks Phipps' team had installed high strength netting. If another piece broke away, the netting would keep it from falling to the ground. The solution was elegant in its ease of installation and even the color choice made it almost invisible.

However,

the Colorado capitol needed and deserved much more than just a temporary fix. Our team was charged with creating a plan, developing documents, finding qualified subcontractors, and pioneering the use of materials in certain cases to restore and even improve our capitol dome to its early days of glory.

Excellence in project execution and management/team approach

Project goals are essential to effective plans. *This* project's goals were enormous due to the building's function and complexity. The project was a bit like restoring a priceless piece of art whose canvas is rotting, supported by unknown structures, while on display, and the final result must be perfect – *and* it has to be competitively bid and sequenced over 3 non-guaranteed funding periods. GH Phipps added The

Chrisman Company of Michigan to our team, as they had completed similar work on the Michigan state capitol building.

The project execution plan was developed meticulously during the preplanning where all team members knew the goals and addressed the issues including:

- Nonexistent drawings
- Occupation by the states' political leaders
- High security – At times even Federal (FBI, Secret Service)
- Noise and dust control
- Safety for everyone
- Abatement – asbestos and lead paint
- Scaffold support with no structural drawings
- New product investigation
- Budget limitations
- Yearly budget constraints
- Prevent future rusting from weather and interior humidity
- Competitive bids required in every trade

The hazardous material abatement drove the need for an enclosed scaffold system which eventually encased the entire drum and dome. The team had to develop clear and accurate bidding documents, but this was hampered since drawings in the 1890s were more like works of art than detailed, engineered documents. Phipps quickly created a laser point cloud drawing of all the structural members. This **state of the art advancement** produces a 3 dimensional array of points in a digital map created by walking through every accessible attic and ceiling space. This array is analyzed to establish the scaffold system's vertical loading points as well as horizontal points for wind loading. Scaffold bidders were given this information as well as a detailed schedule. The scrim used to enclose the area was designed with breakaway seams if the wind exceeded 60 MPH.

Next a “forensic package” was developed. One-eighth of the symmetrical drum and dome structure was analyzed and picked apart to establish best-guess quantities of broken pieces and the best methods of discovery for the bid documents. Phipps had three different methods of stripping performed – *sand blasting, CO2, and chemical*. The results of each method were published in the bid documents so firms could choose which method best suited their expertise.

A complex schedule had to be created. Only 1/3 of the project funding could be guaranteed at a time, so the schedule had milestone completions built in. If only one funding period was provided, our schedule had to allow the project to be at a stopping point. This imposed a number of difficulties on all team members, from manpower to purchasing to job flow. The project had to be executed moving from the bottom up which is never an efficient method. But the funding constraint was unchangeable.

A final project execution component involved work over 1,600 miles away. Our team member, Chrisman, was working on our Nation's Capitol Dome. A stripped cast iron piece had received its final paint but quickly rust was showing through. The cast iron forging process has off-gas, which creates tiny cavities and dimples in the surface. Lead paint used in 1905 covered these gaps, but today's paints do not. Water can get in, fill the cavity, rust and then bleed. Our teams met in both locations to find a solution. A product for cast iron structures has not been marketed, but several auto body filler products were reviewed and found to be perfect. A 6-step process was established – prime/"bondo"/2nd prime epoxy/"bondo"/spot prime/final paint. Several inspections and touch-ups were included and often involved flashlight inspections to highlight any imperfections.

Environmental /Safety

Originally asbestos was used in the copper shingle assembly on the curved dome, and every piece of cast iron had multiple layers of lead paint. The abatement of these hazardous products was a challenge. Five different methods were investigated and rejected. Sand blasting the surface was selected. The power necessary to move the sand mix up over 120' required a large pump, which created a low frequency noise. The engine noise decibels did not violate the noise restrictions, but just as one may "feel" the sub-woofer in a vehicle several cars away this engine frequency could be *felt* inside the capitol offices. Our team quickly addressed the issue with sound attenuation around the source. Even with the project's safety concerns of workers frequently being in scaffold 100' and higher, there were no lost time accidents on this project. Even the occasional night visitor, intrigued by the chance to climb to the top of this great monument, was stopped by attentive security, alerted by motion sensors and cameras.

Excellence in client service and / or contribution to community

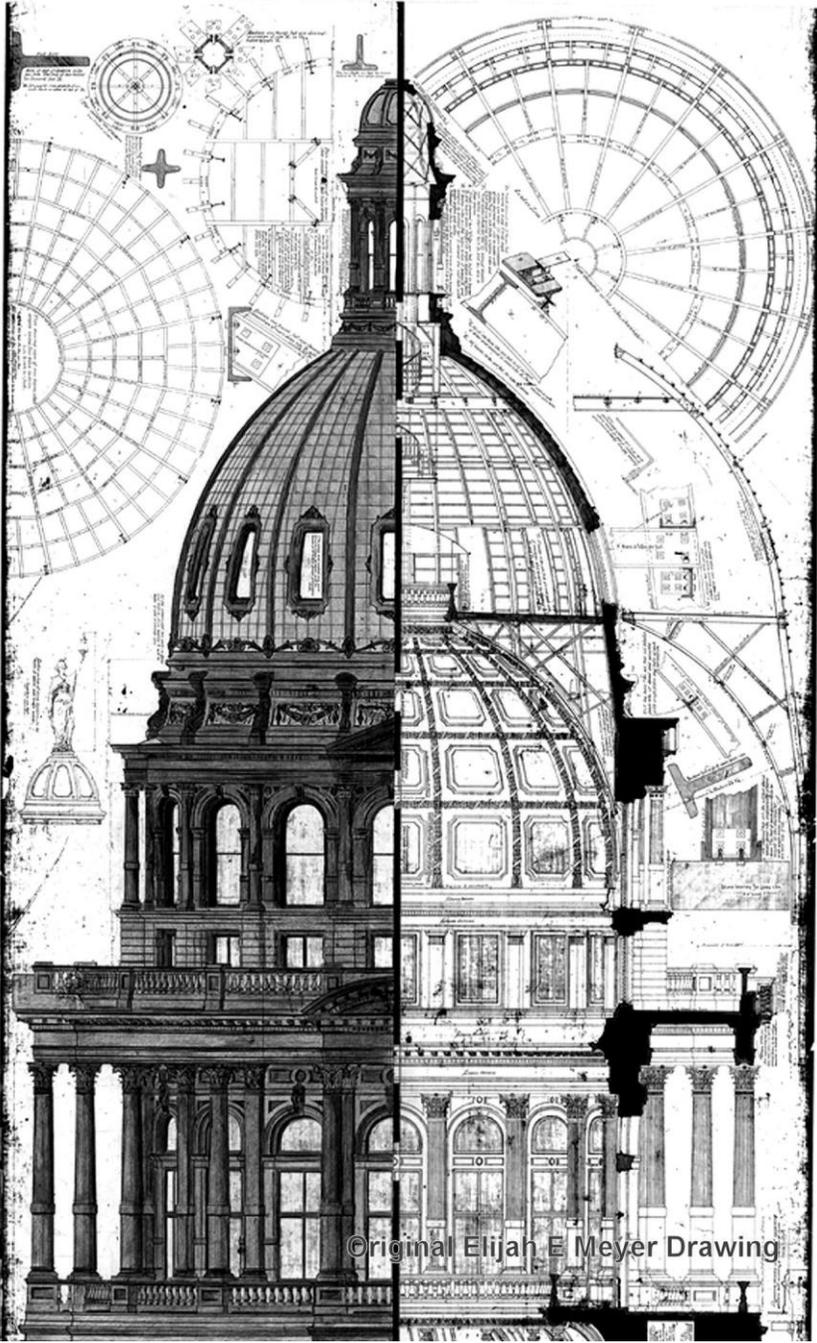
Phipps had been awarded a number of projects at the capitol over the last decade and in every case exceeded expectations. This project again met and exceeded every expectation of the building's occupants – tourists/visitors/senators/representatives/staff/security, and even the governor. When the scaffold finally reached the very top lantern, access was available as never before. GH Phipps showed excellent client service as a multitude of VIP's requested a guided tour. Addressing all safety concerns for each person, our team guided each group up the 308 steps and through a maze of scaffold while educating along the way. The delivery of this high profile project under budget without a single incident also exemplifies excellence

in client service.

The dome –comprised of 5,280 new individual copper “shingles”-was re-gilded with gold leaf donated by a mining company in Cripple Creek, Colorado. The first gold gilding in 1908 was added by popular demand to celebrate the Colorado Gold Rush. Surprisingly, less than 14 lbs (200 oz) of 24-karat gold is all that was required. Gold’s properties are perfect in keeping strength and shine even though microns thin. The thin gold leaf was prepared in Florence, Italy, the only facility on earth doing this process. One final, meticulous step sent 2 rappelling gilders from the top lantern performing the last inspection, applying gold leaf and polish to the areas where the scaffold system had been resting on the dome face.

GH Phipps is proud to have had a part in restoring our state’s most beautiful and emblematic building. The capitol is ready to take on Denver’s storms and temperature fluctuations for the next 100 years. Some experts believe that Colorado’s capitol is one of the most beautiful and ornate in the 50 States. When the upper deck is reopened to the public for the first time in many years, thanks to this project, building tours will once again include perhaps the best part of our state, the great outdoors and incredible views.

The polished team of GH Phipps is pleased to have helped the state shine in a capitol way, dazzling visitors from far and wide.



Original Elijah E Meyer Drawing











