George Washington’s Other Resting Place:
Restoring the Washington Equestrian Monument

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Abstract

In 1869, in Richmond, on the grounds of the Virginia capitol, a bronze statue atop a granite monument was dedicated honoring American founding father George Washington. Recent repairs to the historical monument included repointing, stone work, cast iron staircase reconstruction, new flashings, and resetting of all stone paving and stair treads. Unexpected challenges arose in all aspects of the restoration work, requiring the project team to work together closely on this worthy tribute to the Father of America.

Speaker

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INTRODUCTION
In 1869, an incredible tribute to the father of our country was finally completed on the grounds of the capitol of the Virginia Commonwealth in Richmond, Virginia. Construction on the monument had started approximately 18 years prior. The unique aspects of the monument include a large bronze statue of George Washington on horseback, several bronze statues of prominent patriots (“Sons of Virginia”), and smaller bronze statues of allegorical figures (Figure 1). The granite masonry podium on which the statues are placed includes an internal drainage system and a solid stone door that opens to an accessible interior where a cast iron staircase rises to the proposed final resting place for our nation’s first president. The monument is framed by large granite pavers and stair treads that had suffered from joint mortar deterioration, lateral displacement, and heaving.

Despite several prior restoration campaigns, restoration was again necessary by 2010 to address paving distress, stone joint mortar failure, and water infiltration, with the ultimate goal to restore the monument to its original grandeur and preserve it for future generations. Repairs included complete repointing, stone repairs, dismantling and reconstruction of the cast iron staircase, new flashings, and resetting of all stone paving and stair treads. However, unexpected benefits and challenges arose in all aspects of the work, requiring the project team to work together closely on this worthy tribute to our country’s most famous patriot.

MONUMENT HISTORY
A monument as a tribute to George Washington is not unique. Shortly after Washington’s death in 1799, groups and committees began planning for ways to honor the great man. The Washington family had received numerous requests to inter the president’s remains, including a request by Congress to inter him in the United States Capitol building in Washington, DC. While relocating President Washington to the United States Capitol building never came to pass, the Virginia General Assembly planned to build a monument through various resolutions from 1815 to 1818. The resolutions provided that the funding for the monument would be garnered through donations, and that the monument would house the remains of both George and Martha Washington. 2 Discussion of relocating Washington’s remains continued into 1816 and 1832 with Washington’s descendants, Bushrod and John Augustine. They reiterated Washington’s desire to be buried at Mount Vernon and formally declined the requests. The marble sarcophagus at the Capitol crypt, below the rotunda, is now more accurately a cenotaph, providing a monument to George Washington.

On February 22, 1849, an act was passed by the Assembly of Virginia to move forward with designing a monument for George Washington that would be located on Capitol Square in Richmond. The design was released as a competition where participants would be awarded the commission of the design, as well as a $500 premium if their design was approved. The budget provided for the monument was $100,000, and it was to incorporate local granite. This announcement was advertised in numerous newspapers, and the original deadline for designs was December 1, 1849. Shortly after the announcement, the commissioners received numerous requests to extend the deadline, as it was found to be too short. Consequently, the competition deadline was extended to January 8, 1850.

Approximately 64 responses were received, including Robert Mills, who designed prominent monuments such as the Washington Monument in Washington, DC, and Thomas Crawford, who was ultimately awarded the commission. While Mills was not awarded the commission, he did briefly work for Crawford. Crawford’s design originally included five Sons of Virginia, not six, with the original sixth pedestal to hold a statue representing the State of Virginia with the motto, “Let there be light,” with an elevated torch and reference to the destruction of tyranny. Other notable participants in the competition included John McArthur Jr., architect of the Philadelphia City Hall; John Lewis Hayes, architect of the St. Jude Shrine in Baltimore; James Renwick Jr., architect of the Smithsonian Institution in DC; and Henry Exall, an architect who designed numerous prominent houses in Richmond.

In February 1850, a ceremony was held to initiate the monument and lay the cornerstone with Crawford and President Zachary Taylor in attendance, among other dignitaries. The final design was drawn by Crawford in May 1850, and the final contract was signed in June of that year, with the agreement that the monument would be completed by February 22, 1856.

The monument, located just west of the Governor’s Mansion, would feature George Washington sitting on a trotting horse at the top of the granite pedestal, flanked by six sons of Virginia at a lower tier: Thomas Jefferson, Patrick Henry, John Marshall, Thomas Nelson, George Mason, and Andrew Lewis. Each of those are flanked at the lowest tier by corresponding allegorical figures: Independence, Revolution, Justice, Finance, Bill of Rights, and Colonial Times, respectively. Thirteen stars surround the pedestal just below the Washington statue, and 13...
The statues of Lewis and two others were never intended, but rather the allegorical representation of Virginia, Henry Lee, and Daniel Morgan (born in Pennsylvania). These figures were changed by the monument Commission in October 1855. The Commission preferred James Monroe and James Madison; however, those did not make the final design. A coat of arms was also intended to adorn the statue; however, due to problems attaching the bronze element to the monument, it was never used. The existing statues as we now see them were approved by the Commission on March 25, 1856, with the statues in very precise locations.

Crawford had estimated that the bronze equestrian statue would cost approximately $30,000; pedestrian statues, $9,000 each; and shields, $2,000 each. The statues would be designed in Rome, cast in Munich by Ferdinand von Miller, and shipped to Richmond for placement.

Construction began in July 1850 with Robert Mills serving as a supervisor for the monument under Crawford. The relationship between the two was short-lived, as Mills continued to propose alterations to the design to not only Crawford, but also the governor directly. Mills also presented himself as the architect for the Virginia Washington Monument. Mills was eventually removed from the project on October 15, 1852. By this time, the granite for the monument was being laid, and Mills had altered the construction of the pedestal by shortening its perimeter dimension by approximately seven inches. H.W. Herbert replaced Mills and completed the superstructure in 1854.

By the time of Crawford’s death in October 1857, the statues for Jefferson and Henry had been delivered to Richmond. The equestrian statue, wreathes, and stars were cast and prepared for shipping. Ferdinand Von Muller, director of the Munich foundry, estimated that the equestrian statue weighed approximately 30,000 pounds. In November 1857, the main statue was received by many townspeople, who helped hoist the statue from the Walborg, a two-masted square rigger on the James River, to its final resting place near the Capitol. Statues of Mason and Marshall were nearing completion in Rome. Crawford’s wife, Louisa, stepped into her husband’s place upon his death and oversaw many of his projects, including the monument.

The monument was dedicated on February 1858, being only partially completed with the granite pedestal, equestrian statue, Jefferson, Henry, and Mason in place. Randolph Rogers, who met the Crawfords in Rome, was brought in during June 1858 to oversee the rest of the project. With Rogers in place, additional design alterations were proposed, such as the removal of the originally proposed eagles, the attire of Nelson, and a recommendation by the Commission to incorporate bas-reliefs (rejected by Rogers).

The outbreak of the Civil War interrupted the completion of the monument, which was untouched during the Evacuation Fire of April 1865, in which retreating Confederate soldiers lit bridges and supply warehouses on fire to destroy any potential use by Union soldiers. By March 1867, the statue of Marshall was set in place by Henry Exall, who also helped set the statue of Mason in place in 1858. The allegorical figures were placed by August 1868.

The remaining statutory and fencing were installed by 1869, culminating the drawn-out project almost 20 years after it began.

**BACKGROUND**

**Construction**

The monument features bronze statuary, which sits atop of James River granite and stands approximately 55 ft. tall. The stone is bedded in mortar and load-bearing, with tight joints and lead shims transferring gravity loads. The walls of the pedestal include projecting courses, which, at several elevations, serve as water tables and ornamental relief from the otherwise planar granite façades. The stone foundation is enclosed with granite pavers and steps that are set on roughhewn stone foundations and fill. A set of eight steps span between each allegorical figure and lead up from street level to the monument entrance.

The monument is a six-pointed star design in plan. At each point, the Sons of Virginia statues are placed on circular granite pedestals. The bases of the statues are covered with a bronze plinth plate. The monument then extends to an elongated octagonal pedestal structure that supports the equestrian statue. The horse on which Washington sits is attached to the capstone at the right front hoof and back left hoof, and is one of the few equestrian statues founded on only two hooves. The statue plinth bears on the granite capstone, and anchorage for the hooves passes through the capstone on cast iron columns to X-braces within the upper granite structure. The X-braces engage the granite through bronze rods that extend through to the exterior face of the monument and are concealed by the decorative bronze stars (Figure 2). At the interior, the X-braces were originally concealed with brick.

The 9-in.-thick original capstone has a longitudinal joint spanning from north to south and a hatchway centered below the statue that opened to the exterior. The bronze plinth was cast over cast-iron strengthening ribs. Each of the modeler’s names can be seen at the base of the statues and allegorical figures. Engravings of Crawford’s and Ferdinand Miller’s names were found at the bronze plinth plate. The engravings include dates that confirm the order in which the statues were completed. The monument also features the name “Washington” engraved in the granite on the east and west façades, midspan below the projected water table and profiled course.

The monument has an integral drainage system, which takes the collected water from carved gutters in the projecting elements (cornice, water table, and the Sons of Virginia statuary, in descending order) and carries it through the stone walls to a central point at the interior. Approximately 2 ft. above the monument floor, the integral granite collectors meet a short run of copper downspout. The water empties into an open drain that leads below the monument.

The interior of the monument features an ornate cast iron spiral staircase that leads to a circular landing just below the granite capstone. The staircase has alternating decorative spindles. One spindle design is a wreath and arrow, and the other is a flaming torch. There is also a cast iron fence around the perimeter of the monument that was installed in the 1870s to restrict people from climbing the monument. The fence posts have a decorative ball finial with an emerging flames design on the shafts.

A large solid granite door (approximately 12 in. thick) is located at the south of the monument and provides access to the interior. The door includes large iron pin hinges, locking hardware, and bronze casters that roll on a circular track, allowing it to open and close when in operation.
A cast iron decorative gate was later added for security when the door hinges seized and couldn't be moved.

**History of Repairs**

Since the monument’s completion, it has undergone numerous repairs. These mainly took place between 1982 and 1985. Over the years, the bronze statuary had taken on a mottled appearance with black and green coloration. In 1979, a member of the public familiar with corrosion notified the City of Richmond, which, in turn, notified the state, which owns the Equestrian Monument. The appearance was not isolated to this monument, but had become apparent on most statuary in the area. Smaller statues were cleaned and treated as trial repairs, as the statuary would have more uniform appearance and the state was unsure of the potential public reaction. Based upon favorable feedback from the public, treatment of the Washington Equestrian monument began in 1982.

The statue surfaces were corroding (black coloration) and patinating (green). Closer inspection revealed some material loss (as much as 1/8 inch in casting thickness at some locations) and other issues such as cracks and fractures. The state engaged specialists from Washington University Technical Associates (WUTA) to clean, repair, and treat the statues. The statues were cleaned to remove the oxidation and corrosion from the bronze by blasting with glass beads. Cracks were brazed, and breaks were repaired by utilizing similar material to follow the existing profile of the metal. The stars and wreaths had to be reattached, as previous repair attempts failed. Once repairs were made, the statues and other bronze elements were patinated to approximate the original color. The bronze was then sealed using Incralac to protect the surface from air and water. However, this lacquer requires reapplication over the years, as it merely serves as a sacrificial barrier for the bronze. The work was completed in December 1982.

As the monument was surrounded by scaffolding to allow for bronze treatment work, a structural inspection was completed on the statuary and pedestal. Through investigations, it was discovered that a steel confinement band had been installed around the capstone in 1915. Copper flashing covering the original bronze plinth plate and the installed steel confinement band was installed around the same time, based upon an embossed date found on the copper. The confinement band had cracked in several places and needed replacement. The band was installed in two “U” shapes that were secured together with clips. Voids between the steel band and granite were packed with mortar. The bends in each “U” were achieved through laps of steel and large rivets, rather than bending the steel. The granite pedestal was observed once the bronze plinth plate and copper sheeting were pulled away, revealing extensive cracking in the two pieces. It is assumed that this condition led to the installment of the new confinement band as the cracking was extensive enough to result in spalls and potential destabilization of the capstone.

The confinement band was replaced in 1982 and constructed in four sections. They were connected by temporary tension bolts and bolt tabs, which were tightened. The joints between sections received a full-penetration bevel weld. The tabs were removed after welding. Between the granite and steel collar, a 1/8-in.-thick asbestos board was placed to provide a layer of protection against abrasion and high-stress contact. The collar was coated in a butyl rubber caulk in an effort to
reduce any corrosion at the collar (Figure 3). Along the east, the collar was shaped to accommodate the existing displacement of stone. While the 1915 band was removed and collar installed, a crane supported the equestrian statue without resulting in an uplifting force to ensure that the statue remained stable.

Inspection openings were made below the stone pedestal in an attempt to understand the structural anchorage of the statue based upon the conditions and concerns that arose through the steel collar replacement work. Brick rubble just below the pedestal was removed, as it enclosed the edge of the bronze and iron plinth. It was observed that the bronze around the cast-in-iron strengthening ribs had delaminated in some areas. Below the plinth, the bearing devices below the hoofs transferred tensile load to the iron X-bracing that tied to the east and west. The X-bracing was located in a cavity that was also infilled with brick rubble. Removal of the brick revealed the deteriorated condition of the bracing, resulting from water reaching the cast iron elements. The equestrian statue was once again supported to avoid movement during the removal of the rubble.

With the brick removed, the iron X-bracing was visible. The bracing and rods integrate the stone with the statue plinth structure to resist overturning under lateral load. The iron columns, acting as a semirigid connection from the bronze connection to the statue, were degraded. The granite pedestal was badly cracked where the hooves connected to the bronze bearing devices. The spaces between the bearing devices and the stone were originally filled with sulphur to transfer lateral thrust from wind loads on the equestrian statue into the capstone. As part of the original construction, the X-bracing was exposed; it was not until the 1860s or 1870s that it was proposed to be closed with brick rubble, as well as the sulphur replaced with lead or tin black. The sulphur replacement never happened.

Through our research, it was discovered that Mills shortened the perimeter dimension of the granite pedestal by approximately 7 in. without authorization from Crawford. In addition, the height of the equestrian statue was increased from 15 to 20 ft. At the time of construction, Crawford warned that the combination of the two modifications could leave the granite pedestal inadequate to resist lateral thrust from load on the statue. In 1984, the stone was consolidated through the use of epoxy at cracks and high-strength grout at the hoof-bearing devices. In addition to the grout, stud-ded stainless steel anchor plates with the studs facing the grout and stainless steel threaded rods were utilized to assist in distributing load. The bearing devices were coated with asphalt.
roofing cement to minimize any galvanic reaction between the dissimilar materials.

A stainless steel threaded rod ¾ inch in diameter was installed, extending from the south of the hatchway to the southwest corner to serve as a grouted dowel. A bronze ring was installed at the underside of the pedestal center to connect the two granite pieces at the pedestal and numerous cracks that had extended from the hatchway to the perimeter (Figure 4). Lastly, two 3/8-in.-thick by 3-in. by 3-in. angles were welded together to create auxiliary columns that were installed adjacent to the existing iron columns below the bearing devices (Figure 5). Once the repairs were completed, the exposed structural elements were painted with an epoxy coating to reduce the potential for corrosion. The brick rubble was not replaced, leaving the structural elements visible for inspections in the future.

Once the structural repairs were completed in 1984, attention was turned to the condition of the granite, as it was stained and aged with several areas of scaling. The scaling was most obvious under Patrick Henry (southernmost Son of Virginia statue) and at the highest cornice. It was believed that the cause of this stone deterioration was freeze/thaw cycling of the water-saturated near-surface region of the stone. Water was frequently seen at the interior of the monument, seeping through the joints; the gutters were infrequently maintained, which allowed water to collect and the stone to remain wet for prolonged periods. It was also believed that a poor quality of stone was used for the Henry pedestal, consisting of granite that may have been quarried from close to the surface, which had already been exposed to the weather.

Some repairs, such as dutchman and mortar patches, had been performed in the past. Poor repairs were removed and areas patched with a mix of Akemi structural adhesive mixed with granite dust. These patching materials were also used on other holes, spalls, and cracks. A hybrid of stone dutchman and Akemi patch material was used at the Henry pedestal. Once the repairs were completed, the granite was cleaned with ProSoCo Sure Klean Restorative Cleaner.

The mortar joints were cleared of the mortar and caulk, which had been installed at an unknown date, and new caulking was installed. The contractor performing the work believed that using a silicone caulk/sealant at the beveled joints (false joints) would provide better sealing and longer life. Any joints that had voids would be infilled with grout, and then sealant would be installed. Lastly, a silane water repellent was applied to repaired areas and areas where water could result in stone deterioration. The product was not found to provide any observable improvement, and as such, a silicone waterproofing product was applied to the Henry pedestal and below the perimeter fencing as a trial application to evaluate its potential for widespread use. During the repair work, an upper tier of the scaffolding became disengaged during a storm and damaged a part of the granite, as well as an allegorical figure. The same firm that completed the previous bronze restoration work was engaged to perform the statutory repairs, including Lewis’s hat, as it had been temporarily repaired in the past. The work was completed in November 1985.

**Joint and Joint Mortar Conditions**

Repeated attempts were made by several contractors since the 1985 restoration to install material in the stone joints of the monument. In 1985, the joint mortar was removed and sealant installed into the narrow joints. It was quickly realized that water was being retained behind the sealant, potentially damaging the stone, forcing the moisture to the interior, and causing the sealant to fail. The sealant was later removed and replaced with mortar to enable the joints to “breathe,” which also quickly failed. The next attempt included reinstalling sealant, but first the joints were widened to enable installation of backing material and a more durable joint profile. This installation also quickly failed, so a contractor was retained to again replace the sealant with mortar; however, the widened...
joints were cut with a wedge-shaped profile (Figure 6) that was unsuitable for a durable mortar installation. Water entry was not corrected, allowing water exiting through the joints to destabilize the pointing mortar, which also failed prematurely.

Capstone Flashing and Band Deterioration
The copper flashing at the top of the monument was found to be in poor condition, with deteriorated seams and terminations (Figure 7) that allowed water to reach the cast iron plinth and capstone. Corrosion was observed emanating from below the flashing, with its source believed to be the capstone confinement band. Since the band was a structural element that kept the capstone stable, its condition was a significant concern.

Uncontrolled Water Penetration
Even at the time of the monument’s original construction, water infiltration was known to be detrimental to stone masonry installations. Concerns about water infiltration were further compounded by the need to keep the enclosed space dry. One of the novel design features used in the monument’s construction was the internal drainage system that collected rainwater and snow melt in carved gutters at the water tables and statue pedestals, then managed it through holes and channels within the stone masonry (Figure 8) until it ultimately reached a single internal drain. It is not known what was used to make these internal drainage pathways watertight, but over time, more and more moisture, corrosion, and calcite were observed at the interior of the stone, suggesting that they were no longer fully functional. In addition to water entering through the deteriorated drainage system, the vented hatch cover at the capstone (the “cupola”), allowed rainwater to be blown directly into the monument interior.

Cast Iron Staircase Damage
One of the most intriguing and unique features of the monument is the circular stairs that lead from the entrance into the monument to just below the capstone. Further, the stairs were designed with a platform section with casters that rotated over a bronze track, enabling it to close over the stairs and create a complete circular landing (Figure 9). Decades of water entry through the stone and the cupola led to severe deterioration of the staircase elements, including the landing platforms, tread sections, handrails (Figure 10), and stringer supports (Figure 11). Interim painting with minimal surface preparation were
unsuccessful in preventing the continued corrosion damage, including significant loss of component cross-sectional area, placing its overall stability and integrity in jeopardy, as well as making the stairs unsafe.

**Monument Stone Distress and Deterioration**

The granite used for the monument was quarried locally but was of variable quality. Several of the stone units have scaled, leaving a fragile and irregular crust at the stone surface that is often rust-colored due to the oxidation of minerals contained in the near-surface regions of the stone or corrosion of nearby ferrous metals. In addition to the scaling, a number of stone repairs were observed and evaluated that had been installed during the restoration in 1985, as well as periodically since. These included a dutchman using a similar granite, though not well matched for color, in addition to numerous patching mortars of various formulations (Figure 12). Newer, unrepaired stone damage was also observed in the form of spalls, incipient spalls, and cracks (Figures 13 and 14).

The granite pavers and stair treads surrounding the monument were constructed without any accommodation for differential movement, so many of these units were displaced (Figure 15) or heaved. The mortar between the pavers and treads was deteriorated,
cracked, or missing from the joints entirely. The combination of displacement and missing joint material left the pavers and treads rife with tripping hazards.

THE RESTORATION
Stabilizing the Stone Joint Conditions

The existing joint profile posed a problem in that its wedge shape prevented adequate compaction of mortar lifts and encouraged the mortar to fall out of the joints. Since the joints were already modified from their original profile and there was a long history of failed repointing, it was decided to further modify the joints in an attempt to optimize the joint profile for the new pointing mortar. The sides of the joints were ground parallel to each other, and the joint depth was increased to a uniform \( \frac{3}{4} \) in., while not increasing the joint width (Figure 16).

Given the historic significance of the monument, it was important to establish the type of historical mortar used, so that it could be matched if possible. Given the time of construction, it was relatively certain that Portland cement was not part of the mortar. Compositional analysis of mortar samples obtained from deep within the stone joints confirmed the original mortar was whitish in color and based on a lime putty binder. The project team agreed to use a similar mortar for consolidating and repointing the joints.

Since lime putty mortar cures by carbonation, it can take several months to gain full compressive strength. The cure time can also be dramatically extended in colder weather, as the chemical reaction responsible for curing is slowed as the temperature decreases. This extended cure time lag became an issue for the schedule because the pointing was being performed over the winter season whenever the temperature would remain above 40°F. However, because of the slow cure time, the joint mortar was vulnerable to rain washing the uncured material out of the joints. Due to loss of pointing mortar, the final repointing was delayed until spring and consistently higher ambient temperatures.

As with any masonry assembly, it was believed that properly repointing the mortar joints (installing an appropriate pointing mortar in three compacted lifts) would substantially reduce water infiltration through the stone masonry into the monument interior. To add an additional level of protection, the skyward-facing joints were repointed but capped with an elastomeric sealant, including all the joints that traversed the water table courses with integral gutters.

Reducing the Impact of Future Water Penetration

One of the primary objectives of the restoration was to substantially reduce water infiltration into the monument and to protect components vulnerable to damage from water. Because the copper flashing over the capstone was in poor condition, replacement was necessary, and allowed underlying elements such as the capstone confinement band and statue plinth to be inspected and repaired if necessary. Copper flashing replacement also enabled installation of a high-temperature waterproofing membrane to provide a redundant layer of protection to the stone below. Prior to placement of the membrane underlayment, the plinth was surveyed and found to be damaged at several locations that required restoration (Figure 17). The confinement band was inspected and found to have superficial corrosion but otherwise to be in good condition, so the project team decided against replacement. The accessible surfaces of the band were abrasively blasted to remove laitance, older dampproofing, and any corrosion, then painted with a robust corrosion-inhibiting coating (Figure 18).

The original thickness and profiles of...
the original copper flashing were replicated with one exception—the flashing was extended over the uppermost water table and integral gutter to reduce water entry through the stone joints and prevent water from saturating the upper stone units. Based on the pattern of stone damage and staining, it was believed that this integral drain leader was leaking, so extending the flashing prevented water from reaching this section of the internal drainage system. The cupola was also redesigned to better prevent wind-blown moisture from entering the monument by incorporating a wider overhang and louvers at the vertical surfaces.

Lastly, the structural components of the statue support system, including the X braces and hoof support columns, had not been maintained since the restoration completed in 1985; therefore, all elements within the monument and below the capstone were abrasive-blasted in place to SSPC5 SP 6, Commercial Blast Cleaning requirements, then painted with a corrosion-inhibiting coating (Figure 19).

Reconstruction of a Masterpiece

The circular staircase within the monument is a key feature of its architecture and a great example of unique craftsmanship at the time of construction. As mentioned previously, prior attempts at restoration included painting the cast iron in-situ, but the lack of adequate surface preparation and quality control made any benefits short-lived. Our restoration design included completely deconstructing the staircase to enable repairs and painting. Every
piece was tagged, evaluated for damage, and then individually repaired (Figure 20) or replaced with new elements cast to match the existing.

Unfortunately, the handrail (which was replaced previously) could not be salvaged, so a new two-piece assembly was fabricated, precisely replicating the original except that stainless steel studs were incorporated into the top rail section to limit the potential for corrosion. Many sections of the stringer rail were damaged from corrosion caused by water leakage and had to be replaced in kind. The majority of the decorative balusters were trimmed to remove corroded, unsound material, but to preserve the original profiles and proportions, stainless steel discs were fabricated to make up any loss in height.

Once repaired, all of the staircase elements were reassembled to ensure proper fit and confirm adequate clearances prior to the final paint coating. All pieces were then brush-blasted and painted with a multicoat industrial-grade finish, including a zinc-rich primer, an epoxy stripe coat, polyurethane intermediate coat, and a fluoropolymer top coat for a total coating thickness of approximately 12 mils.

Prior to reconstructing the stairs, the circular center support post was to be abrasive-blasted and field-painted. Though the level of corrosion on the support was minimal, it was decided to replace the support post with one fabricated from grade 304 stainless steel pipe to minimize the risk of future damage from corrosion. In addition, all fasteners used to reassemble the stairs were made of grade 304 stainless steel (Figure 21). Lastly, the semicircular landing platform was reconditioned, repaired with new infill metal, and restored to enable it to rotate once again (Figure 22).

**Stone Restoration the Right Way**

Though the local source for the stone was known, the quarry had closed several years ago. However, just before the quarry closed, many of the last granite blocks were
used to line the bank of the James River and were owned by the James River Parks System. Not only was the contractor able to match the stone type exactly, they were able to match the color of the individual stone units to be repaired with specific blocks along the river, enabling unusually precise stone matching (Figure 23). All unsound and discolored patches were replaced with dutchman repairs, with a minimum size of 2 inches in any direction. No patching was allowed—only stone dutchman repairs (Figure 24 and 25). To minimize loss of historical fabric, cracks were typically pointed with patching mortar colored to match the stone instead of replacing the unit.

Much of the granite masonry, pavers, and treads were stained due to weathering and exposure to the elements. The repair process focused on maintaining the original appearance and texture of the stone, with careful selection of stone types and colors to ensure a seamless integration into the existing structure. The use of traditional stone masonry techniques, such as the dutchman repair, allowed for precise and conservative restoration practices, preserving the historical integrity of the site.

Figure 23 – Fragment of monument stone (left), and sample from block along the James River.

Figure 24 – Completed ashlar dutchman repair.

Figure 25 – Completed carved dutchman repair.
to ferrous minerals and corrosion of steel elements, such as shims, gate elements, and the fencing. Numerous cleaning trials were performed to identify the most effective general cleaning agent, and a 10% solution of oxalic acid was selected to address iron oxide staining. However, after performing the trials, the oxalic acid solution was also found to serve as an excellent general cleaning agent for all of the stone without any damage.

**Modernizing a Traditional System**

The paving and steps surrounding the monument suffered from the inability to accommodate changes in volume over time. Our restoration design included incorporating expansion joints radially and circumferentially to control future movements (Figure 26). All of the stair treads and pavers were removed, stored, and reset on a new mortar bed. This was challenging, given the rough-hewn surfaces at the underside of the pavers and treads. As a result, the setting bed thickness was highly variable, and the originally specified bed reinforcement was abandoned (Figure 27). The treads also required trimming to accommodate the new expansion joint widths and to ensure that stone-to-stone contact was eliminated to avoid future damage. Once the treads were completely removed, the compacted rubble foundation required stabilization. A lean, low-strength concrete was used to fill voids in the foundation material as the treads were reset. After all the treads and pavers were reinstalled, the joints were filled, raked back, and then pointed with a Type M Portland cement mortar for durability.

**THE RESULT**

The opportunity to restore a monument to the Father of our Country does not come often, so when it does, it should be done with tremendous care. Through a combination of traditional repairs and modern enhancements executed by talented craftsmen, this monument will continue to serve as a worthy tribute for decades to come (Figures 28, 29, and 30).
REFERENCES

ENDNOTES
1. The Resolution to Bury President George Washington at the U.S. Capitol, December 23, 1799. Resolution published just nine days after George Washington’s death issues that requests be made to General Washington’s family for his body to be interred under a marble monument. Although George stated in his will that he wished to be buried at Mount Vernon, Martha consented to the resolution’s request, stating, “Taught, by that great example which I have so long had before me, never to oppose my private wishes to the public will...”
5. The Society for Protective Coatings (formerly the Steel Structures Painting Council).