Colorado State Capitol Historic Roof Restoration

Category 3: Meeting the Challenge of a Difficult Job- Fransen Pittman General Contractors

A phenomenon among local Coloradoans is the undying pride of being a Colorado native. Comprised of golden plains, snow capped mountains and such spectacular beauty it inspired Katherine Lee Bates to write “America the Beautiful”, it’s easy to understand the unconditional love for this state. In 2016, Fransen Pittman was awarded the opportunity to work on a project as integral to the fabric of Colorado as her purple mountain majesties. Earning the contract as the CM/GC for the Colorado State Capitol Historic Roof Restoration served as a unique honor while also offering uncommon challenges that required heedfulness, collaboration, and problem-solving innovation to overcome.

After decades of persistent moisture infiltration and deviations from the historic character of the envelope building, FP was solicited to remove the Capitol’s existing roof and restore it with copper and slate roofing, replicating its original condition when it was first built in the late 1800’s. Navigation of the tight site, safe transfer of workers and supplies, and protection of historic murals and building finishes were unique challenges to solve. The early discovery of asbestos in the original roofing and attic quickly expanded the scope of the project and the complexity of an already challenging site.

At the start of the project, ~ 2000sqft of ACM (asbestos-containing material) were known and isolated in one portion of the roof. By the time the project finished, we discovered over 50,000sqft of ACM both in and outside of the building. The asbestos was sprinkled randomly throughout the attic spaces and envelope structure in swaths of anywhere from 20sqft to 1000sqft in many areas apart from the originally known ACM location. To protect the public, the workers, and the environment from asbestos contamination while working on the exterior, FP created a temporary structure using scaffolding and shrink wrap. The shrink wrap top kept the asbestos contained within 3 layers of plastic while also keeping the weather out of the building. Due to the extensive process of abatement, it became necessary to cover the entirety of the demoed areas with shrink wrap and to create a temporary water management system. Each time asbestos was discovered, FP moved quickly to get scaffolding set up and abatement started and completed with as minimal impact to the overall schedule as possible.

The abatement of asbestos in the attic presented several obstacles that required finesse and attention to overcome. Scaffolding had to be imported through the roof around irregular shapes to build a false floor that sealed the asbestos and prevented it from contaminating any surrounding pipes. This scaffolding was carefully built so that the weight bore only on the existing structure of the building. We utilized the expertise of Ground Penetrating Radar Systems to locate the center of the structural I-beams buried in the concrete floor, and diligently monitored the installation to ensure no deflection or damage occurred to the historic House and Senate chambers ceiling below. Once inside the attic, the temporary structure acted as a clean

room. Workers were required to wear hazmat suits with respirators and a temporary tunnel was created with showers and pressure washers for workers to clean themselves before exiting to prevent any contamination. It was a necessity to constantly monitor all water connections to prevent damage on the historic decoratively painted and frescoed ceilings below. Ventilation within the temporary structure was another challenge that required heightened care. While applying the abatement insulation with spray foam, our workers were especially careful to prevent fires that would quickly spread and devastate our State's Capitol.

After the asbestos abatement, the entire roof was replaced with copper and slate materials to return the roof back to its original state while incorporating sustainability in the process. From the combination of copper and zinc in the standing seam panels, to the slate shingles and copper gutters, adhering to historic guidelines took Fransen Pittman across the world searching for the best artisans and materials. FP recruited historic enclosure experts and procured products with authentic historic value. While the original roof was built with Buckingham Slate Tiles (a material we know today is not acceptable for low sloped roofing), to achieve a similar look Freedom Gray copper standing seam tiles were chosen. This material is coated on each side with a tin-zinc alloy that is durable, environmentally friendly, and has a natural weathering ability that in ~5 years will match the color of the original Buckingham Slate. In the high sloped areas, Buckingham Slate mined from the same quarry in the 1800's was reintroduced. This dense material holds a life expectancy of 150+ years and shares a home on many historic buildings. The gutter assembly and extreme low sloped areas were restored back to their original glory using mill copper. All the mill copper was seamed with full soldered joints using the historic iron soldering method passed down from generations. Each installer had to undergo specific training to learn how to solder the seams and pass monthly testing to confirm they retained the skill to perform it correctly. To ensure quality work, FP maintained a combination of expert "old hands" with young who showed impressive skill and craftsmanship. From initial project kickoff through closeout, we worked closely with the subcontractor and architecture firm to ensure the best roof installation methods were utilized. Because of this collaboration, the Capitol received a 2018 North American Copper in Architecture Award for outstanding use and installation of copper materials.

When faced with historic problems, FP employed innovative solutions to provide efficiency in construction and achieve significant cost and energy savings. Buried beneath two feet of brick wall, the existing rain leaders were porous and leaked badly when rains came in. To solve the leaking without any damage, FP utilized liners made up of spun fiberglass that would allow the material to expand to the diameter of the pipe. The liner is shipped in a partially cured state that requires extensive care so that the resin remains in a gel state until hardened. The material is then wound and inverted as it is pulled down the pipe with a small robot, allowing the uncured resin to be exposed to the outside of the liner and the Capitol pipe. The material is inflated with air pressure and another robot is sent down the pipe with a camera to confirm there is no damage to the pipe. Once confirmed, a UV light is turned on and the robot travels back up the liner at a speed of 1 foot/minute until it reaches the top and the material is fully cured. This process creates a durable, effective material and remains strong even at 50 years.

Formerly removed due to deterioration, FP recreated and improved on the historic vents and louvers. These impressive artistic pieces are up to 15’ tall and extremely ornate. While achieving precise duplication of the details and proportions of the originals, the new structures are constructed of stainless steel with far more robust structures than the originals, ensuring that they will last for many generations to come. Using photographs of the original State Capitol, a 60-foot decorative flagpole was reintroduced and now sits above the westward facing gable exactly reproducing the original Victorian appointments.

No other landmark is as reminiscent of Colorado’s history and as indicative of its future than the State Capitol. Built with iconic Colorado materials from across the state, this national landmark is home to the legislative decision makers and the civic community alike. To uphold this important institution, the State Capitol remained 100% operational throughout the duration of the project. This means that Fransen Pittman carefully scheduled work around active legislative sessions, public protests, and community events. Though our work had to completely shut down during these periods, to stay on schedule FP worked quietly in the basement reinforcing the structure and completed the remaining work when legislative sessions, protests, and civic events ended.

The State Capitol is not only utilized by legislators and aides with offices directly under the attic and roof, but home to multiple constituent tours Monday-Friday. As school field trips and Capitol workers traverse throughout the building, FP ensured that our work didn’t interfere with any operations in the interior. We carefully scheduled material deliveries and large equipment usage, and constructed temporary pedestrian/visitor tunnel entrances with overhead protective structures to ensure the safety of the public. While working 100’ off the ground, constant monitoring of material handling, storage, and fall protection was essential. Daily safety inspections, observations, and training prevented any injury. Our close work developing specific safety and quality procedures earned FP a Circle of Safety Award by Pinnacol Assurance and most importantly, we walked away with zero recordable injuries.

During this once in a lifetime project, FP conducted frequent tours for the public to explore the Capitol and view unique features, like the names scribed on the interior dome ceiling of every craftsman who’s worked there before. Overcoming each challenge and delivering a successful project was an honor. We’re proud to now have our name adorned on the dome ceiling.


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