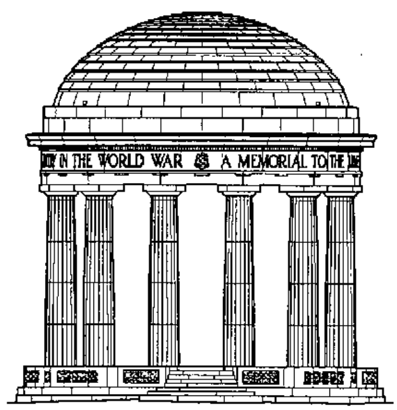
DISTRICT OF COLUMBIA
WAR MEMORIAL

Historic Structure Report
& Cultural Landscape Assessment

National Mall & Memorial Parks
PMIS NO. 43699



May 2006

John G. Waite Associates, Architects PLLC
384 Broadway, Albany, NY 12207
64 Fulton Street, Suite 402, New York, New York 10038

ACKNOWLEDGEMENTS

The successful completion of this project would not have been possible without the support and assistance of a number of organizations and individuals. To some, special thanks is owed. Terry Carlstrom, former Regional Director for the National Capital Region (NCR), Vikki Keys, Superintendent, National Mall & Memorial Parks (NAMA) and Steve Lorenzetti, Deputy Superintendent and former Division Chief of Resource Management, NAMA, provided the support which made the project a priority and allowed for its realization. Park Rangers Michael Kelly, Aaron Steketee, and John Lockwood, NAMA, through their ongoing interest and research into the structure and the events surrounding the Memorial, provided a sound research base on which the Developmental History portion of the report is based. Binh Nguyen and Ray Wooden in the Park's Resource Management Division were invaluable in providing access and logistical support to the investigative team. Mark Shara, Paul Davidson and Andrea Righi at the Historic American Buildings Survey, National Park Service provided the drawing documentation. Mike Giller and and Lori Irish of the Denver Service Center ensured that the contracting portion of the project was committed in a timely manner. Jennifer Talken- Spaulding, Cultural Resource Specialist, NAMA and Maureen DeLay Joseph, Historical Landscape Architect, NCR reviewed and critiqued the narrative, making it a more polished product. Finally, in addition to those named here, this project also benefited from the knowledge and help of numerous other individuals whose help is greatly appreciated.

Tony Donald,Architect,NPS-NAMA
January 2006

ACKNOWLEDGEMENTS

JOHN G. WAITE ASSOCIATES, ARCHITECTS PLLC
384 Broadway, Albany, New York 12207

John G. Waite, FAIA
Clay S. Palazzo
Nancy Rankin
Chelle M. Jenkins
Carrie M. Britt

Landscape Architecture
ELMORE DESIGN COLLABORATIVE
1655 Main Street, Suite 302, Springfield, MA 01103

Thomas J. Elmore
Anne C. Wellington

Architectural History
MOUNT IDA PRESS, INC.
152 Washington Avenue, Albany, New York 12210

Diana S. Waite
Jessica Fisher Neidl

Structural Engineer
ROBERT SILMAN ASSOCIATES, PLLC
1053 31st Street, NW, Washington, DC 20007

John Matteo

Masonry Cleaning
MASONRY STABILIZATION SERVICES CORPORATION
3741 Greenway Circle, Lawrence, Kansas 66046

Frances Gale

SKIDMORE , OWINGS & MERRILL LLP
2001 K. Street, NW, Washington, DC

Robert Hammell
Hamid Kia
Elizabeth Laywood

CONTENTS

EXECUTIVE SUMMARY

The District of Columbia War Memorial was built in 1931 using funds from the citizens of Washington, DC to honor the more than 26,000 residents of the district who served in World War I. The Memorial is located in West Potomac Park, between the Reflecting Pool and Independence Avenue. A circular, open-air, Doric structure, it was designed by the architect Frederick H. Brooke (with associated architects Nathan C. Wyeth and Horace W. Peaslee) as a memorial and a bandstand. It was intended that each concert would be a tribute to those who served in the war.

John G. Waite Associates, Architects and consultants Robert Silman Associates (structural engineers), Elmore Design Collaborative (landscape architects), and Masonry Stabilization Services Corporation (stone conservators) surveyed the DC War Memorial over the course of four investigative field trips spanning from March 2005 to July 2005. Mt. Ida Press prepared the architectural history.

Much of the material used to research the history and development of the monument was found in the holdings of the National Archives in Washington, D.C., and at College Park, Maryland, and in the archives of the Commission of Fine Arts in Washington. Many documents were provided by the National Capital Parks-Central (now known as National Mall & Memorial Parks) office. The researchers also spoke with staff at the National Park Service, the Lyndon B. Johnson Presidential Library, and the Martin Luther King Library.

ARCHITECTURAL SUMMARY

After nearly seventy five years of service, the Memorial remains in relatively good condition; this is largely attributable to the high quality of its original design and construction.

The Memorial is built of Danby, Vermont marble, with a concrete foundation set on concrete and wood piles. Twelve fluted Doric columns support the domed roof. The inner dome and outer dome are constructed of Guastavino tiles, and clad in marble. On the base of the Memorial are inscribed the names of the 499 Washington residents who died in service in World War I. The names were inscribed on the face of the platform in alphabetical order with no distinction by rank, race, or gender; seven of the 499 names are those of women.

Years of deferred maintenance have taken a toll on the Memorial. Open mortar joints and failed sheet metal flashings have allowed water to infiltrate the brick, terra cotta tile, and marble. The movement of water through the masonry has left calcium carbonate deposits at the stone joints and at the natural flaws in the marble.

Freeze-thaw cycling of the saturated masonry has caused the displacement of marble, and in some instances it has induced significant cracks in individual stones. Water escaping from failed internal downspouts, located within four of the twelve marble columns, has caused staining on the columns, and is supporting the growth of algae at the base of the columns. Infrequent maintenance has allowed the exposed marble surfaces to become dirty and stained from atmospheric pollutants and biological growth.

LANDSCAPE SUMMARY

The Memorial is set on a north/south axis within a wooded landscape to the east and west. Flagstone paving has been added over concrete and gravel walks and minor additions have been made to accommodate interpretive signs. Dogwood trees and many azalea bushes have been added and volunteer vegetation permitted to grow, all of which has changed the appearance of the landscape. Despite these changes, the essence of the original landscape survives.

RECOMMENDATIONS

The DC War Memorial should continue to function as a memorial, and should again be used as a bandstand. Regular use of the Memorial will help to ensure the building's viability and continued recognition, fostering constant and ongoing maintenance. The treatment of the structure should, at a minimum, adhere to the Secretary of the Interior's Standards for the Treatment of Historic Properties.

A thorough program of masonry conservation should be completed, including cleaning, pointing, and repairs. Storm water drainage systems for the building and site should be renewed. Lighting for the building should be re-assessed. Pathways between Independence Avenue and the Reflecting Pool should be restored. The historic character of the surrounding landscape should be re-established so that band concerts can once again be held at the memorial with adequate space for the audience.

The recommendations for the future conservation and treatment of the building and site include the following:

1. Clean the marble construction of the memorial, removing soil, stains, biological growth, and mineral deposits.
2. Conduct building probes to determine the nature and condition of the bronze tension ring reinforcement at the base of the outer dome.
3. Remove and reset individual pieces of displaced marble. Pin broken stones and perform dutchman repairs. Point the marble construction of the memorial.
4. Install new lead gutter and flashings to replicate the original sheet metal construction, and replace the existing internal downspouts in four columns.

   Alternate: Install sheet metal flashings and drip edges over the capstones at the base of the outer dome, and over the built-in gutter.
5. Replace the electrical panel box and circuit wiring that services the memorial.
6. Replace the cove lighting beneath the lower dome.

7. Provide new telephone service to the memorial.
8. Make improvements to the vault beneath the bandstand and provide a new floor access panel to the vault.
9. Clean out the attic space between the domes and adjust the counterweighted attic access panel.
10. Within the attic space, point the brick construction of the drum for the upper dome.
11. Reconstruct the paved access to the memorial, extending from Independence Avenue to the Reflecting Pool.
12. Restore the lawn areas adjacent to the memorial, removing overgrown azaleas and dogwoods planted in formal alignment.
13. Carefully map and restore the site drainage.
14. Trim the trees and planting that shade the memorial.
15. Establish a new memorial marker system for the trees in the vicinity of the memorial.
16. Develop a maintenance manual for the long term care of the memorial and site.

MANAGEMENT SUMMARY

ADMINISTRATIVE DATA

LOCATIONAL DATA

Building Name: District of Columbia War Memorial

Location: West Potomac Park, between the Reflecting Pool and Independence Avenue.

RELATED STUDIES

District of Columbia War Memorial Project, 2004-5, Historic American Buildings Survey, HABS No. DC-857.

CULTURAL RESOURCE DATA

National Register of Historic Places: The Memorial is located in West Potomac Park, part of the East and West Potomac Parks Historic District, listed November 1973; revised listing July 1999.

PERIOD OF SIGNIFICANCE

Circa 1931.

PROPOSED TREATMENT

Restoration of structure and landscape to original configuration and appearance, so that the Memorial can again be used as a bandstand; stabilization of marble masonry; repair and restoration of drainage for building and site.

PART 1

DEVELOPMENTAL HISTORY

HISTORICAL BACKGROUND AND CONTEXT

The District of Columbia War Memorial was built in 1931 to honor the more than 26,000 residents of Washington, D.C., who served in World War I. The memorial stands in West Potomac Park in a grove of trees between the Reflecting Pool and Independence Avenue. It is the only local monument in the immediate vicinity of the National Mall. A circular, open-air, Doric structure, it was designed with the purpose of being both a memorial and a bandstand, from which each concert would be a tribute to those who served in the war.

With an overall height of 47 feet and a diameter of 44 feet, the D.C. War Memorial is considerably smaller than the other monuments on the Mall. It is built almost entirely of Vermont marble from a Danby, Vermont, quarry. The domed roof is supported by twelve fluted columns, each 22 feet in height and 3 feet 10 inches in diameter.

The memorial stands on a 4-foot-high circular marble platform around which are inscribed the names of the 499 Washington residents who died in service during World War I. The names were inscribed on the face of the platform in alphabetical order with no distinction by rank, race, or gender; 7 of the 499 names are those of women.[1]

THE DISTRICT OF COLUMBIA AND THE GREAT WAR

World War I marked the first time in American history that the United States sent soldiers abroad to defend foreign soil.[2] When the U.S. entered the war in April 1917, it had a standing army of about 127,500 soldiers. By the time the war ended 19 months later, on November 11, 1918, the American Expeditionary Force as a whole had grown to nearly 5 million enlistees (approximately 4 million men and women served in the U.S. Army, and an additional 800,000 served in other branches of the military.) When the war was over the U.S. calculated that its forces had suffered an estimated 360,300 casualties: 234,300 were wounded, and 126,000 were dead. Hundreds more were missing.[3]

More than 26,000 men and women from the District of Columbia joined the Army, Navy, Marine Corps, and Coast Guard during World War I. In a brief retrospective report written in 1937, Washington architect Frederick H. Brooke gave the following summary of the District's military participation in the war:

> During the World War, National Guardsmen from the District of Columbia saw service, mostly in the Twenty-ninth, Forty-first, Forty-second, and Ninety-third Divisions. Washingtonians inducted, under the Selective Service Act, into the National Army were, for the most part, assigned to the Seventy-ninth Division. In these and other Divisions they fought in such memorable campaigns as the Meuse-Argonne, St. Mihiel, and in the Champagne.

The District of Columbia furnished 6,000 men to the navy during the World War. They were widely distributed and took part in practically every branch of the service. They were represented on twenty-eight battleships; took part in convoy, transport, and transportation duty, mine laying and sweeping, served on the *Cyclops*—lost without a trace—on the *Nicholson* and *Lydonia*, credited with sinking enemy sub-marines, and manned naval guns in France.

Marines, as part of the Second Division, fought through the above campaigns and at Chateau-Thierry.[4]

PRELIMINARY PLANS AND THE DISTRICT OF COLUMBIA WAR MEMORIAL COMMISSION

The war had been over for less than a month when letters in support of erecting local memorials to veterans and fallen soldiers began pouring in to the Commission of Fine Arts.[5]

In Washington Frank B. Noyes, the president of the Associated Press and the *Washington Evening Star*, and his wife, Janet T. Noyes, who was active in many civic organizations in Washington, spearheaded the effort to erect a memorial to the residents of the District of Columbia who served in the war. Early design proposals ranged from a simple, inscribed marble tablet to a complex plan for erecting not one but several memorials of different styles throughout the city, including additions to many school buildings in Washington that could be used as community centers "to develop among the people in the neighborhoods of the city the democratic principles for which the soldiers fought."[6] Charles Moore, chairman of the Commission of Fine Arts, supported the idea that there should be two classes of memorials, the first being "tablets bearing the names for the permanent record of the men from the community who fought" and the second a "more elaborate memorial symbolizing the lessons of the war."[7]

Janet T. Noyes had been the first to suggest replacing an old wooden bandstand that stood at the east end of the polo field in West Potomac Park with a marble structure that could serve the dual function of a bandstand and a memorial to the District's war dead. In October 1919 Frederick H. Brooke submitted to the Commission of Fine Arts a preliminary study of the memorial. Brooke's vision was of a circular, open-air Corinthian temple surrounded by a stepped base. The structure had a domed roof and was located in a formal, park-like setting (Figs. 1 and 2).[8]

The means and cost of creating a suitable memorial was an issue that required attention from the earliest stage of the project. In order to give the memorial appropriate prominence, it almost certainly would have to occupy government property within the city. Nevertheless, the cost of erecting it had to be met entirely by public subscription with no government funding.[9]

The first step in proceeding with the memorial was the formation of an ad hoc committee that sought to organize themselves as an official commission. On April 8, 1920, a joint resolution was introduced in the House of Representatives "providing for the appointment of a commission for the purpose of erecting in Potomac Park in the District of Columbia a memorial to those members of the armed forces of the United States from the District of Columbia who served in the Great War."[10] The resolution would not be passed for another four years.

Meanwhile, the Commission of Fine Arts assumed its sanctioned role in advising on the proposed memorial. In the early years after the war every meeting of the commission included discussion of erecting one or more world war memorials in Washington. "Submission after submission has been before the Commission," stated the 1921 annual report, "and questions of both art and policy have been considered." Still, the fine arts commission was slow to approve a plan, proffering that it was better to wait, to be cautious, to let the "issues of the war and its results and ideals...detach themselves from the confusion and conflicting emotions" that had left the country reeling in the wake of one of the more catastrophic events the world had known. The commission believed that only after the passage of time would an artist have the perspective to express "something higher and more enduring than the incidents of strife and costume of fighting men." To exemplify this phenomenon, the commission evoked great works then in progress, pointing out that more than half a century had elapsed since the Civil War had ended, and the national memorials to Lincoln and Grant were only then about to be completed. "Such instances," stated the commission, "bid us pause to let Time make sure foundations under our heroes."[11]

The public had its first glimpse of the proposed memorial when one of Brooke's 1919 drawings was published in the December 14, 1923, edition of the *Evening Star*. The caption beneath the drawing indicated that the structure would be a "white marble structure for band concerts," and the "newly formed committee of the National Capital Chapter of the Garden Club of America (Mrs. Frank B. Noyes, chairman) proposes to erect either on the site of the bandstand at [the] polo grounds or some other spot in Potomac Park."[12] (Ultimately a subcommittee of the garden club would be responsible for shaping the grove that surrounds the memorial.)

The resolution creating the District of Columbia War Memorial Commission was passed on June 7, 1924, as Public Resolution No. 28 of the 68th Congress. It stipulated that the memorial was to be "of artistic design suitable for military music and shall take the place of the present wooden band stand in Potomac Park."[13]

The first meeting of the newly formed commission was held at Frank B. Noyes's office in the Star Building on the afternoon of Friday, December 12, 1924. Present at the meeting in addition to Noyes were commission members Gist Blair, Charles A. Baker, Gen. Anton Stephan, J. R. McDonald, and Col. E. Lester Jones. Much work was accomplished at this initial meeting; Frank Noyes was unanimously elected permanent chairman of the commission, a position in which he would take active interest until his death in 1948. E. Lester Jones was elected as secretary. Also during this meeting two additional members, Edward B. McLean, of the *Washington Post*, and G. Logan Payne, "representing the Hearst papers," were elected to the commission.[14]

At the meeting Frank Noyes presented Brooke's 1919 plans to the commission and explained in detail the "thoughts that had been discussed by Brooke and himself." Noyes also read aloud a letter from Brooke expressing his "great interest" in the project, enthusiasm that was compounded by the fact that Brooke himself was a veteran of the war. To move ahead with the project, the plans required the approval of Congress's Library Committee, as well as both houses of Congress. The record does not show the memorial commission's comments on Brooke's plans, but it does note that Noyes suggested that Brooke submit further studies.[15]

Though Resolution 28 had stipulated in 1924 that the war memorial was to take the place of the wooden bandstand, the question of the building's location was not actually settled until January 1928.[16] The foundation could not be designed before a site was selected because the "character of the filled-earth would govern the type of foundations for the proposed building."[17] Structural engineer M. S. Rich, of Washington, D.C., was consulted in January 1924 with regard to the base in Brooke's design. Rich calculated that as the memorial was then designed, the load at the base of each one of the twelve columns was 55,000 pounds, or a total or 660,000 pounds.[18]

Tests conducted in Potomac Park revealed that the depth to bedrock varied a great deal within short distances in the park. Evidently the old wooden bandstand stood in an area where the bedrock was prohibitively deep and therefore would not be a suitable site for the new structure, which, because of its weight and mass, required that foundation piles be driven down to bedrock. Considering this new information, Brooke suggested that the memorial be built not on the site that had been approved by Congress but at the other end of the polo grounds, where the bedrock was closer to the surface (Fig. 3).[19]

For purely aesthetic reasons the Commission of Fine Arts was in favor of another site altogether, away from the polo grounds—the willow grove in West Potomac Park that was "opposite a point midway in the length of the Lincoln Memorial Pool," quite close to where the memorial stands today. Through the influence of the Commission of Fine Arts and with the necessary support of the Army Corps of Engineers, the resolution was amended to allow for erecting the memorial "upon such other site in Potomac Park as may be selected by the Director of Public Buildings and Public Parks of the National Capital and approved by the Joint Committee on the Library acting with the advice of the Commission of Fine Arts."[20]

In March 1925 the Commission of Fine Arts examined another round of sketches for the memorial. This design was credited not only to Frederick Brooke, but also to architects Nathan C. Wyeth and Horace W. Peaslee (Fig. 4). Only a few changes, however, had been made to the design: two steps were added to the six-step platform around the memorial, and the domed roof was given a greater curve, thereby giving the building more height. This version of the design was still in the Corinthian style and bore no inscriptions on the building's exterior. The Commission of Fine Arts made "considerable objection to the details" of the revised design and recommended that Brooke, in consultation with prominent New York architect William Adams Delano, restudy the memorial plans and submit a revised design that May.[21] Delano served on the Commission of Fine Arts from 1924 to 1928.

The original architects submitted another design to the Commission of Fine Arts, which was approved, though somewhat tentatively, on May 21, 1925.[22] This design did away with the Corinthian details and adopted the more austere Doric form. The commission agreed that the memorial should be a "little higher to the top of the dome than the width, but lower than the surrounding trees." This version of the design included bronze railings between the columns, an inscribed frieze, and grilles set into the curve of the roof, just above the entablature (Fig. 5). The fine arts commission described the new design as being "much better" than the previous one, but the discussion suggests that many of the details still had not been worked out. The members discussed the idea of installing a metal roof, to make the structure waterproof, and criticized the "dormer windows," but it was concluded that these matters could be addressed down the line.[23] The architects submitted further revisions on July 2 and December 17, 1925 (Fig. 6).[24] These plans showed "pierced marble screens" in place of the metal grilles at the curve of the roof and indicated that electrical outlets for light fixtures would be installed every 3 feet on the interior ledge of the cornice. This plan also showed the ceiling placement of the inscribed names.[25]

In late February 1926 a plaster model of the proposed memorial was placed on display at the Woodward and Lothrop department store at Eleventh and F streets NW in downtown Washington. The display occupied an entire store-front window and attracted "much attention" (Fig. 7). Constructed at one-half-inch scale, the model was reported to be "complete in every detail with its surroundings of miniature trees and marble benches"; in the dome of the model were "inscribed in miniature the more than 200 names."[26]

The 1925 design had been approved with the understanding that the exact location of the memorial was subject to further study. Three years later, on January 6, 1928, Lieut. Col. U. S. Grant III, Director of Public Buildings and Public Parks of the National Capital, and William Adams Delano visited West Potomac Park. The location for the memorial had been narrowed down to two possible sites: one at the polo grounds and the other in the "grove of willows about midway between the cross axis of the Lincoln Memorial Reflecting Pool and the Tidal Basin."[27]

Grant was a driving force in selecting the site. According to correspondence, he requested meetings with Frank Noyes on several occasions beginning in the spring of 1927 to discuss the matter. On October 4, 1927, Grant wrote to Brooke:

> I am very anxious to get the location of the District of Columbia War memorial definitely fixed. I wrote to Mr. Frank B. Noyes on the subject last spring and never got more than a promise to take the matter up. If you are advised as to his ideas and those of the Committee, could I come over and see you and try to get the matter fixed, at least so far as to know just what you want to do so that it can be started on its course through the Fine Arts Commission and Planning Commission? If such an interview with you will initiate a step towards settling the question, let me know by telephone and I will come over to your office to talk it over.[28]

Grant and Delano both preferred the willow grove as the site for the memorial and temporarily marked a spot in the grove with a bottle when they visited the site on January 6, 1928. The Commission of Fine Arts approved that site on January 17, 1928.[29]

Still, the memorial's location within the grove needed to be fixed more exactly, and there was some quibbling over it throughout that spring and summer of 1928. The spot that Grant and Delano had selected was about 400 feet west of 17th Street. Charles Moore, as chairman of the Commission of Fine Arts, was opposed to placing the memorial anywhere in West Potomac Park, thinking the location was not "exactly right."[30] But after examining the Mall Plan of 1901 the members of the fine arts commission discovered that the plan allowed for, and even suggested, the incorporation of a feature on either the north or the south side of the Reflecting Pool "at about the point selected for the location of the bandstand." The commission agreed that because the memorial was to be located in the grove of trees, it need not have "axial relations with any element in the plan" of the Mall. Nevertheless, the commission requested that Grant make a survey of the area and prepare a sketch plan showing these features on axis.[31] In late July or early August 1928 a life-size silhouette of the memorial was erected in West Potomac Park in order to convey the size of the building in relation to its surroundings.[32]

Grant delivered his report on the optimal location for the memorial at the August 6, 1928, meeting of the Commission of Fine Arts. Though it was obvious that the site selected by Grant and Delano was not exactly on axis with the Mall as the 1901 Plan would dictate, the commission superseded the stipulations of the 1901 Plan and agreed that it was more important that the memorial be situated in the previously selected, "very suitable" location in the willow grove because it was more aesthetically pleasing. The commission decided that if, in the future, another memorial were to be erected on the north side of the Reflecting Pool, it could be made to balance with the bandstand, with little change to the 1901 plan.[33]

THE ARCHITECTS: FREDERICK H. BROOKE, NATHAN C. WYETH, AND HORACE W. PEASLEE

Frederick H. Brooke had first submitted plans to the memorial commission in 1919. No record has been found indicating that anyone but Brooke was ever considered for the job. Once the building was "definitely to become a reality" with the passage of Resolution 28 in 1924, Brooke informed the memorial commission that Nathan C. Wyeth and Horace W. Peaslee had agreed to act as his associates in preparing the plans.[34]

It is not entirely clear what roles Wyeth and Peaslee played in designing the memorial; except for the inclusion of their names on some of the 1924 and 1925 drawings and the base inscription, they are rarely mentioned in connection with project, and what contractual arrangements were made with them are not known.

None of the three architects was a native of Washington, but each had come to the city early in their careers and lived the remainder of their long lives there. Frederick Brooke was a native of Birdsboro, in Berks County, Pennsylvania, and graduated from Yale University in 1899. He continued his study of architecture at the University of Pennsylvania in 1901 and 1902 and at the École des Beaux-Arts in Paris from 1902 to 1906. He came to Washington after returning from Europe and made it his home for the rest of his life. By the time of his death, in 1960, Brooke had designed several embassies, chanceries, and clubs throughout Washington and was also a driving force in the restoration of Dumbarton Oaks in Georgetown.[35]

Nathan C. Wyeth was a Chicago native who studied at the art school at the Metropolitan Museum of Art in New York and then went to the École des Beaux-Arts, where he graduated in 1899. That year he returned to the U.S., living in New York briefly before relocating to Washington, where he became the chief designer for the Department of the Treasury. In 1904 he moved to the Department of the Interior, where he served as the chief architect for the Capitol for one year. In 1905 Wyeth entered private practice. He is perhaps best known for his West Wing addition to the White House (1909–1913), the design of the Tidal Basin Inlet Bridge, the Battleship *Maine* monument in Arlington National Cemetery, and the designs of the embassies of the Soviet Union, Mexico, Afghanistan, Canada, and Chile. Beginning in 1934 he was the municipal architect of the District of Columbia, a position he held for twelve years. He died in 1963.

Horace W. Peaslee was the youngest of the three men. Born in the small town of Malden Bridge, in Columbia County, New York, in 1885, Peaslee graduated from Cornell University in 1910. The following year he moved to Washington, where he became a landscape designer for the city. He later went into private practice. Peaslee was also a founding member of the Committee of 100 of the Federal City, which was established to help shape the physical evolution of the city while safeguarding the fundamental values of the L'Enfant Plan and the McMillan Commission. Peaslee served as vice-chairman of this committee from its inception in 1923 until his death in 1959. His body of work included designs for many parks, monuments, and private residences in Washington. His best-known works are the U.S. Marine Corps War Memorial (Iwo Jima), completed in 1954, and the Zero Milestone.

All three men were veterans of World War I.[36]

FUNDRAISING CAMPAIGNS, 1926–1931

On February 27, 1926, the *Evening Star* published the following endorsement of the memorial, supporting the fundraising that was set to begin in a little more than a month's time:

> Every effort has been made to attain in the plans of the memorial a combination of beauty and dignity, which shall at once be appropriate, useful, and unique. It is believed that the temple will adequately meet these requirements. In its lovely natural setting, white and graceful, with the exquisite simplicity of old Greece, it will stand through the years as the expression of the city's pride in the men who fought in [sic] its behalf. From the grove where it will stand vistas will stretch to the Lincoln Memorial, the Reflecting Basin, the Tidal Basin, and the Arlington shores of Virginia. And used for military concerts, as planned, each concert will be a memorial service for the deeds of the living whom we honor and the dead whose memories we cherish. The building of this memorial is, we believe, a cause in which every Washingtonian will wish to play a part.[37]

To make the memorial a reality, the residents of Washington would need to pull together and give generously: it was calculated that a sum of $200,000 would have to be collected before construction of the memorial could begin.[38]

On March 13, 1926, before the official start of the campaign, President Calvin Coolidge made a personal contribution to the fund. In a letter to Frank B. Noyes, the President expressed his gratitude for the project, stating that it was an "exceedingly worthy proposal."[39] To ensure Washington's utmost participation in the drive, President Coolidge authorized the solicitation of funds in government departments.[40] Posters promoting contributions were hung in "conspicuous places throughout the offices," and employees who wished to contribute to the fund were given envelopes in which to enclose their donations. The envelopes were, in turn, collected by the heads of the various offices and then turned over to John Poole, chairman of the campaign committee and treasurer of the fund, at the Federal-American National Bank.[41]

The fundraising campaign was officially launched on April 11, 1926.[42] The commission issued a statement on that day, encouraging "every Washingtonian to contribute to this memorial; to those for whom someone near and dear served and to those not so favored. Your contribution...should not be a burden, but a personal tribute to the one, out of all of the 26,000 names to be enshrined, who means the most to you."[43]

Volunteer collectors blanketed the city with a door-to-door collection program. Much of this volunteer corps was made of up of Gold-Star Mothers—those who lost their sons and daughters in the war. These women were described as "among the most active workers in the campaign, giving all of their time" to the effort. The first four days of the campaign raised $23,050.[44] In another three days' time the fund swelled to $44,699. The names of individual contributors, private companies, and notes of thanks to anonymous donors were printed regularly in the *Evening Star*. At the beginning of the second week of the campaign, to encourage more donations, subscriptions were accepted at any bank within the District, as well as at any police station.[45] To promote awareness of the campaign, local movie theaters regularly played a three-minute film about the planned memorial and the fundraising scheme. The film depicted the model of the memorial as well as footage of District soldiers in action.[46]

Employees of departments of various government offices pooled their resources and contributed to the drive in the name of their respective offices. The employees of the Department of Agriculture contributed $585.50. Workers at the United States Shipping Board gave $277.40, and employees of the Library of Congress sent in $153.60. Group donations were also made by the Department of Commerce and the Government Printing Office. Local women's organizations and other clubs participated in a similar manner; in the spring of 1926 contributions were made by the American Women's Legion, the District of Columbia League of Women Voters, the Park View Women's Club, the Catholic Daughters of America, and the District of Columbia chapter of the War Mothers' Organization.[47] The District of Columbia Department of the Disabled American Veterans publicly endorsed the project on May 22, 1926.[48]

Edith Bolling Galt Wilson, widow of President Woodrow Wilson, donated $25 to the campaign. She sent her contribution to the memorial-fund treasurer, John Poole, unaccompanied by a letter. Her check was simply attached to an *Evening Star* news clipping about the memorial.[49]

As the fundraising campaign progressed, it called for additional staff. An appeal was made for volunteer typists who could assist in the campaign by addressing "several thousand letters" to go to prospective donors.[50] Still, despite the initial success in collecting donations, cash contributions dwindled as the weeks passed. A year after the fund-raising effort commenced, the memorial fund had not met its initial $200,000 goal, falling short by $140,000.[51]

On May 1, 1927, the *Evening Star* published a full-page reproof, chiding Washingtonians with a statement that theirs was the only city that had not erected a memorial to its defenders in the war. The admonishment continued, playing on the city's sense of pride and shame: "Of all the leading cities in the United States, Washington alone has failed to erect a suitable memorial to those who served. We were not slackers in war. Shall we be slackers in peace?"[52]

To reinvigorate the campaign, a second drive was held in the first week of May 1927; the goal was to raise $20,000 per day over the course of the week. Campaign volunteers again blanketed the city, making door-to-door calls for donations. The short film about the memorial project, made the previous year, was again run in movie houses. Local radio stations broadcasted advertisements for the campaign interspersed with their usual programming, along with speeches extolling the importance of the memorial.[53] Benefit concerts by the city's military bands were staged to take place throughout the week at various locations in the city. All donations to the fund were made tax deductible.[54]

Booths were set up in government offices as donation-collection stations to facilitate contributing to the fund. From their pulpits Episcopal, Catholic, and Jewish leaders urged their congregations to participate in the drive. Buttons emblazoned with the number "535," representing the number of Washington residents at that time calculated to have been lost during the war, were distributed to contributors.[55]

In the first day of the renewed effort, the campaign raised $10,215, or a little more than half the day's goal. Three days later the mark of $25,000 was exceeded. On May 5 the memorial fund reached $36,000. That day, which proved to be the most successful of the campaign, saw the combined donation of $10,950.28.[56] On that same day, in the *Evening Star*, Newbold Noyes, the son of Frank and Janet Noyes and chairman of the memorial campaign committee, made an emotional appeal to the citizens of Washington:

> This is a frank statement of the fact that, at its present rate of progress, the Memorial campaign will fail...It will take the answering of these questions by each of us:
>
> Do I, as one for whom they died, feel that I owe nothing to the fitting perpetuation of the memory of our war dead?
>
> Do I want to find thin excuses for not doing what I know I, personally, ought to do?
>
> Do I want others to carry the obligation of this community to those who died as its representatives in 1918–1919, while I dodge my share of that obligation?
>
> Do I not want to subscribe, generously, gratefully, and gladly to the Washington War Memorial—*paying what I can now and the balance of my subscription during the next three years?*
>
> What is going to be YOUR answer to these questions, Washingtonians?[57]

On the following day, May 6, the campaign fund counted a total of $43,231. Nearing the close of the week-long effort, the memorial campaign committee reported that they found the returns to have been disappointing, but those in charge of the campaign were "unwilling to concede defeat"; they were "banking on last-minute reports from a number of sources yet to be heard from." District school children were encouraged to each give five cents to the cause, and on the final day of the drive they collectively donated $799.30.[58] The District police force contributed $2,089.64; the fire department, $60.85.[59]

Veterans of the war were encouraged to give as well. An anonymous veteran wrote the following note to encourage his fellow veterans to participate in the drive:

> I inclose [sic] a small contribution to the District War Memorial. I think the word "patriot" is a pompous word, and I do not subscribe as a patriot. I think there is a lot of blah about the love for our soldiers, and I do not subscribe for love. Nor am I particularly interested in whether the proposed memorial is architecturally correct, or whether a tree must be cut down to make a place for it, or whether it will stand in the center of Pennsylvania Avenue or Rock Creek Park. I leave such details to those who ought to know what is best. I send this contribution because I heard the Marine Band play "The Battle Hymn of the Republic" in front of the Earle Theater the other evening, and because the music and the Spring twilight and the Marines brought back a lot of memories.

He continued with a personal account, describing in gruesome but poetic detail the violent and devastating loss of several of his friends in battle. He concluded: "The memorial will stand for something for me, and what it is I cannot write, for I only feel it. And the fact that some fate over which I had no control, sent me, as one in millions of others, to France, and makes me now a 'veteran,' does not create within me that sense of modesty which, from all I hear, makes some others abstain from taking part in the raising of this memorial."[60]

Still, veteran participation was not without dissent. Some, as individuals, and at least one local post of the American Legion, opposed the memorial and chose not to contribute. These veterans took issue with the fact that the design had not been approved by veterans, whom they believed, should have had a stronger voice in deciding upon a plan. They wanted a more utilitarian structure, "to house ex-servicemen's organizations and possibly a National Guard armory."[61]

When this second phase of the memorial fund drive came to a close on May 9, the campaign had collected $77,256.31, or little more than half of the $140,000 goal for the week. Meanwhile, however, the total sum required to begin construction had been revised downward. The *Evening Star* reported that the memorial commission stated that "while the cost of the memorial, with the necessary landscaping and amplification devices and other equipment has been placed at $200,000, the memorial itself may be built with about $155,000."[62]

When combined with the $60,000 that had been raised the previous year, the $77,000 raised in May 1927 left the memorial campaign fund with a shortfall of about $18,000, which had to be filled before construction could begin. After the close of the official fundraising drive, the campaign committee unanimously agreed that the appeal would continue, unofficially and with a volunteer skeleton crew, until the remainder of the money was raised. At this time the headquarters for the committee was moved from the New Willard Hotel to the Star Building, also on Pennsylvania Avenue.[63]

On May 21, 1927, a benefit luncheon was held at the Mayflower Hotel, and thereafter a so-called "Dollar Day" initiative was aimed at those Washingtonians who had not yet contributed to the fund. With these efforts and ongoing public pleas for donations, the deficit steadily ebbed away over the following weeks. On May 29, 1927, the *Washington Post* reported that the fund now stood at $149,138, bringing the total to within $5,861 of the goal of $155,000 that was needed for construction to begin.[64]

Over the next three years the memorial commission collected on the pledges that had been made in the 1927 drive. By May 1930, $135,000 had been taken in, but there still remained another $20,000 to be collected.[65] Securing this amount proved to be no easy task. In the few years since the conclusion of the 1927 campaign drive, the social and economic climate in the country had changed dramatically. After the stock-market crash in October 1929, the economy foundered, and many Washingtonians who had pledged funds two years earlier suddenly found themselves unable to donate what little cash they had for the erection of a marble bandstand. A general committee, headed by Frank Lee, vice president of the Mount Vernon Savings Bank, was appointed by the executive council of the Washington Central Labor Union to organize another fundraising campaign in 1930. This campaign, however, adopted a slightly different approach. Lee's 14-member committee was made up of representatives from various unions and included typographers, bookbinders, painters, teachers, musicians, machinists, steamfitters, plumbers, press assistants, plate printers, and federal employees. It was this committee's goal to contribute funds themselves and encourage others to do so as well.[66] The chauffeurs', bricklayers', bakery salesmen's, and elevator constructors' unions also lent their support by giving generously to the campaign.[67]

In November 1930 the International Association of Machinists organized a multi-act midnight show at the Rialto Theater in Washington to benefit the war-memorial fund. In addition to an opening concert by the 140-piece Veterans of Foreign Wars Overseas Band, the show featured a new comedic film entitled *See America Thirst* and performances by dancers, a monologist, a contortionist, and a psychic, as well as novelty singing and musical acts.[68]

In a similar spirit the Central Labor Union put on a two-week-long fair at Fifth Street and Florida Avenue NE in June 1931. The fair, which drew "large crowds of supporters," was kicked off with a parade and included "several big outdoor shows."[69]

PREPARATIONS FOR CONSTRUCTION

After five years of constant appeals and fund-raising events, the campaign committee had completed its task; it had raised the amount needed to break ground in West Potomac Park. During the winter of 1931 the final details of the memorial design were worked out: the placement of the inscriptions, the size of the chamber beneath the memorial, and the domed ceiling were addressed.[70]

In early February Frederick Brooke wrote to the Commission of Fine Arts with a proposal to change the approved design in order to provide a better space for the inscription of the names. The ceiling, Brooke had decided, would be too high for people to read the inscribed names of those lost in the war, and he proposed instead that the base of the memorial be modified to accommodate the inscriptions there, closer to eye-level. Brooke suggested that the new base be 4 feet in height and that the names be inscribed into its marble surface. With the new design the memorial would not be surrounded by a stepped platform. Instead, the altered plan called for two flights of stairs, each with eight steps, aligned axially at the north and south sides of the memorial leading up to the platform. Brooke assured the members of the fine arts commission that with the exception of the change in the base, the design remained entirely the same. A dedicatory inscription, the text of which had not yet been determined, would precede the list of names. According to this plan, bas-relief insignia of the branches of the armed forces, as well as the seals of the District of Columbia and the United States, would be carved on the east and west sides of the memorial. The commission approved Brooke's revised plan at its February 12, 1931, meeting (Fig. 8).[71] The bas-relief insignia, however, ultimately did not appear as planned. The seal of the District of Columbia was carved onto the west side of the memorial, but the U.S. seal was not used; instead, *The Great War for Civilization* seal was carved onto the east side.

The 1925 approved plans had called for a cellar beneath the memorial large enough to contain a bathroom and to store chairs to be used at the concerts. This plan was abandoned in February, 1931, when it was determined that chairs for events could be supplied and delivered by the government.[72] The idea for the bathroom was also given up at this time. A small subterranean space large enough to hold electrical equipment was retained.

While the issues of the inscriptions and the cellar were easily resolved, the structure's acoustical requirements were not. At the January 6, 1931, meeting of the Commission of Fine Arts, Horace Peaslee, who had been listed as an associate architect for the project, had criticized the design, saying that, according to the leader of the Marine Band, the curved ceiling was not the best shape for good acoustics. He posited that the installation of a simple, flat sounding board in the ceiling would be "much better."[73]

In the month that followed Brooke researched the matter in support of his design. He reported to the fine arts commission on February 12 that, according to Dr. Paul R. Heyl of the Acoustical Division of the Bureau of Standards, a "shallow dome is far better if the audience is away from the bandstand." Brooke also reported that while bandmasters often like a marble floor because it makes the sound within the bandstand "distinct," the marble floor is "not so good acoustically for the audience." Brooke then read a letter from the famous bandleader John Philip Sousa in which Sousa said that the "most successful bandstands are somewhat in the shape of the one which Brooke had designed." Brooke also noted that Carl Engel, Chief of the Music Division of the Library of Congress, had been consulted and that he had no objections to the design. In spite of these endorsements, the commission suggested that Brooke give further attention to the question of acoustics.[74] In the end Brooke evidently prevailed, for the memorial was built with the domed ceiling.

During this critical time of the memorial's planning, the Commission of Fine Arts' resident landscape architect, Ferruccio Vitale, was abroad and unavailable for consultation. In his place James L. Greenleaf, the commission's former landscape architect, was consulted, and in December 1930 he gave Charles Moore the following advice with regard to the memorial's landscape design: "The ultimate good effect must rely upon a well developed grove and the beauty of the structure under the resulting light and shade. I would absolutely avoid all fancy planting and flower beds."[75] Greenleaf further recommended that the wooded area extending south of the reflecting pool from 17th Street to the Lincoln Memorial be cleaned out and that the shrubbery and trees be thinned in preparation for construction.[76]

In early February the Commission of Fine Arts began determining which trees at the site could be removed and which could be left standing in the grove. The goal was to create the most aesthetically pleasing environment for the memorial while at the same time accommodating large numbers of concertgoers.[77] Workmen marked the trees, and on the afternoon of February 12 members of the fine arts commission and Irving W. Payne, landscape architect of the office of Public Buildings and Public Parks, inspected the site in preparation for removing the trees and clearing the space so that the bandstand would have an "appropriate setting."[78]

The specifications for the memorial were finalized on March 4, 1931 (Fig. 9-12).[79] The general description of the work indicated that the memorial was to be a "circular building of the open temple form" and that it was to be "supported by composite piles." The "pile caps and floor construction" were to be of reinforced concrete, and the dome was to be of "Guastavino laminated tile construction, with ceiling and outer surface of dome faced with marble."The memorial site was described as being "level with an average elevation of about 12 feet (D.C. datum)."A temporary office and privy were set up on the site for the duration of construction.[80]

The test borings made in March 1928 had determined that there were only four feet of surface earth above the waterline. Below that "sand, clay, and river mud were encountered to a depth of 53 feet, where bedrock was found."[81] The results from the test borings led the architects to determine that 47-foot-long composite wood-and-concrete piles would be the best means of supporting the foundation. The lower sections of the piles were to be wood and the upper 15-foot length would be concrete. Brooke reported that the piles were 10½ inches in diameter. Four piles were used to support each of the 12 columns, and one pile was driven into the earth below the small chamber beneath the center of the memorial. A 5-foot-wide, 12-sided ring rested atop the piles and was braced by concrete cross beams.[82]

By March 12, 1931, six local contractors had submitted bids for the project: Davis, Wick, Rosengarten Co.; Boyle Robertson Co.; Frank L. Wagner; James Baird Co.; George A. Fuller; and Chas. H. Tomkins.[83] The memorial commission selected the lowest bidder, James Baird Co., Inc., and entered into contract with that firm on April 11, 1931. Baird's bid was for $137,135.00, which was to be paid to the company in monthly installments.[84] Baird was well known in Washington. His company had recently built the Internal Revenue Service Building at 1111 Constitution Avenue, and "as the principal owner of several buildings" in Washington, he was "known to be one of the largest taxpayers in the National Capital."[85]

CONSTRUCTION, APRIL TO OCTOBER 1931

Lumber was hauled to the site on April 17, 1931, and construction began on April 23. The pile driving started on May 16.[86] The work to be carried out by the Baird firm included "all necessary excavation; the driving of piles; reinforced concrete and construction as shown; the erection of marble-work throughout and dome of Guastavino-tile construction; also electrical work for interior lighting; and plumbing work in connection with drainage system for storm water."[87] The contract stipulated that the work was to be completed by November 1, 1931. H. A. McQuary was the superintendent of the job.[88]

It was expected that it would take approximately two months for the quarrying and finishing of the marble to be completed, during which time the foundation was constructed and made ready to receive the memorial's base and superstructure.[89] By June 27, 1931, when the first shipment of marble arrived in Washington from the Danby, Vermont, quarry, workers at the site had made "good progress": 50 piles had been driven into the earth (one more than the 49 detailed in the March 4 specifications), and most of the concrete foundation had been finished. Photographs that appeared in the July 12, 1931, issue of the *Sunday Star* showed the base nearly completed, as well as a partially finished framework for the dome lying on the ground (Fig. 14).[90]

On July 20, 1931, the list containing the names of each of the 26,048 residents of the District of Columbia who served in the war was placed in a "specially prepared" copper box measuring 12 by 18 inches. The list was typed on special 100-percent cotton-fiber paper, the same kind used for currency, furnished by the paper division of the Bureau of Standards; it was then the most long-lived paper known to science. In addition to the list the box contained a set of the building plans, a copy of that day's *Evening Star*, and coins and paper currency with the latest dates. The box was sealed and placed within a carved niche on the inner face of the cornerstone by Maj. Gen. Anton Stephan, a member of the memorial commission, who was one of the four men given the task of compiling the final, correct list of District soldiers lost in the war. The *Evening Star* reported that there were no formal exercises attending General Stephan's task that morning; it was instead a "simple matter-of-fact execution of a masonry task, in which he was assisted by Frederick H. Brooke, architect for the memorial."[91]

By August 3, 1931, the marble base was complete, and the twelve columns had been erected and were ready to receive the dome.[92] (Fig. 15) Work progressed swiftly. On September 29 the half-ton keystone of the outer dome was laid in place. On the next day the *Evening Star* reported that this task had been performed with an "informal ceremony in the presence of representatives of several groups interested in the construction of the memorial" (Fig. 16). The *Star* noted that the inner dome was composed of 365 stones and the outer dome consisted of 324 larger stones.[93]

In his 1937 report Brooke described the dome construction as being of an "inner and outer shell of Guastavino laminated construction. The marble ceiling was erected on wood centers with 6" cramps (1650) built into the masonry. The lower Guastavino shell was built around these projecting cramps. In reverse fashion the outer Guastavino shell held dowels which anchor the outer marble dome."[94]

The 4-foot-diameter marble roundel at the center of the inner dome weighs an estimated 300 to 400 pounds and rests on a marble ledge. This panel can be removed by means of a system of pulleys and a counterweight in order to access to the space between the two domes. It is not entirely clear when this mechanism was installed, as it does not appear on any of the original drawings, but it is likely that it was rigged during the construction of the ceiling and roof.[95]

The highest point of the curved ceiling is about 30 feet above the floor, and the underside of the roof is 7 feet 6 inches above the center of the ceiling dome. A "five-ply tar and tar-felt membrane waterproofing" was applied to the outside of the outer Guastavino shell beneath the marble roof tiles.[96] The convex surface of the inner dome was covered with a heavy coating of tar waterproofing as well. A lead gutter was installed around the base of the outer dome, and drainpipes were inserted in 6-inch-diameter holes drilled through the center of the northeast, southeast, southwest, and northwest columns. Electrical fixtures were installed at 2-foot intervals in the interior cornice of the lower dome.[97] The marble facing of the exterior cornice was applied to brick backing. On September 30, 1931, the stone masons were reported to be putting the "finishing touches on the inside of the dome" and "smoothing the edges of the marble ceiling." It was projected that the scaffolding surrounding the memorial would be removed during the following week and that the marble-tile floor with its twelve-point-star-pattern would be laid then.[98]

During the first three weeks of October, work at the site continued: the scaffolding was removed, the floor was nearly completed, and the construction of the 8-foot-wide stone sidewalks was underway. On October 14 the *Evening Star* reported that the memorial was then "almost complete."[99] A little more than a week later, on October 23, the memorial was reported to be "virtually complete," and the grounds were being prepared for the upcoming dedication ceremony, which was slated for 11 a.m. on November 11, 1931. The site was being graded, new sod was being laid down, and the sidewalks were still under construction.[100]

Meanwhile, Maj. Gen. Benjamin Franklin Cheatham, retired quartermaster general of the U.S. Army, had been appointed chairman of a special subcommittee of the National Capital Chapter of the Garden Club of America.[101] This subcommittee was responsible for the creation of the memorial grove surrounding the memorial, and its members included Mrs. David A. Reed, Mrs. Jesse H. Metcalf, Mrs. Robert L. Bacon, and Mrs. William R. Castle. Janet T. Noyes, who was also a member of the subcommittee, headed the Committee of the National Capital of the Garden Club of America at the time. Janet Noyes reported that by April 16 the subcommittee had raised $600 toward the memorial trees.[102]

On the afternoon of April 16, 1931, Cheatham and some members of the fine arts commission visited the site, and he "urged that the Commission recommend a landscape architect to prepare a plan." James L. Greenleaf was retained; he arrived in Washington on April 23 to serve as consulting landscape architect.[103]

Frederick Brooke explained the landscape concept to William Adams Delano in September 1931:

> When the site was fixed by unanimous consent on the axis of Nineteenth Street, it was with the idea of some kind of vista giving a glimpse of the Memorial along that line and perhaps some day from a distance to the North.
>
> Later Mr. Moore called Mr. Greenleaf into consultation as to the entourage and planting for our building. It was Mr. Greenleaf who suggested, among other things, an open vista North and South but one formed by trees not too strictly in line or necessarily of the same species.

> To this end it is proposed to leave as many trees as conform to the idea of informal approaches from North and South and add other trees where required. Of the old willows near the building, one was blown down, fortunately without damage, and others were a menace and have been removed. In general good trees about the site will be left to help our grove...
>
> We all want to make a grove about the Memorial which shall be entirely informal but since this is a public monument, we are convinced that it must be clearly seen from the adjacent roadways and easily approached by perhaps sizable crowds.[104]

At the September 24, 1931, meeting of the Commission of Fine Arts, Cheatham submitted a design for the landscape treatment. The plan showed a 70-foot approach at the axis of 19th Street on the south side of the Reflecting Pool. The meeting minutes recorded that the vista was "to be 50 feet wide, flanked by sidewalks, shaded by trees with a grass panel between." The fine arts commission endorsed the plan.[105]

The special committee planned to plant hardy elm trees, indigenous to the area, in an irregular pattern in the grove. An area 50 feet in circumference around the memorial was to be covered with sod, with the grove of trees then spreading outward. The plan was approved by the District of Columbia World War Memorial Commission and by James L. Greenleaf. The special committee hoped that some of these trees would be planted before the dedication. With this goal in mind General Cheatham and his committee sent out invitations to veterans' organizations, as well as to individuals, to participate in the memorial grove project. The following message was attached to the invitations:

> To carry out the memorial idea and to complete the setting for this classic shrine it is proposed to plant a grove of trees around it, each tree to be a memorial in itself. Procuring and moving the proper kind of tree, approximately 12 inches in diameter and 25 feet high, and placing thereon a bronze tablet suitably inscribed to record the name of the donor will cost about $200. Veteran organizations and patriotic individuals are invited to help make this grove a reality. Money donations may be made to any member of the committee, any one desiring to present a suitable tree, which is located in Washington or the immediate vicinity, should communicate with the chairman.
>
> The planting should be done this Fall in order that the best results be obtained, so it is urged that donations be sent in as soon as possible.[106]

The existing grove consisted of "willows and various types of swamp trees of soft wood." The committee's plan called for the old trees to be cut down and replaced as contributions of new trees arrived. "It is the aim of the committee," Cheatham wrote, "to leave the present grove as it is until the new trees arrive. In other words, there will be no destruction of present trees until new ones arrive and replace the old." Cheatham continued, elaborating on the landscaping scheme:

> It is the purpose to leave some of the great willows as a background in the distance, and to plant also some large tulip trees some distance away

> from the memorial. Then in between this outer fringe of the grove and the elms around the memorial will be planted other hardwoods, such as oaks, beech, and elms. They will be irregularly placed so as to avoid the semblance of formal design. Rather the effect will be to create a new forest setting for the classic beauty of the marble temple...
>
> But the memorial grove will continue to expand and to grow, it is expected, by the further additions of hardy and sturdy trees, so that the memory of the heroic dead may be preserved, both in the marble and in the living trees, for centuries to come.[107]

During the last week of October the first elm — a gift from Janet T. Noyes, the memorial's "principal proponent"— was planted in the memorial grove.[108] Later she was recalled to be "more responsible than any other individual for the gathering of funds for and the completion of the District of Columbia War Memorial in Potomac Park."[109]

On October 9, 1931, Lieut. Col. U. S. Grant III, Director of Public Buildings and Public Parks of the National Capital, contacted the Potomac Electric Power Company, requesting the installation of electrical service at the memorial. Grant noted that the bill for electricity used at the site would be sent to the Office of Public Buildings and Public Parks of the National Capital.[110]

THE INSCRIPTIONS

In the 1925 plans, the inscription on the frieze read "In Memory of the Men and Women of the District of Columbia..." The March 1931 plans reveal that this wording was changed to read as it does today: "A Memorial to the Armed Forces from the District of Columbia Who Served Their Country in the World War."

Selecting the names of the soldiers to be inscribed on the base of the monument proved to be a "matter of considerable difficulty."[111] The American Legion's list of the fallen soldiers included 536 names, while lists supplied by the U.S. Army, Navy, and Marine Corps included the names of 448 individuals. Adding to the confusion, 344 names appeared on one or the other list but not on both. To resolve this situation Frank B. Noyes appointed a five-person committee to research and prepare a correct list of all of the names that were to appear on the memorial.

In the end, a list of 499 names was compiled based on the following criteria: First, the person must have died while in active service prior to the official ending of the war, or the person must have been discharged because of a physical injury sustained during the war and died prior to November 11, 1918. Second, the person must have been an actual resident and citizen of the District of Columbia prior to his or her entry into the service.[112] The service lists were verified by checking the names against War Department service cards. In addition, the lists were printed three times in local newspapers so that the public could supply suggestions and corrections.[113]

The inscription of the names was underway but not completed by the time of the dedication ceremony. On November 13 Brooke reported that the carving was going very slowly and that he was "pressing for more carvers and greater progress."[114]

A few days after the dedication, a complaint was lodged about the quality of the inscriptions. Alfred C. Liebler of 1650 Harvard Street NW in Washington wrote to Grant requesting, in the public interest, that the carving of the names be stopped at once and that the "already disfigured stone replaced as the work so far done is not in harmony with the work as a whole." Liebler, whose connection with and reason for interest in the memorial is unknown, noted that the "vari-sized, illshapen, and poorly spaced lettering" looked like vandalism rather than quality workmanship.[115] F. B. Butler of the Office of Public Buildings and Public Parks of the National Capital responded to Liebler's complaint, indicating that the matter of the inscriptions was in the hands of the architect, and he suggested that Liebler contact Brooke. It is unclear whether any changes were made.[116]

The identity of the artisan or artisans who executed the six bas-relief medallions is unknown.

WALKWAYS

Frederick Brooke sought to purchase the stone needed for the circular walkway from the government. He noted in a May 1931 letter that flagstone sidewalks in front of the U.S. Treasury Building were being replaced with concrete, and he hoped to reuse that flagstone.[117] This request was met, and flagstone that was being removed in the repaving of Constitution Avenue was hauled to the memorial site in June.[118]

An estimate of $750 for the construction of 500 square yards of granular rock walks on a 4-inch cinder base was submitted on September 21, 1931. This proposal did not include the necessary grading. Frank T. Gartside, the Chief of the Park Division of the Office of Public Buildings and Public Parks of the National Capital, suggested that the R. K. Funkhouser Company of Hagerstown, Maryland, be contracted to construct the walks.[119]

According to the 1931 annual report of the Director of Public Buildings and Public Parks of the National Capital, the memorial would be finished ahead of schedule, during fiscal year 1932 (Fig. 17).[120]

The public was invited to the dedication ceremony, and Frank B. Noyes extended an official invitation to veterans on the day before the dedication. A special place had been reserved for attending veterans, and Noyes wrote that they would be given "special attention." All members of the Washington branches of the American Legion, Veterans of Foreign Wars, Disabled American Veterans, and American Gold Star Mothers were urged to attend.[121]

THE DEDICATION CEREMONY

The dedication of the District of Columbia War Memorial, part of the national observance of Armistice Day, November 11, 1931, was the main commemorative event in Washington on that day. The ceremony was designed to be "vivid with the colors" under which the soldiers of the District had "died on the field of action" and "stirring with the martial music to which they marched." The weather on that day was "mostly cloudy and somewhat cooler" than usual.[122]

For the 20 minutes preceding the start of the ceremony, the Marine Band, led by the 77-year-old Washington native and "incomparable bandmaster" John Philip Sousa, performed. Music resounded from the flag-and-garland-draped memorial for the gathered crowd of "several thousand." At 11 a.m. the band struck up "Hail to the Chief," and President Hoover, accompanied by aides and First Lady Lou Henry Hoover, arrived through the entrance to the north of the memorial and took their designated places on the speaker's stand.[123] Justice F. D. Letts, of the District Supreme Court, then announced that at 11 a.m. it had been 13 years, to the day and to the hour, that the armistice had been signed and that the "war to end all wars" had ended.

The program that followed was brief. Lieut. Col. U. S. Grant III introduced memorial commission chairman Frank B. Noyes. The invocation was given by Chaplain Benjamin J. Tarsky, of the U.S. Army, after which Sousa led the Marine Band in playing his famous composition "The Stars and Stripes Forever." Noyes then presented the memorial to President Hoover, who accepted it on behalf of the United States. The President delivered a short speech lauding the heroic deeds of the soldiers who had died in the war and stressing the ever-increasing need for peace and diplomacy in an increasingly dangerous world:

> It is by building good will and constructive effort among nations that we can best honor the memory of the men who died that the world should have peace. This monument stands for men who fought not alone for their country, but to establish the principles of justice and peace. We pay tribute here to their valor. We honor them for their sacrifice. We respect their memory by renewing our obligations to the purposes and ideals for which they fought.[124]

The President's speech was broadcast by radio across the country by the National Broadcasting Company and the Columbia Broadcasting System.

Mrs. George Gordon Siebold, national president of the American Gold Star Mothers, then placed a wreath with a ribbon tied at the top, a symbol of death and mourning, at the memorial. Taps was played by a bugler, and the benediction was given by the Rev. Arthur L. Smith, department chaplain of the American Legion. The half-hour-long ceremony concluded with the band playing the "Star Spangled Banner.[125]

In the days following the dedication it was reported that several hundred people visited the memorial each day. The lights were left on in the memorial until 10 p.m. each night after the dedication until November 15.[126]

The project apparently was finished within budget. On November 17, 1931, Frank Noyes requested a statement of expenses for the dedication ceremony. He wrote that at that time they were "scraping the bottom of the till."[127]

After the dedication, plans for grading and seeding the area around the memorial were made for the following spring. All left-over materials, which included 45 bags of "path material," were removed from the site as well.[128]

The memorial received the Washington Board of Trade Committee on Municipal Arts's 1931–1932 award for architecture.

PART 1

DEVELOPMENTAL HISTORY

DEVELOPMENT AND USE

OBSERVANCES, EVENTS, AND CONCERTS

The first band program was held at the memorial on June 2, 1932. The 77-member U.S. Marine Band opened with "Heroes All" to an audience of 2,000. Other selections performed that night included "Les Preludes," a cornet solo of "Fantasie Capriccioso," and a saxophone solo of "Beautiful Colorado." A photograph published in the June 4, 1932, *Washington Herald* shows the concertgoers seated on the grass. The issue of benches and chairs had evidently not yet been worked out. Capt. Taylor Branson led the Marine Band (Fig. 18).[129]

Beginning on May 1, 1936, the American Legion and its auxiliary organizations held annual commemorative observances at the memorial. The Marine Band played at these events, which included a ritual known as the "Poppy Processional," in which junior members of participating organizations placed festoons of poppies on a white cross in front of the memorial.[130]

On June 15, 1939, the 50th anniversary celebration of John Philip Sousa's famous piece "The Washington Post March" was celebrated at the memorial. The event drew a large crowd. The *Washington Post* described a picturesque scene, noting that the audience "sat on rustic benches and sprawled in the cool grass" around the memorial, "under the bright night sky and the brooding trees" of the nearby grove. The crowd "sat raptly through an hour and a half of music," which was described as a "more lively set" than the usual "classical stuff" that was played at the concerts held at the memorial. Following the rendition of "The Washington Post March," a "burst of applause ringed the Memorial and it slowly died while the softly lighted dome seemed to brighten with the dimming day and throw into bolder relief the tall white columns against the blue coats of the band and its glittering instruments."[131]

In the years to come, the two people most responsible for making the memorial a reality were thanked and honored at the memorial that they worked so tirelessly to create and maintain. Janet T. Noyes died in 1942, at the age of 74. Frank Noyes died six years later, in 1948, aged 85. Tributes were paid to both. Janet Noyes was remembered at the May Day ceremony in 1943, before a crowd of more than 400 people for her "great assistance…in founding the District Memorial," her "patient effort," and a "life rich in accomplishment" (Fig. 20). The American Legion paid tribute to Frank Noyes at the May Day celebration in 1949, placing a wreath at the memorial and singing "America" and "Trees" in his honor.[132]

The District of Columbia World War Memorial and May Day Corporation was created in 1940. This organization has arranged annual memorial observances at the memorial since that time.[133]

REPAIRS AND MAINTENANCE

The care, custody, and maintenance of the District of Columbia War Memorial was officially placed under the jurisdiction of the Parks Division of the Office of Public Buildings and Public Parks of the National Capital on February 6, 1932. The responsibility of guarding of the memorial was placed with the Protection Division at that time.[134] On June 10, 1932, maintenance of the memorial was transferred to the Buildings Division (Potomac Park Group), while the maintenance of the grounds remained the responsibility of the Parks Division.[135] On the following June 10, 1933, President Franklin Delano Roosevelt issued an executive order reorganizing and consolidating the Office of Public Buildings and Public Parks and other federal parks under the National Park Service. Care of the memorial was placed under the jurisdiction of the National Park Service at that time.[136]

Care of the memorial was transferred again on June 30, 1939, this time into the hands of the superintendent of National Capital Parks division of the National Park Service.[137] In 1965 National Capital Parks-Central was established to administer the National Park Service units in the memorial core of Washington D.C. This office has been responsible for the D.C. War Memorial since that time.[138]

Security at the memorial became an issue almost immediately after its dedication. It was impossible to monitor the memorial at all times: budgetary constraints simply did not allow for it. A night watchman had been provided by the contractor throughout construction until a few days following the dedication. On November 16, 1931, the morning after the watchman's service ended, Brooke visited the site and noticed that the base of the building had been "dirtied and streaked, greatly marring the appearance and endangering the carved names and inscriptions." Also, one of the carved insignias had been "slightly broken." Brooke attributed the vandalism to "thoughtless boys." Site superintendent H. A. McQuary reported that he had observed three boys roller skating over the marble floor.[139]

As a result of this incident Brooke requested that a permanent watchman be assigned to the memorial or that it receive better police protection.[140] Grant observed that newly completed structures tended to "receive more abuse immediately after being turned over than after the public has become accustomed to it." He reassured Brooke that "rigid policing" would eliminate all difficulties.[141]

Though the memorial was patrolled by three separate police beats and was inspected at intervals by a plain-clothes police officer, vandalism was an increasing problem by late winter 1932. The grove of trees that had been such an important feature of the landscape design and was intended to create an air of solemnity and peacefulness instead provided a meeting place for vagrants, ne'er-do-wells, and rambunctious youths. The effects on the memorial were obvious, with garbage constantly accumulating at the site.[142] The problem prompted Frederick Brooke to inquire of Grant in February 1932 whether it would be possible to hire a "half-guardian" for the memorial. Brooke suggested that a retiree or a "partially incapacitated veteran" could be on hand on the weekends and on some weekdays during the summer when the numbers of tourists and visitors increased. Brooke pointed out that, when he had recently visited the memorial, he had cleaned mud from the floor and sides of the building, removed broken alcohol bottles, and again shooed away roller-skating children.

Brooke noted that the memorial required weekly sweeping and mopping. Special care was necessary when cleaning the inscriptions; he requested that the letters not be brushed, for fear of dislodging some of the parts that had come off during the sandblasting and had been cemented back in place.[143]

The memorial was a magnet for teenagers. Though a "No Roller Skating" sign had been placed on the site in the spring of 1932, the use of the memorial as an ersatz roller rink proved to be an ongoing problem. Also on at least one occasion a group of teens was stopped by police for playing tag on the memorial and dirtying the place "quite badly by sliding across the floor from one pillar to the other"; the park police officer noted that there wasn't "a square foot of the place that they missed." Though no real damage resulted from this incident, such activities marred the memorial's solemn character.[144] Worse still, people began driving up to the memorial at night and parking on the grass; the memorial and surrounding grove had become a "rendezvous for those who shunned the light." As a result, keeping the memorial lighted at night became crucial.[145]

On March 9, 1933, U. S. Grant III wrote to Brooke inquiring about the proper locations for drinking fountains at the site. Evidently there were already fountains in place since Grant wrote of their "relocation," but he sought Brooke's input on "giving consideration to the convenience of the public, drainage so that the water splashed about will not make a bad spot on the lawn, and the cost of making the change." Grant also noted that funds were "very, very scarce," and he expected that they would be even scarcer the following year.[146]

In November 1936 scaffolding was erected on the site and the coffered ceiling was thoroughly cleaned. On November 10, 1938, a new time switch was installed for the lighting system to ensure that the memorial would be lighted each night by 6 p.m.[147] But in late December 1939 arrangements were made to have the U.S. Park Police manually turn the lights on and off.[148]

In addition, the flagstone walk around the memorial had not withstood the elements well. By 1935 repairs were necessary as the "material had disintegrated very rapidly." The deteriorated condition of the flagstone was blamed on the "elements and natural causes" and not on "abuse from the public." C. Marshall Finnan, superintendent of the National Park Service, noted that his office could make temporary repairs but that ultimately they would need to "resort to another type of paving material." The need for the repairs was brought to Finnan's attention by Frank and Janet Noyes, who visited the memorial regularly.[149]

As of June 9, 1937, the memorial fund had a balance of $690.81. This amount was sufficient for the memorial commission to contract with local stone mason, Louis Perna and Sons, Inc., for the removal of the existing circular walkway, the cutting of new pieces of the selected gray Pennsylvania flagstone, and delivery of the material to the site. The laying of the stone was to be done under another contract and with the financial support of the National Park Service.[150]

The flagstone-setting plan and pattern were approved in September 1937, and by the end of the month the cutting of the stone was underway. It was the memorial commission's goal that the work be completed in time for the Armistice Day exercises on November 11 that year.[151]

An October 1937 inspection report stated that the ceiling and floor of the memorial were "badly in need of cleaning" and that "considerable pointing of the stone work" was necessary. It was recommended that this work be carried out before spring so that the memorial would be in "good condition" for the summer.[152] While some cleaning of the memorial may have been done at this time, the repointing was not.

In the spring of 1938 water leakage through one of the columns of the north side of the memorial was detected. Brooke reported that it looked as though the damage had been occurring "for some time," but he could not determine whether the leak was coming from the outside gutter, from the interior electric-light trough immediately below the dome, or from the space between the inner and outer shells of the dome.[153]

Brooke followed this letter to Finnan with another in which he pointed out that discoloration was occurring on the floor of the memorial, at the base of the northeast-east column, and on the inscriptions due to dampness, probably the result of a clogged brass rain-water conductor in the column. Brooke suggested clearing the downspout of the obstruction to prevent further discoloration. He noted that the streaking on the floor could be removed, but he feared that the discoloration on the inscriptions could not be cleaned satisfactorily.[154]

F. F. Gillen, Chief of the Construction Division of the National Park Service, investigated the situation in mid-June 1938. He reported that some of the joints in the gutter and the connection between the gutter and the downspout were open and that it was from these locations that the water was seeping in between the gutter and the stone and emerging from the joints of the stone. The busy summer concert schedule did not allow for immediate repairs: approximately three concerts per week were being held at the memorial at the time. Gillen recommended that the marble be cleaned during the summer to at least improve the memorial's appearance; in the fall, after the concert season, scaffolding would be erected, and the repairs to the gutters and downspouts would be made.[155]

However, the repairs were not made in the fall of 1938, "owing to the stress of other work." When Brooke inspected the memorial the following April, he found that water was entering through the interior cornice and washing down the columns. Brooke noted that a "great deal of dirt" had "accumulated on the parapet wall of the exterior and on the floor between the columns."[156]

Improvements and repairs were begun at the site in June 1939 and continued through November of that year. The lead gutter was removed and replaced with a new nickel-plated copper one. The cost for the gutter materials was $125; the labor cost for "forming, plating, and installing" the new gutter was $150; and the fee for the required five stonemasons for ten days' work was $400, for a total of $675.[157] Also during that time the entire exterior of the dome and entablature were repointed with a "lead wool and caulking compound." Corson and Gruman Co., of Washington, were engaged to do the repointing and cleaning at a cost of $9,000.[158] Ultimately, time did not permit the cleaning of the interior surface or the columns that year.[159]

In late July 1939 the Public Works Administration granted a total of $80,000 for an extensive rehabilitation plan for the memorial grounds. Of this sum, $15,000 was to be devoted to the "improvement of the grounds" surrounding the memorial and the cleaning of the building itself. A total of $25,000 was to be put toward "landscaping and mass planting of dogwood trees" in the vicinity of the memorial, and $40,000 was to be used in the "treatment of trees and shrubbery, including moving, transplanting, etc."[160]

From June 9 to August 23, 1949, the memorial was cleaned and the mortar joints repointed. In December 1949 it was cleaned and washed down again.[161]

No records were located for the periods between 1940 and 1949 and 1950 and 1967. The newspaper clippings from the 1950s and 1960s report on the annual May Day ceremonies held at the memorial.

In July 1968 William R. Failor, the superintendent of National Capital Parks-Central, reported that "serious structural deficiencies" existed at the memorial, with the most serious being leakage of rainwater through joints in the masonry. The leaks caused staining of the external marble surface, created built-up mineral deposits in several places, and, he believed, jeopardized the structural strength of the building. The superintendent also reported that seams and expansion joints on the hidden gutter had deteriorated, and there had been "considerable spalling" of the stonework.[162]

On August 21, 1968, National Capital Parks–Central staff architect William A. Dennin submitted to Failor a report on the condition of the memorial (see Appendix). In this report Dennin corroborates Failor's assessments and elaborates on the drainage problems and possible means of addressing them. It was also crucial that the memorial be cleaned; vandals had defaced the building with spray-painted peace symbols (Fig. 22).[163]

The August 21 report is significant in many ways. Not only does it describe in great detail the condition of the memorial at that time, but it also indicates how the extant memorial differs from the March 1931 plans. Dennin noted that the "offset ledge at the base of the exterior dome" was not constructed "according to the working drawings, i.e., with a solid piece of marble extending back to the dome." Dennin observed that, instead, the ledge was "only marble faced with a 4-inch-wide lead cap behind the facing covering brick backup."

Dennin also pointed out that the ten 1-foot-by-3-foot grille-covered vents on the memorial's outer dome that were part of the 1925 plans, but which were not included in the 1931 drawings had not been abandoned altogether; rather, the design had been modified. The report indicated that four 6-by-12-inch vents were installed. Dennin also pointed out that the counterbalancing mechanism between the domes must have been installed as an afterthought as it did not appear on any of the original drawings.[164]

In February 1970 the circular hatch door located in the center of the floor was stolen. The steel door was decorated with an eagle and stars in low relief.[165]

Drawings of the elevation and cornice details of the memorial were done by a D. Robinson of the National Park Service in March 1971 in preparation for repairing the drainage problem and repairing and replacing the walkways and the lighting system in the memorial (Fig. 23).[166]

In October 1977 the stone walks around the memorial were described as being in "very poor condition with some stones missing or sunken." It was also reported that "several joints in the floor under the dome and in both sets of steps" were in need of repointing.[167]

The following month the memorial was described as being in "substandard maintenance condition" and that a "complete rehabilitation" was needed to bring it up to standard. It was recommended that all surfaces of the memorial, inside and out, be steam cleaned, all joints be raked and recaulked, the roof waterproofed, rain gutters and down spouts replaced, and all stone walkways and floors removed and reset.[168]

The record does not indicate what, if any, of the work recommended in 1977 was carried out. It is certain, however, that the drainage problem was not sufficiently addressed, because it was brought up again a few years later, in 1983. An inspection checklist dated February 7 of that year indicates that water seeping from the dome had again run down the columns to the floor, a problem that had plagued the memorial from the beginning. Areas of the floor were blackened and had an "orangish coloring," and it was noted that the discoloration could not be removed with regular cleaning. It was also reported at that time that there were cracks around the base "in outer areas through many names."[169]

An inspection carried out by Tony Donald of the National Park Service Denver Service Center in April 1984 indicated that at that time water damage was causing the formation of stalactites on the memorial, as well as extensive staining of the dome ceiling. The same report notes that the "1971 plans for rehabilitation of the memorial" were "apparently not carried out." The inspection report also noted that there was "some evidence of failure at the top of the columns."[170]

Investigation of the memorial's dome took place on July 24 and 25 and August 6, 1984. The following month a report was submitted in which the memorial was described as having "reddish and brown stained spots on the dome and bluish-green stains on the face of the memorial's base," as well as "numerous dark stains on the floor around the column bases." It was also noted that stalactites were forming from the soffits around the column capitals, and there was vegetation growing from the joints on the dome. The marble floor showed signs of deterioration, flaking, and spalling.[171]

The investigation also showed that parts of the roof and cornice continued to deteriorate. Though the Guastavino vaults were in "good condition," the waterproofing tar paper was peeling off the convex surface of the lower dome. Lime was leaching out of the mortar around the base of the upper dome, and the face of the cornice's brick backing was spalling off inside the dome. All joints in the roof were deemed "deteriorating and detrimental," and "caulking at all flashings" was in "various stages of deterioration." All joints in the base and ledge of the cornice had deteriorated, and the seams in the gutter were cracked (Fig. 24).[172]

By the summer of 1998 the memorial and its surrounding walkways were still in need of repairs, and the site was deemed unsafe for visitors.[173] National Capital Parks–Central determined that the "cracked stones" of the memorial needed to be repinned or replaced, and stones that had already broken needed to be replaced or repaired. The report does not specify the location of these cracked stones. Overall cleaning, recaulking, and repointing of the memorial was also called for, and sugaring marble needed to be consolidated. The cost for this work was estimated at $300,000 in July 1998. In spite of the memorial's seriously deteriorating state, the work was not undertaken. When the estimate was revised in January 2005, the cost of completing the project climbed to $450,000.[174]

In July 1998 National Capital Parks–Central also recommended that the stone walkways be removed and the subbase reconstructed. Undamaged stone would be reused where possible, and new stone would be laid down where necessary. The entire walkway was in need of repointing. The cost for this phase of the project was estimated at $101,137.20.[175]

A June 2002 investigation revealed significant spalling, clogged drains, loose caulk, cracked flashing, and vegetation pushing through mortarless joints. The drains were cleared at this time.

In March 2003 the old Pittsburgh Permaflector light fixtures were removed from the memorial, and eight fluorescent lights were installed in the interior cornice. The fixtures that were removed appeared in the Pittsburgh Reflector Company's 1937 catalog as style p-75-A. These fixtures may have dated to the original lighting installation in 1931, or it is possible that they were installed in 1939, when the memorial underwent the Public Works Administration renovation.[176]

In October 2004 the memorial was "visibly deteriorating" and in need of "extensive preservation work."[177] Following the completion of HABS documentation in the spring of 2005, John G. Waite Associates, Architects, PLLC, was retained to complete a historic structure report for the memorial.

NOTES

Many of the newspaper clips from the *Evening Star*, the *Sunday Star*, the *Washington Post*, the *Washington Times*, and the *Washington Herald* were provided by Tony Donald, National Park Service, National Mall & Memorial Parks Resource Management.

1. Frederick H. Brooke, "The District of Columbia War Memorial," RG 79, Records of the National Park Service, National Capital Region Subject Files, 1924–1931, Box 35, File 1430/D.C. Memorial, May 27, 1927 to August 31, 1939, NA-CP.
2. "A Closer Look at The Stars and Stripes," Library of Congress Web site, www.memory.loc.gov/ammem/sgphtml/sashtml/aef.html (accessed July 11, 2005).
3. Ibid. Wikipedia on-line encyclopedia, http://en.wikipedia.org/wiki/World_War_I#Casualties (accessed August 3, 2005).
4. Brooke, "The District of Columbia War Memorial."
5. "Asks for Suggestion for War's Memorial," *Evening Star*, December 26, 1918.
6. Minutes of the Meeting of the Commission of Fine Arts, October 17, 1919. Commission of Fine Arts, Washington, D.C. A model of the memorial tablet was rejected by the Commission of Fine Arts in October 1919. "Community Center Quarters Proposed War Memorials," *Evening Star*, April 18, 1924.
7. Program for the dedication of memorial trees to men and women of the District of Columbia who died while in the military or naval service of the United States during the World War, 1917–1918. Before a permanent, stone memorial was erected,- 507 trees—representing the number of District soldiers killed in action—were planted along both sides of 16th Street and marked with plaques bearing the soldiers' names. This living memorial was dedicated on May 30, 1920. "Community Center Quarters Proposed War Memorials," *Evening Star*, April

18, 1924. Charles Moore served as the chairman of the Commission of Fine Arts from 1915 until 1937.

8. Brooke, "The District of Columbia War Memorial." Bids to construct the open Corinthian memorial were obtained in 1919 from four leading local builders; the lowest figure was $55,700.

9. Ibid.

10. Joint Resolution providing for the appointment of a commission for the purpose of erecting in Potomac Park in the District of Columbia a memorial to those members of the armed forces of the United States from the District of Columbia who served in the Great War. H.J. Res. 331, 66th Cong. 2nd sess. (April 8, 1920), RG 79, Records of the National Park Service, National Capital Region Subject Files, 1924–1931, Box 35, File 1430/D.C. Memorial, May 27, 1927 to August 31, 1939, NA-CP. The resolution stated that the commission was to be composed of the following 12 members: Joseph A. Berberich, John Joy Edson, Mrs. William Corcoran Eustis, Robert N. Harper, E. Lester Jones, Arthur D. Marks, Frank B. Noyes, James F. Oyster, Roland S. Robbins, Edgar D. Shaw, Herman Suter, and W. B. Westlake, as well as "any other person who with the approval of a majority of the commission is added thereto or substituted for any member thereof."

11. *The National Commission of Fine Arts, Ninth Report, July 1, 1919 to June 30, 1921* (Washington, D.C.: GPO, 1921), 67–68.

12. "Proposed 'Temple of Music'," *Evening Star* [?], December 14, 1923.

13. Joint Resolution providing for the appointment of a commission for the purpose of erecting in Potomac Park in the District of Columbia a memorial to those members of the armed forces of the United States from the District of Columbia who served in the Great War. Public Resolution No. 28, 68th Cong, June 7, 1924. RG 79, Records of the National Park Service, National Capital Region Subject Files, 1924–1931, Box 35, File 1430/D.C. Memorial, May 27, 1927 to August 31, 1939, NA-CP. The resolution stipulated that the commission be composed of Charles A. Baker, Edward F. Colladay, John Joy Edson, Mrs. William Corcoran Eustis, Isaac Gans, E. Lester Jones, Arthur D. Marks, Frank B. Noyes, Anton Stephan, J. R. McDonald, and Gist Blair.

14. Minutes of the Meeting of the Commission of Fine Arts, December 12, 1924. RG 79, Records of the National Park Service, National Capital Region Subject Files, 1924–1931, Box 35, File 1430/D.C. Memorial, May 27, 1927 to August 31, 1939, NA-CP.

15. Ibid.

16. Minutes of the Meeting of the Commission of Fine Arts, January 6, 1928. Commission of Fine Arts, Washington, D.C.

17. Frederick H. Brooke to C. O. Sherrill, February 5, 1925. RG 79, Records of the National Park Service, National Capital Region Subject Files, 1924–1931, Box 35, File 1430/D.C. Memorial, May 27, 1927 to August 31, 1939, NA-CP.

18. M. S. Rich to Frederick H. Brooke, January 9, 1924. RG 79, Records of the National Park Service, National Capital Region Subject Files, 1924–1931, Box 35, File 1430/D.C. Memorial, May 27, 1927 to August 31, 1939, NA-CP.

19. C. O. Sherrill to Frederick H. Brooke, February 7, 1925. Frederick H. Brooke to C. O. Sherrill, February 20, 1925. RG 79, Records of the National Park Service, National Capital Region Subject Files, 1924–1931, Box 35, File 1430/D.C. Memorial, May 27, 1927 to August 31, 1939, NA-CP. Though Sherrill himself had no objection to the change in site, he pointed out to Brooke in a letter dated March 2, 1928, that the resolution approving the

construction of the memorial was passed on the condition that the new bandstand would replace the old one.

20. C. O. Sherrill to Frederick H. Brooke, May 2, 1925. RG 79, Records of the National Park Service, National Capital Region Subject Files, 1924–1931, Box 35, File 1430/D.C. Memorial, May 27, 1927 to August 31, 1939, NA-CP. Draft of amendment of Public Resolution No. 28, 68th Cong., approved June 7, 1924. No date for amendment. RG 79, Records of the National Park Service, National Capital Region Subject Files, 1924–1931, Box 35, File 1430/D.C. Memorial, May 27, 1927 to August 31, 1939, NA-CP.

21. Minutes of the Meeting of the Commission of Fine Arts, March 27, 1925. Commission of Fine Arts, Washington, D.C.

22. Charles Moore to Frederick H. Brooke, May 22, 1925. RG 79, Records of the National Park Service, National Capital Region Subject Files, 1924–1931, Box 35, File 1430/D.C. Memorial, May 27, 1927 to August 31, 1939, NA-CP. Minutes of the Meeting of the Commission of Fine Arts, May 21, 1925. Commission of Fine Arts, Washington, D.C.

23. *The National Commission of Fine Arts, Tenth Report, July 1, 1921 to December 31, 1925* (Washington, D.C.: GPO, 1926), 91. Minutes of the Meeting of the Commission of Fine Arts, May 21, 1925. Commission of Fine Arts, Washington, D.C. C. O. Sherrill to Frederick H. Brooke, May 29, 1925. RG 79, Records of the National Park Service, National Capital Region Subject Files, 1924–1931, Box 35, File 1430/D.C. Memorial, May 27, 1927 to August 31, 1939, NA-CP.

24. July 2 and December 17, 1925, revised plans for the District of Columbia Memorial, F. H. Brooke, Architect, N. C. Wyeth and H. W. Peaslee, Associated. District of Columbia War Memorial File, National Capital Parks-Central, courtesy of Tony Donald.

25. May 1925 plans for the District of Columbia Memorial, F. H. Brooke, Architect, N. C. Wyeth and H. W. Peaslee, Associated. Revised July 2, 1925 and December 17, 1925. District of Columbia War Memorial File, National Capital Parks-Central, courtesy of Tony Donald.

26. "D.C. War Memorial Campaign Pushed," *Evening Star*, February 27, 1926. The reference to the size of the model was in a letter from Frederick H. Brooke to F. B. Butler, November 21, 1931. RG 79, Records of the National Park Service, National Capital Region Subject Files, 1924–1931, Box 35, File 1430/D.C. Memorial, May 27, 1927 to August 31, 1939, NA-CP. In his 1937 retrospective report, Brooke notes that the model was one quarter scale.

27. Minutes of the Meeting of the Commission of Fine Arts, January 6, 1928. Commission of Fine Arts, Washington, D.C.

28. U. S. Grant III to Frederick H. Brooke, October 4, 1927. RG 79, Records of the National Park Service, National Capital Region Subject Files, 1924–1931, Box 35, File 1430/D.C. Memorial, May 27, 1927 to August 31, 1939, NA-CP.

29. Charles Moore to Lieut. Col. U. S. Grant III, January 17, 1928, included with the Minutes of the Meeting of the Commission of Fine Arts, January 6, 1928. Commission of Fine Arts, Washington, D.C. RG 79, Records of the National Park Service, National Capital Region Subject Files, 1924–1931, Box 35, File 1430/D.C. Memorial, May 27, 1927 to August 31, 1939, NA-CP.

30. Minutes of the Meeting of the Commission of Fine Arts, May 24 and August 6, 1928. Commission of Fine Arts, Washington, D.C.

31. Charles Moore to U. S. Grant III, April 21, May 25, July 14, and July 16, 1928. RG 79, Records of the National Park Service, National Capital Region Subject Files, 1924–1931, Box 35, File 1430/D.C. Memorial, May 27, 1927 to August 31, 1939, NA-CP. Minutes of the

Meeting of the Commission of Fine Arts, May 24, 1928. Commission of Fine Arts, Washington, D.C.

32. Frederick H. Brooke to U. S. Grant III, May 4, 1928. RG 79, Records of the National Park Service, National Capital Region Subject Files, 1924–1931, Box 35, File 1430/D.C. Memorial, May 27, 1927 to August 31, 1939, NA-CP.

33. Minutes of the Meeting of the Commission of Fine Arts, May 24 and August 6, 1928. Commission of Fine Arts, Washington, D.C.

34. Brooke, "The District of Columbia War Memorial."

35. "Frederick H. Brooke, 82, Dead; Architect in Capital 40 Years," *New York Times*, December 26, 1960. An excerpt from Brooke's obituary recounts several of his projects: "Brooke was the local architect for the British Embassy. He also designed extensive alterations and additions for the Embassies of Iran and New Zealand and Swedish Embassies. Abroad, he designed the United States Consulate in Bluefields, Nicaragua."

36. Ibid. "Nathan C. Wyeth, Architect, Was 93," *New York Times*, September 3, 1963. "Horace Peaslee, Architect, Dies; Designed Landmarks in Capital," *New York Times*, May 19, 1959.

37. "D.C. War Memorial Campaign Pushed," *Evening Star*, February 27, 1926.

38. Ibid. This article included a list of names of the members of the memorial commission on that date. Frank B. Noyes was chairman, Col. E. Lester Jones was secretary, and John Poole was chairman and treasurer of the campaign committee. Other members included Charles A. Baker, Gist Blair, Edward F. Colladay, John Joy Edson, Mrs. William Corcoran Eustis, Issac Gans, John M. Gleissner, Edward B. McLean, J. R. McDonald, G. Logan Payne, Julius I. Peyser, and Anton Stephan. "District Soldiers Memorial Replica Put on Exhibition," *Washington Post*, February 27, 1926. This article reported that 258 names would be inscribed in the curved ceiling of the building. The *Washington Post* reported on February 27, 1926, that the public would need to contribute $250,000 to the campaign. This is the only account with this sum, so it is likely a misprint.

39. "President Gives to Memorial Fund," *Evening Star*, April 12, 1926.

40. U. S. Grant III memorandum to Division Chiefs, April 15, 1926. RG 79, Records of the National Park Service, National Capital Region Subject Files, 1924–1931, Box 35, File 1430/D.C. Memorial, May 27, 1927 to August 31, 1939, NA-CP.

41. "D.C. War Memorial Drive Opens Today," *Sunday Star*, April 11, 1926. E. W. Libbey to B. C. Gardner (Chief of the Administrative Division of the Office of Public Buildings and Public Grounds), March 6, March 24, and April 3, 1926. B. C. Gardner memorandum to the Director of the same office, April 12, 1926. U. S. Grant III memorandum to Division Chiefs, April 15, 1926. RG 79, Records of the National Park Service, National Capital Region Subject Files, 1924–1931, Box 35, File 1430/D.C. Memorial, May 27, 1927 to August 31, 1939, NA-CP. A month before the fundraising drive began Frank Noyes requested a meeting with the chief clerk of each executive department. On March 9 Noyes met with these men to obtain permission to post placards and posters advertising the fundraiser in the offices of various government agencies. The posters were reviewed at a meeting of the chief clerks and Frank Noyes on April 8, 1926. Those who contributed to the fund were urged to place their names on the envelopes so that their names could be compiled into lists which were supposed to have been deposited in the cornerstone with the other materials. This part of the plan never happened.

42. "D.C. War Memorial Drive Opens Today," *Sunday Star*, April 11, 1926.

43. Ibid.

44. "Federal Workers to Aid Memorial," *Evening Star*, April 4, 1926. "Memorial Plan Backed," *Evening Star*, April 9, 1926. "Memorial Fund Total Now $23,050," *Evening Star*, April 15, 1926. "Memorial Team Captains Meet," *Evening Star*, May 7, 1927.

45. "$44,699 Already in Memorial Fund," *Sunday Star*, April 18, 1926. The *Evening Star* and the *Washington Post* were the two greatest contributors in the first week, having donated $5,000 and $2,000, respectively.

46. "D.C. War Memorial Drive Opens Today," *Sunday Star*, April 11, 1926. "$10,215 Collected in Memorial Drive," *Evening Star*, May 2, 1927. The film was shot by Nat Glasser, chief cameraman for Washington theater magnate Harry M. Crandall.

47. "War Mothers Give Aid to Memorial," *Sunday Star*, April 25, 1926. "$1,000 More Given to Memorial Fund," *Evening Star*, May 11, 1926. "Three More Gifts to D.C. Memorial," *Evening Star*, May 13, 1926. The American Women's Legion donated $100 to the cause. The League of Women Voters and the Park View Women's Club each sent in $25; and the Department of Commerce sent in $154.75. "Clerks Increase Memorial Gifts," *Evening Star*, June 10, 1926.

48. "Disabled Veterans to Aid Memorial," *Evening Star*, May 24, 1926.

49. "Mrs. Wilson Aids Memorial Fund," *Evening Star*, June 2, 1926.

50. "Appeal Made to Typists," *Evening Star*, February 26, 1926. Mabel T. Boardman, secretary of the memorial commission campaign committee, issued the appeal for help in addressing letters and envelopes. The request for assistance evidently appealed largely, if not solely, to women. The following names were listed in the article as having responded to the call: Mrs. Emily H. Butler, Miss Jane Fellows, Mrs. Pearl K. Hill, Mrs. Fred C. Kelly, Miss Marion Vickers, Mrs. J. H. Pearson, Miss Nan Harris, Miss Francis Feagans, Mrs. Helen M. Packwood, and Miss Minnie Schwarzmann. Volunteers were asked to report to the Red Cross headquarters, Seventeenth and E streets.

51. "Speakers at Luncheon Stress Need for $140,000 to Honor D.C. War Dead," *Evening Star*, May 1, 1927. For criticism of Washington residents and their lack of support for the project, see "Scores D.C. Lack of War Memorial," *Evening Star*, April 4, 1927.

52. No title. *Sunday Star*, May 1, 1927.

53. "$10,215 Collected in Memorial Drive," *Evening Star*, May 2, 1927. Frederick William Wile's speech was broadcast on Sunday night, May 2, 1927 at 6:30 pm on station WRC. William P. Kennedy spoke the following day at 6 pm on station WMAL with an appeal for the memorial.

54. "$10,215 Collected in Memorial Drive," *Evening Star*, May 2, 1927.

55. "Memorial Drive Opens Tomorrow," *Sunday Star*, May 1, 1927. The exact number of District residents killed in service in the war was not settled as of 1927. Various compiled lists showed disparate numbers.

56. "$10,215 Collected in Memorial Drive," *Evening Star*, May 2, 1927. "Memorial Fund Goes Over $25,000," *Evening Star*, May 4, 1927. "Memorial Fund Reaches $36,000," *Evening Star*, May 5, 1927.

57. "Has Washington Forgotten?", *Evening Star*, May 5, 1927.

58. "Memorial Fund Goes Over $25,000," *Evening Star*, May 4, 1927. "Memorial Fund Raised to $43,231," *Evening Star*, May 6, 1927. "Memorial Team Captains Meet," *Evening Star*, May 7, 1927. "Memorial Drive Reaches $77,256.31," *Evening Star*, May 9, 1927.

59. "Memorial Drive Reaches $77,256.31," *Evening Star*, May 9, 1927. Evidently there was a contest held among the various police and fire divisions for the group that brought in the

largest sum. The article reported that the Detective Bureau won the "cup offered to the police for the largest subscription, the detectives having turned in a total of $645.50, while Engine Co. No. 8, with its $15, will get the cup for the Fire Department."

60. "Veteran Gives Bit Because Memorial Appeal Stirs Memory of Lost Buddies," *Evening Star*, May 4, 1927.

61. "Veterans Urged by McGahan to Get Behind Memorial," *Evening Star*, May 5, 1927. "Costello Post Group Fights War Memorial," *Evening Star*, May 7, 1927. "Memorial to Rise Despite Deficit," *Evening Star*, May 9, 1927.

62. "Memorial to Rise Despite Deficit," *Evening Star*, May 9, 1927.

63. "Memorial Drive Reaches $77,256.31" and "Memorial to Rise Despite Deficit," *Evening Star*, May 9, 1927.

64. "Memorial Deficit Cut Nearly Half By $11,227 in Gifts," *Washington Post*, May 15, 1927. "War Memorial Dollar Day Aimed at Nongivers," *Washington Post*, May 18, 1927. "Fund of War Memorial is Swelled to $149,138," *Washington Post*, May 29, 1927.

65. "War Memorial Aid Pledged by Labor," *Evening Star*, May 30, 1930.

66. Ibid.

67. "Press Assistants Indorse Memorial," *Evening Star*, June 26, 1930. "Bricklayers Give $500 to Memorial," *Evening Star*, October 10, 1930.

68. "Show Sponsored to Aid Memorial," *Sunday Star*, November 16, 1930. "Stage Stars Help Memorial Benefit," *Sunday Star*, November 23, 1930. "Benefit Show Planned For Memorial of War," *Washington Herald*, November 23, 1930.

69. "Locals Sponsor Fair Attractions," *Sunday Star*, May 24, 1931. "Labor Completes Plans for Parade," *Evening Star*, June 9, 1931. "War Memorial Marble Arrives from Vermont," *Evening Star*, June 27, 1931.

70. Minutes of the Meetings of the Commission of Fine Arts, January 6 and February 12, 1931. Commission of Fine Arts, Washington, D.C.

71. Minutes of the Meeting of the Commission of Fine Arts, February 12, 1931. Commission of Fine Arts, Washington, D.C.

72. Frederick H. Brooke to C. O. Sherrill, April 27, 1925. Frederick H. Brooke to U. S. Grant III, February 20, 1931. F. B. Butler to Frederick H. Brooke, February 24, 1931. RG 79, Records of the National Park Service, National Capital Region Subject Files, 1924–1931, Box 35, File 1430/D.C. Memorial, May 27, 1927 to August 31, 1939, NA-CP.

73. Minutes of the Meeting of the Commission of Fine Arts, January 6, 1931. Commission of Fine Arts, Washington, D.C.

74. Minutes of the Meeting of the Commission of Fine Arts, February 12, 1931. Charles Moore to Frederick H. Brooke, February 16, 1931. Commission of Fine Arts, Washington, D.C.

75. James L. Greenleaf to Charles Moore, December 15, 1930. RG 79, Records of the National Park Service, National Capital Region Subject Files, 1924–1931, Box 35, File 1430/D.C. Memorial, May 27, 1927 to August 31, 1939, NA-CP. Toward the end of his long career, Greenleaf served as the landscape-architect member of the Commission of Fine Arts from 1918 until 1927. During that time he exerted tremendous "influence over the development of many sights in Washington, D.C., most notably the grounds for the Lincoln Memorial." Charles A. Birnbaum and Robin Karson, *Pioneers of American Landscape Design* (New York: McGraw-Hill, 2000), 147–148. Norman T. Newton, *Design on the Land: The Development of Landscape Architecture* (Cambridge, Mass., and London: The Belknap Press

of the Harvard Univ. Press, 1971), 431-433. Ferruccio Vitale replaced Greenleaf as the fine arts commission's landscape architect in 1927 and served until 1932.

76. "Clearing of Area for D.C. War Memorial Bandstand Urged," *Evening Star*, January 14, 1931. James L. Greenleaf to U. S. Grant III, December 15, 1930. RG 79, Records of the National Park Service, National Capital Region Subject Files, 1924–1931, Box 35, File 1430/D.C. Memorial, May 27, 1927 to August 31, 1939, NA-CP.

77. "Arts Group to Pick Trees to Be Cleared," *Evening Star*, February 5, 1931. This article also reported that "originally, the area south of the reflecting pool was set aside as a prospective forest area. This program has now been altered so that the World War Memorial of the National Capital may be erected there." "War Memorial Will Be Pushed," *Evening Star*, February 13, 1931.

78. Minutes of the Meeting of the Commission of Fine Arts, February 12, 1931. Commission of Fine Arts, Washington, D.C.

79. Specification for the Proposed District of Columbia Memorial to Be Built in Potomac Park, Washington, D.C., RG 79, Records of the National Park Service, National Capital Region Subject Files, 1924–1931, Box 35, File 1430/D.C. Memorial, May 27, 1927 to August 31, 1939, NA-CP. The original specifications were submitted on March 20, 1925, and were subsequently revised on December 18, 1925, and then finalized on March 4, 1931. District of Columbia War Memorial File, National Capital Parks-Central, courtesy of Tony Donald.

80. Specification for the Proposed District of Columbia Memorial to Be Built in Potomac Park, Washington, D.C., RG 79, Records of the National Park Service, National Capital Region Subject Files, 1924–1931, Box 35, File 1430/D.C. Memorial, May 27, 1927 to August 31, 1939, NA-CP.

81. Brooke, "The District of Columbia War Memorial."

82. Ibid.

83. Frederick H. Brooke to U. S. Grant III, March 12, 1931. RG 79, Records of the National Park Service, National Capital Region Subject Files, 1924–1931, Box 35, File 1430/D.C. Memorial, May 27, 1927 to August 31, 1939, NA-CP.

84. James Baird Company, Inc. contract for work on the District of Columbia Memorial. April 11, 931. RG 79, Records of the National Park Service, National Capital Region Subject Files, 1924–1931, Box 35, File 1430/D.C. Memorial, May 27, 1927 to August 31, 1939, NA-CP.

85. "Temple Contract Given to Baird, Co.," *Evening Star*, April 4, 1931.

86. "Memorial to Start," *Evening Star*, April 16, 1931. *Annual Report of the Director of Public Buildings and Public Parks of the National Capital, 1932* (Washington, D.C.: GPO, 1932), 49–50. Frederick H. Brooke to U. S. Grant III, May 16, 1931. RG 79, Records of the National Park Service, National Capital Region Subject Files, 1924–1931, Box 35, File 1430/D.C. Memorial, May 27, 1927 to August 31, 1939, NA-CP.

87. Specification for the Proposed District of Columbia Memorial to Be Built in Potomac Park, Washington, D.C., RG 79, Records of the National Park Service, National Capital Region Subject Files, 1924–1931, Box 35, File 1430/D.C. Memorial, May 27, 1927 to August 31, 1939, NA-CP.

88. Frederick H. Brooke to U. S. Grant III, May 16, 1931. RG 79, Records of the National Park Service, National Capital Region Subject Files, 1924–1931, Box 35, File 1430/D.C. Memorial, May 27, 1927 to August 31, 1939, NA-CP.

89. "Marble Acquired for War Memorial," *Evening Star*, April 22, 1931.

90. "Work Progressing on War Memorial," *Evening Star*, May 28, 1931. This article included the following details on the work: "Pile driving has been completed, a total of about 50 'combination' piles have been driven into the watery subsoil. These are believed to be the first of the 'combination' piles used on a public building in Washington. They consist of part of wood and part of cement, the wood being at the bottom and the concrete being at the top. Workmen are now laying wooden forms for pouring the concrete foundation on top of the piles." "War Memorial Marble Arrives from Vermont," *Evening Star*, June 27, 1931. "D.C. War Memorial Taking Shape," *Sunday Star*, July 12, 1931.

91. "Memorial Corner Stone Sealed," *Evening Star*, July 20, 1931.

92. "District War Memorial Rising," *Evening Star*, August 3, 1931.

93. "Keystone of D.C. Memorial Temple Laid," *Evening Star*, September 30, 1931.

94. Brooke, "The District of Columbia War Memorial."

95. Memorandum, William A. Dennin, Staff Architect, National Capital Parks-Central to William R. Failor, Superintendent, National Capital Parks-Central, August 21, 1968. RG 79, Accession 79-7524, D66 D.C. War Memorial, 1/1/68-69-70.

96. Specification for the Proposed District of Columbia Memorial to Be Built in Potomac Park, Washington, D.C., RG 79, Records of the National Park Service, National Capital Region Subject Files, 1924–1931, Box 35, File 1430/D.C. Memorial, May 27, 1927 to August 31, 1939, NA-CP.

97. Historic American Building Survey, District of Columbia War Memorial, HABS No. DC-857. Memorandum, William A. Dennin, Staff Architect, National Capital Parks-Central to William R. Failor, Superintendent, National Capital Parks-Central, August 21, 1968. Frederick H. Brooke, "The District of Columbia War Memorial," RG 79, Records of the National Park Service, National Capital Region Subject Files, 1924–1931, Box 35, File 1430/D.C. Memorial, May 27, 1927 to August 31, 1939, NA-CP.

98. "Keystone of D.C. Memorial Temple Laid," *Evening Star*, September 30, 1931.

99. "Memorial Grove Will Be Planted at Doric Temple," *Evening Star*, October 14, 1931.

100. "Hoover is [?] D.C. War Memorial," *Evening Star*, October 23, 1931.

101. Minutes of the Meeting of the Commission of Fine Arts, April 15 and 16, 1931. Commission of Fine Arts, Washington, D.C.

102. "Memorial Grove Will Be Planted at Doric Temple," *Evening Star*, October 14, 1931. Janet T. Noyes to U. S. Grant III, April 16, 1931. RG 79, Records of the National Park Service, National Capital Region Subject Files, 1924–1931, Box 35, File 1430/D.C. Memorial, May 27, 1927 to August 31, 1939, NA-CP.

103. Minutes of the Meeting of the Commission of Fine Arts, April 15 and 16, 1931. Commission of Fine Arts, Washington, D.C.

104. Frederick H. Brooke to William Adams Delano, September 17, 1931. RG 79, Records of the National Park Service, National Capital Region Subject Files, 1924–1931, Box 35, File 1430/D.C. Memorial, May 27, 1927 to August 31, 1939, NA-CP.

105. Minutes of the Meeting of the Commission of Fine Arts, September 24, 25, and 26, 1931. Commission of Fine Arts, Washington, D.C.

106. "Memorial Grove Will Be Planted at Doric Temple," *Evening Star*, October 14, 1931.

107. Ibid.

108. "Memorial Tree Planted," *Evening Star*, October 23, 1931.

109. U. S. Grant III to William Adams Delano, December 2, 1930. Arno Cammerer to C. Marshall Finnan, November 7, 1933. RG 79, Records of the National Park Service, National Capital Region Subject Files, 1924–1931, Box 35, File 1430/D.C. Memorial, May 27, 1927 to August 31, 1939, NA-CP.

110. U. S. Grant III to Potomac Electric Power Company, October 9, 1931. RG 79, Records of the National Park Service, National Capital Region Subject Files, 1924–1931, Box 35, File 1430/D.C. Memorial, May 27, 1927 to August 31, 1939, NA-CP.

111. Brooke, "The District of Columbia War Memorial."

112. Ibid. The five-person committee to determine the final list of names that would be inscribed on the memorial was composed of Maj. Gist Blair, Gen. Anton Stephan, Dr. B. C. MacNeil, Col. ___ Nevitt, and Frederick H. Brooke.

113. Ibid.

114. "Hoover to Give Armistice Day Keynote, Dedicating Temple," *Evening Star*, November 10, 1931. Frederick H. Brooke to U. S. Grant III, November 13, 1931. RG 79, Records of the National Park Service, National Capital Region Subject Files, 1924–1931, Box 35, File 1430/D.C. Memorial, May 27, 1927 to August 31, 1939, NA-CP.

115. Alfred C. Liebler to U. S. Grant III, November 14, 1931. RG 79, Records of the National Park Service, National Capital Region Subject Files, 1924–1931, Box 35, File 1430/D.C. Memorial, May 27, 1927 to August 31, 1939, NA-CP.

116. F. B. Butler to Alfred C. Liebler, November 16, 1931. RG 79, Records of the National Park Service, National Capital Region Subject Files, 1924–1931, Box 35, File 1430/D.C. Memorial, May 27, 1927 to August 31, 1939, NA-CP.

117. Frederick H. Brooke to U. S. Grant III, May 27, 1931. RG 79, Records of the National Park Service, National Capital Region Subject Files, 1924–1931, Box 35, File 1430/D.C. Memorial, May 27, 1927 to August 31, 1939, NA-CP.

118. U. S. Grant III to Frederick H. Brooke, June 4, 1931. RG 79, Records of the National Park Service, National Capital Region Subject Files, 1924–1931, Box 35, File 1430/D.C. Memorial, May 27, 1927 to August 31, 1939, NA-CP.

119. Frank T. Gartside to U. S. Grant III, September 21, 1931. RG 79, Records of the National Park Service, National Capital Region Subject Files, 1924–1931, Box 35, File 1430/D.C. Memorial, May 27, 1927 to August 31, 1939, NA-CP.

120. *Annual Report of the Director of Public Buildings and Public Parks of the National Capital, 1931*. (Washington, D.C.: GPO, 1931), 84.

121. "Hoover to Give Armistice Day Keynote, Dedicating Temple," *Evening Star*, November 10, 1931.

122. Ibid.

123. "War Memorial Dedicated," *Evening Star*, November 11, 1931.

124. Ibid.

125. *Annual Report of the Director of Public Buildings and Public Parks of the National Capital, 1932*. (Washington, D.C.: GPO, 1932), 50. "Hoover to Give Armistice Day Keynote, Dedicating Temple," *Evening Star*, November 10, 1931. "Hoover Lauds U.S. War Dead," *Washington Times*, November 11, 1931. A photograph of the memorial at night time, with the wreath in the center, was published in the November 22, 1931, issue of the *Washington Post*. "War Memorial Dedicated," *Evening Star*, November 11, 1931.

126. Frederick H. Brooke to U. S. Grant III, November 13, 1931. RG 79, Records of the National Park Service, National Capital Region Subject Files, 1924–1931, Box 35, File 1430/D.C. Memorial, May 27, 1927 to August 31, 1939, NA-CP.

127. Frank B. Noyes to U. S. Grant III, November 17, 1931. RG 79, Records of the National Park Service, National Capital Region Subject Files, 1924–1931, Box 35, File 1430/D.C. Memorial, May 27, 1927 to August 31, 1939, NA-CP.

128. U. S. Grant III to Frederick H. Brooke, November 23, 1931. RG 79, Records of the National Park Service, National Capital Region Subject Files, 1924–1931, Box 35, File 1430/D.C. Memorial, May 27, 1927 to August 31, 1939, NA-CP.

129. Mark David Richards, "District of Columbia Service in World War One and the DC World War Memorial," May 22, 2002, http://www.dcwatch.com/richards/020526.htm (accessed August 2, 2005). "Band Season," *Washington Herald* staff photograph, June 4, 1932.

130. "World War Dead Given Veterans' May Day Tribute," *Evening Star*, May 2, 1936.

131. Marshall Andrews, "Sousa's Air Makes D.C. Spine Tingle on Tune's Birthday," *Washington Post*, June 16, 1939.

132. "Mrs. Frank B. Noyes, Wife of Publisher," *New York Times*, November 9, 1942. "Annual Legion Rites to Be Held Today at District War Memorial," *Evening Star*, May 2, 1943. "World War Memorial Rites Pay Homage to 435 Men and Women," *Evening Star*, May 3, 1943.

"Frank B. Noyes, 85, Publisher, Is Dead," *New York Times*, December 1, 1948. "War Memorial Rites Will Include Tribute to Frank B. Noyes," *Evening Star*, April 24, 1949. Mark David Richards, "District of Columbia Service in World War One and the DC World War Memorial," May 22, 2002, http://www.dcwatch.com/richards/020526.htm (accessed August 2, 2005).

133. Program for 70th Annual Commemorative Observance at the District War Memorial–West Potomac Park, Sunday, May 15, 2005. Courtesy of Thomas Kouyeas.

134. General Order No. 453, Office of Public Buildings and Public Parks of the National Capital, February 6, 1932. RG 79, Records of the National Park Service, National Capital Region Subject Files, 1924–1931, Box 35, File 1430/D.C. Memorial, May 27, 1927 to August 31, 1939, NA-CP.

135. Memorandum from James F. Gill, Chief of the Buildings Division of the Office of Public Buildings and Public Parks of the National Capital, June 10, 1932. RG 79, Records of the National Park Service, National Capital Region Subject Files, 1924–1931, Box 35, File 1430/D.C. Memorial, May 27, 1927 to August 31, 1939, NA-CP.

136. U.S. Dept. of the Interior. *A Brief History of the National Park Service*, National Park Service Web site, http://www.cr.nps.gov/history/online_books/kieley/index.htm, (accessed August 5, 2005).

137. Acting Director, unsigned, to General Manager of Buildings, unaddressed, June 29, 1930. RG 79, Records of the National Park Service, National Capital Region Subject Files, 1924–1931, Box 35, File 1430/D.C. Memorial, May 27, 1927 to August 31, 1939, NA-CP. At this time the Columbus Fountain, the House Where Lincoln Died, the Lincoln Memorial, the Lincoln Museum, the Washington Monument, and Lee Mansion were also placed under the jurisdiction of National Capital Parks.

138. Mark David Richards, "District of Columbia Service in World War One and the DC World War Memorial," May 22, 2002, http://www.dcwatch.com/richards/020526.htm (accessed August 2, 2005). In March 2005 National Capital Parks-Central was renamed National Mall & Memorial Parks (NAMA).

139. Frederick H. Brooke to U. S. Grant III, November 19, 1931. RG 79, Records of the National Park Service, National Capital Region Subject Files, 1924–1931, Box 35, File 1430/D.C. Memorial, May 27, 1927 to August 31, 1939, NA-CP.

140. Frederick H. Brooke to U. S. Grant III, November 16, 1931. RG 79, Records of the National Park Service, National Capital Region Subject Files, 1924–1931, Box 35, File 1430/D.C. Memorial, May 27, 1927 to August 31, 1939, NA-CP.

141. U. S. Grant III to Frederick H. Brooke, November 18, 1931. RG 79, Records of the National Park Service, National Capital Region Subject Files, 1924–1931, Box 35, File 1430/D.C. Memorial, May 27, 1927 to August 31, 1939, NA-CP.

142. Frederick H. Brooke to U. S. Grant III, April 4, 1932. RG 79, Records of the National Park Service, National Capital Region Subject Files, 1924–1931, Box 35, File 1430/D.C. Memorial, May 27, 1927 to August 31, 1939, NA-CP. Cleaning up and removal of debris "left around the D.C. Memorial" was required in early April 1932.

143. Frederick H. Brooke to U. S. Grant III, February 16 and March 2, 1932. RG 79, Records of the National Park Service, National Capital Region Subject Files, 1924–1931, Box 35, File 1430/D.C. Memorial, May 27, 1927 to August 31, 1939, NA-CP.

144. Pvt. H. W. Brown, United States Park Police to Capt. P. J. Carroll, United States Park Police, October 28, 1933. Memorandum from J. Johnson, Foreman of Laborers, Potomac Park Group, November 1, 1933. RG 79, Records of the National Park Service, National Capital Region Subject Files, 1924–1931, Box 35, File 1430/D.C. Memorial, May 27, 1927 to August 31, 1939, NA-CP.

145. Arno B. Cammerer to C. Marshall Finnan, November 7, 1933, RG 79, Records of the National Park Service, National Capital Region Subject Files, 1924–1931, Box 35, File 1430/D.C. Memorial, May 27, 1927 to August 31, 1939, NA-CP.

146. U. S. Grant III to Frederick H. Brooke, March 9, 1933. RG 79, Records of the National Park Service, National Capital Region Subject Files, 1924–1931, Box 35, File 1430/D.C. Memorial, May 27, 1927 to August 31, 1939, NA-CP.

147. E. J. Little, War Department, to H. R. Owen, November 11, 1936. C. Marshall Finnan to Frank B. Noyes, November 16, 1938. RG 79, Records of the National Park Service, National Capital Region Subject Files, 1924–1931, Box 35, File 1430/D.C. Memorial, May 27, 1927 to August 31, 1939, NA-CP.

148. Memorandum from George E. Clark, Acting Superintendent, National Capital Parks, December 29, 1939. District of Columbia War Memorial File, National Capital Parks–Central, courtesy of Tony Donald.

149. Frank B. Noyes to C. Marshall Finnan, August 29, 1935. C. Marshall Finnan to Frank B. Noyes, September 7, 1935. C. Marshall Finnan to George Clark, September 7, 1935. RG 79, Records of the National Park Service, National Capital Region Subject Files, 1924–1931, Box 35, File 1430/D.C. Memorial, May 27, 1927 to August 31, 1939, NA-CP.

150. Frederick H. Brooke to C. Marshall Finnan, June 9, 1937. C. Marshall Finnan to Frederick H. Brooke, July 8, 1937. Frederick H. Brooke to Louis Perna & Sons, Inc., July 9, 1937. Frederick H. Brooke to C. Marshall Finnan, July 29, 1937. RG 79, Records of the National Park Service, National Capital Region Subject Files, 1924–1931, Box 35, File 1430/D.C. Memorial, May 27, 1927 to August 31, 1939, NA-CP.

151. Frederick H. Brooke to Louis Perna & Sons, Inc., September 30, 1937. RG 79, Records of the National Park Service, National Capital Region Subject Files, 1924–1931, Box 35, File 1430/D.C. Memorial, May 27, 1927 to August 31, 1939, NA-CP. D.C. War Memorial,

Washington, D.C., Flagstone Setting Plan, approved September 1937, file no. 65.45-15. RG 66, Records of the Commission of Fine Arts, D.C. Metro Area/D.C. War Memorial, NA-CP.

152. Charles A. Peters Jr., Superintendent of Public Buildings, National Park Service, to [?] Little, October 28, 1937. RG 79, Records of the National Park Service, National Capital Region Subject Files, 1924–1931, Box 35, File 1430/D.C. Memorial, May 27, 1927 to August 31, 1939, NA-CP.

153. Frederick H. Brooke to C. Marshall Finnan, April 18, 1938. RG 79, Records of the National Park Service, National Capital Region Subject Files, 1924–1931, Box 35, File 1430/D.C. Memorial, May 27, 1927 to August 31, 1939, NA-CP.

154. Frederick H. Brooke to C. Marshall Finnan, June 1, 1938. RG 79, Records of the National Park Service, National Capital Region Subject Files, 1924–1931, Box 35, File 1430/D.C. Memorial, May 27, 1927 to August 31, 1939, NA-CP.

155. Charles A. Peters Jr. to Frederick H. Brooke, June 23, 1938. RG 79, Records of the National Park Service, National Capital Region Subject Files, 1924–1931, Box 35, File 1430/D.C. Memorial, May 27, 1927 to August 31, 1939, NA-CP.

156. Frederick H. Brooke to Charles A. Peters Jr., April 11, 1939. Charles A. Peters Jr. to Frederick H. Brooke, May 4, 1939. Records of the National Park Service, National Capital Region Subject Files, 1924–1931, Box 35, File 1430/D.C. Memorial, May 27, 1927 to August 31, 1939, NA-CP.

157. F. R. Brant, Acting Superintendent, Revenue, Post Office Group, National Park Service to Charles A. Peters Jr., May 12, 1939. RG 79, Records of the National Park Service, National Capital Region Subject Files, 1924–1931, Box 35, File 1430/D.C. Memorial, May 27, 1927 to August 31, 1939, NA-CP.

158. "D.C. War Memorial in Park Undergoes Face Lifting," *Evening Star*, November 5, 1939.

159. Handwritten note, dated June 30, 1939, by F. R. Brant, Acting Superintendent, Revenue, Post Office Group, National Park Service, at the bottom of a memorandum from H. L. Wooten, Acting General Manager of Buildings, National Park Service, dated June 3, 1939. RG 79, Records of the National Park Service, National Capital Region Subject Files, 1924–1931, Box 35, File 1430/D.C. Memorial, May 27, 1927 to August 31, 1939, NA-CP.

160. E. K. Burlew, First Assistant Secretary and Budget Officer, Department of the Interior, to Arno B. Cammerer, Director, National Park Service, July 13, 1939. RG 79, Records of the National Park Service, National Capital Region Subject Files, 1924–1931, Box 35, File 1430/D.C. Memorial, May 27, 1927 to August 31, 1939, NA-CP.

161. Brief report on D.C. War Memorial, author unknown. RG 79, Accession 66A1097, 1430/DC Memorial and 1430-10, Maintenance, Statues and Monuments. No records were located for the periods between 1940 and 1949 and 1950 and 1967. The newspaper clippings from the 1950s and 1960s report on the annual May Day ceremonies held at the memorial.

162. William R. Failor, Superintendent of National Capital Parks-Central, to Regional Director, July 16, 1968. District of Columbia War Memorial File, National Capital Parks–Central, courtesy of Tony Donald.

163. Action Line, *Evening Star*, June 29, 1968.

164. William A. Dennin, Staff Architect, to William R. Failor, Superintendent of National Capital Parks-Central, to Regional Director, August 21, 1968. District of Columbia War Memorial File, National Capital Parks–Central, courtesy of Tony Donald.

165. William Failor, Superintendent of National Capital Parks–Central, to General Superintendent, February 5, 1970. Brief report on D.C. War Memorial, author unknown. District of Columbia

War Memorial File, National Capital Parks–Central, courtesy of Tony Donald. Frederick H. Brooke, "The District of Columbia War Memorial," RG 79, Records of the National Park Service, National Capital Region Subject Files, 1924–1931, Box 35, File 1430/D.C. Memorial, May 27, 1927 to August 31, 1939, NA-CP. Brooke's report notes that the door was aluminum.

166. Rehabilitate D.C. War Memorial, National Capital Parks-Central, March 1971, prepared by D. Robinson, National Parks Service. Drawing no. 801-89890. District of Columbia War Memorial File, National Capital Parks–Central, courtesy of Tony Donald.

167. D.C. War Memorial report, October 7, 1977. District of Columbia War Memorial File, National Capital Parks–Central, courtesy of Tony Donald.

168. U.S. Department of the Interior, National Park Service Development/Study Package proposal, November 23, 1977. District of Columbia War Memorial File, National Capital Parks–Central, courtesy of Tony Donald.

169. National Park Service Inspection Checklist for Statues, Memorials, and Monuments. February 7, 1983. District of Columbia War Memorial File, National Capital Parks–Central, courtesy of Tony Donald.

170. April 13, 1984, Inspection of D.C. War Memorial by Tony Donald, NPS. District of Columbia War Memorial File, National Capital Parks–Central, courtesy of Tony Donald.

171. Thomas E. Fields, D.C. World War Memorial Investigation and Recommendation, September 28, 1984, pp. 1-2. District of Columbia War Memorial File, National Capital Parks–Central, courtesy of Tony Donald.

172. Thomas E. Fields, D.C. World War Memorial Investigation and Recommendation, September 28, 1984, drawing of existing conditions at the cornice. District of Columbia War Memorial File, National Capital Parks–Central, courtesy of Tony Donald.

173. The record does not indicate if the work proposed in the 1970 and 1980 was carried out.

174. Correct Life Safety Issues at the District of Columbia War Memorial, project identification no. PMIS 27782, July 15, 1998, updated January 22, 2005. District of Columbia War Memorial File, National Capital Parks–Central, courtesy of Tony Donald.

175. Repair Slate Walkway at the District of Columbia War Memorial, project identification no. PMIS 27804, July 15, 1998, updated January 22, 2005. District of Columbia War Memorial File, National Capital Parks–Central, courtesy of Tony Donald.

176. Light Fixtures Taken from the DC World War Memorial, West Potomac Park, Washington DC, May 2003. District of Columbia War Memorial File, National Capital Parks–Central, courtesy of Tony Donald.

177. Create HABS and HSR Documentation for DC War Memorial, project identification no. PMIS 43699, September 21, 1998, updated October 22, 2004. District of Columbia War Memorial File, National Capital Parks–Central, courtesy of Tony Donald.

PART 1

DEVELOPMENTAL HISTORY

TIMELINE

November 11, 1918	War War I ends.
December 1918	Letters to Commission of Fine Arts support erecting local memorials.[1]
October 1919	Frederick H. Brooke submits preliminary study of the memorial to the Commission of Fine Arts.[2]
April 8, 1920	Joint resolution was introduced in the House of Representatives "providing for the appointment of a commission for the purpose of erecting in Potomac Park in the District of Columbia a memorial to those members of the armed forces of the United States from the District of Columbia who served in the Great War."[3]
December 14, 1923	One of Brooke's 1919 drawings published in the *Evening Star*.[4]
June 7 1924	Resolution creating the District of Columbia War Memorial Commission was passed as Public Resolution No. 28 of the 68th Congress.[5]
December 12, 1924	The first meeting of the commission held at Frank B. Noyes's office in the Star Building.[6]
May-June 1925	Resolution amended to allow memorial to be erected on another site in Potomac Park.[7]
May 21, 1925	Commission of Fine Arts tentatively approves architects' design.[8]
July 2 1925	Architects submit further revisions[9]
December 17, 1925	Architects submit further revisions.[10]
February 1926	Plaster model of proposed memorial placed on display at the Woodward and Lothrop department store.[11]
April 11, 1926	Fundraising campaign officially launched.[12]
May 1927	Second fundraising campaign.[13]
January 17, 1928	The Commission of Fine Arts approves site.[14]
July-August 1928	Life-size silhouette of memorial was erected in West Potomac Park.[15]
January-February 1931	Memorial design finalized. Inscriptions to be placed on base of memorial.[16]

February 1931	Commission of Fine Arts determines which trees to remove from grove.[17]
March 4, 1931	Specifications finalized.[18]
April 1931	Maj. Gen. Benjamin Franklin Cheatham, retired quartermaster general of the U.S. Army, appointed chairman of special subcommittee of the National Capital Chapter of the Garden Club of America, to create memorial grove.[19]
April 11, 1931	Contract awarded to James Baird Co., Inc.[20]
April 23, 1931	Construction begins.[21] James L. Greenleaf, consulting landscape architect for memorial, arrives in Washington.[22]
June 1931	Flagstone removed during repaving of Constitution Avenue hauled to memorial site.[23]
June 27, 1931	First shipment of marble from Danby, Vermont arrives in Washington.[24]
July 20, 1931	Copper box with list of DC residents who served in the war, along with a set of building plans, copy of that day's Evening Star, and coins and paper currency with current dates, placed in cornerstone.[25]
August 3, 1931	Marble base complete; columns erected.[26]
September 24, 1931	Landscape plan by Cheatham endorsed by Fine Arts Commission.[27]
September 29, 1931	Keystone of outer dome laid in place.[28]
October 1931	First elm (a gift from Janet T. Noyes) is planted in memorial grove.[29]
October 9, 1931	Lieut. Col. U. S. Grant III contacts the Potomac Electric Power Company, requesting the installation of electrical service at the memorial.[30]
November 11, 1931	District of Columbia War Memorial dedicated.[31]
February 6, 1932	Care and maintenance of memorial given to Parks Division of the Office of Public Buildings and Public Parks of the National Capital.[32]
June 2, 1932	The first band program held at the memorial.[33]
June 10, 1932	Maintenance of the memorial transferred to the Buildings Division (Potomac Park Group); maintenance of grounds remains with Parks Division.[34]
June 10, 1933	Care of memorial placed under jurisdiction of the National Park Service.[35]
1935	Flagstone walk repairs necessary.[36]
November 1936	Ceiling cleaned.[37]

September 1937	New flagstone-setting plan and pattern approved.[38]
October 1937	Report by Charles A. Peters Jr., Superintendent of Public Buildings, National Park Service, recommending that memorial be cleaned and repointed.[39]
April 1938	Frederick H. Brooke notes water leakage through one of columns on north side of memorial.[40]
November 10, 1938	New time switch installed for lighting system.[41]
April 1939	Frederick H. Brooke notes water entering through interior cornice.[42]
June 15, 1939	50th anniversary celebration of John Philip Sousa's "The Washington Post March" celebrated at the memorial.[43]
June 30, 1939	Care of the memorial transferred to National Capital Parks division of the National Park Service.[44]
June-November 1939	Improvements and repairs to memorial include: replacement of lead gutter with nickel-plated copper gutter; repointing of exterior of dome and entablature with "lead wool and caulking compound."[45]
1940	The District of Columbia World War Memorial and May Day Corporation created.[46]
November 1942	Janet T. Noyes dies.[47]
November 1948	Frank Noyes dies.[48]
June 9-August 23, 1949	Memorial cleaned and mortar joints repointed.
December 1949	Memorial cleaned.[49]
1965	Care of memorial placed under National Capital Parks-Central.[50]
August 21, 1968	Report by National Capital Parks–Central staff architect William A. Dennin notes drainage problems and recommends repairs. Vandals have defaced building with graffiti.[51]
February 1970	Hatch door to basement space stolen.[52]
March 1971	D. Robinson of NPS prepares drawings of elevation and cornice for repairs to drainage system; repairing and replacing walkways; replacing lighting system.[53] (These repairs were not carried out.)[54]
October 1977	Stone walks in poor condition.[55]
November 1977	Memorial in poor condition.[56]
February 7, 1983	Water leaking from dome. Areas of the floor blackened and had "orangish coloring."[57]

April 1984	Inspection report by Tony Donald of the National Park Service Denver Service Center notes ceiling stains and stalactites caused by leaks.[58]
September 1984	Inspection report notes "reddish and brown stained spots on the dome and bluish-green stains on the face of the memorial's base," as well as "numerous dark stains on the floor around the column bases." Stalactites forming from the soffits around the column capitals. Vegetation growing from dome joints. Marble floor is deterioration, flaking, and spalling.[59]
	Waterproofing tar paper peeling off the convex surface of the lower dome; lime leaching from mortar around the base of the upper dome; face of cornice's brick backing spalling inside dome; roof joints deteriorating; flashing caulking deteriorating; joints in base and ledge of cornice deteriorated; seams in gutter cracked.[60]
July 1998	Site deemed unsafe for visitors.[61]
July 1998	National Capital Parks–Central recommends that stone walkways be removed and the subbase reconstructed.[62]
June 2002	Investigation report notes significant spalling, clogged drains, loose caulk, cracked flashing, and vegetation pushing through mortarless joints. Drains cleared, and remedial repairs begun, including limited pointing and powerwashing.
March 2003	Pittsburgh Permaflector light fixtures removed from the memorial, and eight fluorescent lights installed in the interior cornice.[63]
2004-2005	Historic American Buildings Survey (DC-857) history and drawings completed.
Summer 2004	Roofing slates repointed by NPS crew (Binh Nguyen and Ray Wooden), using 5:1:1 mortar mixture.
2005	John G. Waite Associates, Architects of Albany, New York prepares Historic Structure Report.

TIMELINE NOTES

1. "Asks for Suggestion for War's Memorial," *Evening Star*, December 26, 1918.
2. Frederick H. Brooke, "The District of Columbia War Memorial," RG 79, Records of the National Park Service, National Capital Region Subject Files, 1924–1931, Box 35, File 1430/D.C. Memorial, May 27, 1927 to August 31, 1939, NA-CP.
3. Joint Resolution providing for the appointment of a commission for the purpose of erecting in Potomac Park in the District of Columbia a memorial to those members of the armed forces of the United States from the District of Columbia who served in the Great War. H.J. Res. 331, 66th Cong. 2nd sess. (April 8, 1920), RG 79, Records of the National Park Service, National Capital Region Subject Files, 1924–1931, Box 35, File 1430/D.C. Memorial, May 27, 1927 to August 31, 1939, NA-CP.

4. "Proposed 'Temple of Music'," *Evening Star* [?], December 14, 1923.

5. Joint Resolution providing for the appointment of a commission for the purpose of erecting in Potomac Park in the District of Columbia a memorial to those members of the armed forces of the United States from the District of Columbia who served in the Great War. H.J. Res. 331, 66th Cong. 2nd sess. (April 8, 1920), RG 79, Records of the National Park Service, National Capital Region Subject Files, 1924–1931, Box 35, File 1430/D.C. Memorial, May 27, 1927 to August 31, 1939, NA-CP.

6. Minutes of the Meeting of the Commission of Fine Arts, December 12, 1924. RG 79, Records of the National Park Service, National Capital Region Subject Files, 1924–1931, Box 35, File 1430/D.C. Memorial, May 27, 1927 to August 31, 1939, NA-CP.

7. Draft of amendment of Public Resolution No. 28, 68th Cong., approved June 7, 1924. No date for amendment. RG 79, Records of the National Park Service, National Capital Region Subject Files, 1924–1931, Box 35, File 1430/D.C. Memorial, May 27, 1927 to August 31, 1939, NA-CP.

8. Charles Moore to Frederick H. Brooke, May 22, 1925. RG 79, Records of the National Park Service, National Capital Region Subject Files, 1924–1931, Box 35, File 1430/D.C. Memorial, May 27, 1927 to August 31, 1939, NA-CP. Minutes of the Meeting of the Commission of Fine Arts, May 21, 1925. Commission of Fine Arts, Washington, D.C.

9.. July 2, 1925, revised plans for the District of Columbia Memorial, F. H. Brooke, Architect, N. C. Wyeth and H. W. Peaslee, Associated. District of Columbia War Memorial File, National Capital Parks-Central, courtesy of Tony Donald.

10.. December 17, 1925, revised plans for the District of Columbia Memorial, F. H. Brooke, Architect, N. C. Wyeth and H. W. Peaslee, Associated. District of Columbia War Memorial File, National Capital Parks-Central, courtesy of Tony Donald.

11.. "D.C. War Memorial Campaign Pushed," *Evening Star*, February 27, 1926.

12. "D.C. War Memorial Drive Opens Today," *Sunday Star*, April 11, 1926.

13. "$10,215 Collected in Memorial Drive," *Evening Star*, May 2, 1927.

14. Charles Moore to Lieut. Col. U. S. Grant III, January 17, 1928, included with the Minutes of the Meeting of the Commission of Fine Arts, January 6, 1928. Commission of Fine Arts, Washington, D.C. RG 79, Records of the National Park Service, National Capital Region Subject Files, 1924–1931, Box 35, File 1430/D.C. Memorial, May 27, 1927 to August 31, 1939, NA-CP.

15. Frederick H. Brooke to U. S. Grant III, May 4, 1928. RG 79, Records of the National Park Service, National Capital Region Subject Files, 1924–1931, Box 35, File 1430/D.C. Memorial, May 27, 1927 to August 31, 1939, NA-CP.

16. Minutes of the Meeting of the Commission of Fine Arts, February 12, 1931. Commission of Fine Arts, Washington, D.C.

17. Minutes of the Meeting of the Commission of Fine Arts, February 12, 1931. Commission of Fine Arts, Washington, D.C.

18. Specification for the Proposed District of Columbia Memorial to Be Built in Potomac Park, Washington, D.C., RG 79, Records of the National Park Service, National Capital Region Subject Files, 1924–1931, Box 35, File 1430/D.C. Memorial, May 27, 1927 to August 31, 1939, NA-CP.

19. Minutes of the Meeting of the Commission of Fine Arts, April 15 and 16, 1931. Commission of Fine Arts, Washington, D.C.

20. James Baird Company, Inc. contract for work on the District of Columbia Memorial. April 11, 931. RG 79, Records of the National Park Service, National Capital Region Subject Files, 1924–1931, Box 35, File 1430/D.C. Memorial, May 27, 1927 to August 31, 1939, NA-CP.

21. "Memorial to Start," *Evening Star*, April 16, 1931. *Annual Report of the Director of Public Buildings and Public Parks of the National Capital, 1932* (Washington, D.C.: GPO, 1932), 49–50. Frederick H. Brooke to U. S. Grant III, May 16, 1931. RG 79, Records of the National Park Service, National Capital Region Subject Files, 1924–1931, Box 35, File 1430/D.C. Memorial, May 27, 1927 to August 31, 1939, NA-CP.

22. Minutes of the Meeting of the Commission of Fine Arts, April 15 and 16, 1931. Commission of Fine Arts, Washington, D.C.

23. U. S. Grant III to Frederick H. Brooke, June 4, 1931. RG 79, Records of the National Park Service, National Capital Region Subject Files, 1924–1931, Box 35, File 1430/D.C. Memorial, May 27, 1927 to August 31, 1939, NA-CP.

24. "War Memorial Marble Arrives from Vermont," *Evening Star*, June 27, 1931.

25. "Memorial Corner Stone Sealed," *Evening Star*, July 20, 1931.

26. "District War Memorial Rising," *Evening Star*, August 3, 1931.

27. Minutes of the Meeting of the Commission of Fine Arts, September 24, 25, and 26, 1931. Commission of Fine Arts, Washington, D.C.

28. "Keystone of D.C. Memorial Temple Laid," *Evening Star*, September 30, 1931.

29. "Memorial Tree Planted," *Evening Star*, October 23, 1931.

30. U. S. Grant III to Potomac Electric Power Company, October 9, 1931. RG 79, Records of the National Park Service, National Capital Region Subject Files, 1924–1931, Box 35, File 1430/D.C. Memorial, May 27, 1927 to August 31, 1939, NA-CP.

31. "War Memorial Dedicated," *Evening Star*, November 11, 1931.

32. General Order No. 453, Office of Public Buildings and Public Parks of the National Capital, February 6, 1932. RG 79, Records of the National Park Service, National Capital Region Subject Files, 1924–1931, Box 35, File 1430/D.C. Memorial, May 27, 1927 to August 31, 1939, NA-CP.

33. "Band Season," *Washington Herald* staff photograph, June 4, 1932.

34. Memorandum from James F. Gill, Chief of the Buildings Division of the Office of Public Buildings and Public Parks of the National Capital, June 10, 1932. RG 79, Records of the National Park Service, National Capital Region Subject Files, 1924–1931, Box 35, File 1430/D.C. Memorial, May 27, 1927 to August 31, 1939, NA-CP.

35. U.S. Dept. of the Interior. *A Brief History of the National Park Service*, National Park Service Web site, http://www.cr.nps.gov/history/online_books/kieley/index.htm, (accessed August 5, 2005).

36. Frank B. Noyes to C. Marshall Finnan, August 29, 1935. RG 79, Records of the National Park Service, National Capital Region Subject Files, 1924–1931, Box 35, File 1430/D.C. Memorial, May 27, 1927 to August 31, 1939, NA-CP.

37. E. J. Little, War Department, to H. R. Owen, November 11, 1936. RG 79, Records of the National Park Service, National Capital Region Subject Files, 1924–1931, Box 35, File 1430/D.C. Memorial, May 27, 1927 to August 31, 1939, NA-CP.

38. Frederick H. Brooke to Louis Perna & Sons, Inc., September 30, 1937. RG 79, Records of the National Park Service, National Capital Region Subject Files, 1924–1931, Box 35, File 1430/D.C. Memorial, May 27, 1927 to August 31, 1939, NA-CP. D.C. War Memorial, Washington, D.C., Flagstone Setting Plan, approved September 1937, file no. 65.45-15. RG 66, Records of the Commission of Fine Arts, D.C. Metro Area/D.C. War Memorial, NA-CP.

39. Charles A. Peters Jr., Superintendent of Public Buildings, National Park Service, to [?] Little, October 28, 1937. RG 79, Records of the National Park Service, National Capital Region Subject Files, 1924–1931, Box 35, File 1430/D.C. Memorial, May 27, 1927 to August 31, 1939, NA-CP.

40. Frederick H. Brooke to C. Marshall Finnan, April 18, 1938. RG 79, Records of the National Park Service, National Capital Region Subject Files, 1924–1931, Box 35, File 1430/D.C. Memorial, May 27, 1927 to August 31, 1939, NA-CP.

41. E. J. Little, War Department, to H. R. Owen, November 11, 1936. C. Marshall Finnan to Frank B. Noyes, November 16, 1938. RG 79, Records of the National Park Service, National Capital Region Subject Files, 1924–1931, Box 35, File 1430/D.C. Memorial, May 27, 1927 to August 31, 1939, NA-CP.

42. Frederick H. Brooke to Charles A. Peters Jr., April 11, 1939. Charles A. Peters Jr. to Frederick H. Brooke, May 4, 1939. Records of the National Park Service, National Capital Region Subject Files, 1924–1931, Box 35, File 1430/D.C. Memorial, May 27, 1927 to August 31, 1939, NA-CP.

43. Marshall Andrews, "Sousa's Air Makes D.C. Spine Tingle on Tune's Birthday," *Washington Post*, June 16, 1939.

44. Acting Director, unsigned, to General Manager of Buildings, unaddressed, June 29, 1930. RG 79, Records of the National Park Service, National Capital Region Subject Files, 1924–1931, Box 35, File 1430/D.C. Memorial, May 27, 1927 to August 31, 1939, NA-CP.

45. F. R. Brant, Acting Superintendent, Revenue, Post Office Group, National Park Service to Charles A. Peters Jr., May 12, 1939. RG 79, Records of the National Park Service, National Capital Region Subject Files, 1924–1931, Box 35, File 1430/D.C. Memorial, May 27, 1927 to August 31, 1939, NA-CP.

46. Program for 70th Annual Commemorative Observance at the District War Memorial–West Potomac Park, Sunday, May 15, 2005. Courtesy of Thomas Kouyeas.

47. "Mrs. Frank B. Noyes, Wife of Publisher," *New York Times*, November 9, 1942.

48. "Frank B. Noyes, 85, Publisher, Is Dead," *New York Times*, December 1, 1948.

49. Brief report on D.C. War Memorial, author unknown. RG 79, Accession 66A1097, 1430/DC Memorial and 1430-10, Maintenance, Statues and Monuments.

50. Mark David Richards, "District of Columbia Service in World War One and the DC World War Memorial," May 22, 2002, http://www.dcwatch.com/richards/020526.htm (accessed August 2, 2005).

51. Action Line, *Evening Star*, June 29, 1968.

52. William Failor, Superintendent of National Capital Parks–Central, to General Superintendent, February 5, 1970. Brief report on D.C. War Memorial, author unknown. District of Columbia War Memorial File, National Capital Parks–Central, courtesy of Tony Donald.

53. Rehabilitate D.C. War Memorial, National Capital Parks-Central, March 1971, prepared by D. Robinson, National Parks Service. Drawing no. 801-89890. District of Columbia War Memorial File, National Capital Parks–Central, courtesy of Tony Donald.

54. April 13, 1984, Inspection of D.C. War Memorial by Tony Donald, NPS. District of Columbia War Memorial File, National Capital Parks–Central, courtesy of Tony Donald.

55. D.C. War Memorial report, October 7, 1977. District of Columbia War Memorial File, National Capital Parks–Central, courtesy of Tony Donald.

56. U.S. Department of the Interior, National Park Service Development/Study Package proposal, November 23, 1977. District of Columbia War Memorial File, National Capital Parks–Central, courtesy of Tony Donald.

57. National Park Service Inspection Checklist for Statues, Memorials, and Monuments. February 7, 1983. District of Columbia War Memorial File, National Capital Parks–Central, courtesy of Tony Donald.

58. April 13, 1984, Inspection of D.C. War Memorial by Tony Donald, NPS. District of Columbia War Memorial File, National Capital Parks–Central, courtesy of Tony Donald.

59. Thomas E. Fields, D.C. World War Memorial Investigation and Recommendation, September 28, 1984, pp. 1-2. District of Columbia War Memorial File, National Capital Parks–Central, courtesy of Tony Donald.

60. Thomas E. Fields, D.C. World War Memorial Investigation and Recommendation, September 28, 1984, drawing of existing conditions at the cornice. District of Columbia War Memorial File, National Capital Parks–Central, courtesy of Tony Donald.

61. Correct Life Safety Issues at the District of Columbia War Memorial, project identification no. PMIS 27782, July 15, 1998, updated January 22, 2005. District of Columbia War Memorial File, National Capital Parks–Central, courtesy of Tony Donald.

62. Repair Slate Walkway at the District of Columbia War Memorial, project identification no. PMIS 27804, July 15, 1998, updated January 22, 2005. District of Columbia War Memorial File, National Capital Parks–Central, courtesy of Tony Donald.

63. Light Fixtures Taken from the DC World War Memorial, West Potomac Park, Washington DC, May 2003. District of Columbia War Memorial File, National Capital Parks–Central, courtesy of Tony Donald.

PART 1

DEVELOPMENTAL HISTORY

HISTORIC IMAGES AND DRAWINGS

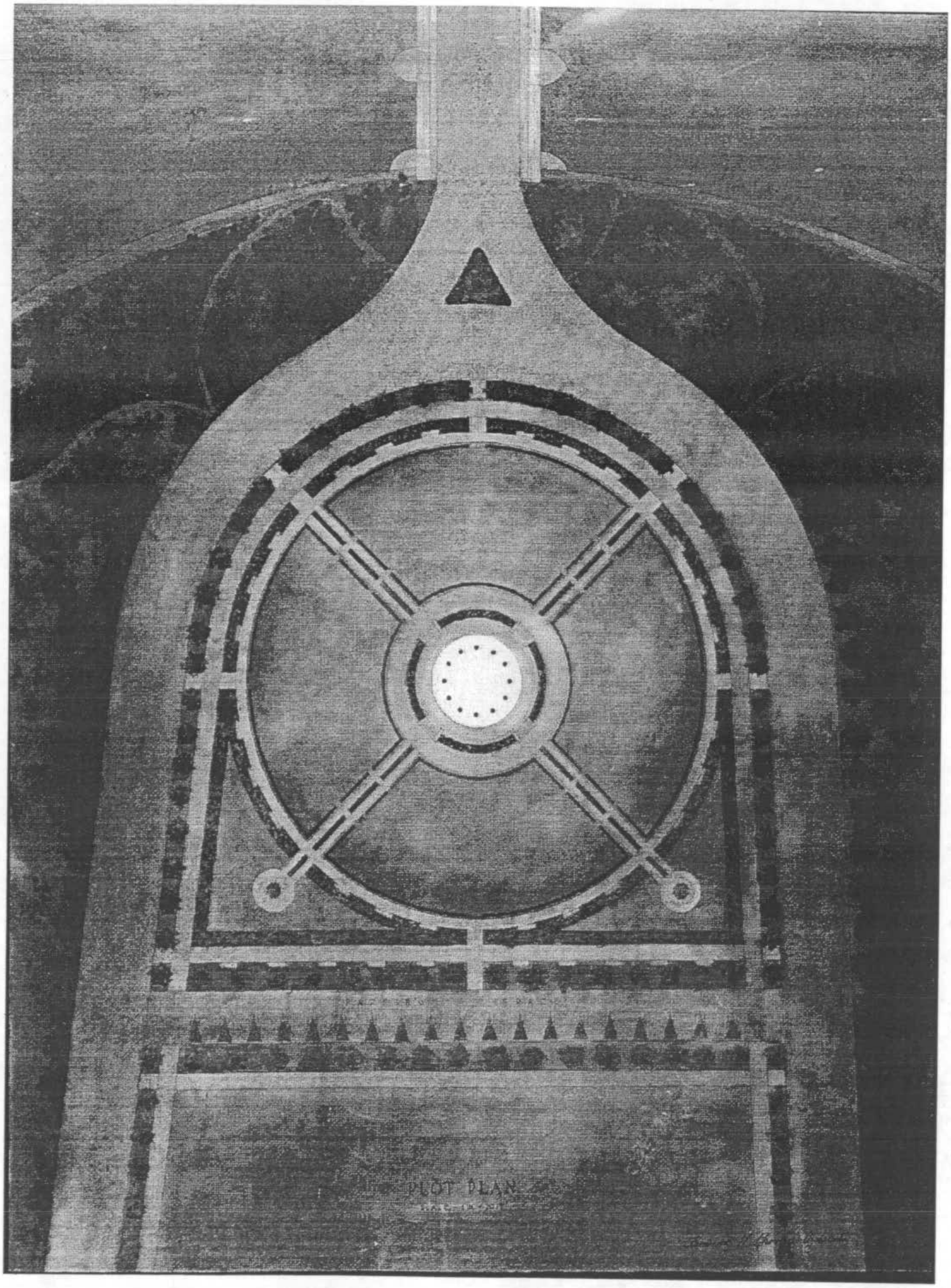


Figure 1. Plot Plan, October 17, 1919, by Frederick H. Brooke. [Commission of Fine Arts, Washington, D.C.]

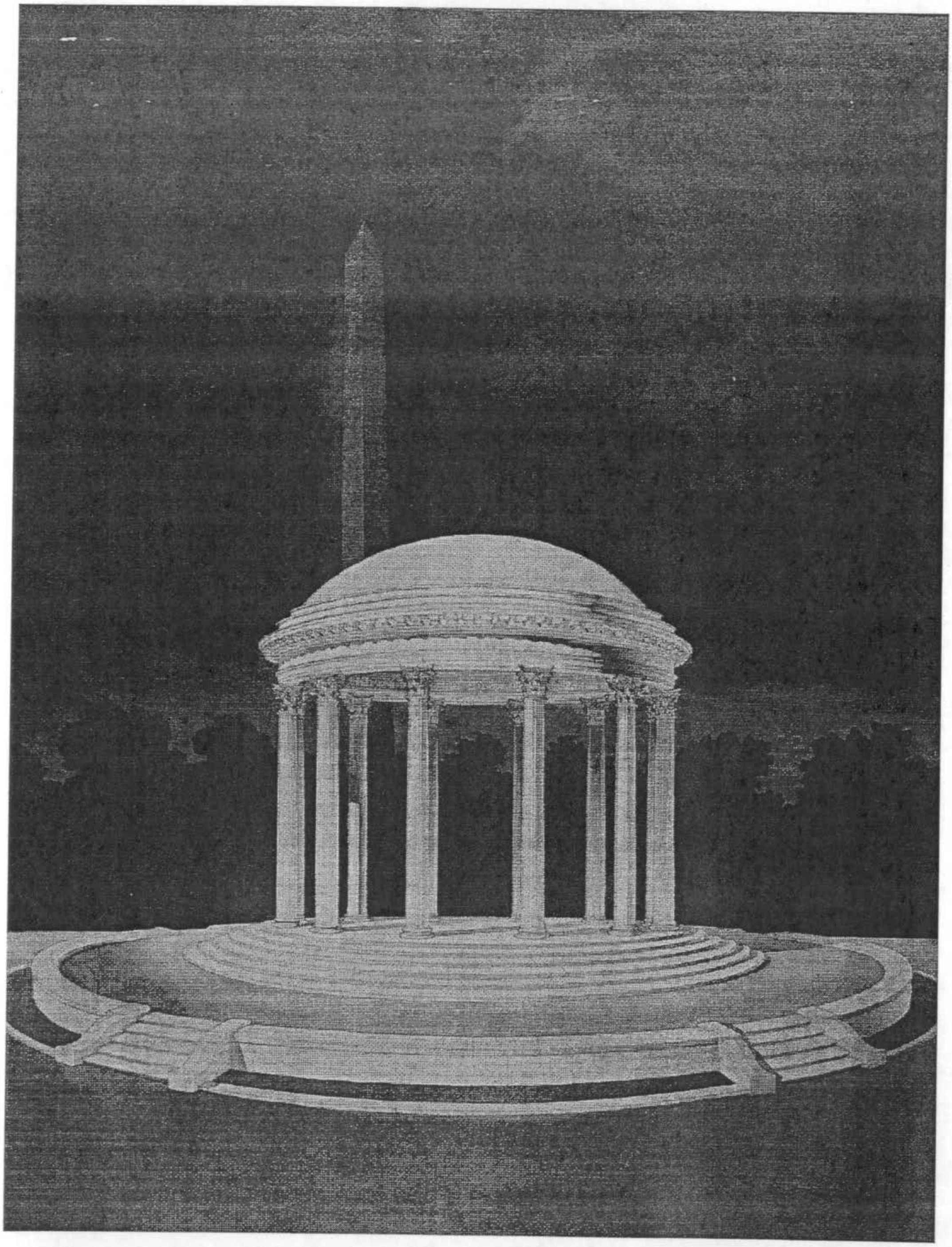


Figure 2. Rendering by Frederick H. Brooke, October 17, 1919. [Commission of Fine Arts, Washington, D.C.]

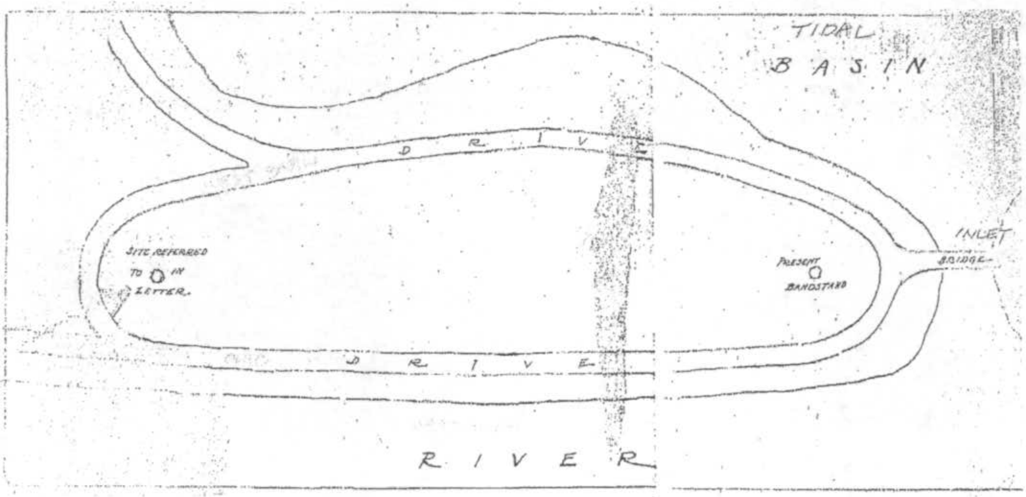


Figure 3. Plan by Frederick H. Brooke of the proposed site, February 20, 1925. [RG 79, Records of the National Park Service, National Capital Region Subject Files, 1924–1931, Box 35, File 1430/D.C. Memorial, May 27, 1927 to August 31, 1939, NA-CP].

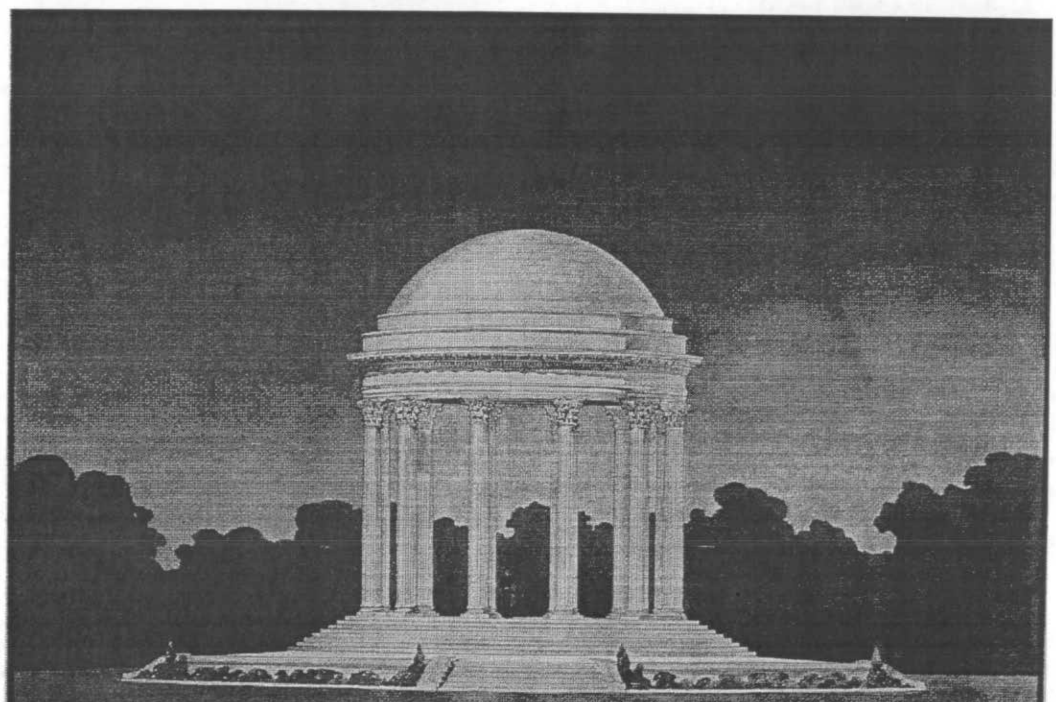


Figure 4. "Proposed District of Columbia Memorial Perspective," March 1925, by Frederick H. Brooke, Nathan C. Wyeth, and Horace W. Peaslee. [Commission of Fine Arts, Washington, D.C.]

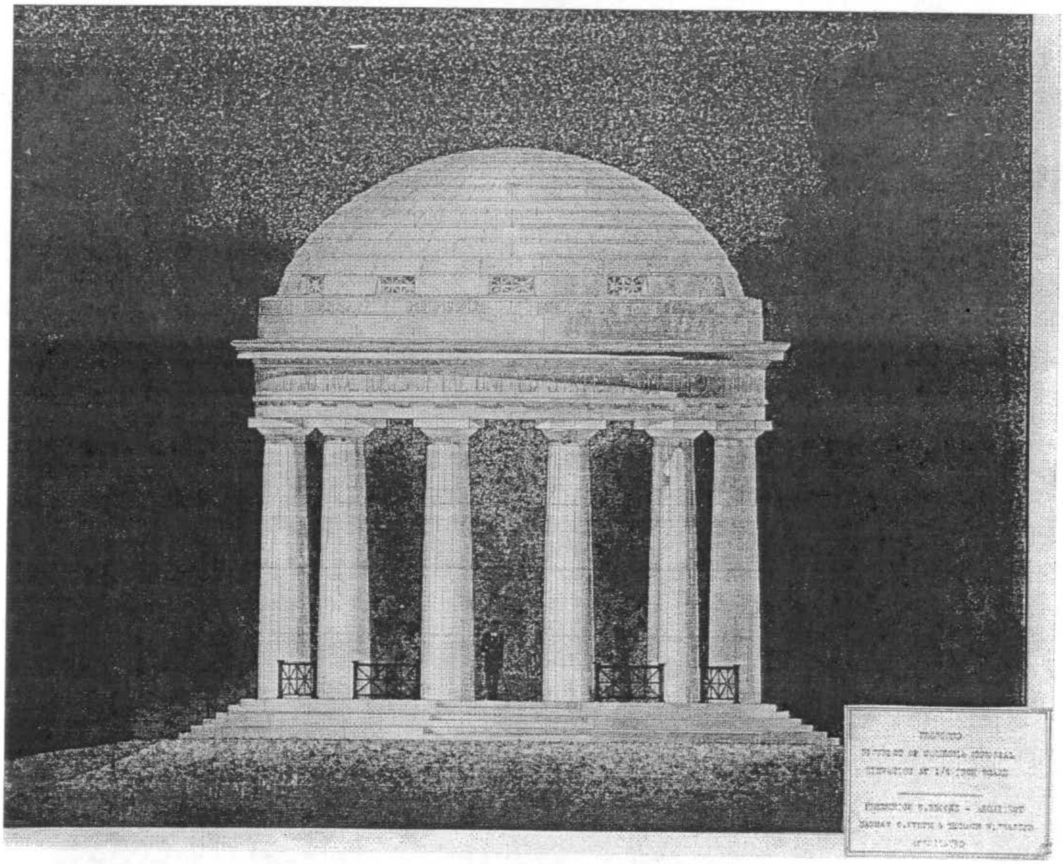


Figure 5. "Proposed District of Columbia Memorial, Elevation at 1/2 Inch Scale," May 1925, by Frederick H. Brooke, Nathan C. Wyeth, and Horace W. Peaslee. [Commission of Fine Arts, Washington, D.C.]

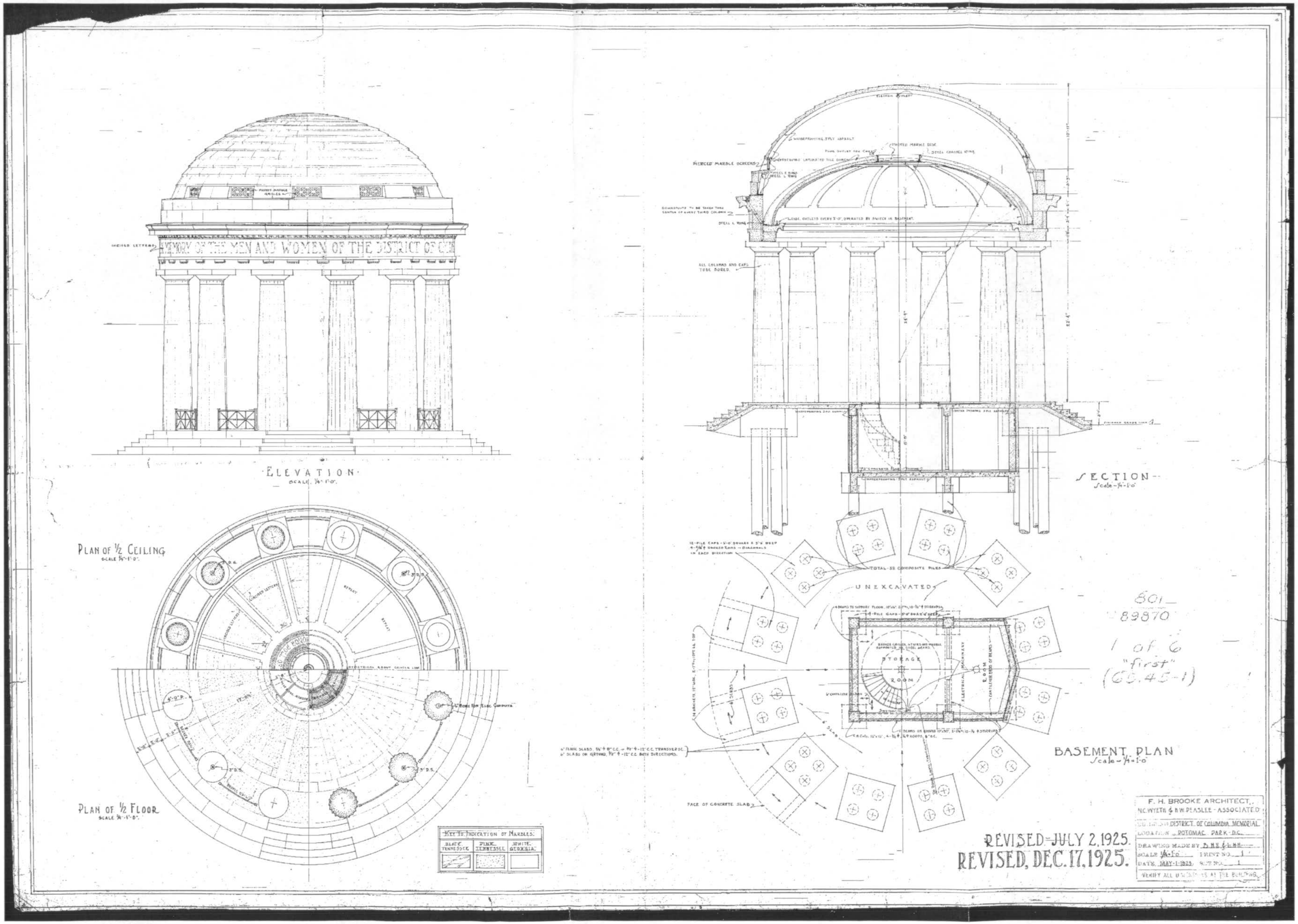


Figure 6. Drawings for District of Columbia Memorial, revised July 2, 1925 and revised December 17, 1925, by F.H. Brooke, Architect, and N.C. Wyeth and Horace Peaslee, Associated. [National Park Service]

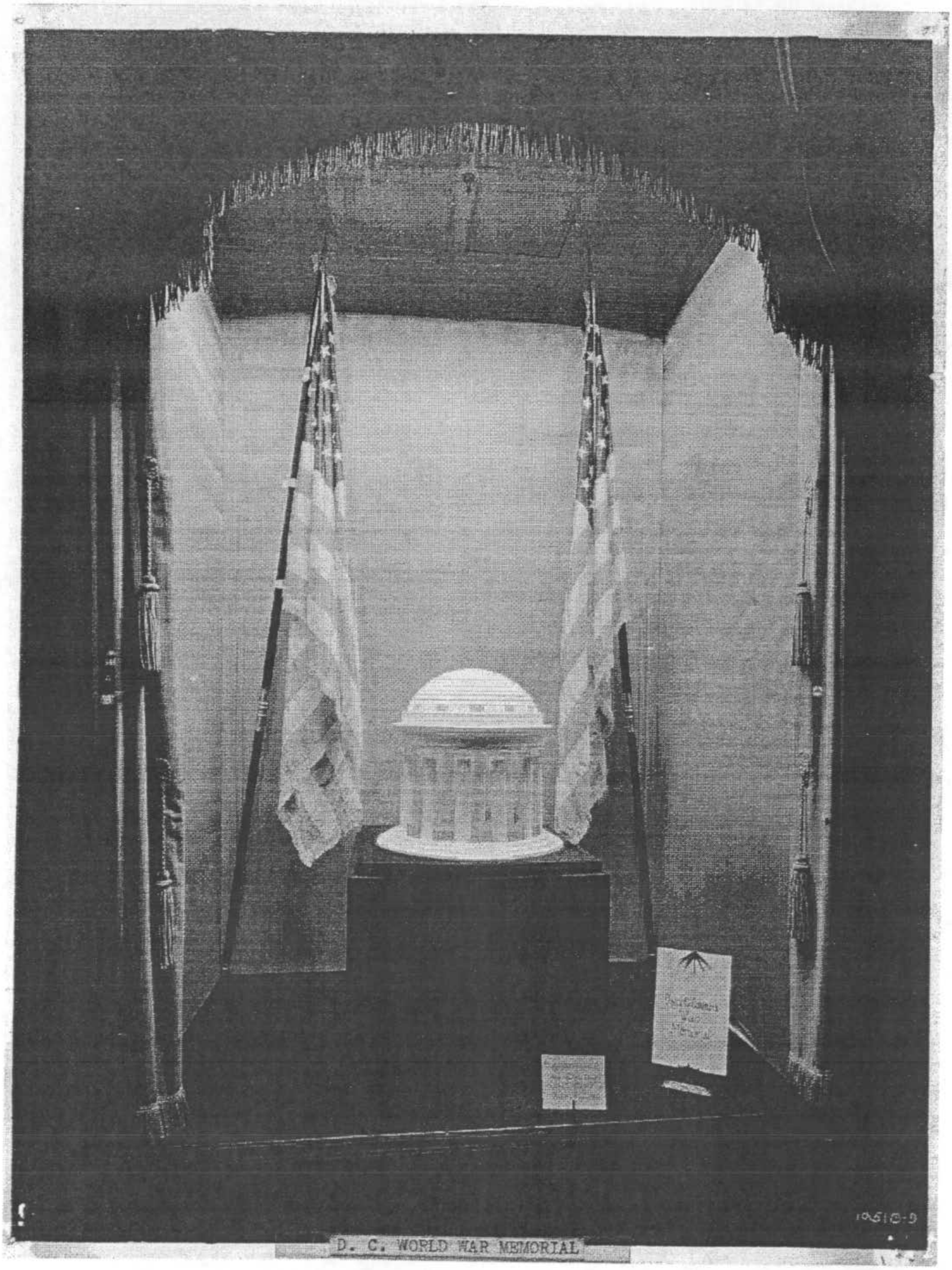


Figure 7. Plaster model of proposed Memorial, displayed at the Woodward & Lothrop department store in late February, 1926. [Commission of Fine Arts, Washington, D.C.]

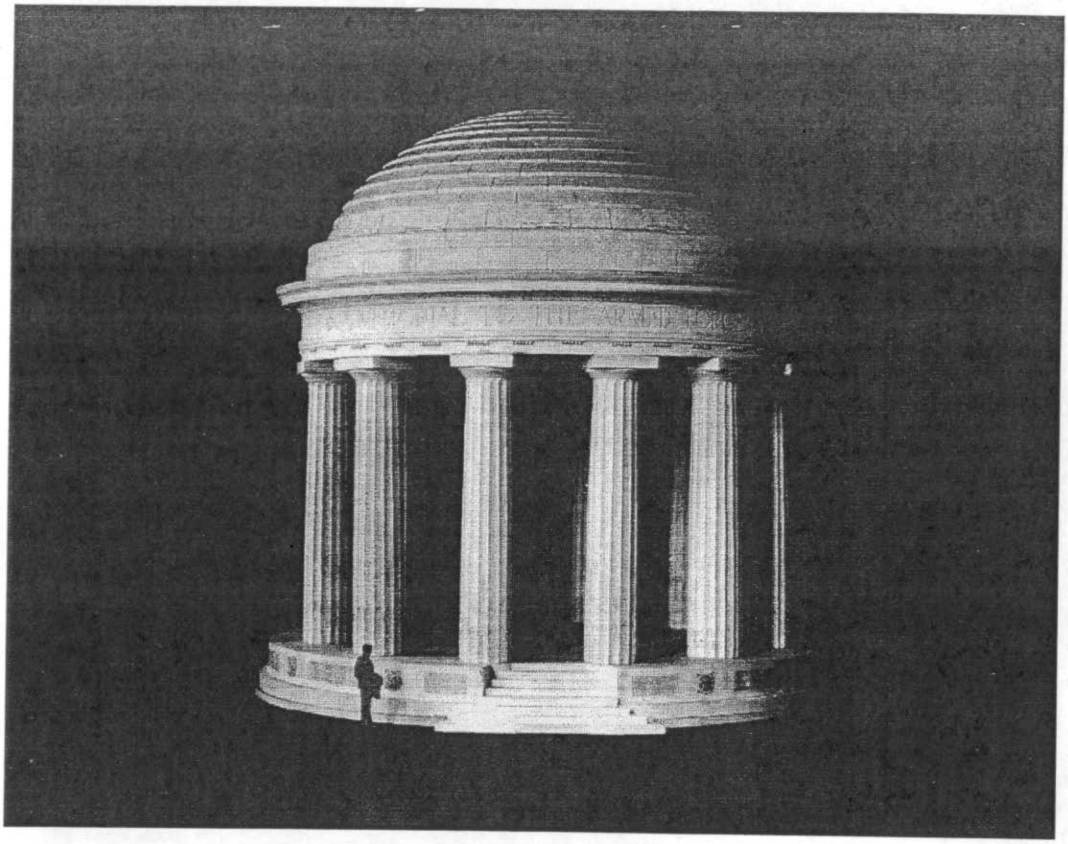


Figure 8. Revised model by Frederick H. Brooke, February 1931. [Commission of Fine Arts, Washington, D.C.]

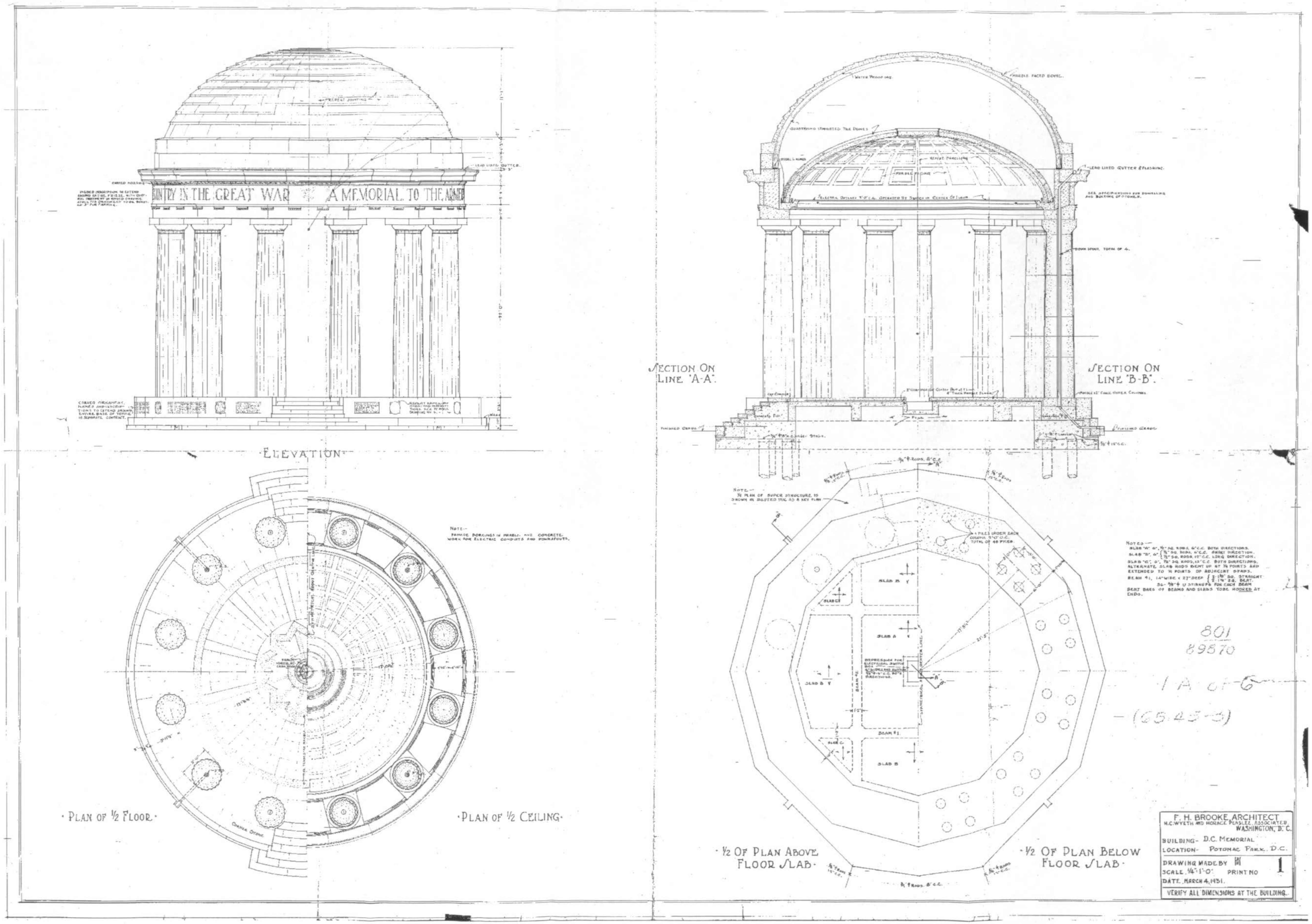


Figure 9. Drawings for DC War Memorial, March 4, 1931, by F.H. Brooke, Architect, and N.C. Wyeth and Horace Peaslee, Associated. [National Park Service]

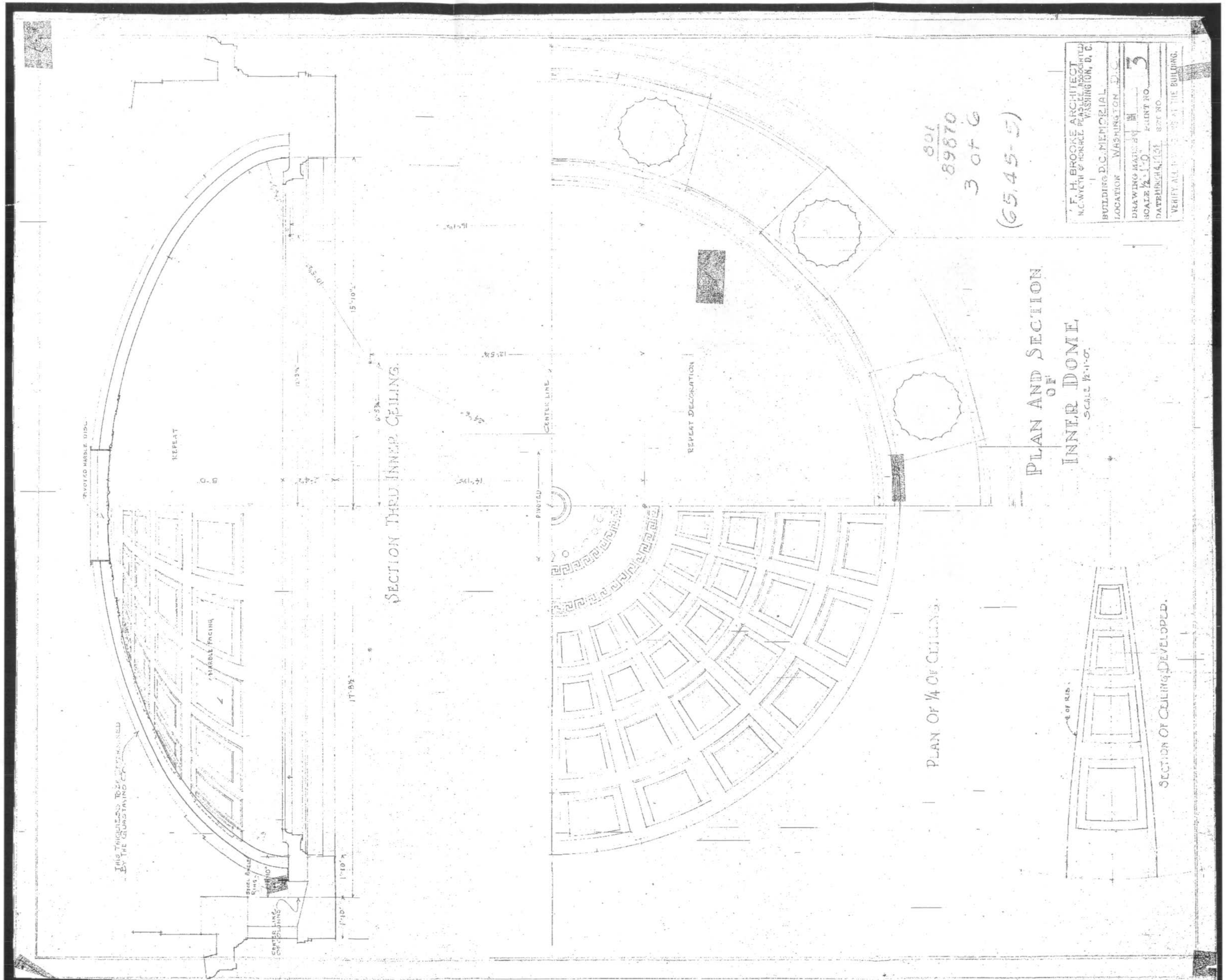


Figure 10. Plan and Section of Inner Dome, March 4, 1931, by F.H. Brooke, Architect, and N.C. Wyeth and Horace Peaslee, Associated. [National Park Service]

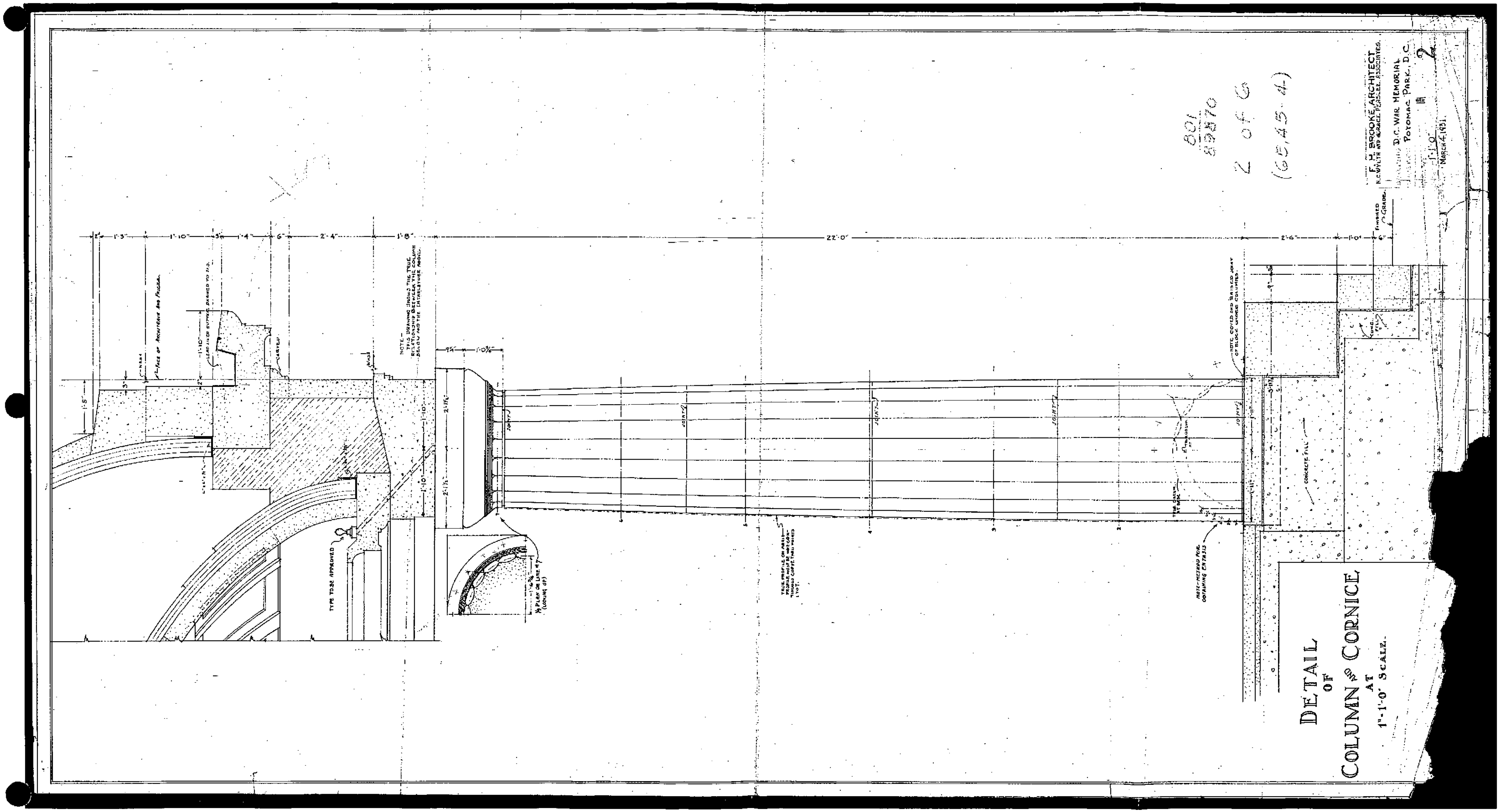


Figure 11. Detail of Column and Cornice, March 4, 1931, by F.H. Brooke, Architect, and N.C. Wyeth and Horace Peaslee, Associated. [National Park Service]

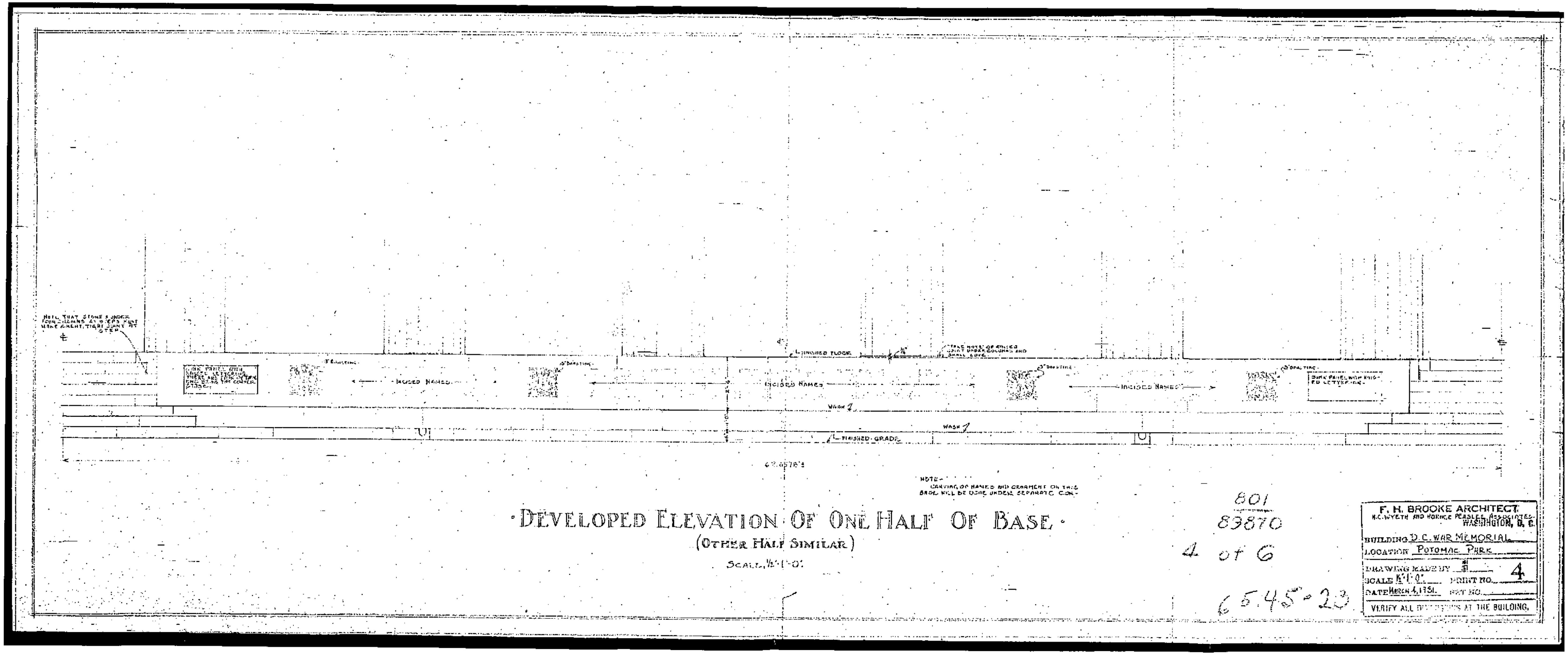


Figure 12. Developed Elevation of One Half of Base, March 4, 1931, by F.H. Brooke, Architect, and N.C. Wyeth and Horace Peaslee, Associated. [National Park Service]

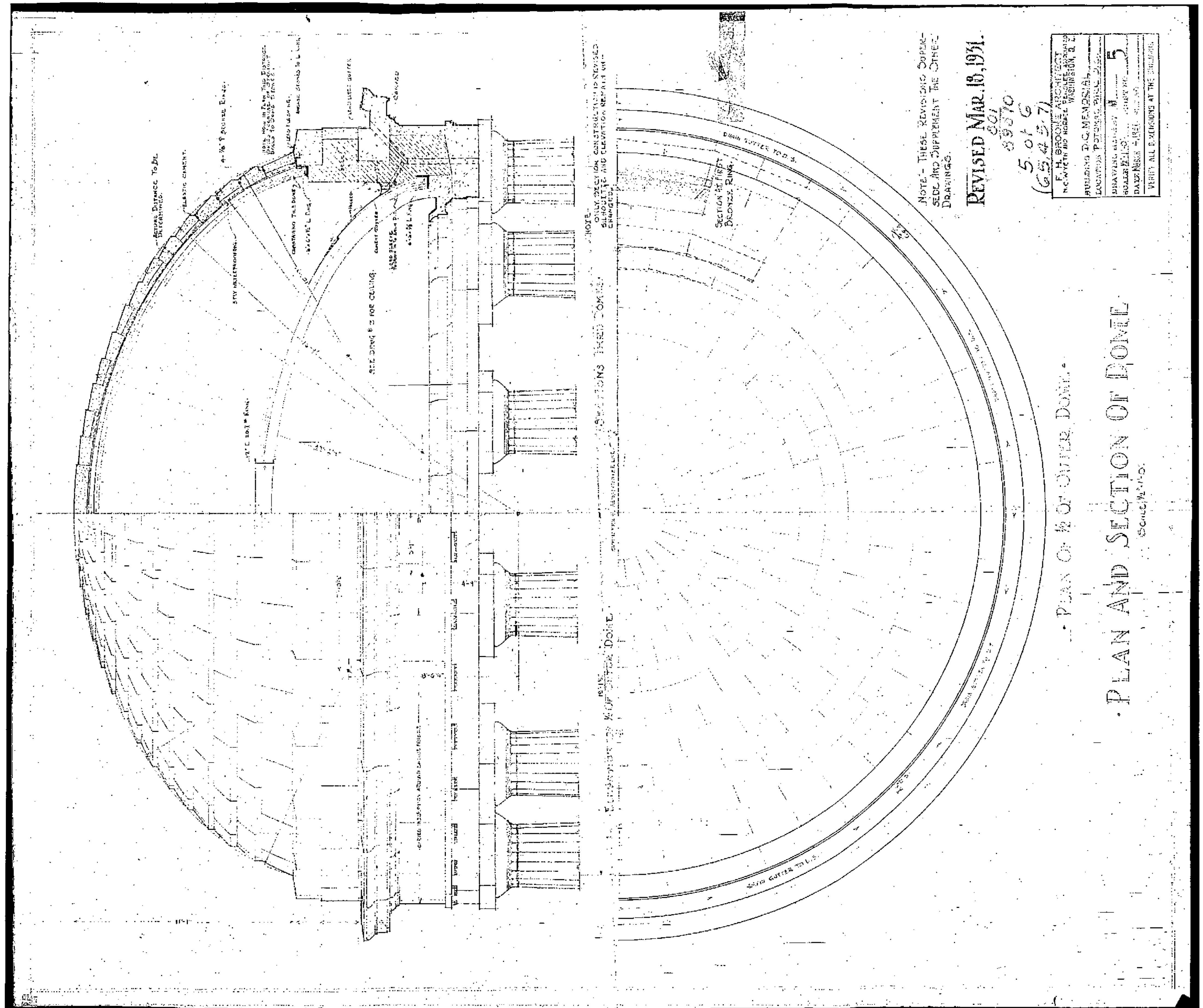


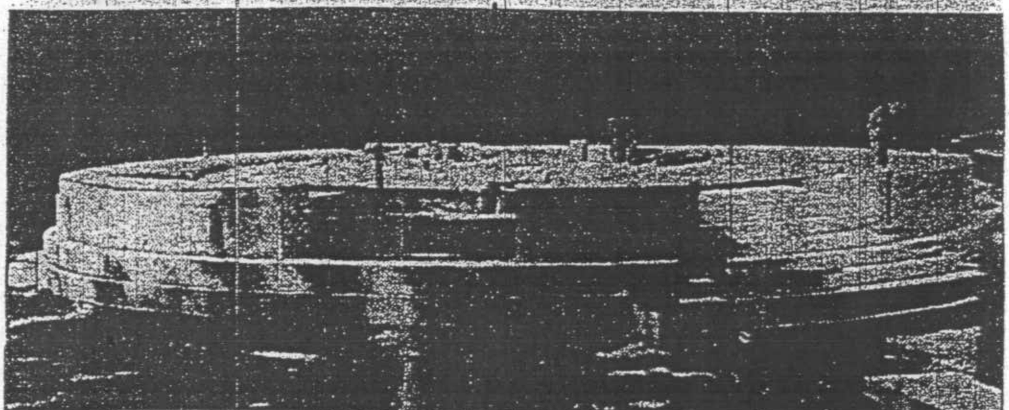
Figure 13. Plan and Section of Dome, revised March 18, 1931, by F.H. Brooke, Architect, and N.C. Wyeth and Horace Peaslee, Associated. [National Park Service]

day Star GENERAL

MORNING, JULY 12, 1931. **

D. C. War Memorial Taking Shape

PROGRESS SHOWN ON CLASSIC TEMPLE.



Workmen have nearly completed the base of the Doric temple being erected in Potomac Park as a memorial to the District's World War heroes. Funds for the edifice were raised by popular subscription.

Lower: Framework of graceful dome which will top the temple.

—Star Staff Photos.

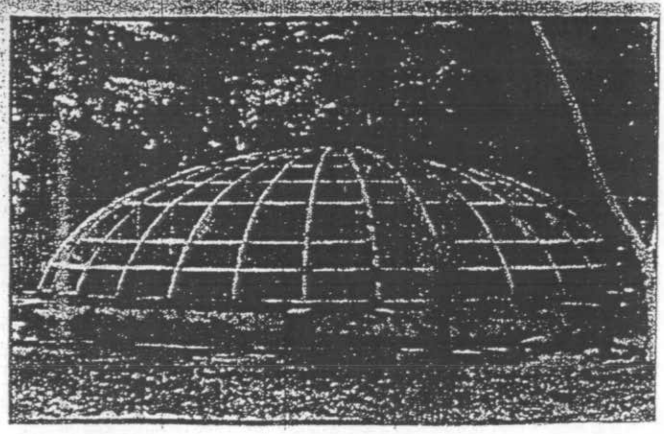


*Figure 14. "D.C. War Memorial Taking Shape." [*Sunday Star, *July 12, 1931.]*

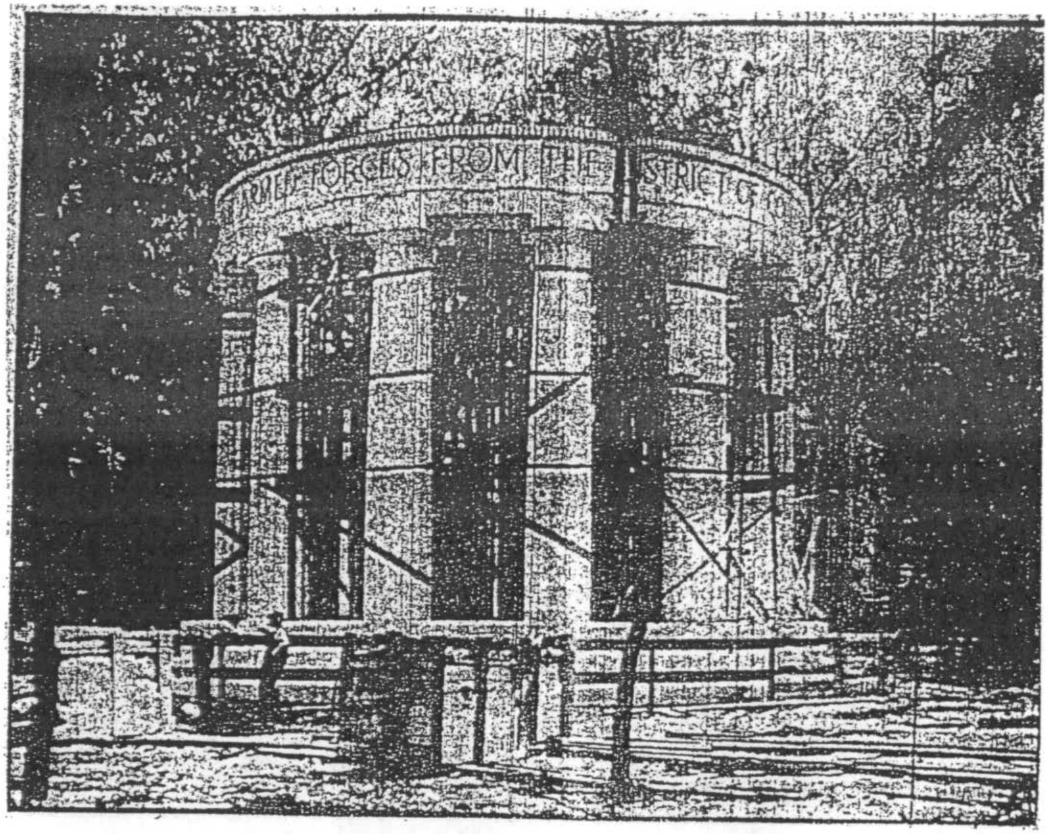


Figure 15. "District War Memorial Rising." [Evening Star, *August 3, 1931]*

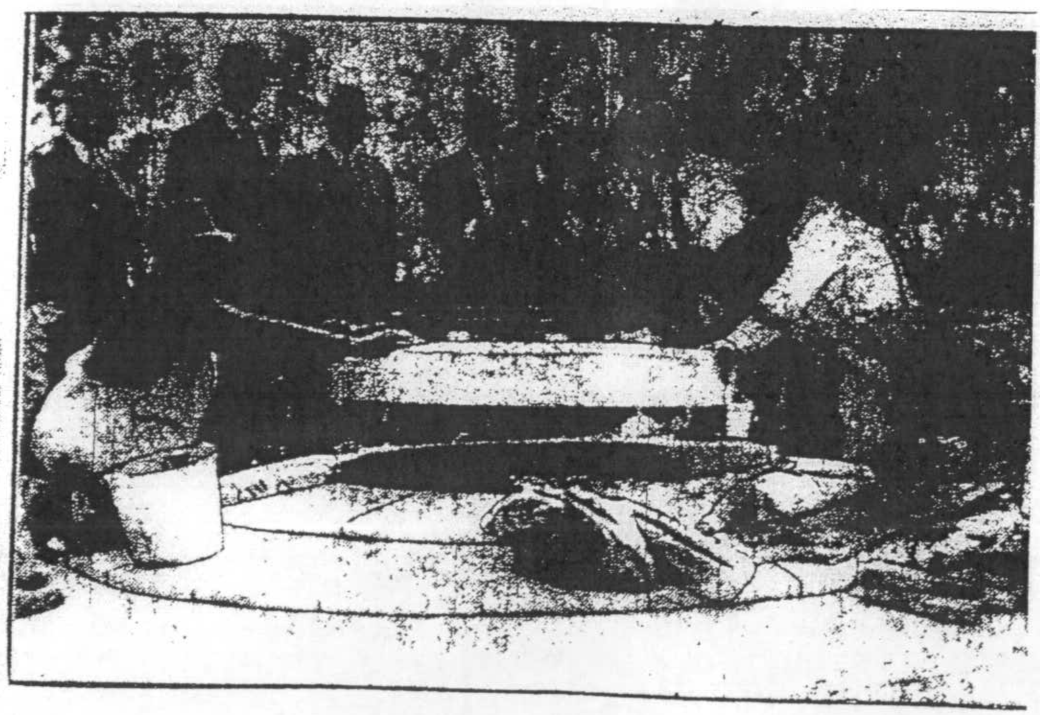


Figure 16. "Keystone of D.C. Memorial Temple Laid," [Evening Star, *September 30, 1931.]*

Figure 17. The memorial soon after completion. [Commission of Fine Arts, Washington, D.C.]

Figure 18. "Band Season," Washington Herald *staff photograph, June 4, 1932.*

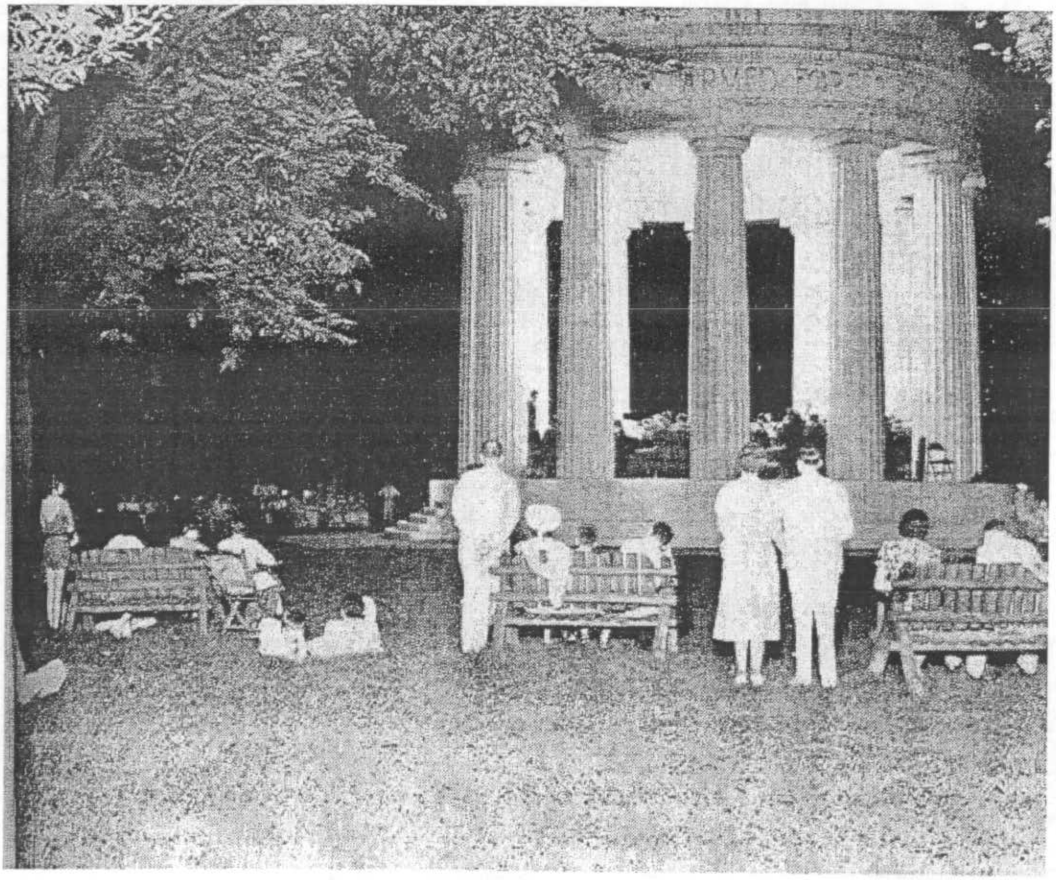


Figure 19. The Memorial circa 1939. Note the movable benches. [James B. Williams and Ian Forbes, Fees and Charges for Public Recreation, A Study of Policies and Practices *(Washington, DC: GPO, 1939)]*

*Figure 20. Janet Noyes was honored at this annual observance at the Memorial in 1943. [*Evening Star, *May 3, 1943]*

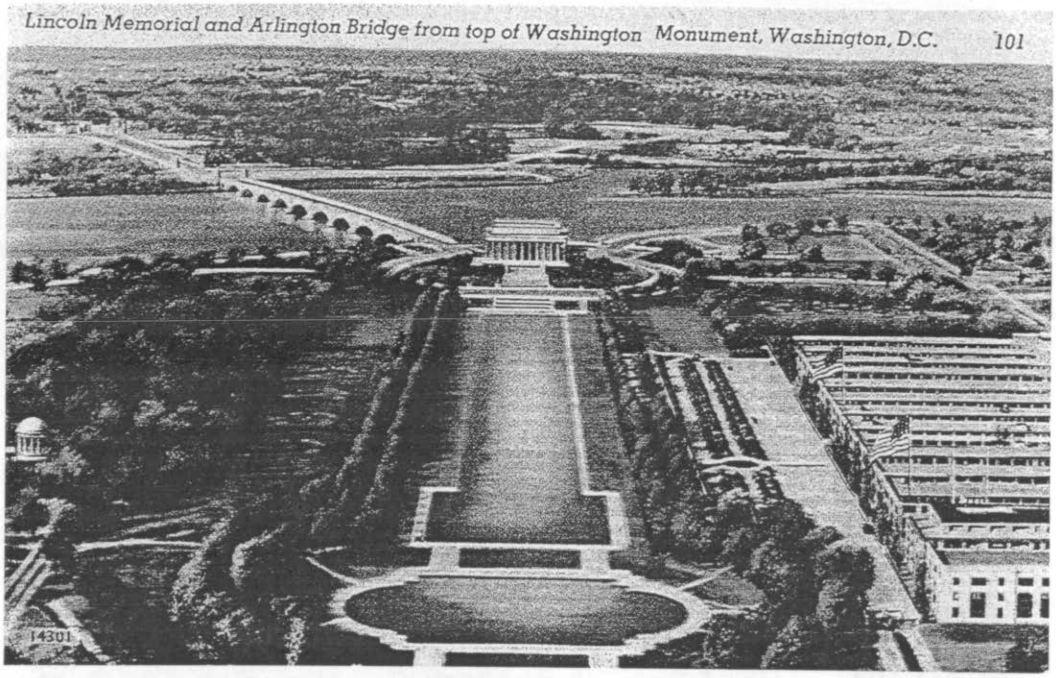


Figure 21. Postcard of "Lincoln Memorial and Arlington Bridge from top of Washington Monument, Washington, D.C," circa 1946. The Memorial can be seen at the left side of the postcard. [JGWA]

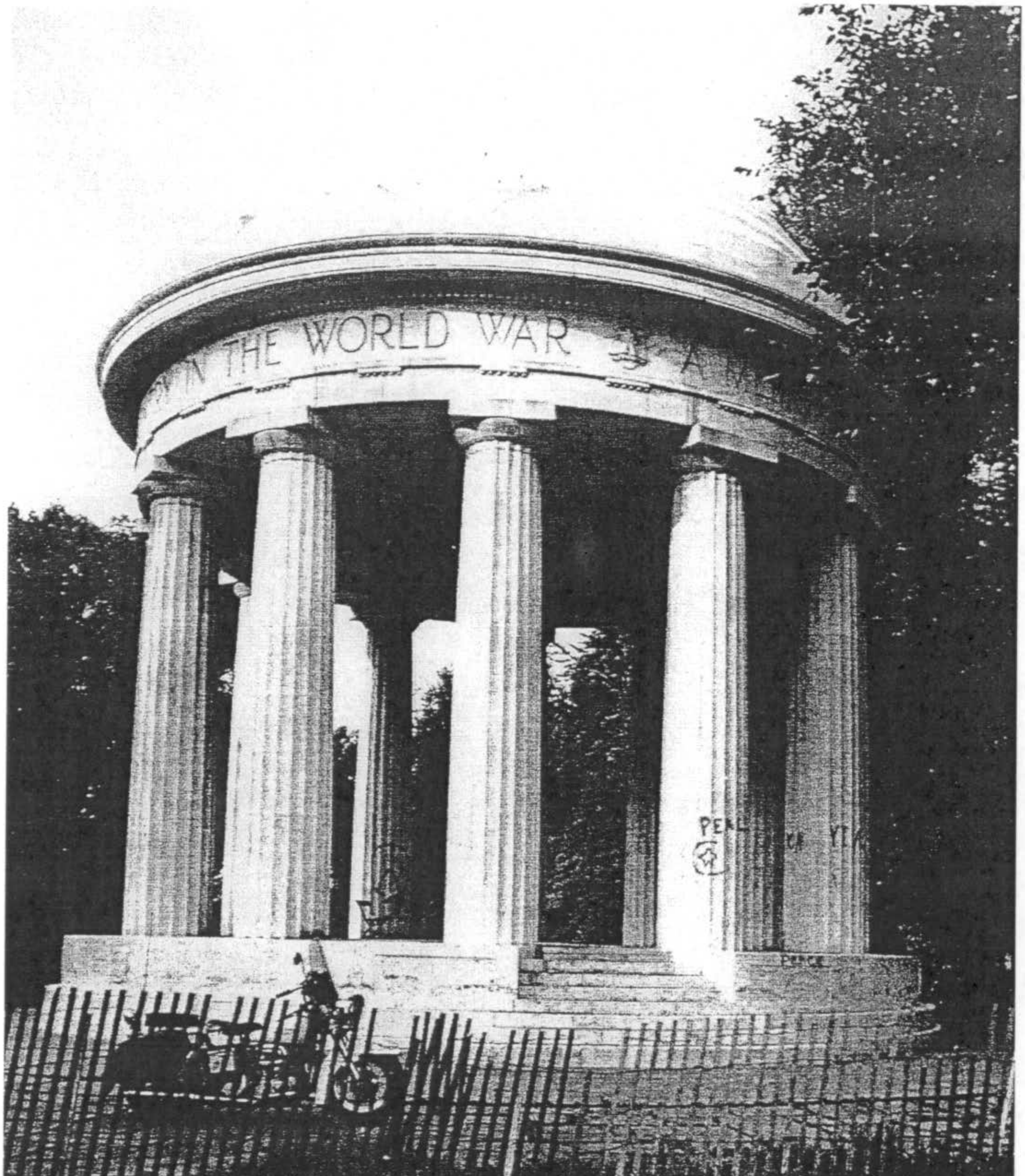


Figure 22. In 1968, vandals defaced the Memorial with graffiti. [Action Line, Evening Star, *June 29, 1968]*

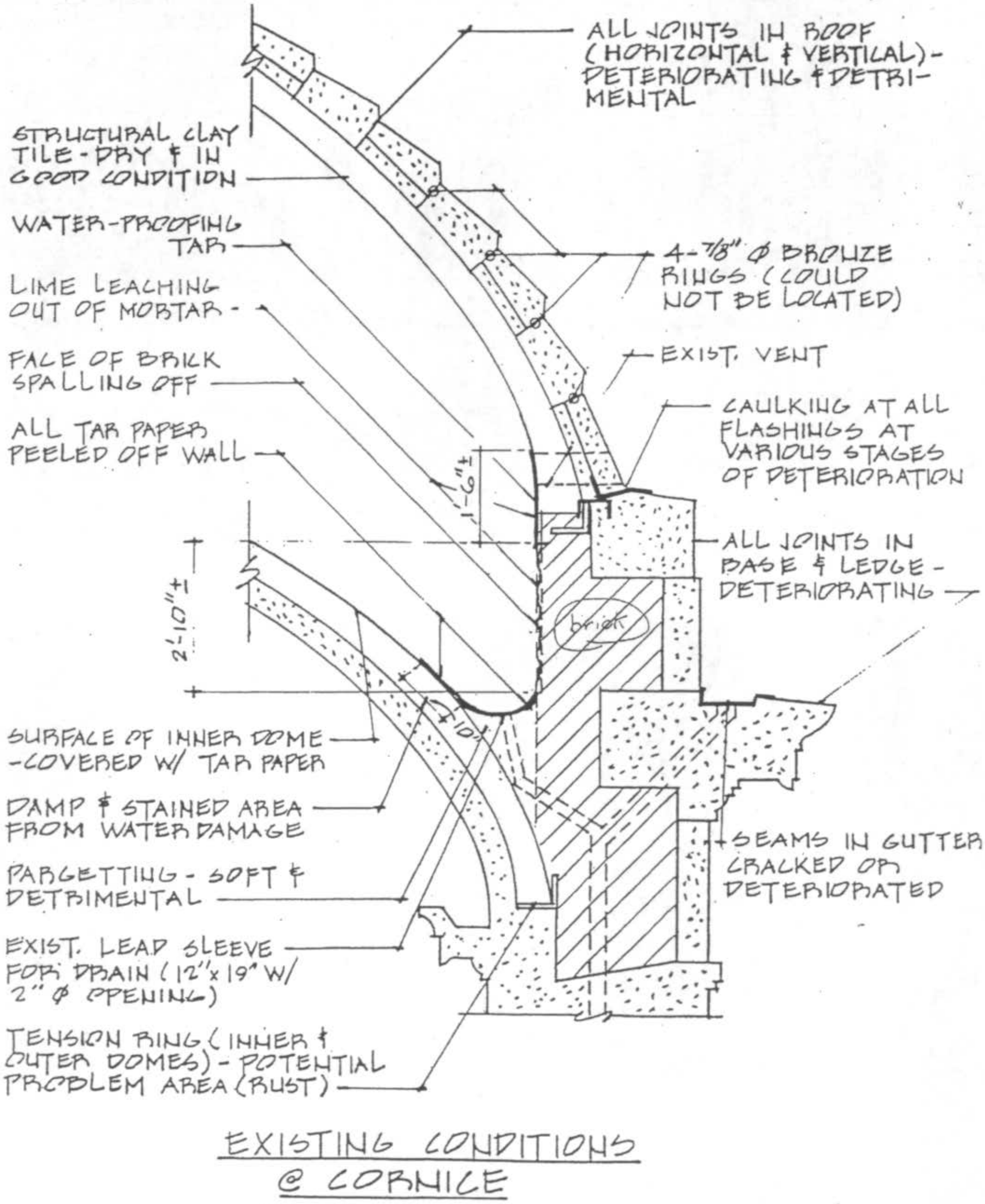


Figure 24. "Existing Conditions @ Cornice," included in September 28, 1984 report by Tom Fields. [District of Columbia War Memorial File, National Capital Parks–Central, courtesy of Tony Donald.]

Figure 25. The Memorial in April 1996, photograph by S. Kohler. [Commission of Fine Arts, Washington, D.C.]

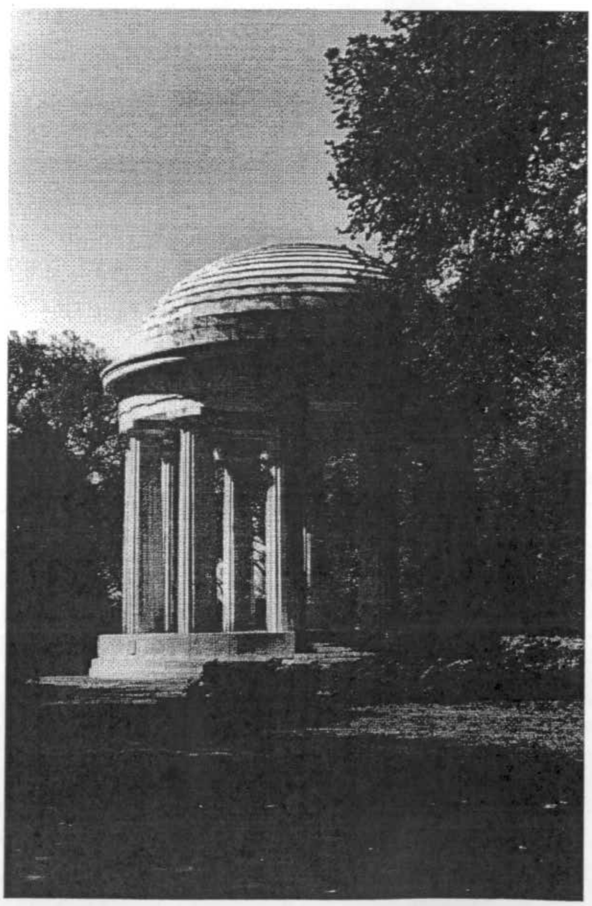


Figure 26. The Memorial, circa 1990s. [Commission of Fine Arts, Washington, D.C.]

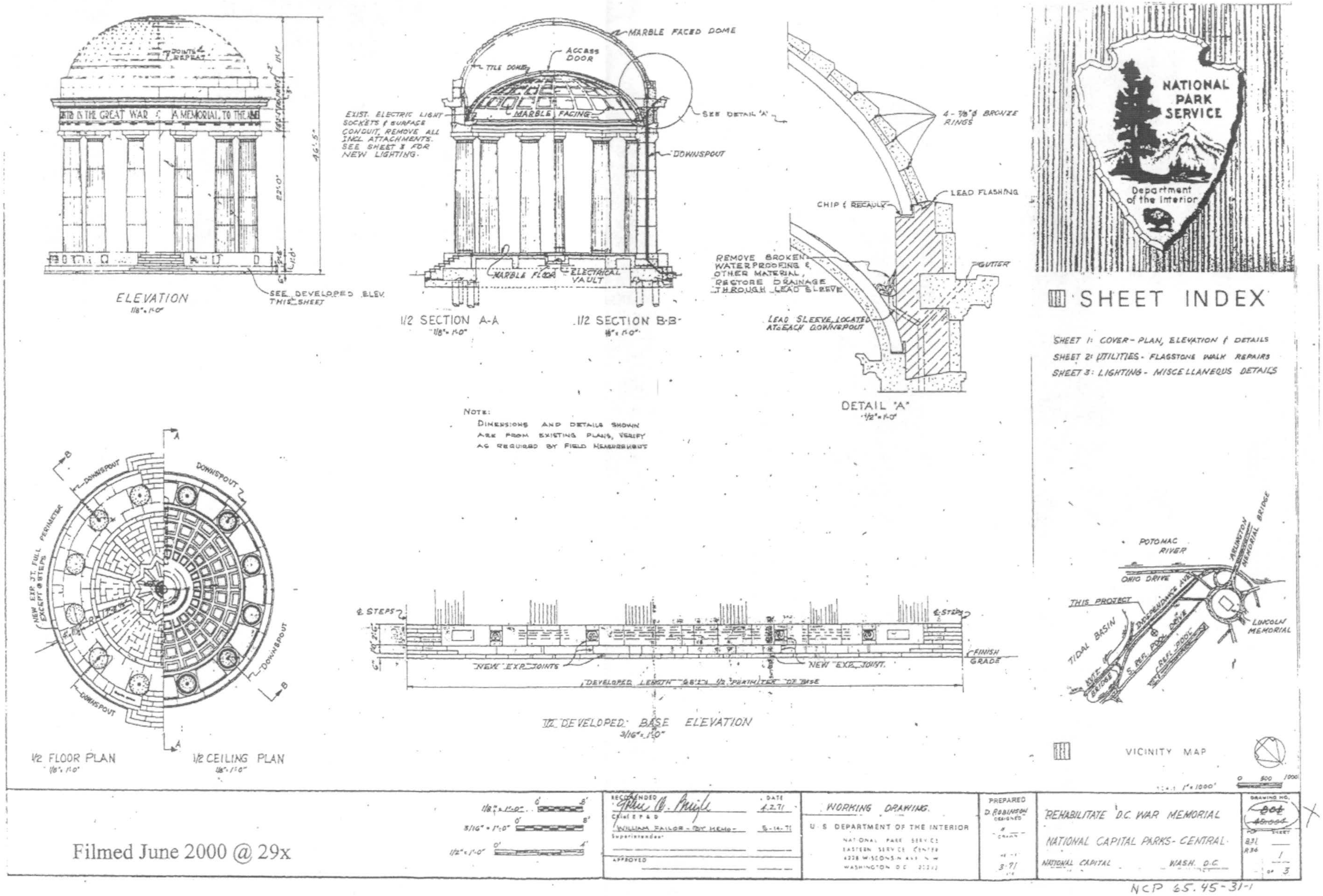


Figure 23. "Rehabilitate D.C. War Memorial, National Capital Parks-Central," March 1971, prepared by D. Robinson, National Parks Service. [Drawing no. 801-89890. District of Columbia War Memorial File, National Capital Parks–Central, courtesy of Tony Donald.]

PART 1

PHYSICAL DESCRIPTION

THE MEMORIAL

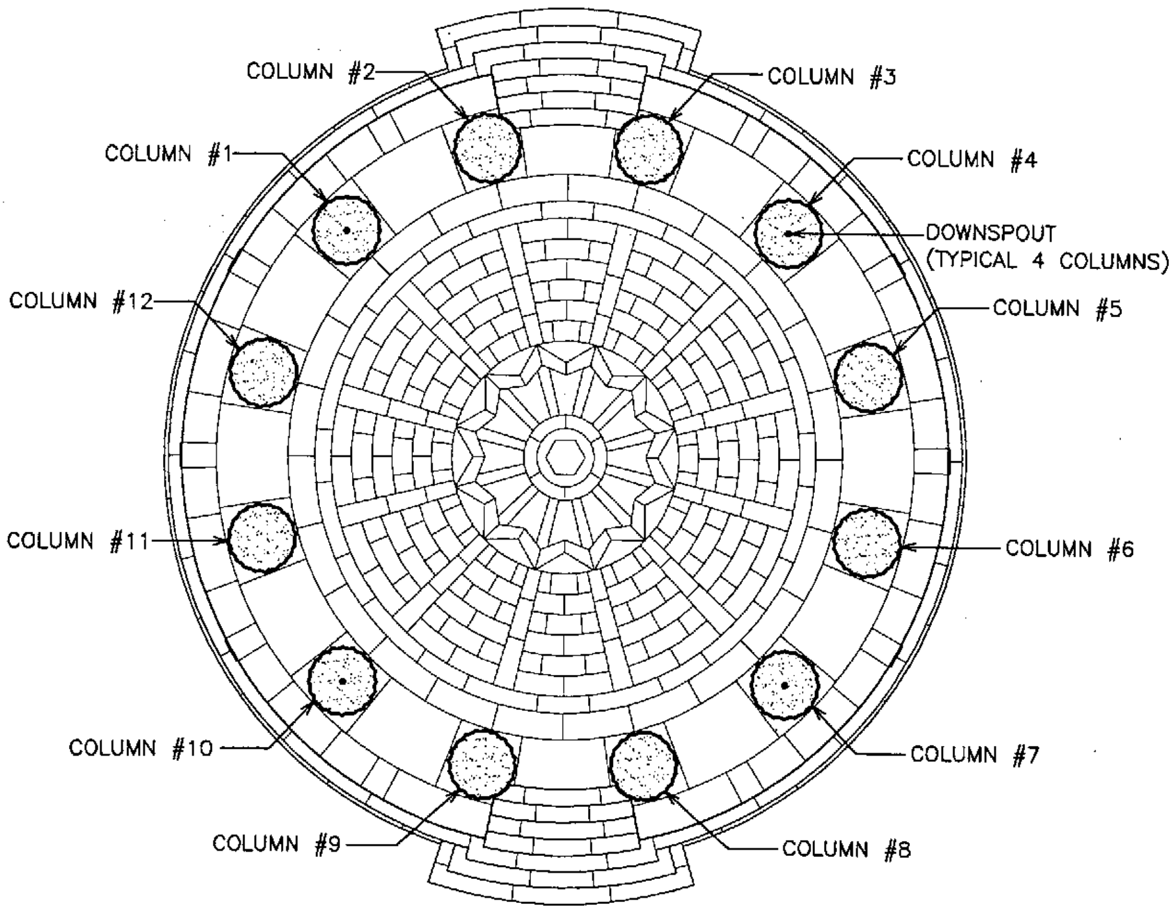
John G. Waite Associates, Architects and consultants, Robert Silman Associates, Structural Engineers; The Elmore Collaborative, Landscape Architects; and Masonry Stabilization Services Corporation, stone conservators surveyed the DC War Memorial, located in West Potomac Park, to the southeast of the Lincoln Memorial, over the course of four investigative field trips spanning from March 2005 to July 2005. After nearly seventy-five years of service, the memorial has survived remarkably well; this is largely attributable to the high quality of the structure's original design and construction.

The Memorial is built of Danby, Vermont marble, with a concrete foundation set on concrete and wood piles. Twelve fluted Doric columns support the domed roof. The inner dome and outer dome are constructed of Guastavino tiles, and clad in marble.

Years of deferred maintenance have taken a toll on the memorial. Open mortar joints and failed sheet metal flashings have allowed water to infiltrate the masonry construction of the dome. The movement of water through the brick, terra cotta tile, and marble construction has resulted in the deposition of calcium carbonate at joints in the stonework and at fissures, or natural flaws, in the marble. Freeze-thaw cycling of the saturated masonry has caused the displacement of marble, and in some instances it has induced significant cracks in individual stones. Water escaping from failed internal downspouts, located within four of the twelve marble columns, has caused staining and lime run on the columns, and is supporting the growth of algae at the base of the columns. Infrequent maintenance has allowed the exposed marble surfaces to become dirty and stained from atmospheric pollutants and biological growth.

General problems include:

- Marble surfaces suffer from atmospheric and biological growth staining on exterior and interior surfaces, despite recent maintenance cleaning. There is a buildup of surface soiling / contaminants on the marble of the west elevation, where pressure washing has not been undertaken by the National Park Service.
- Many stones above the cornice level exhibit a bright yellow-orange streaked staining pattern on both horizontal and vertical surfaces. This phenomena appears to be occurring beneath the surface of the stone.
- Joints are open throughout the memorial, particularly on the upper dome and cornice elements, despite recent maintenance and re-pointing efforts. There are moss and plants growing in the open mortar joints, and there is algae growing on the marble on the west elevation of the memorial.



DC WAR MEMORIAL
COLUMN KEY PLAN

- Insect infestation, including wasp nests and spider webs, occurs at the underside surfaces of the column capitals, lintels, and coffered ceiling.

Based on the "Classified Structures User's Guide Condition Definitions," the Memorial is in fair condition. This is an improvement from the LCS assessment in 1998; since that time, debris has been removed and the masonry has been cleaned and repointed.

The existing numbering system for the columns was used in this report to facilitate the description and to locate conditions.

FOUNDATIONS

According to Frederick Brooke's description of the construction, the Memorial is built on a "composite type of pile, 47 feet long, having lower sections of wood averaging 10-1/2 inches in diameter and the upper sections (15 feet in length) of concrete. Of these piles four support each of the twelve columns and one the small electrical chamber. On the piles rests a twelve-sided ring, 5 feet wide braced by concrete cross beams."

BASE

The plinth of the Memorial is composed of a 21'-9" diameter circular platform that rises 2'6" from a stepped base. The marble tiles that form the bandstand floor sit above two 6" deep layers of concrete.

Curved steps on the north and south sides of the Memorial (between columns 2 and 3 and 8 and 9) ascend to the platform. Each flight has eight risers, approximately 6" high.

The cornerstone is located in the cheek wall to the east of the north steps. The inscription on the cornerstone reads:

> THIS MEMORIAL WAS ERECTED THROUGH THE VOLUNTARY
> SUBSCRIPTIONS OF THE PEOPLE OF WASHINGTON • IT WAS
> DEDICATED ON ARMISTICE DAY NINETEEN HUNDRED AND
> THIRTY-ONE BY HERBERT HOOVER PRESIDENT OF
> THE UNITED STATES • WITHIN THIS CORNER-STONE ARE
> RECORDED THE NAMES OF THE TWENTY-SIX THOUSAND
> WASHINGTONIANS WHO WHEN THE UNITED STATES ENTERED
> THE WORLD WAR ANSWERED THE CALL TO ARMS AND SERVED
> IN THE ARMY NAVY MARINE CORPS AND COAST GUARD.

According to Brooke, a carved niche on the inner face of the cornerstone holds a 1'-0" x 1'-8" copper box. In the box is a list of the 26,048 residents of the District of Columbia who served in the war, a set of the building plans, a copy of the Evening Star, and coins and paper currency with the latest dates.

On the cheek wall to the west of the south steps an inscription reads:

> FREDERICK H. BROOKE
> ARCHITECT
> HORACE W. PEASLEE

NATHAN C. WYETH
ASSOCIATE ARCHITECTS

The base of the Memorial is inscribed with the names of the District residents who died in service during World War I (see Appendix F for a list of the names). The names begin to the west of the north steps with a dedicatory inscription:

> THE NAMES OF THE MEN AND WOMEN FROM THE
> DISTRICT OF COLUMBIA WHO GAVE THEIR LIVES
> IN THE WORLD WAR ARE HERE INSCRIBED AS A
> PERPETUAL RECORD OF THEIR PATRIOTIC SERVICE
> TO THEIR COUNTRY • THOSE WHO FELL AND THOSE
> WHO SURVIVED HAVE GIVEN TO THIS AND TO FUTURE
> GENERATIONS AN EXAMPLE OF HIGH IDEALISM
> COURAGEOUS SACRIFICE AND GALLANT ACHIEVEMENT

Columns of names encircle the memorial in a counter-clockwise manner and are are interspersed with bas-relief stone medallions. The three on the west side (from north to south) are the Crest Seal of the United States, the seal of the District of Columbia, and the seal of the United States Navy. On the east side (from south to north) are the seal of the United States Marine Corps; the seal of The Great War for Civilization; and the seal of the United States Coast Guard.

Problems

- Several stones on the west side of the memorial have shifted slightly out of plane.
- The carved stone panel between columns 6 and 7 is cracked above the projecting ornament.
- Many stones with engraved names are fissured.
- The joint between the base of the memorial and the flagstone paving is open, and the mortar is deteriorated.
- To the southeast and northwest, there are rough horizontal tooling marks visible on the marble base of the memorial, just above grade level. The flagstone paving in these areas may have settled over time, exposing tooling marks that were never meant to be seen.

COLUMNS

Twelve Doric columns support the entablature. Each 21'-11 3/4" high column has twenty flutes, and measures 3'-9 9/16" in diameter at the platform, tapering up to 3'-1 1/2" at the annulet below the capital. Each column capital is made up of a simple circular echinus supporting a square abacus.

Each column shaft is assembled from four drums. Columns 1, 4, 7, and 10 contain drainspouts, which are cast-iron (according to the original specifications).

Problems

- Small marble spalls are visible just beneath the base of most column capitals, at the top of the fluted shafts.
- Heavy calcium carbonate deposits have formed at most column capitals, directly beneath open mortar joints.
- At columns 1, 4, 7, 10 a dark rust-colored staining is present at the lowermost horizontal mortar joints of the marble column shafts, and on the fluted shafts beneath these joints. The internal downspouts within these columns appear to be leaking. Following a recent period of rainfall, water was observed to be leaking from the mortar joints between the drums of these four columns, and puddling at the base of the columns. This appears to be a chronic problem because the constant presence of water on the marble paving at the base of these columns is supporting the growth of algae.

  Generally, at the inclusions and imperfections in the marble drums of these columns, stains and lime run streak downward. Staining and lime run (calcium carbonate) are also visible streaking down from the horizontal joints between the drums.
- Vertical fissures or imperfections in the marble appear to act as weep holes for moisture. There is significant calcium carbonate deposition associated with these fissures.
- Most column capitals are heavily encrusted with calcium carbonate.
- The dark staining visible on the column shafts may be related to the dry deposition of air-borne sulfur contaminants. The resulting black staining signals the conversion or transformation of marble to gypsum.
- Many of the column base stones are cracked, chipped, or spalled; and have been inappropriately repaired with a cementitious material.
- Significant areas of mineral deposition and encrustation occur at the joints between the column capitals and the lintels spanning between columns 10, 11, and 12.
- During a recent rainfall, it was observed that column 12 was generally saturated with water. This column may have an abandoned electrical conduit riser that is acting as a conductor for water.

ENTABLATURE

The 6-0" high entablature includes a plain architrave topped by a regula (a projecting fillet). In a classic Doric entablature, the freize above the regula would normally be ornamented with triglyphs. Instead, the plain freize is inscribed with:

> A MEMORIAL TO THE ARMED FORCES FROM THE DISTRICT OF COLUMBIA WHO SERVED THEIR COUNTRY IN THE WORLD WAR

Punctuating the beginning and end of the inscription at the north side of the Memorial is an carved eagle holding arrows and an olive branch in his talons (a modified version of the eagle in the Great Seal).

Below the regula are twenty-four sets of guttae (each set with six small drops) that would traditionally be placed beneath the triglyphs. A denticulated bed molding visually supports the cornice, which includes (from bottom to top) a fillet, fascia, fillet, and an ovolo.

Problems

- Copper staining is visible on the marble cornice at the perimeter of the memorial and within the vertical joints of the cornice. Gypsum deposits are present beneath the cornice stones.
- Most vertical and horizontal mortar joints within the projecting cornice are open or deteriorated; the problem is pronounced on the south elevation of the memorial.
- Several projecting cornice stones on the northwest and southwest sides of the memorial exhibit severe vertical through-cracking that continues to the underside of each stone. Hairline cracks and surface spalls are present on the top horizontal surfaces of these stones.
- The projecting cornice stone aligned with column 10 has a major through-crack, and is vertically displaced by approximately 1/4".
- Small stone spalls and chipped edges are visible at the mortar joints on the underside of the cornice stones.
- Five (5) marble lintels between columns on the north and east sides of the memorial exhibit severe cracking on their undersides; and there are several cracks within the lintels spanning between columns 2, 3, and 4, where leaking water has left mineral deposits.

DOME

The Gaustavino tile dome, rising above a 3'-4 1/4" high ledge, is covered with fourteen courses of marble tiles and a circular marble cap; the marble tiles are approximately 6-1/2" thick.

The tiles were recently repointed by a National Park Service crew using a 5:1:1 mortar mixture. This work was partially completed during the summer of 2004. It was reported that plants were growing in the open mortar joints of the roof, and that a significant build-up of decomposing leaves had filled the external gutter.

The 1931 drawings show the ledge to be solid marble in two sections, extending back to the Guastavino tile. As built, the ledge is made up of two courses of marble facings; a lead cap at the inside edge of the ledge covers the interior brick.

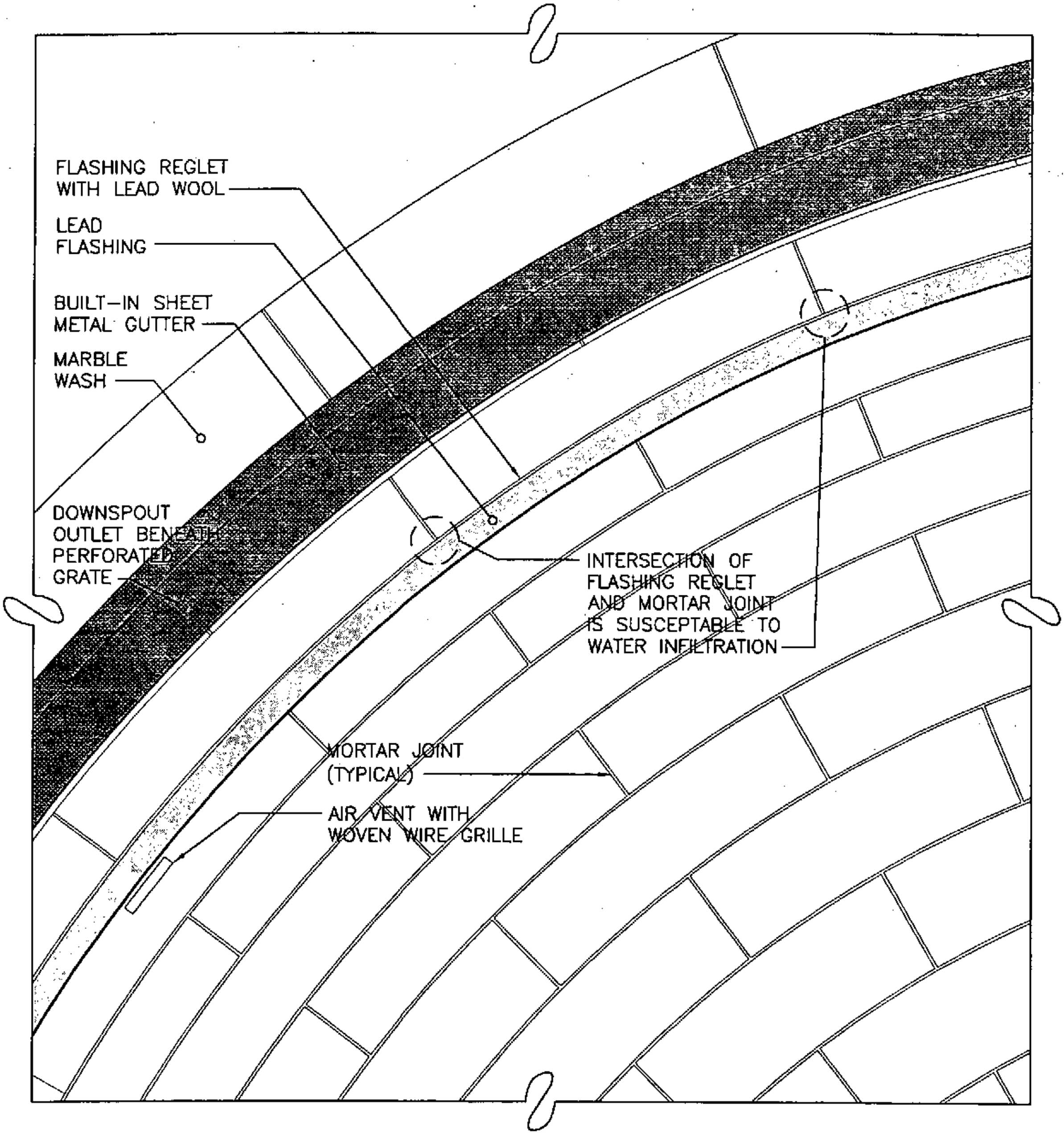
In the bottom course of the dome, four 4" high x 7-1/2" wide vents with lead scuppers are fitted with stainless steel wire screens.

A shallow 8" wide gutter is cut into the base of the dome ledge, at the top of the entablature. The 1931 lead lining gutter has been replaced by 3'-0" lengths of lead-coated copper, soldered together. Four lead drain outlets are located in the gutter above columns 1, 4, 7 and 10. At each outlet, an outlet pipe extends down to a "Y" juncture at the head of a vertical downspout within the column. According to the original drawings and specifications, the downspouts within the columns are cast-iron. These downspouts extend to catch basins to the northeast, northwest, southeast, and southwest of the Memorial. The basins were originally covered with gratings; the gratings at the northeast and northwest basins have been removed. The northeast grate has been converted to a manhole. A search for the northwest grate, as part of the investigation for this report, found a structure with a concrete cap in that location; it appears that the northwest grate may have been replaced with a capped concrete distribution box.

The horizontal lead flashing at the base of the marble roofing on the dome is the original lead flashing from the 1931 construction period. The lead flashing extends out from under the lowest course of marble roofing and terminates in a curving, segmental reglet cut in the sloping surface of the stonework capping the drum of the dome. The lead flashing was originally wedged in the reglet with lead wool; much of the wool has been replaced with elastomeric sealant.

Problems

- Approximately twenty-five percent (25%) of the mortar joints on the dome are open or deteriorated. Generally, these are concentrated on the north and east sides of the memorial.
- Two areas of marble stones on the dome have shifted out of plane. These displacements have occurred on the east and northwest sides of the memorial, and related mortar joints have failed. Some selective repointing has occurred in these areas, but cracks have reappeared in the mortar joints. These areas of stone displacement appear to be located several courses above the presumed location of the brass rings which encircle the lower half of the dome's Guastavino tile construction (according to the original construction documents).
- The woven-wire stainless steel vent grilles at the base of the outer dome are loosely fitted in the openings.
- The lead-coated copper of the replacement gutter is beyond its service life span; the lead is eroded, exposing the thin layer of tin between the lead and copper. Many of the joints in the lead-coated copper have been compromised; they have been torn and pulled apart by thermal expansion and contraction of the metal. The solder joints are cracked. The counter flashing at the back of the gutter is generally loose in the horizontal mortar joint of the marble. Moss and algae are growing in the mortar joint; and sealant, which is over-applied onto the flashing and surrounding stone and mortar, has failed.
- The pitch of the gutter is insufficient for proper drainage to the four downspout outlets. Cross seams in the copper gutter are pronounced, preventing proper drainage.



DC WAR MEMORIAL

ROOF PLAN – REGLET LOCATION

0' 6" 1' 2' 3' 4' 5'

- The gutter is filled with debris, preventing proper drainage.
- The lead flashing at the base of the marble roofing is torn at the intersecting joints in the marble capstones resting on the drum of the dome. While the torn flashing is a significant concern for water infiltration, so is the original detail that establishes the intersection of the reglet and stone joints.
- Most lead wool used for wedging metal flashings into reglets has been removed and replaced with elastomeric sealant. The application of the sealant has not been done in a workmanlike manner.
- The catch basin to the southwest of the memorial was covered with soil, preventing site drainage. The drainage structures to the northeast and northwest of the memorial no longer have gratings; they appear to have been converted to a manhole and a capped concrete distribution box, respectively.

FLOOR

The bandstand platform floor is paved with white and dark grey marble. At the center of the floor, a 3'-3" diameter diamond-plate steel access grate covers the hexagonal opening to the electrical vault below the platform floor. According to Brooke, the original cover (stolen in 1970) was originally a hinged aluminum "circular panel with eagle and stars in low relief." The grate is secured using a cam lock.

Grey marble pavers are arranged in a twelve-pointed star around the opening, set within a dark grey border. Radiating lines of the grey marble extend out to an outer grey border.

Problems

- The diamond-plate steel access cover does not match the original.
- Areas of the bandstand's marble flooring are cracked and chipped, and some areas have been inappropriately repaired.
- There are open mortar joints in the marble flooring of the bandstand.
- Dark staining is present on the marble floor surfaces surrounding the column bases, and areas of encrustation and erosion/pitting are pronounced in these locations.
- Several floor paving stones at the periphery of the bandstand have settled.

INTERIOR ENTABLATURE

The 2'-4 1/2" high interior entablature begins with a two-fascia architrave. The upper fascia curves out to an ovolo bed molding. The projecting cornice is composed of a plain fascia, a cavetto molding, and a cyma recta molding.

Electrical conduit behind the cornice extends to fluorescent lighting fixtures. The existing fixtures replaced the original lighting system.

Problems

- A major vertical crack extends through the interior cornice stone aligned with Column No. 4.
- There is a significant amount of bird excreta at the ledge of the projecting interior cornice.
- Unsightly patch repairs have been made to the interior architrave, above the capitals of Columns No. 1, No. 4, No. 7, and No. 10. These repairs were made at stone spalls and joint failures occurring between the lintel stones.
- Most vertical joints between the interior cornice stones are open, or have deteriorated mortar.
- The modern fluorescent fixtures do not replicate the quality of the historic incandescent lighting. The new fixtures are visible from the bandstand below, and from the street and surrounding landscape.

CEILING

The domed ceiling is faced with marble. In the center of the ceiling is a marble panel that opens to allow access into the attic. The opening is framed by a simple frieze bordered by raised fillets and ornamented with raised circles. Beyond the frieze, two bands of Greek key moldings frame a plain freize; below the outer band, four tiers of recessed panels extend down to the interior cornice.

INTERIOR OF DOME

The construction of the inner and outer domes has not changed since Brooke described the Memorial:

> "The dome construction is one of an inner and outer shell of Guastavino laminated construction. The marble ceiling was erected on wood centers with 6" cramps (1650) built into the masonry. The lower Guastavino shell was built around these projecting cramps. In reverse fashion the outer Guastavino shell held dowels which anchor the outer marble dome. Between the inner and outer shell is a space 7' 6" high at the center. A counter-weighted center marble disc gives access to this space."

The exposed Guastavino tiles of the outer dome are 6" high x 1'-3" wide. The brick masonry that backs up the ledge and entablature is laid in a stretcher bond separated by a single row of solders. Parging covers the inner dome masonry.

A bituminous waterproof coating has been applied to the upper courses of the brick masonry. A waterproof through-wall flashing of bitumen and roofing felt was installed immediately above the steel-angle tension ring retaining the base of the upper tile dome.

The 2'-8" diameter marble roundel at the center of the inner dome sits on a marble ledge. This panel can be removed by means of a system of pulleys and a counterweight in order to access the space between the two domes. A steel ring encircles the panel; clip angles welded to the steel extend up to a ring that is suspended on a 3/4" steel cable. The pulley mechanism is marked: "ERECTED BY F.G. _DLEX, F. H[?] BENDEO[?], 1931" and "SELF LUBRICATING."

The junction of the inner and outer domes forms a shallow trough. In the trough are four 2" diameter lead condensate drain outlets (correlating with columns 1, 4, 7, and 10). These outlets are set in lead pans, each approximately 9-1/2" wide x 1'-6" long. Copper bird's-nest strainers have been inserted in the outlets.

The outlet pipes extend approximately 3'-2" from the lead pans to a "Y" juncture with the external downspout outlet, above the columns' vertical downspouts.

Problems

- A significant amount of efflorescence and calcium carbonate deposition are visible on the interior face of the brick masonry drum supporting the upper dome. Generally, the bituminous waterproof coating applied to this masonry has failed, and the brick is moderately spalled.
- The brick construction of the drum has shifted where the waterproof through-wall flashing was installed.
- The original condensate drainage outlets above columns 1, 4, 7, and 10 have been abandoned. The bird's-nest strainers have been clogged with sand and covered with bitumen and roofing felt.
- There is surface rust on the support structure of the hoist mechanism used to raise the marble attic access panel in the ceiling above the bandstand.
- The counterweight system for the marble attic access panel requires adjustment; there is insufficient force to lift the stone panel.
- A significant amount of debris has collected inside the four air-vent openings at the base of the upper dome.
- Accumulations of leaves and debris were found in the valley between the inner dome and the drum of the outer dome.

VAULT

This small room was originally designed to be much larger, with a small winding stair. It was to hold mechanical equipment as well as folding chairs for concerts. In the final construction, the space was built as an electrical vault.

The vault is 5'-0 1/2" high. One wythe of 2-1/4" high x 8" wide x 4-1/4" deep brick, laid in a stretcher bond, forms the walls; the ceiling is the 1'-0" deep concrete platform on which the marble floor is laid. The floor is finished with 4" x 9" brick pavers. Beyond the brick walls is the concrete foundation and fill.

The hexagonal opening to the Memorial floor is positioned at the north end of the vault. Two iron rungs are embedded in the north brick wall to aid in descending down to the vault.

At the north end of the west wall, a 1'-0" wide, two-course-high section of brick has been removed. A 1'-3" wide x 1'-6" high opening in the north wall provides access to a crawl space within the north portion of the concrete foundation.

Equipment in the north end of the vault include a wood panel on the east wall holding switches, a fuse box, a "Westinghouse" meter, the main switch, and a "Tork" timer. A weatherproof box is mounted to the west wall. The space is lit by an incandescent utility ceiling fixture. An old receptacle box is mounted to the southeast face of the hexagonal ceiling opening.

The south end of the vault is separated from the north end by an iron gate. The gate is hung on the iron frame with a pair of 4" hinges, and is secured with a padlock. The iron frame is supported by two courses of brick at the base; in the gate opening, the base is one course high.

The equipment in the south end of the vault includes the transformer near the east wall and; a General Electric Pneumatic switch on the south wall. A cable extending through the south wall and along the west wall is supported with iron brackets. Rigid conduit extends through the west wall, and sleeve in the west wall holds old conduits (now cut off).

Problems

- The open electrical junction box and panel box on the east wall, and a panel box with exposed conductors on the west wall, are significant electrical shock hazards.
- The hole in the north wall of the vault, opening to the irregular excavated cavity beneath the bandstand floor, is unsupported.

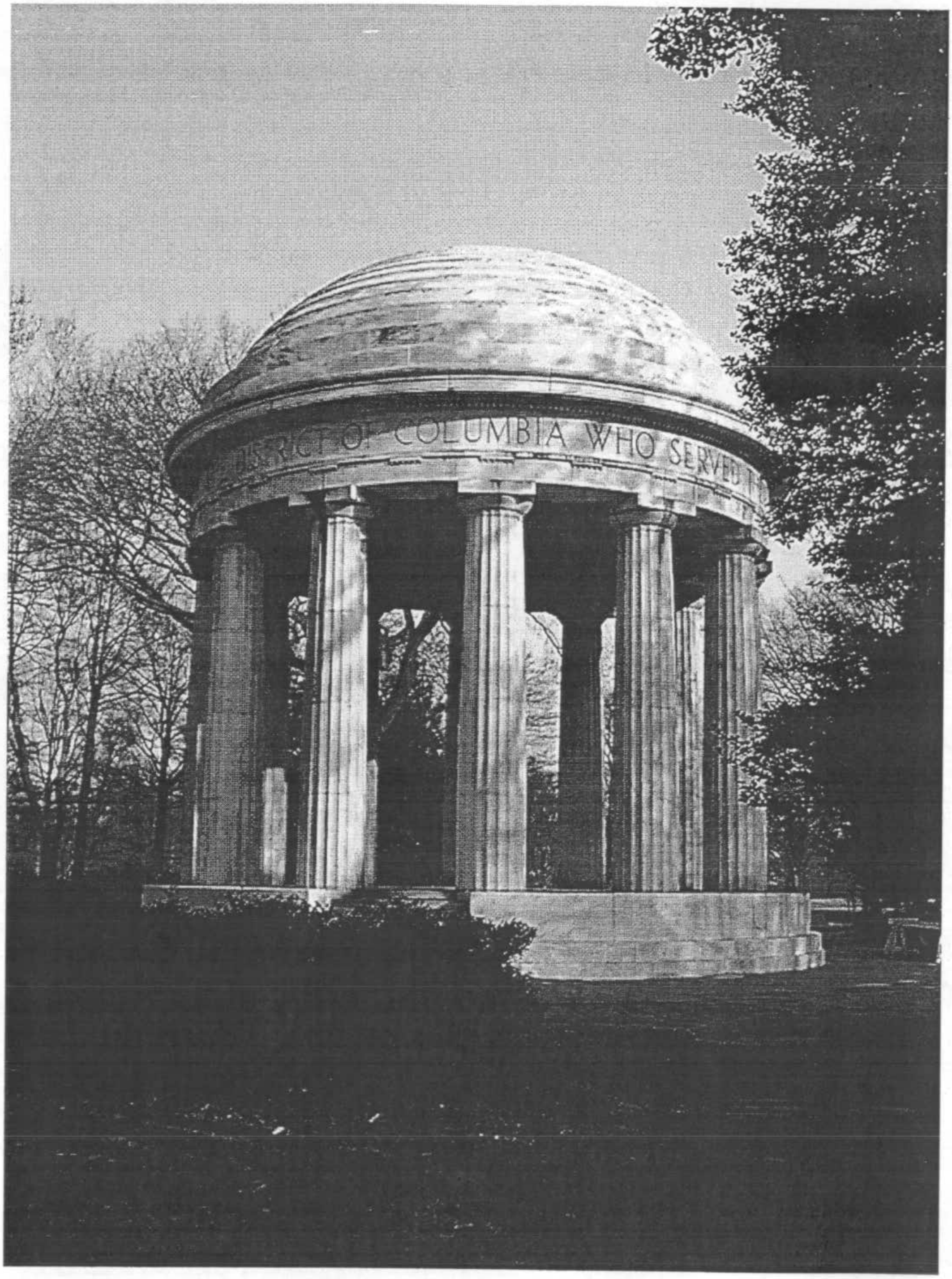
CONTRIBUTING FEATURES

The Memorial is, in its entirety, a contributing feature to the site. The existing lighting system, the replacement floor access cover, and the replacement exterior gutter are not contributing.

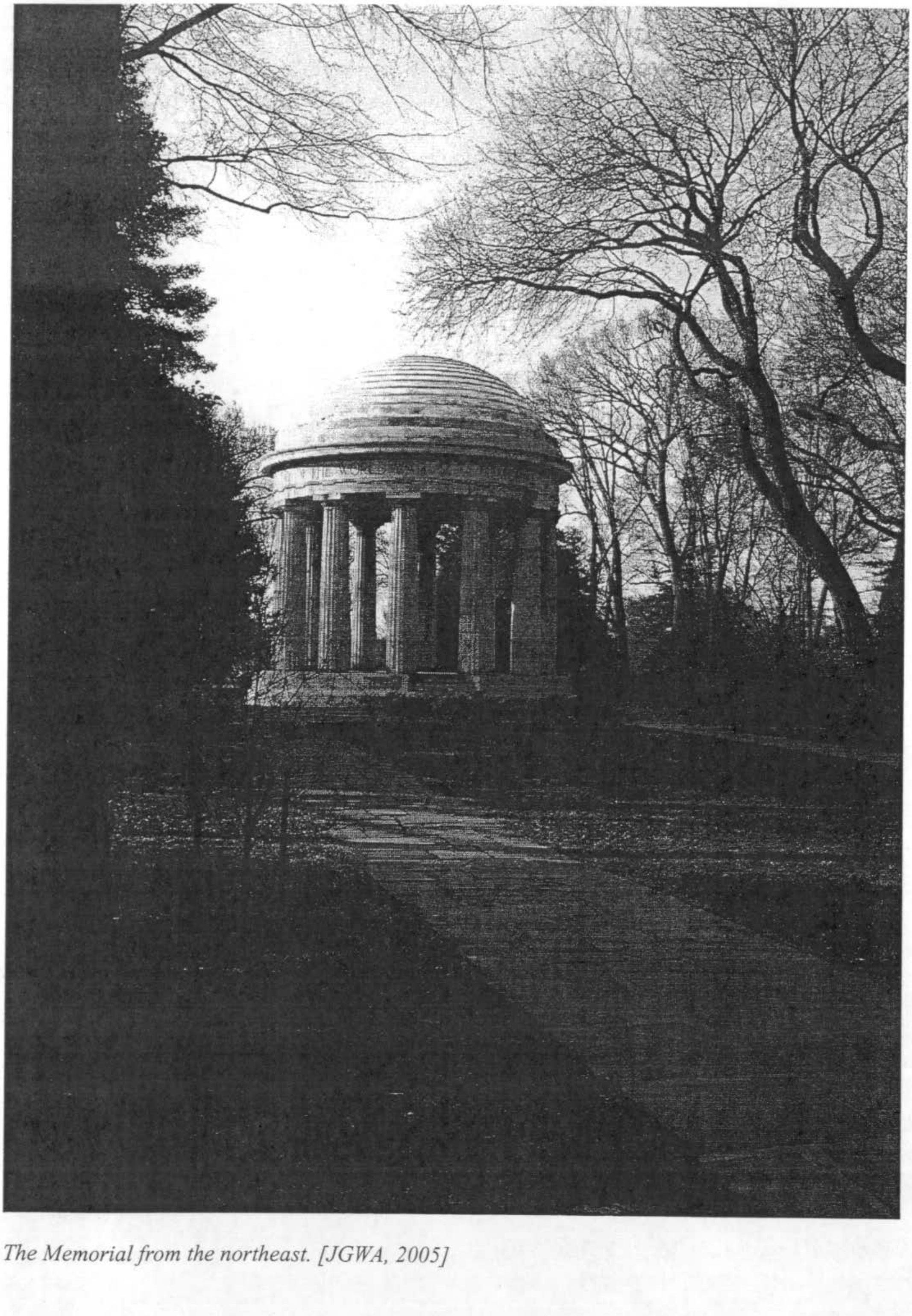
PART 1

PHYSICAL DESCRIPTION

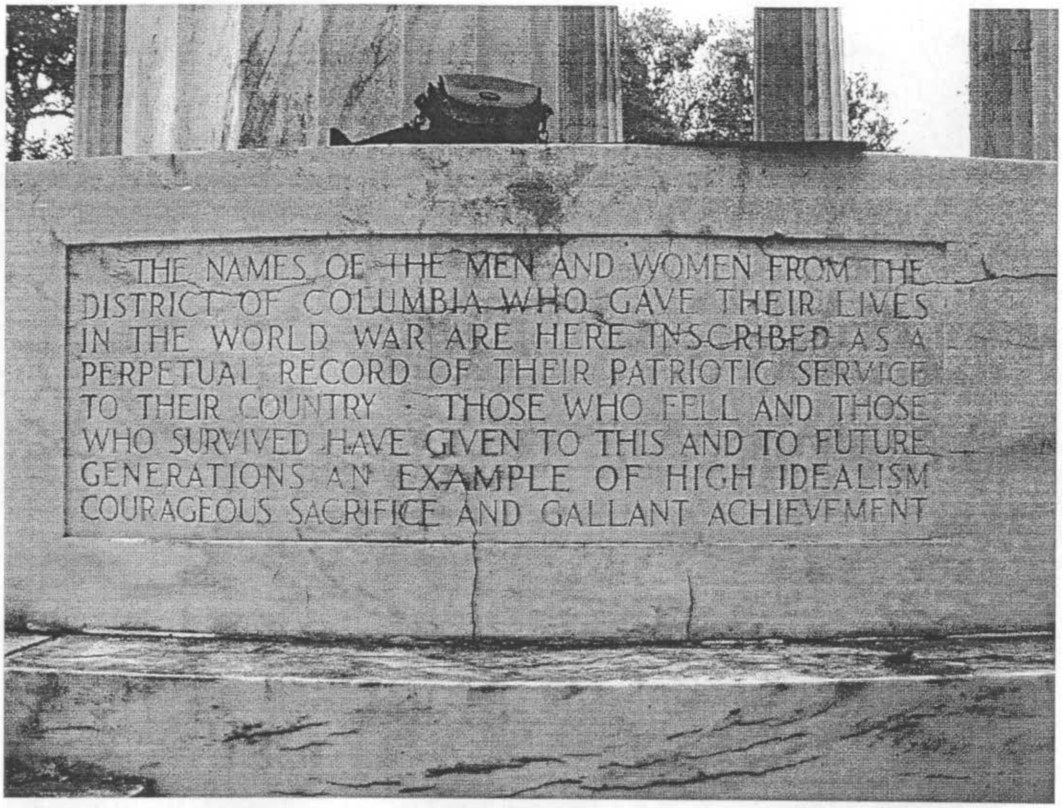
PHOTOGRAPHS

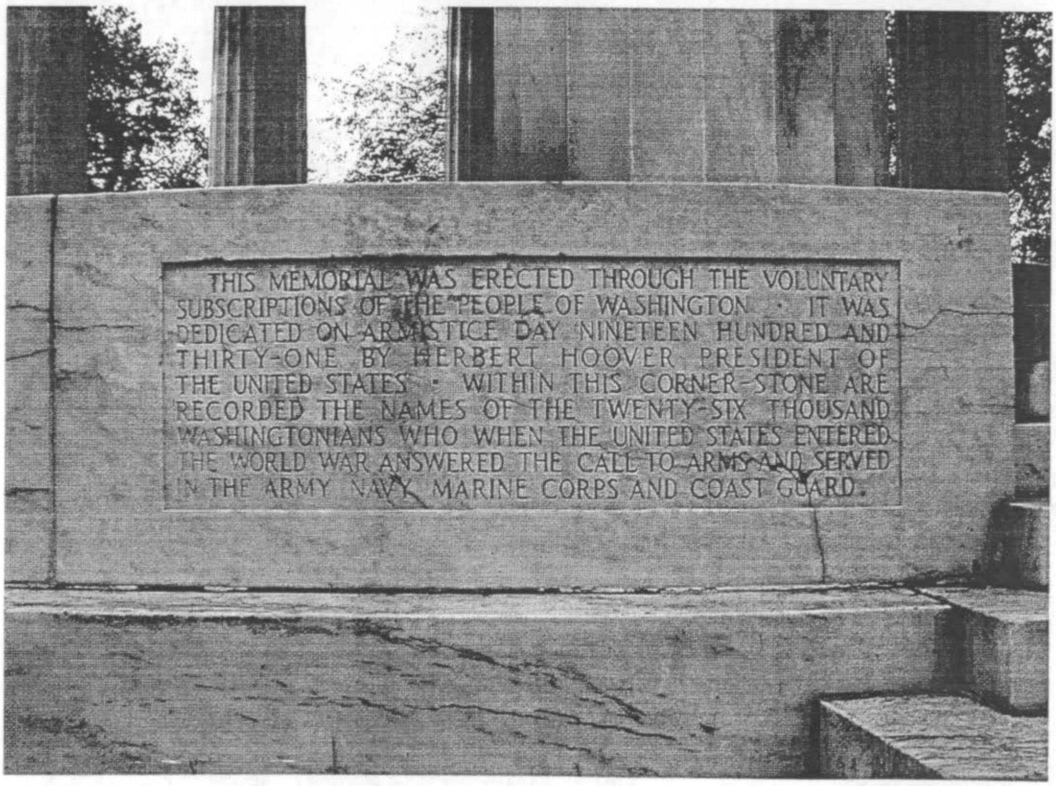


The Memorial from the southeast. [JGWA, 2005]

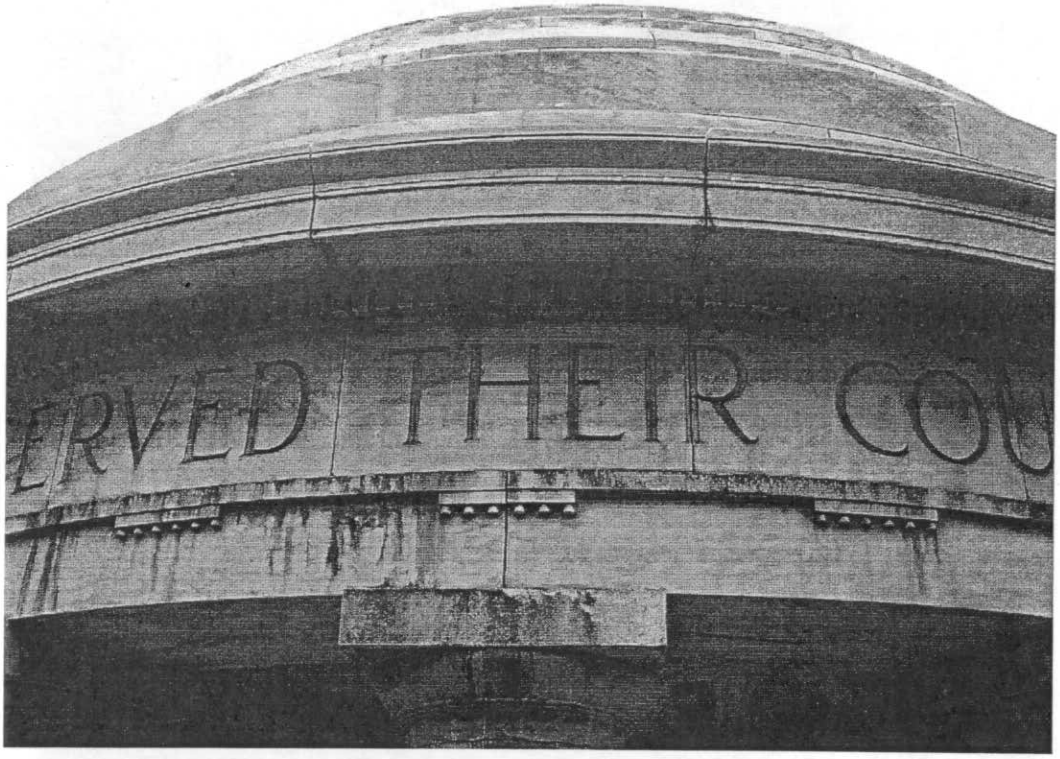


The Memorial from the northeast. [JGWA, 2005]

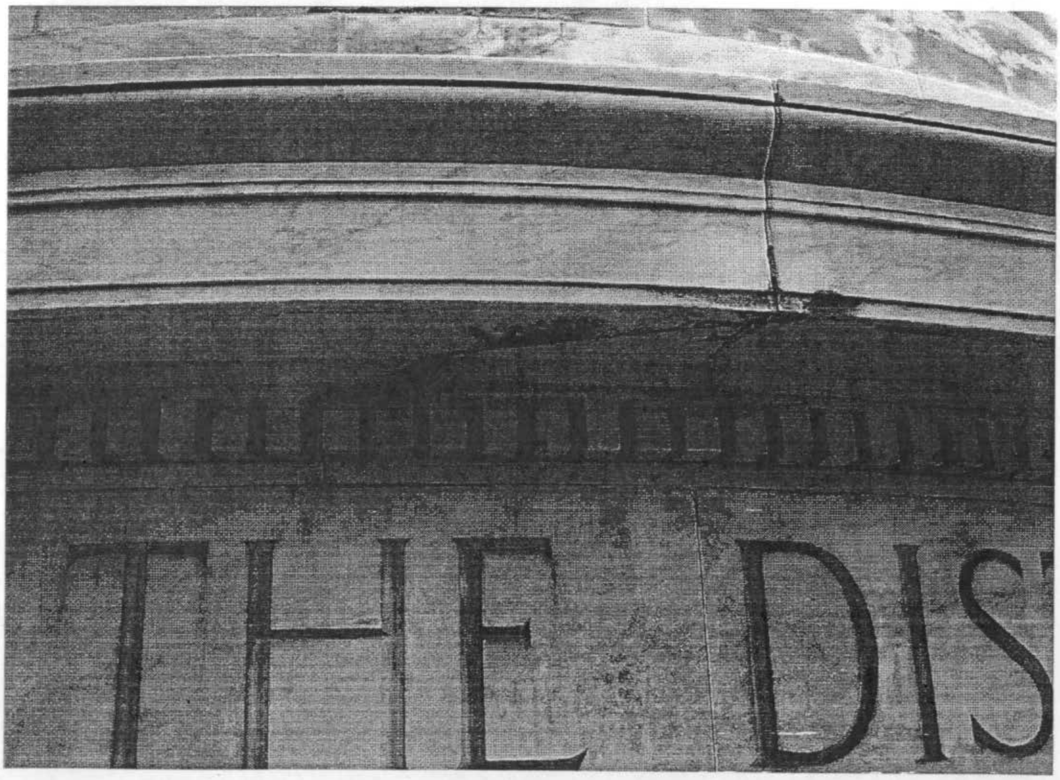




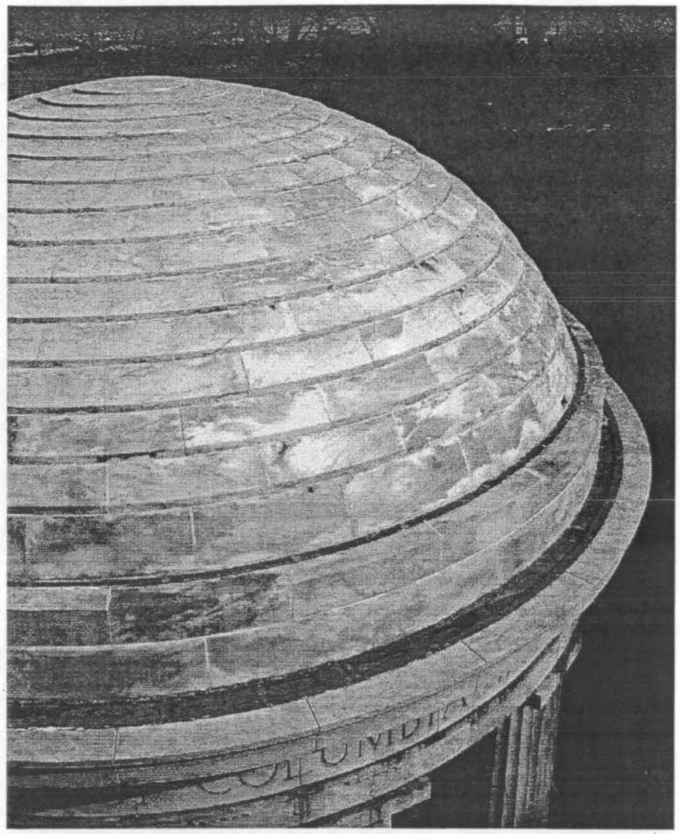
Fissures, cracks, and natural imperfections in the carved marble panels at the base of the Memorial. [NPS, 2004]

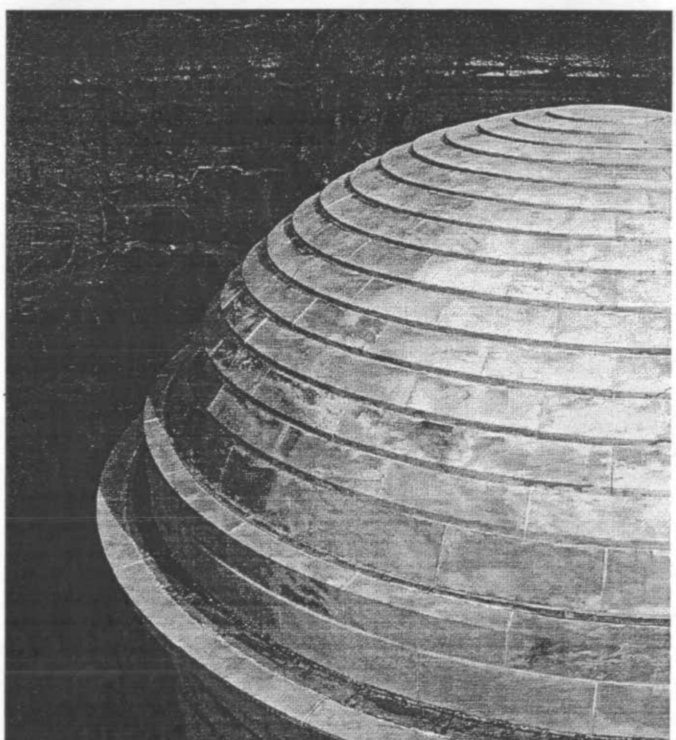


The Memorial entablature. Note the open mortar joints in the marble construction. [JGWA, 2005]

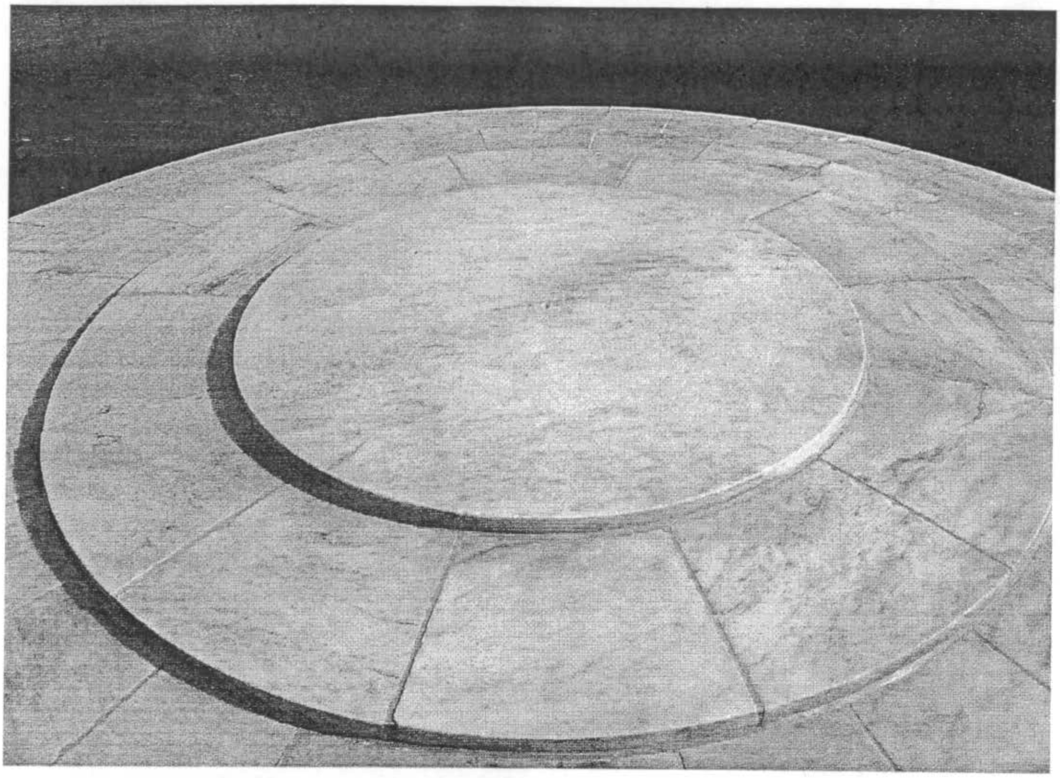


Detail of the cornice. Several of the cornice stones are cracked. [JGWA, 2005]

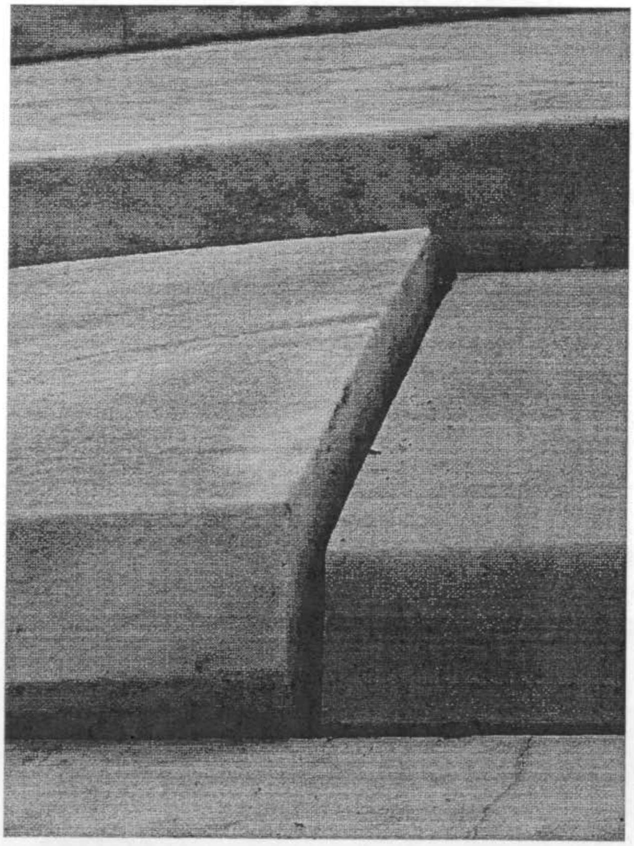




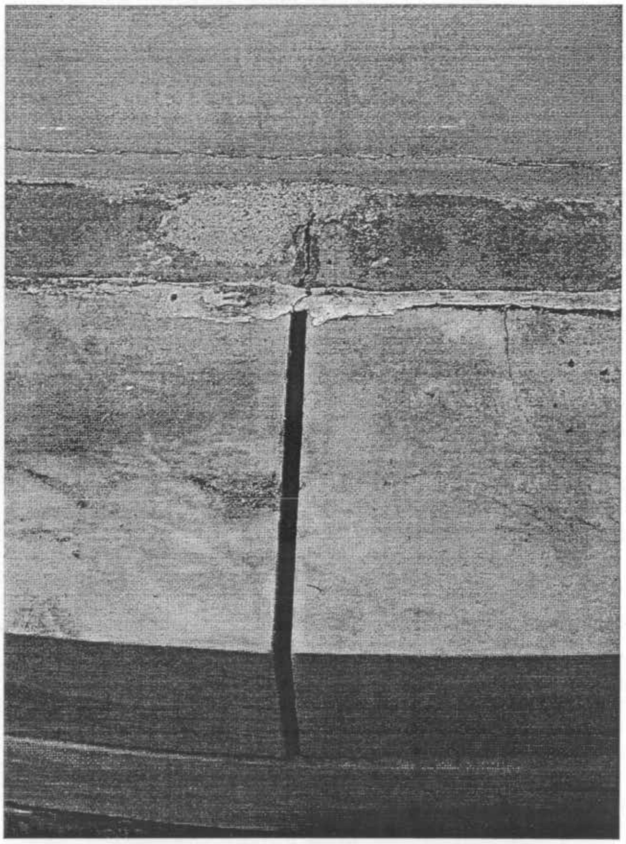
Views of the dome from the south, looking northeast (upper photo) and northwest (lower photo). Note the shallow gutter construction in the protruding cornice. [JGWA, 2005]



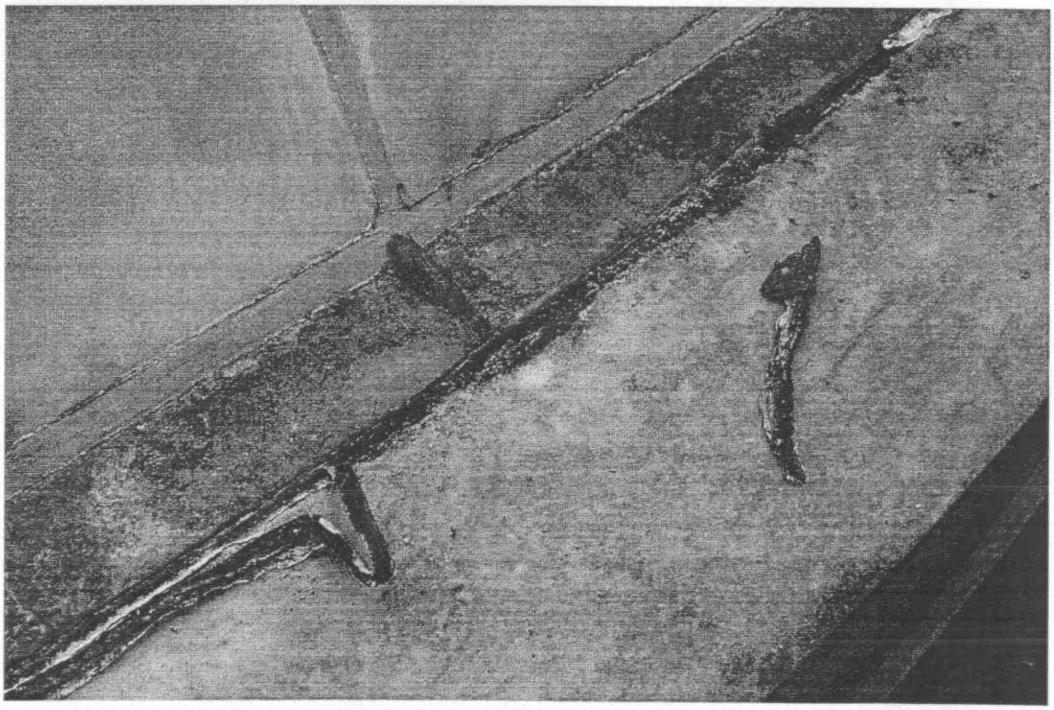
Detail of the capstone of the dome. [JGWA, 2005]



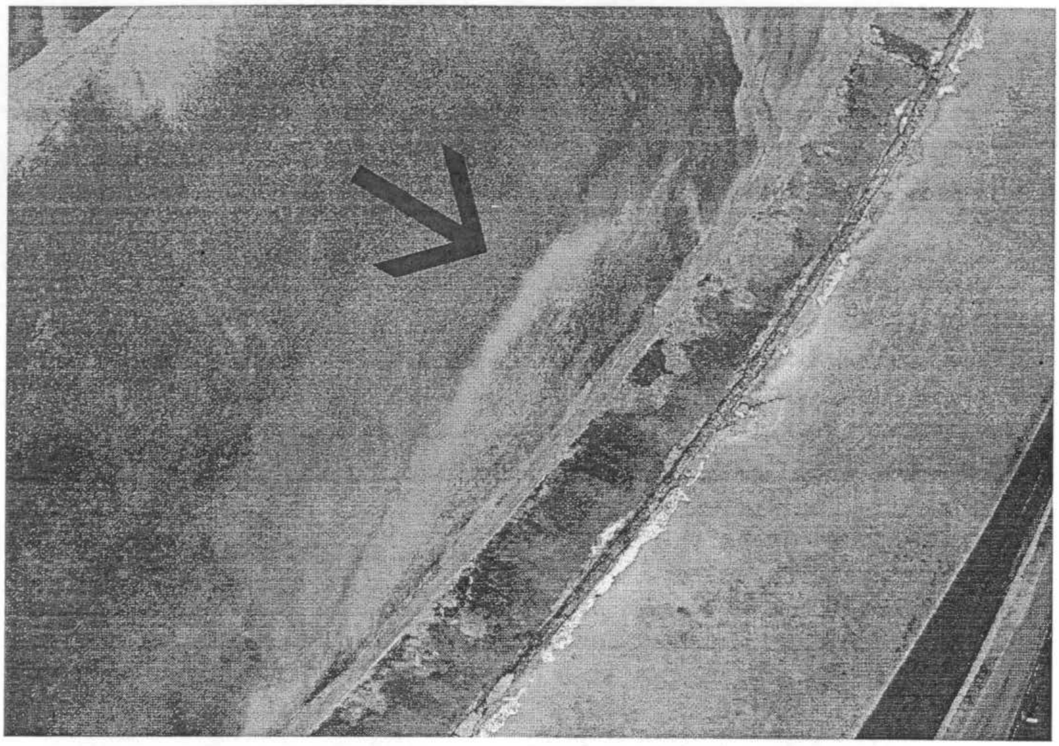
Detail of a displaced marble roofing tile. Water infiltration and freeze-thaw cycling may be contributing to the displacement of the marble. [JGWA, 2005]



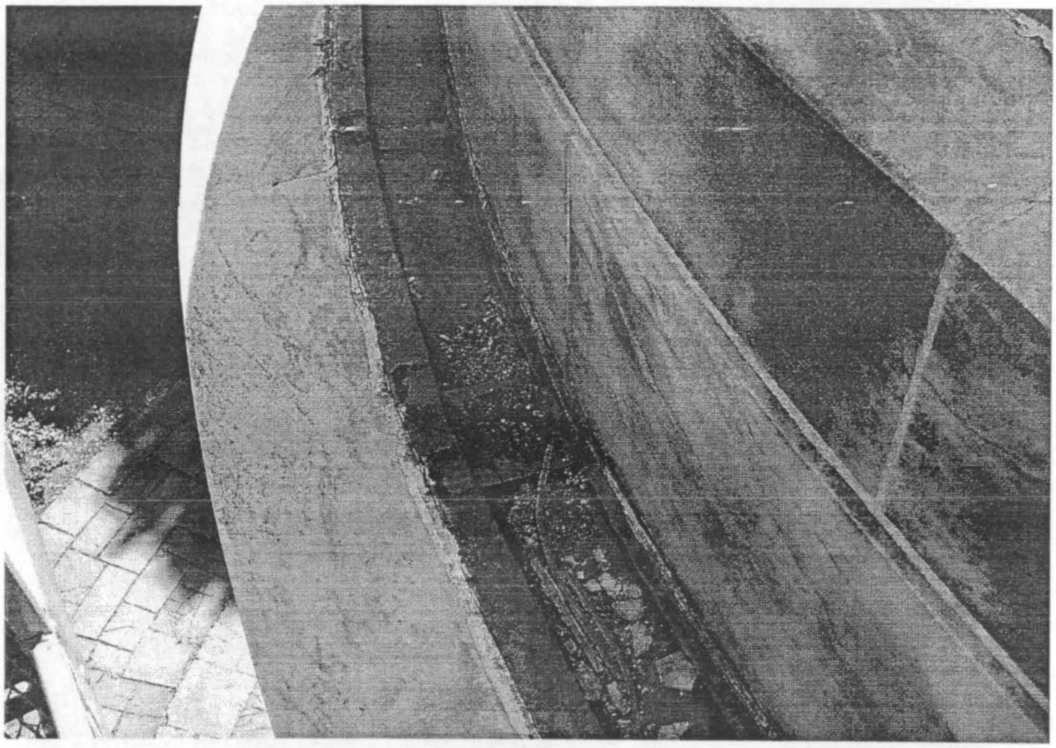
The original lead flashing on the marble capstones of the drum has been torn by the displacement of the stones. The movement of the stones appears to be the result of water infiltration at the open joints in the masonry and subsequent freeze-thaw cracking. [JGWA, 2005]

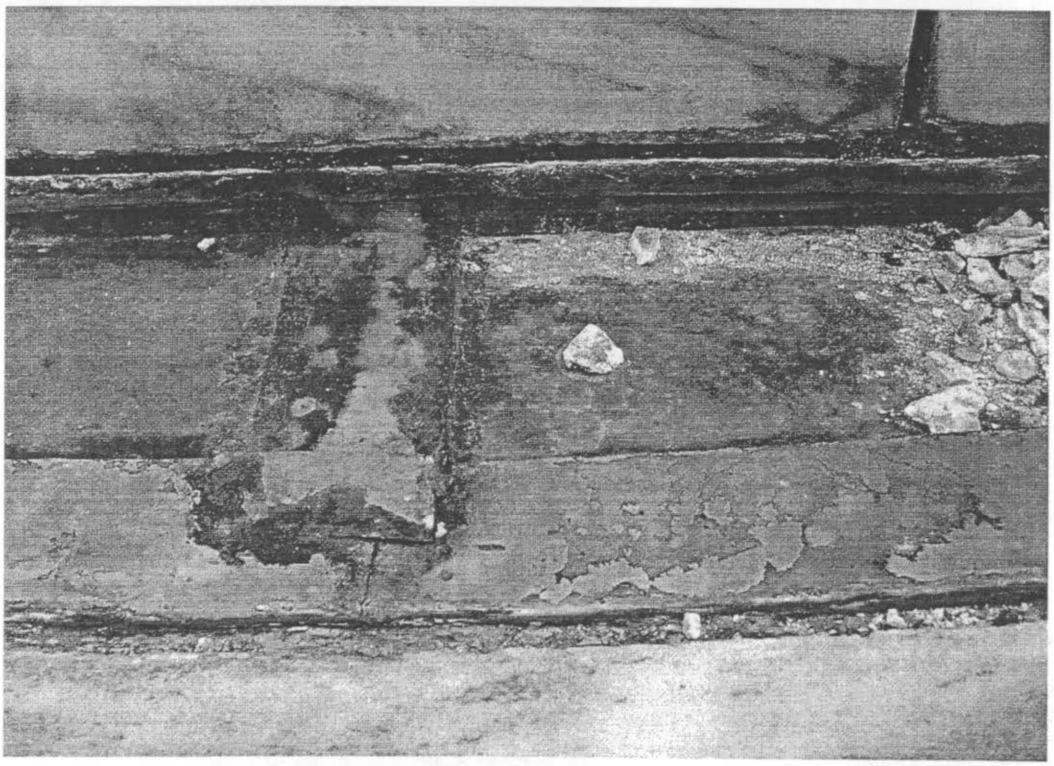


The original lead flashing on the capstones of the drum was wedged into a reglet cut in the stone. Lead wool was used to retain the flashing in the reglet; the reglet has subsequently been filled with sealant in a misguided attempt to repair the flashing. [JGWA, 2005]

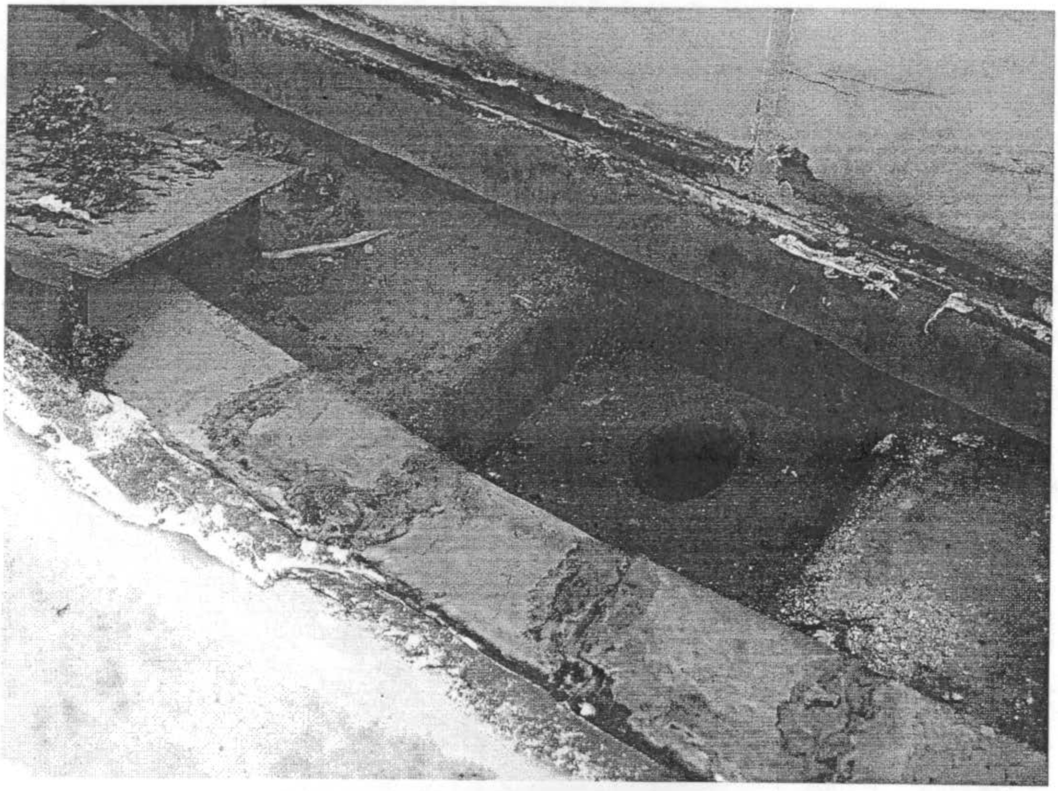


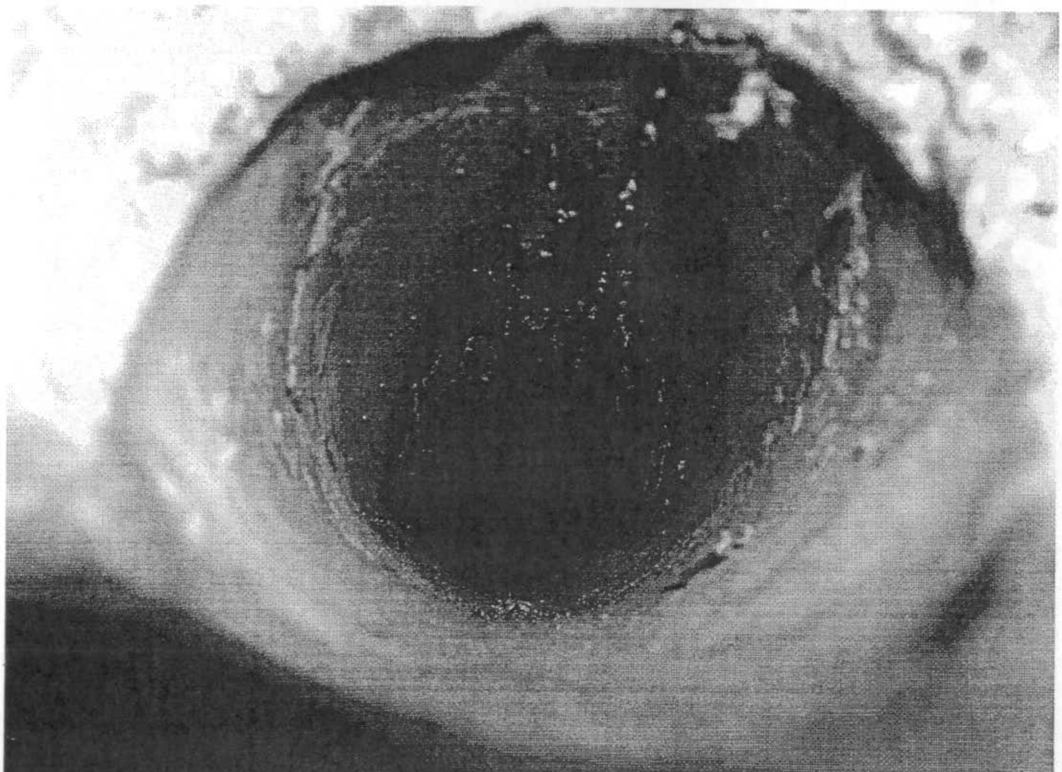
The bright orange and yellow discoloration visible on the outer marble dome appears to be a biological growth below the surface of the marble. [JGWA, 2005]



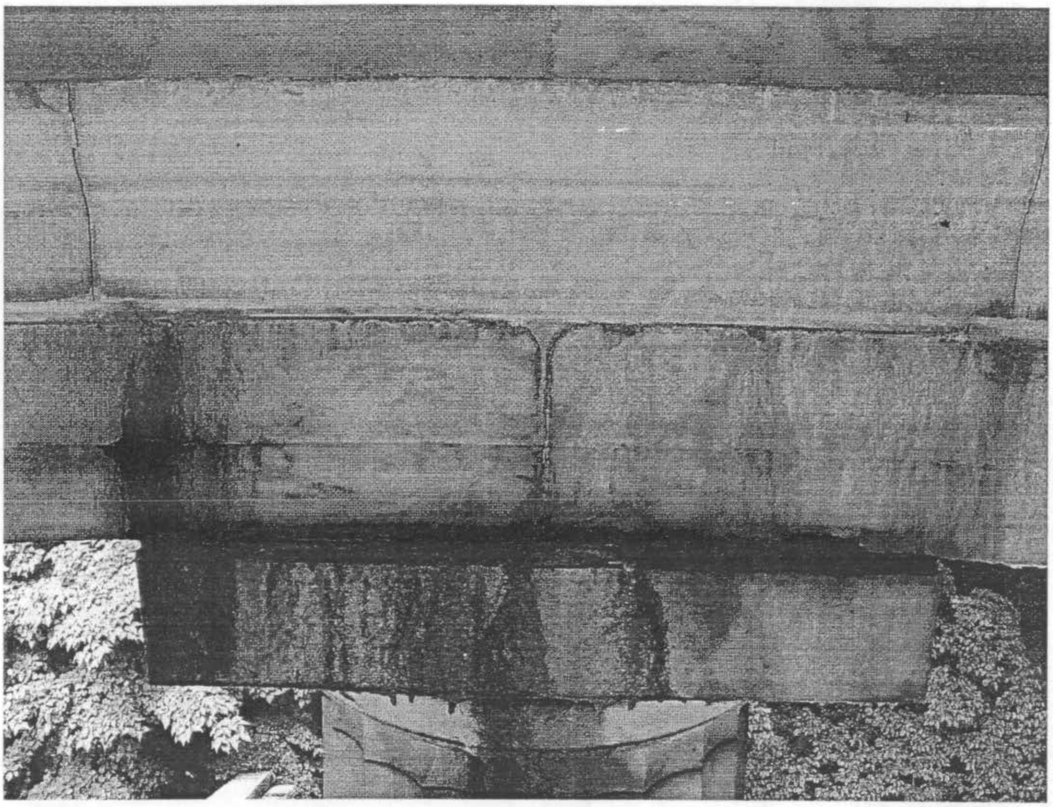


The shallow gutter in the projecting cornice is lined with lead-coated copper (which replaced the original lead flashing). The metal has oxidized and eroded, exposing the intermediate layer of tin. Insufficient pitch, pronounced cross seams, and pieces of deteriorated mortar prevent proper drainage. [JGWA, 2005]

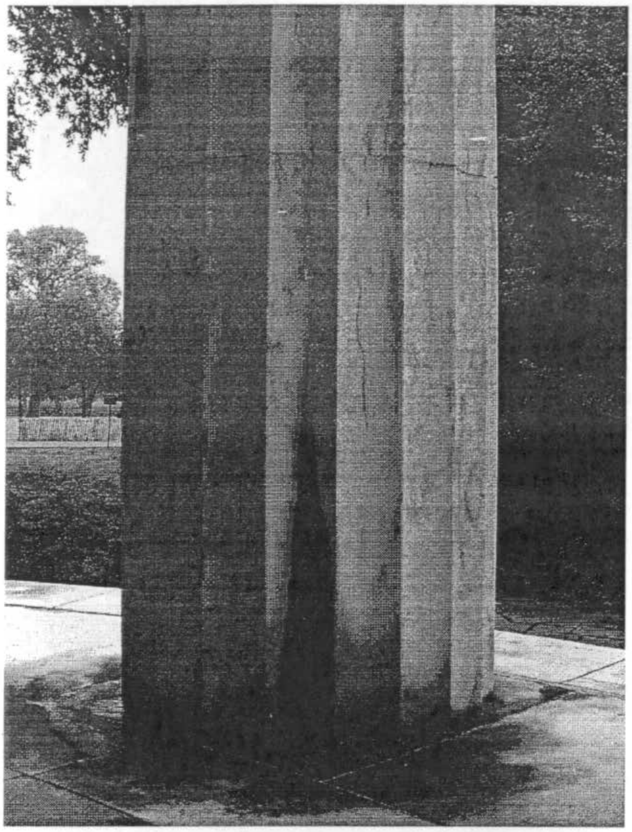


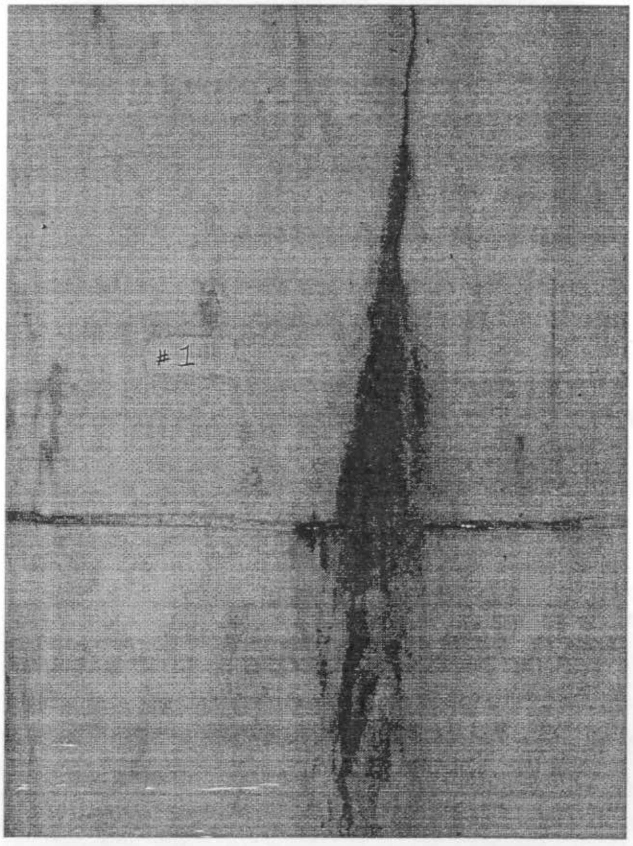


The downspout outlets from the cornice gutter form a "Y" juncture with the condensate drainage outlets in the attic, draining into internal downspouts routed through four of the columns. [JGWA,

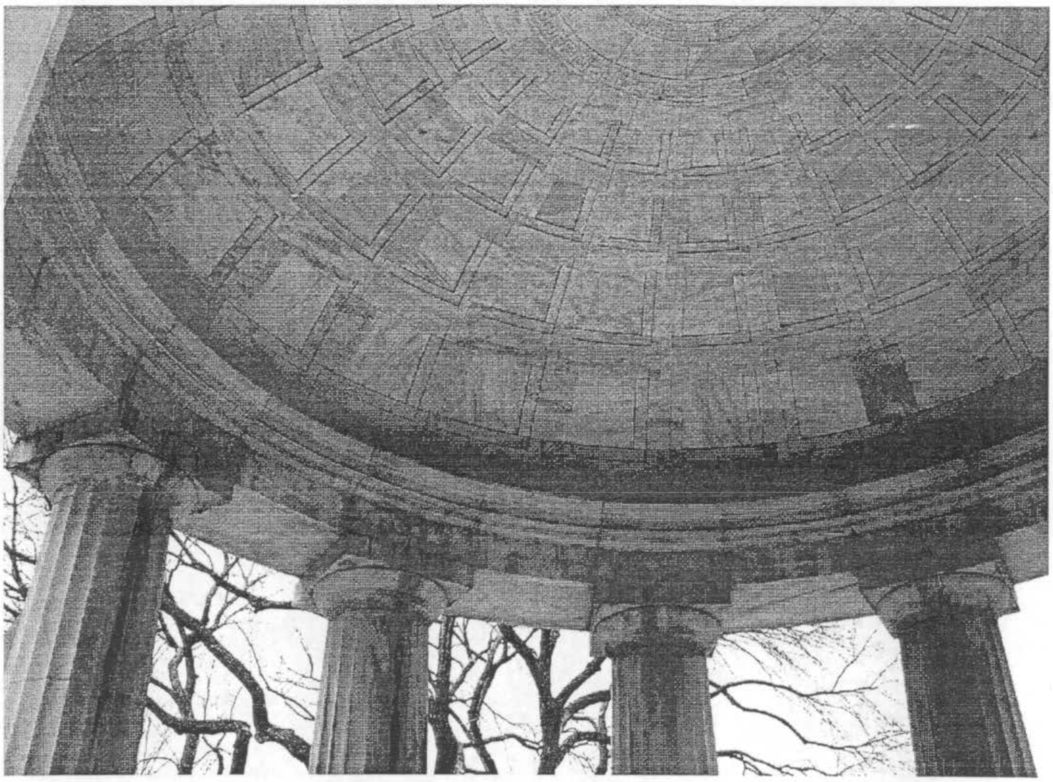


Most of the column capitals are heavily encrusted with calcium carbonate resulting from the percolation of water through the masonry construction. The staining on the capitals and columns is partially attributable to the dry deposition of sulfur contaminents and the formation of gypsum. [JGWA, 2005]

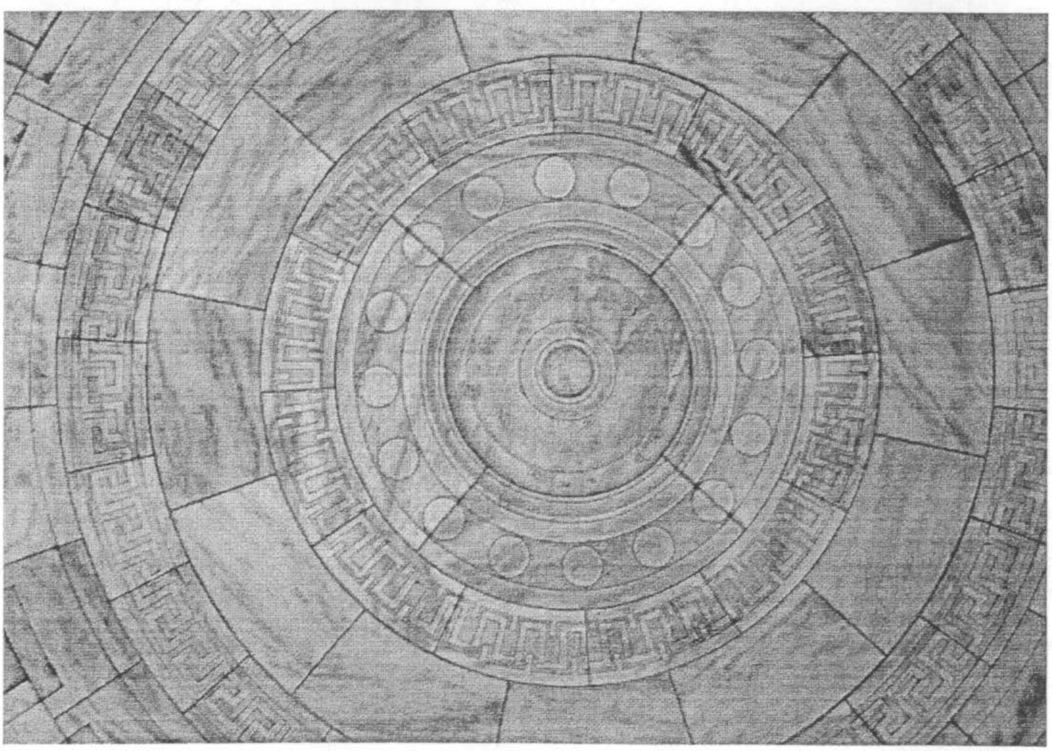




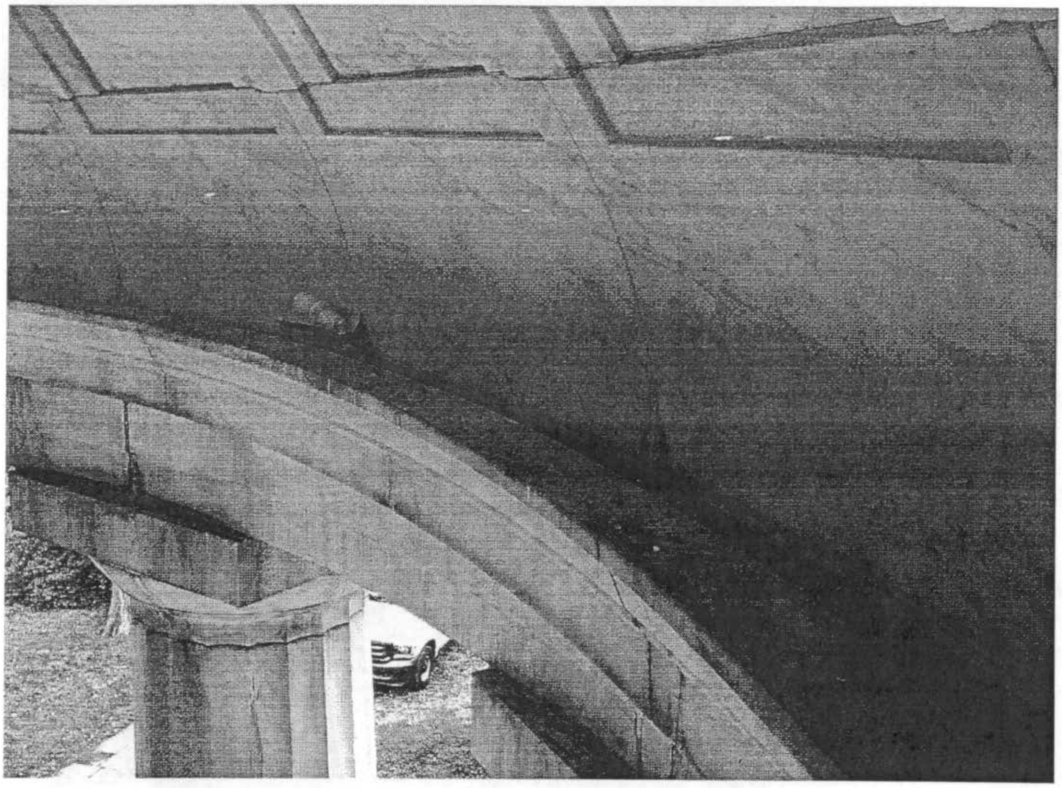
The vertical staining on column 1 (lower photograh) and on column 4 (upper photograph) is indicative of the staining that has occurred on the four columns with failed internal downspouts. The stains originate at fissures and imperfections in the marble where the storm water drainage has escaped. [JGWA, 2005]



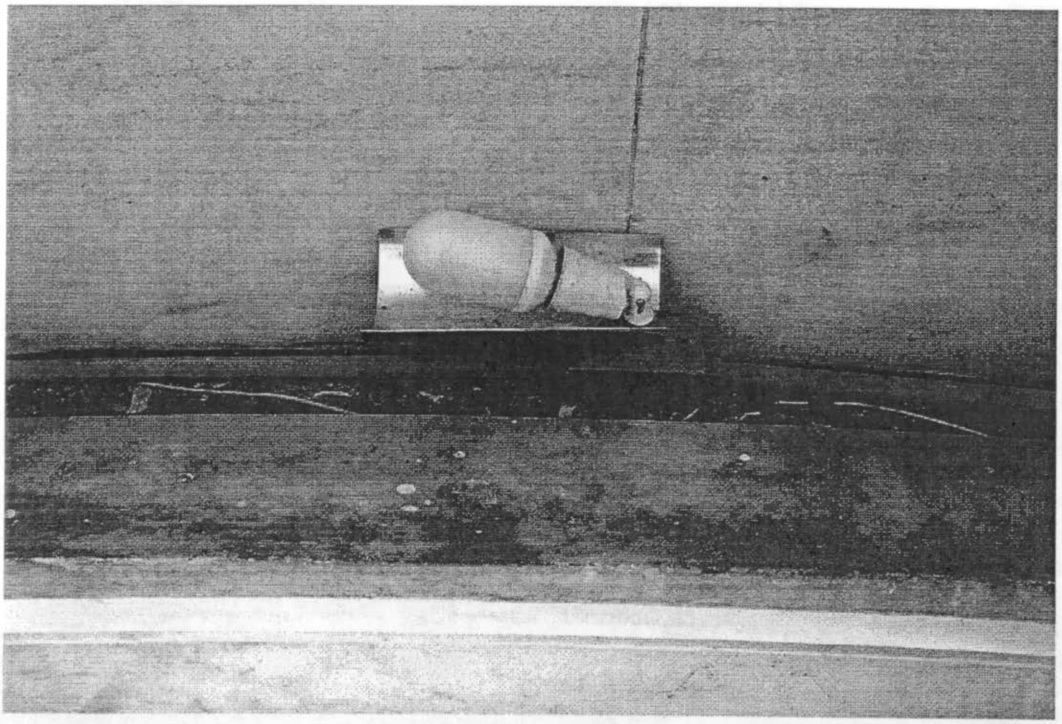
The interior entablature and ceiling of the Memorial. [JGWA, 2005]



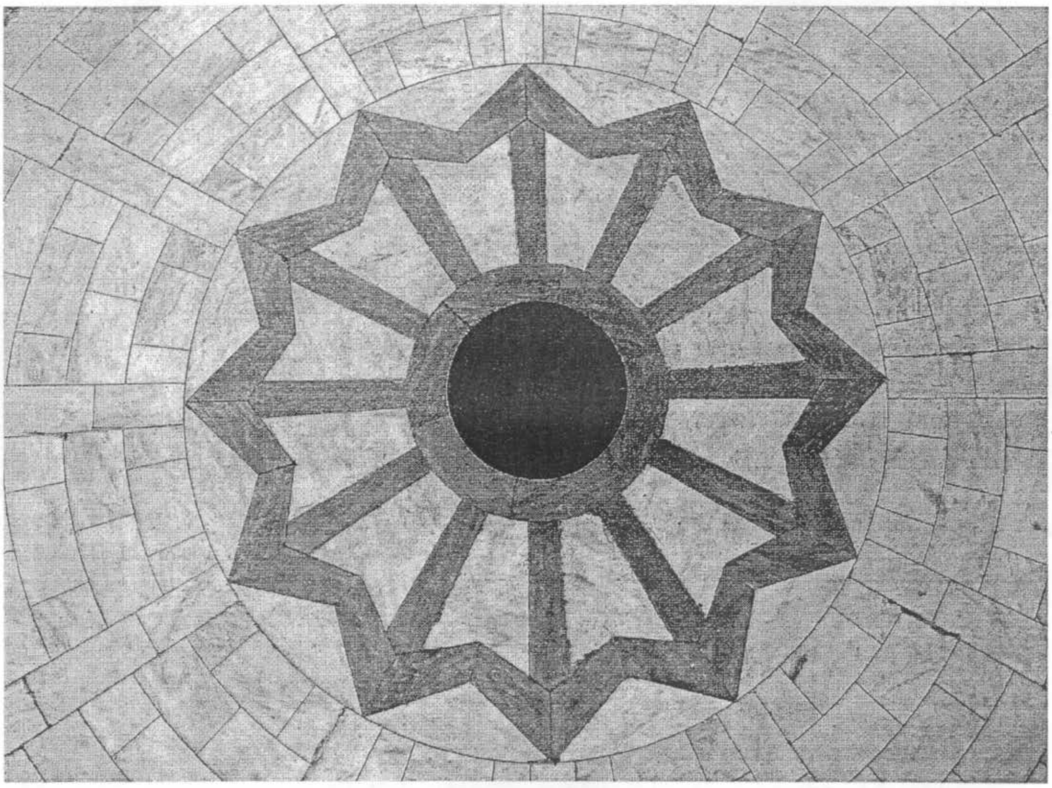
The ceiling of the Memorial. The counterweighted attic access panel is located in the oculus of the lower dome. [JGWA, 2005]



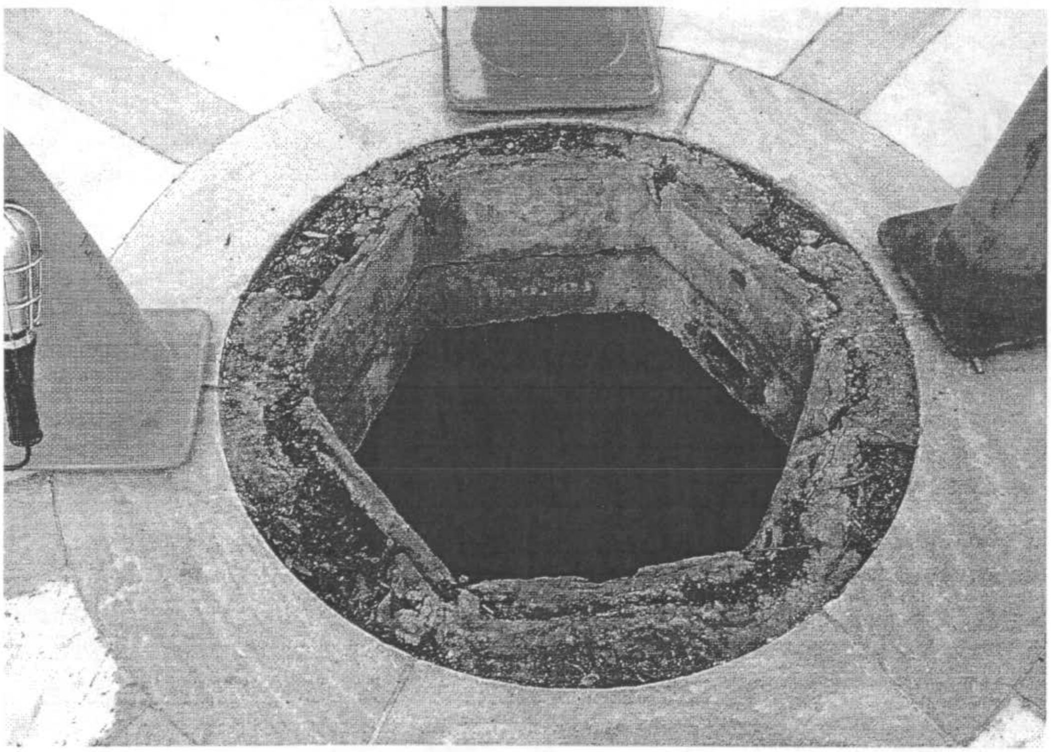
Interior entablature of the Memorial. [JGWA, 2005]



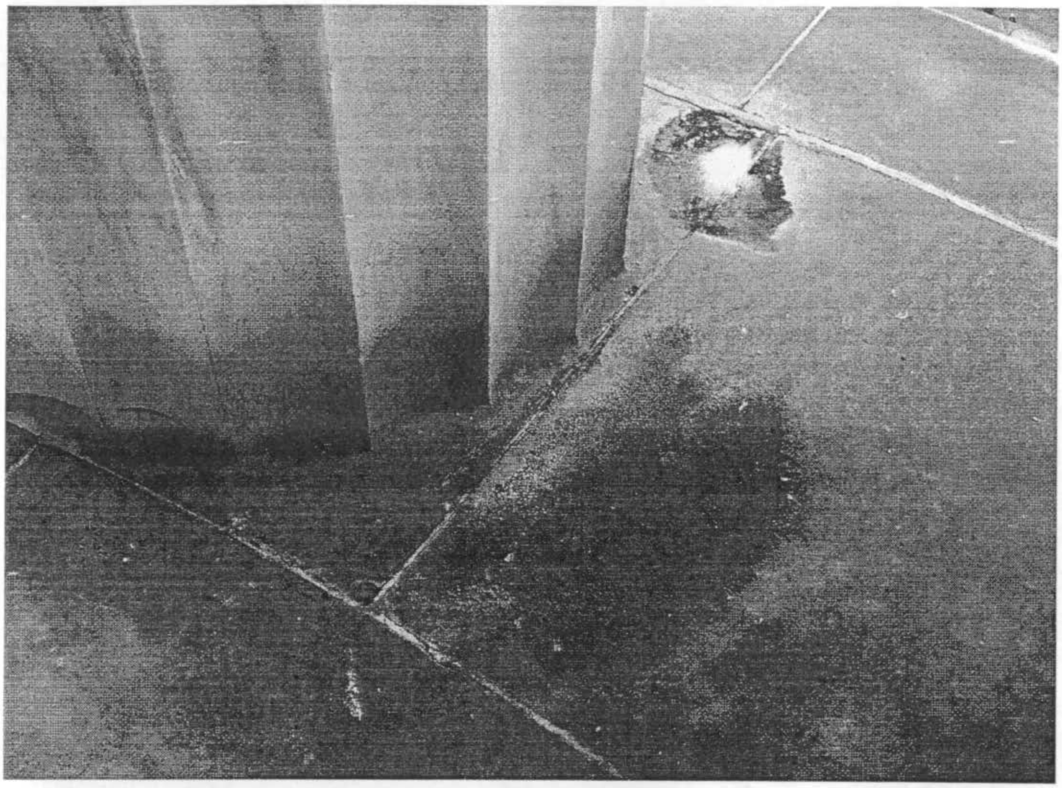
Modern fluorescent lighting has replaced the original incandescent cove lighting at the base of the lower dome. The quality of the fluorescent lighting detracts from the historic character of the Memorial. [JGWA, 2005]



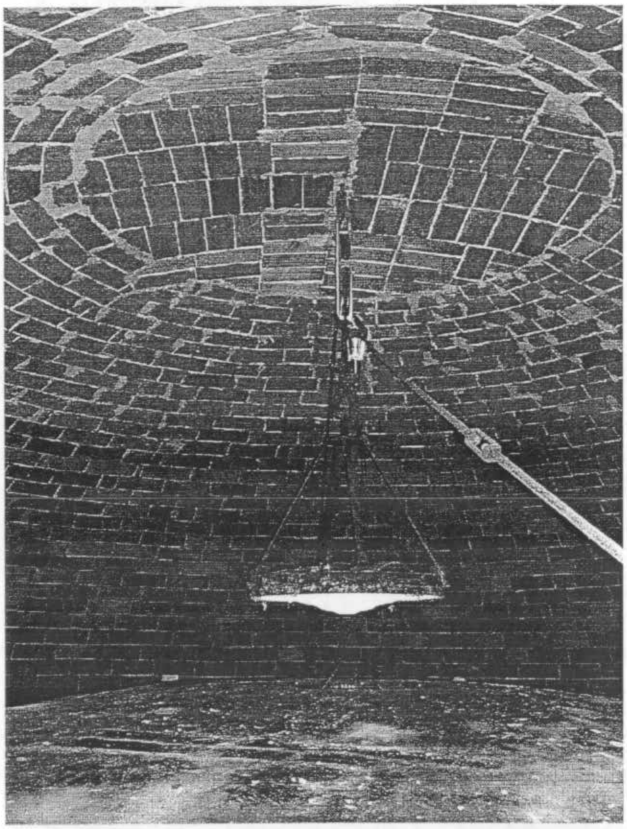
The floor of the Memorial. The original decorative access cover to the vault at the center of the marble floor was stolen in 1970, and has been replaced by a steel cover. [JGWA, 2005]



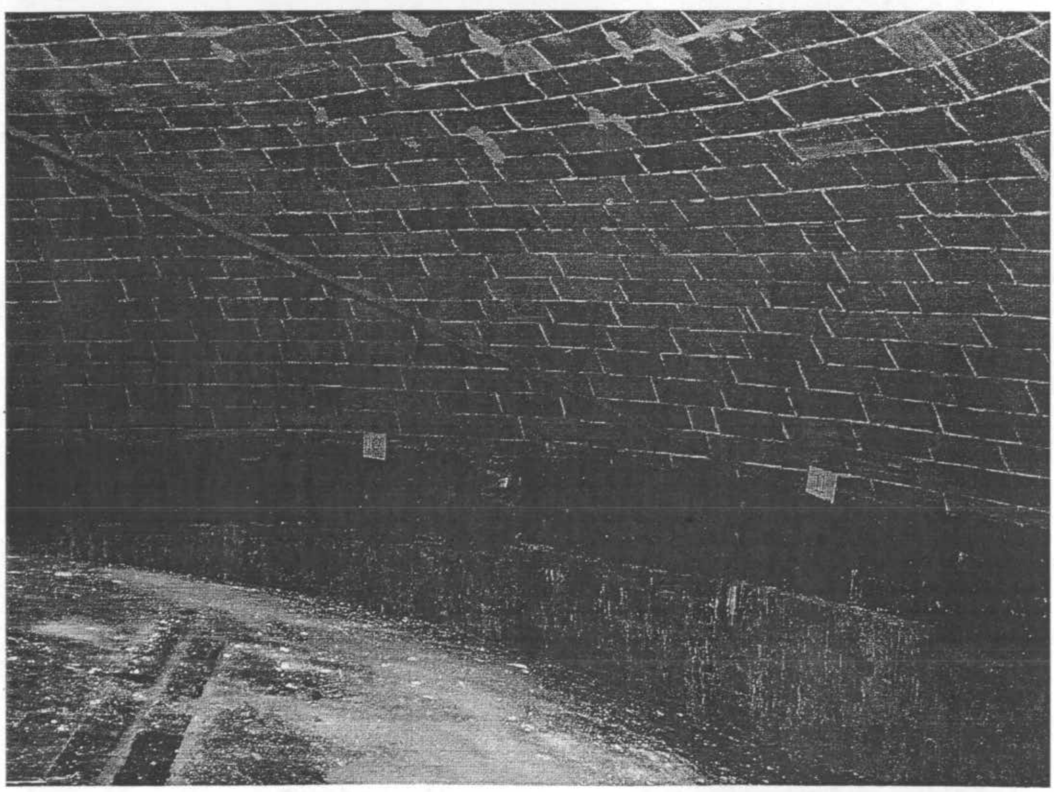
Floor opening providing access to the electrical vault below the Memorial. [JGWA, 2005]



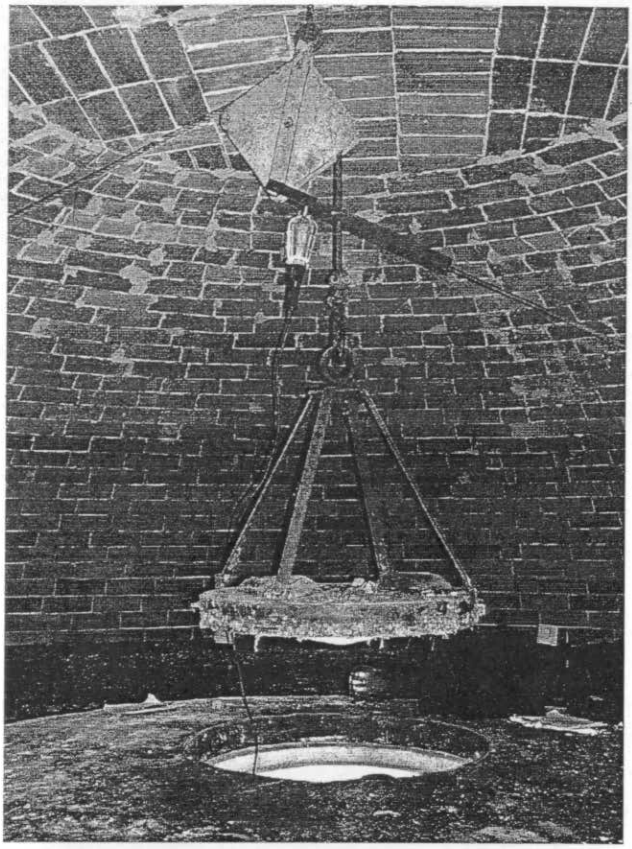
Between the bases of the columns, the marble floor is darkly stained. Areas of encrustation are pronounced in these locations. [JGWA, 2005]

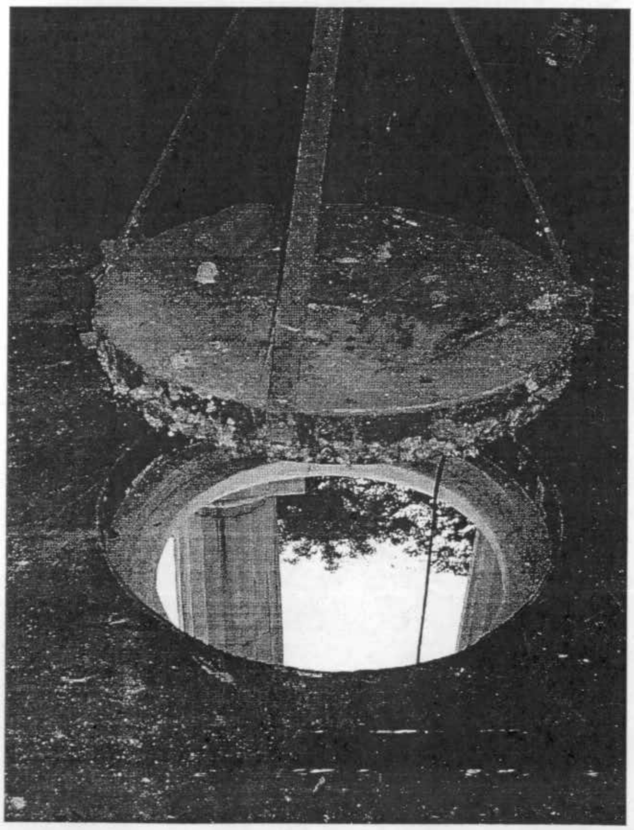


Attic space between the domes. [JGWA, 2005]

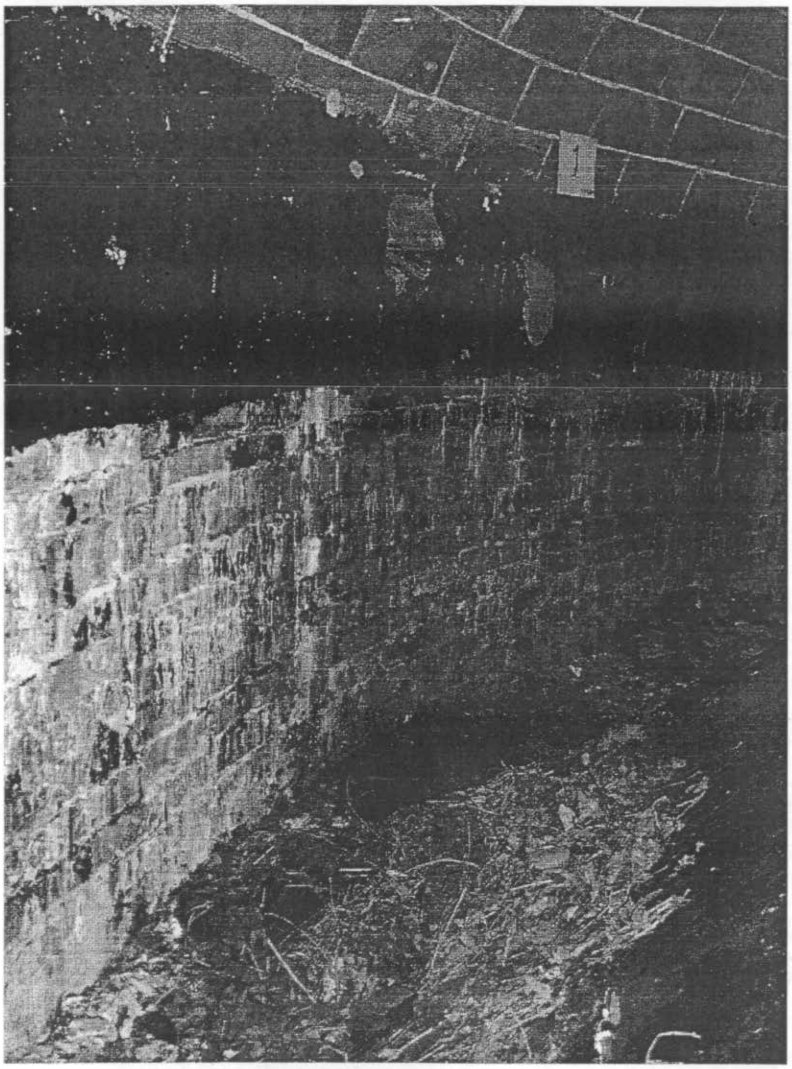


The tile construction of the upper dome bears on the brick drum below. [JGWA, 2005]

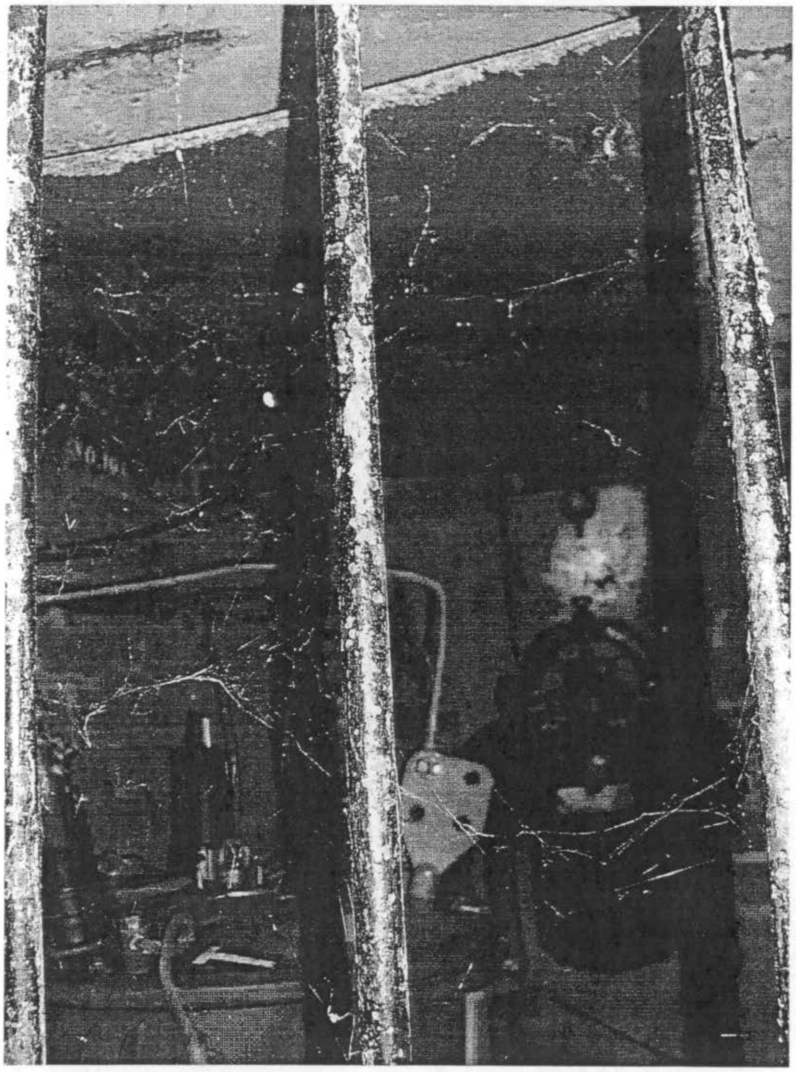




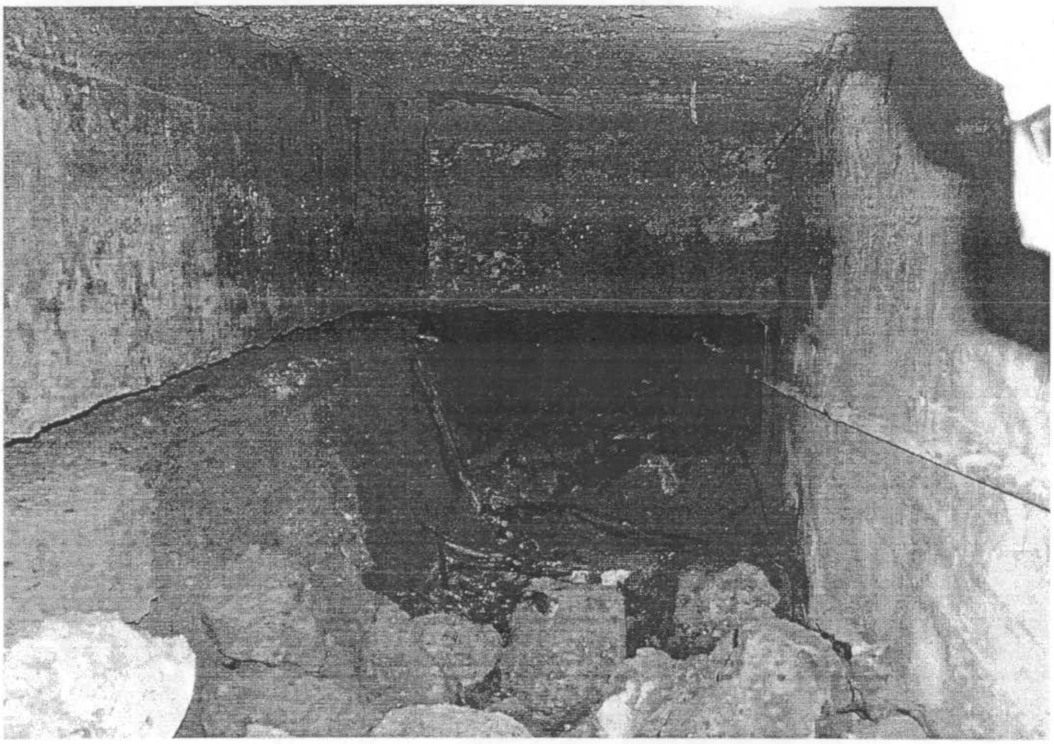
The counterweighted marble access panel is suspended from the Guastavino tile construction of the upper dome. [JGWA, 2005]



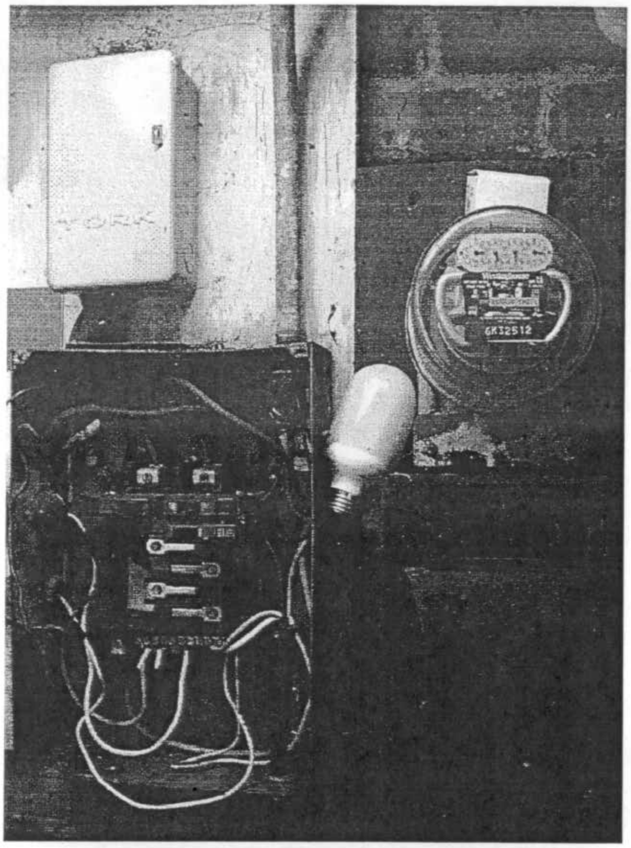
A significant buildup of debris has occurred in the attic space adjacent to an air vent at the base of the upper dome. The waterproof coating on the drum of the dome appears to have delaminated as the result of water infiltration and freeze-thaw cycling. Efflorescence is visible on the brick drum. [JGWA, 2005]

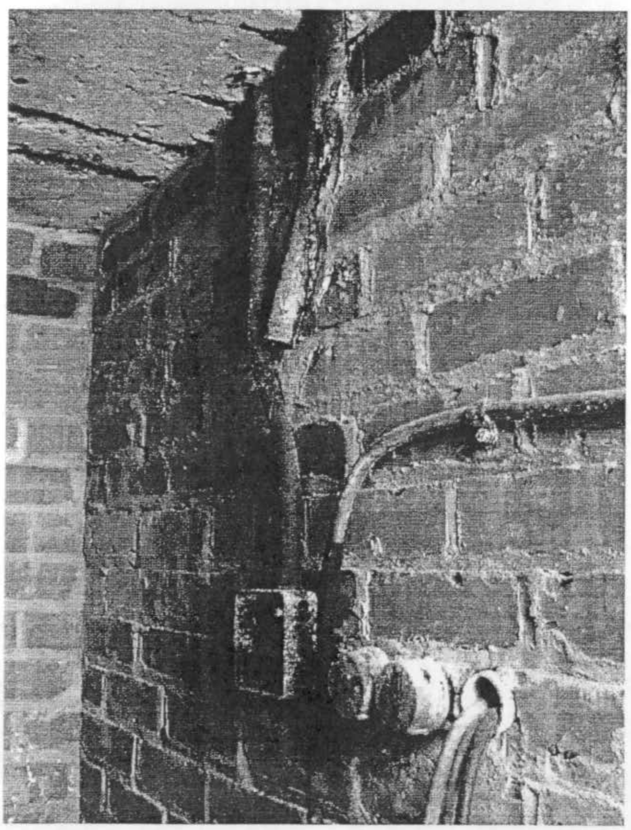


The electrical vault beneath the Memorial, looking south into the transformer room. [JGWA, 2005]



The crawl space to the north of the electrical beneath the Memorial, looking east. It appears that this area was excavated some time after the original construction of the Memorial. [JGWA, 2005]





An open electrical junction box and a panel box with exposed conductors are located in the electrical vault beneath the Memorial. These are significant electrical shock hazards. [JGWA, 2005]

PART 1

PHYSICAL DESCRIPTION

PROBES AND WATER TESTS

John G. Waite Associates and the National Park Service undertook probes and water tests in June and July of 2005.

PROBES

Two probes were undertaken in the attic space between the domes on June 22, 2005. The weather was rainy and overcast. The temperature was approximately 75 degrees F.

A JLG lift was used to access the attic space. The circular stone access panel at the center of the inner dome was hoisted above the oculus of the dome using an internal counter-weighted cable and pulley system. Temporary lighting and power were provided by a portable generator.

Probe A

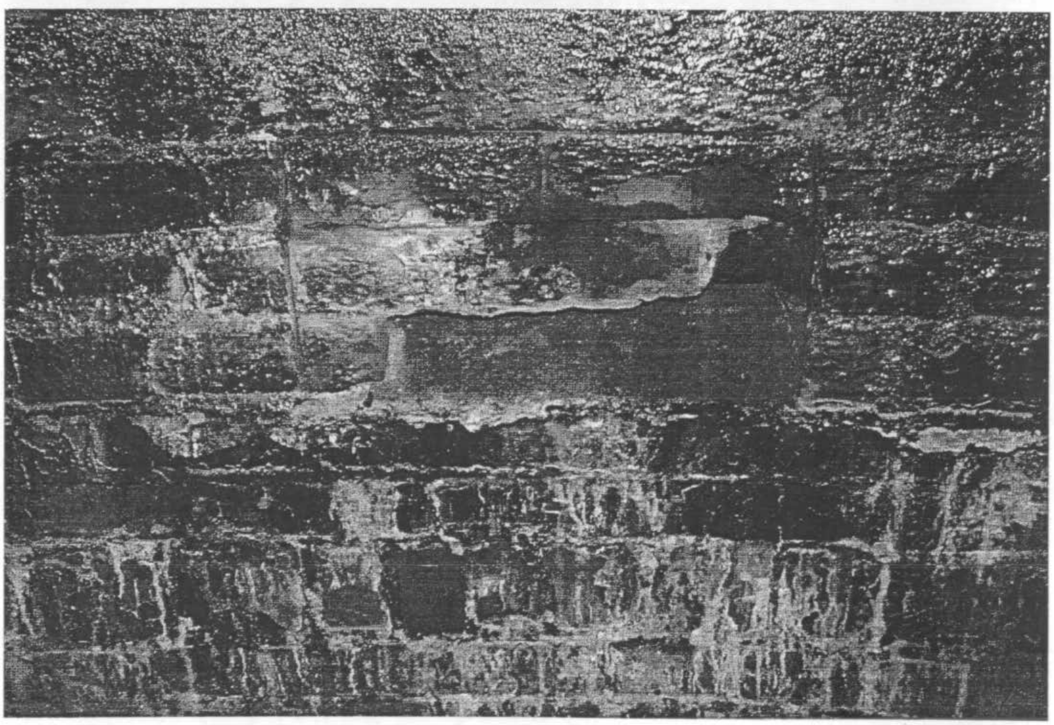
The March 18, 1931 section of the dome (see Figure 13) shows four "7/8" ø Bronze Rings" in the marble tile construction of the outer dome, as well as two metal angle tensions rings: one at the base of the inner dome, and the other at the base of the outer dome. The brick used in the construction of the drum of the outer dome appeared to be displaced by the upper of these two angles that were used to restrain the outward thrust of the dome. There was concern that the angle may have rusted, and oxide jacking had caused movement in the masonry construction. It was postulated that this movement was contributing to the displacement and cracks visible in the marble on the exterior of the structure.

Binh Nguyen and Ray Wooden of the National Park Service executed a building probe within the attic space, between columns 10 and 11, removing brick and mortar with a hammer drill, cold chisels, and an electric grinder in an area approximately 1'-0" high and 1'-6" wide. The probe was approximately 3'-0" above the condensate drainage valley.

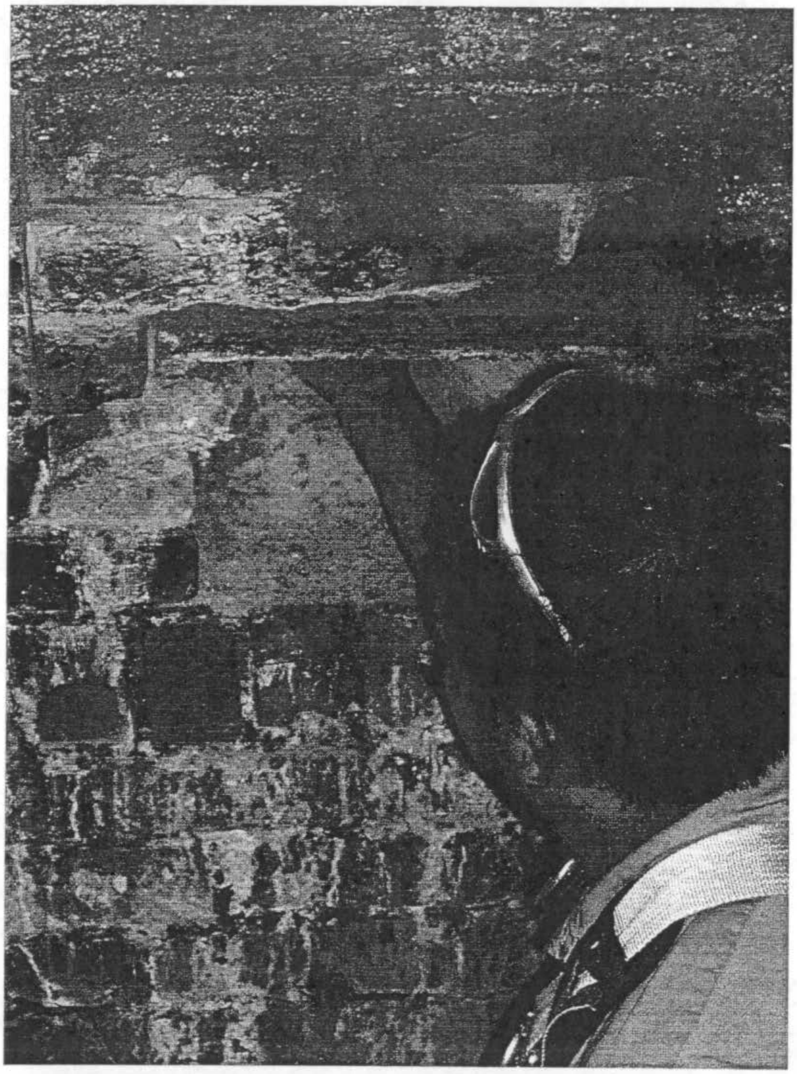
The brick was removed above and below the horizontal leg of the 6"x6"x1/2" steel angle. The terra cotta tile of the outer dome was found to be bearing on the angle, with the vertical leg of the angle restraining the tile. The displaced brickwork was the result of the brick at the upper extent of the drum sliding on a through-wall bitumen-and-felt waterproof flashing that appears to have been installed during the original construction of the memorial. The flashing or membrane appears to have been applied along the vertical surface of the brick drum, within the attic space, and turned into the wall approximately 3'-0" above the condensate drainage valley between the lower dome and the drum of the upper dome. The flashing was laid over the horizontal leg of the steel-angle tension ring, and presumably extended upward at the vertical leg of the steel angle, between the terra cotta tile of the upper dome and the steel angle. It is not known how the flashing or membrane meets the waterproofing on the upper tile dome construction.

Within the attic space the terra cotta tile of the upper dome appeared to be in excellent condition, with no staining, nor indications of failure. Therefore, it was assumed that the waterproofing membrane above the terra cotta dome must be in good condition. It was known that the mortar in the joints of the marble roofing tiles or slates was deteriorated or missing for an extended period of time. It appears that water infiltrated the open joints in the marble dome construction and was shed by the waterproof membrane above the tile dome. The water appears to have drained to the base of the outer dome, where it saturated the masonry construction of the drum; the moisture in the drum construction then appears to have undergone freeze-thaw cycling, causing brick spalling and the delamination of the waterproof membrane from the inner wall of the drum. A significant amount of efflorescence has occurred on the surface of the drum brickwork as the moisture in the drum construction has evaporated.

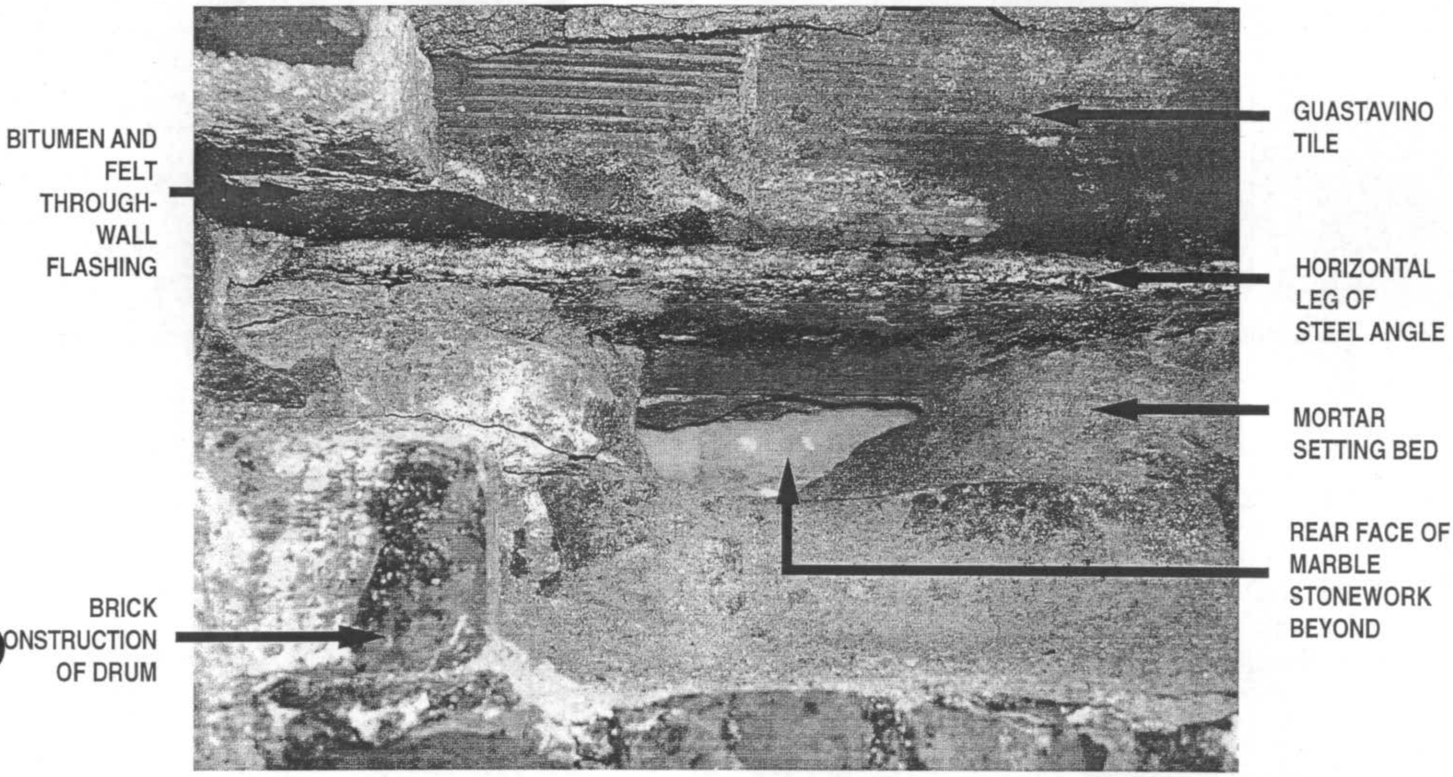
If the through-wall flashing simply continued up the outer surface of the upper tile dome, we would expect the steel-angle tension ring to be seriously corroded as water was shed off the base of the tile dome. This was not the case. The steel was found to be in very good condition, with only a minor degree of surface rust. The membrane on the outer surface of the upper tile dome may have continued out to the lead flashing at the base of the marble dome tiles. In this way the integrity of the steel angle may have been preserved. The 3"± void between the vertical leg of the steel angle and the back face of the marble cap stone of the outer drum may have contributed to the survival of the angle (see drawings).



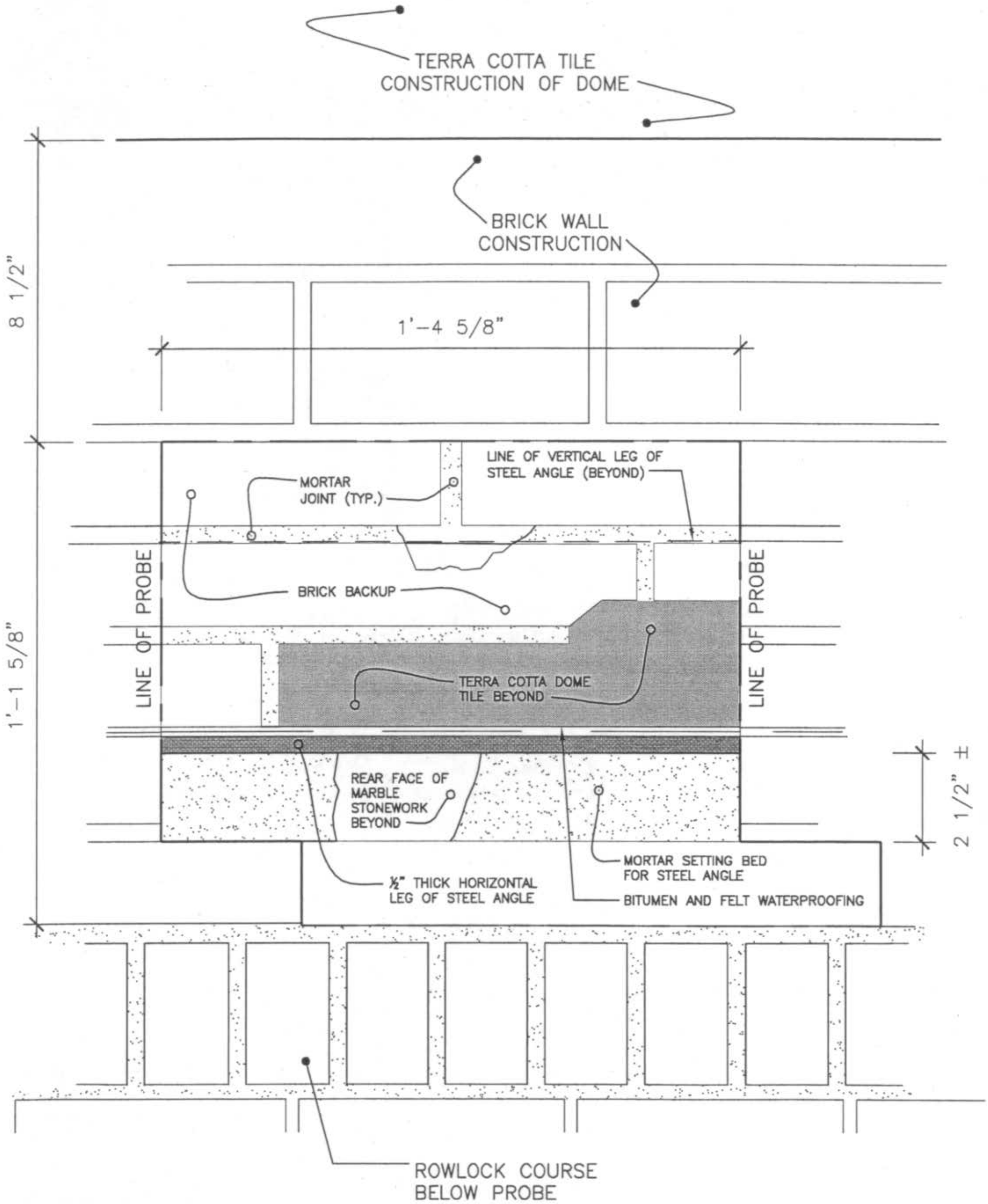
Probe A investigated the condition of the steel angle tension ring at the base of the upper dome. Binh Nguyen and Ray Wooden of the National Park Service removed brick and mortar from the drum construction supporting the dome. The probe was located between columns 10 and 11. [JGWA, 2005]



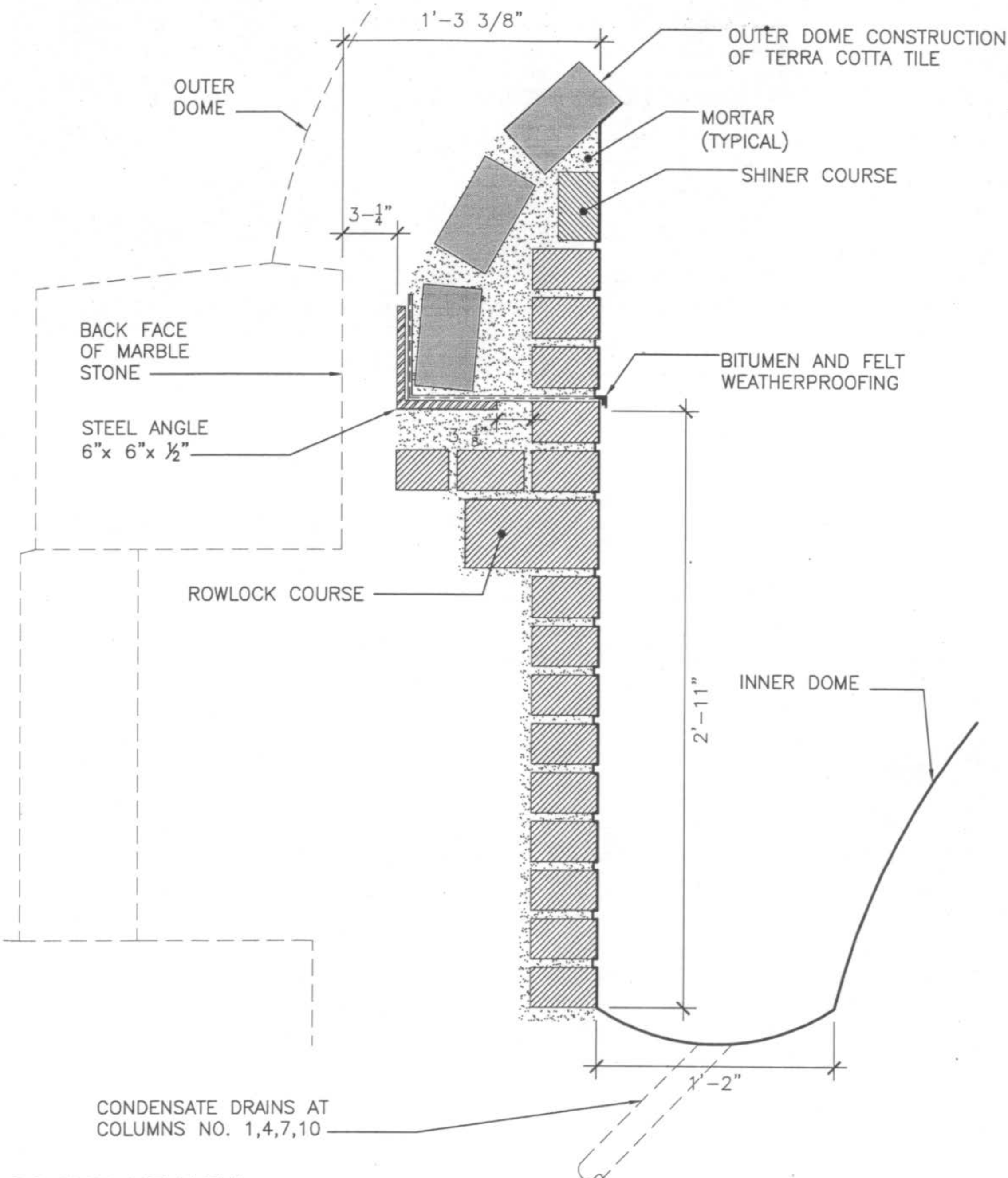
Binh Nguyen of the National Park Service investigating the void between the steel angle tension ring and the marble construction beyond. [JGWA, 2005]



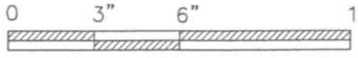
Detail view of Probe A. [JGWA, 2005]



DC WAR MEMORIAL
PROBE A –ELEVATION
JUNE 22, 2005



DC WAR MEMORIAL
PROBE A –SECTION THROUGH OUTER DOME AND DRUM
JUNE 22, 2005

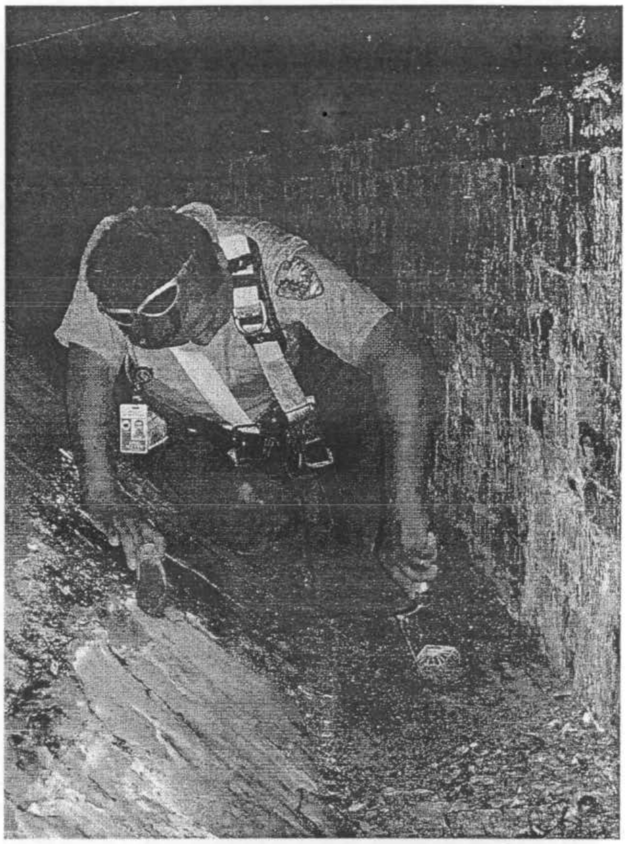


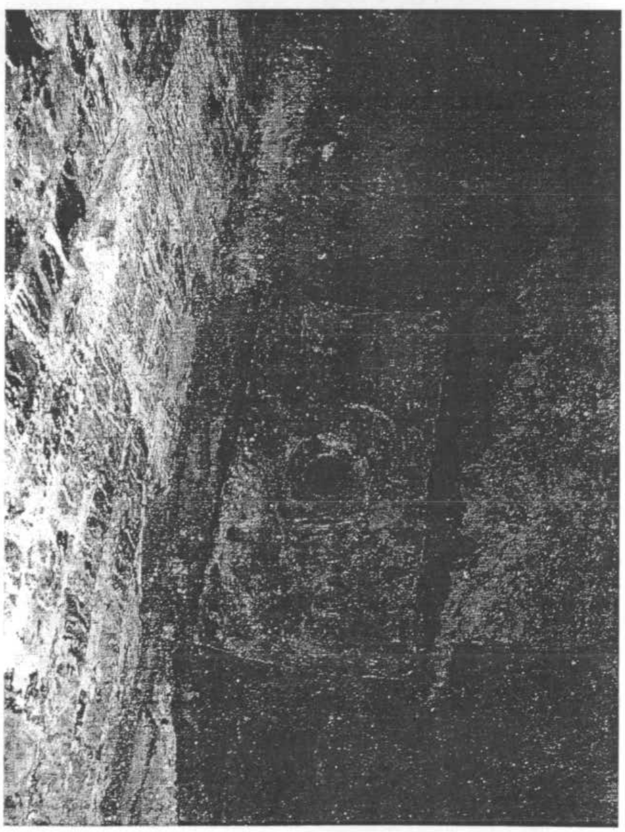
Probe B

The lead condensate drain outlet above column 10 was located and exposed. Roofing felt coated with bitumen was removed from the area immediately above the drain outlet, and sand was swept away. The outlet and deformed, copper bird's nest strainer were blocked with sand.

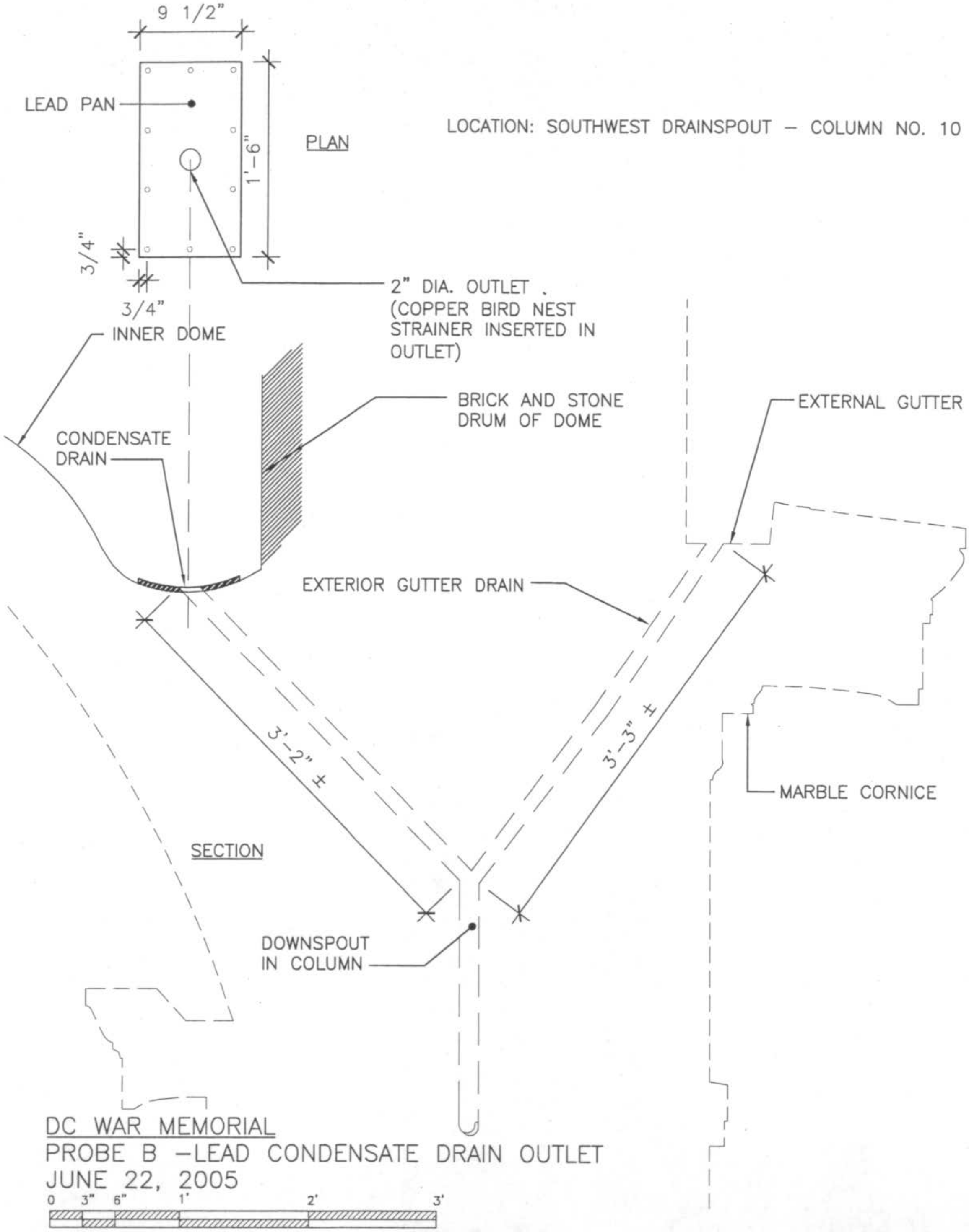
A lead flashing or pan, approximately 9-1/2" wide by 1'-6" long was exposed. There was a 2" diameter outlet located at the center of the pan. The pan was located in the shallow trough or valley at the intersection of the inner dome and the drum construction of the outer dome. The drum construction consisted of brick as a backup material for the marble entablature.

The outlet pipe extends approximately 3'-2" from the lead pan to a "Y" juncture with the external downspout outlet at the head of the vertical downspout within the column shaft.





Probe B investigated the condensate drainage outlet above column 10. The outlet and bird's nest strainer were blocked with sand and covered with bitumen-coated roofing felt.


9 1/2"
LEAD PAN
PLAN
1'-6"
3/4"
3/4"
LOCATION: SOUTHWEST DRAINSPOUT – COLUMN NO. 10
2" DIA. OUTLET .
(COPPER BIRD NEST
STRAINER INSERTED IN
OUTLET)
INNER DOME
BRICK AND STONE
DRUM OF DOME
EXTERNAL GUTTER
CONDENSATE
DRAIN
EXTERIOR GUTTER DRAIN
3'-2" ±
3'-3" ±
MARBLE CORNICE
SECTION
DOWNSPOUT
IN COLUMN
DC WAR MEMORIAL
PROBE B –LEAD CONDENSATE DRAIN OUTLET
JUNE 22, 2005
0
3"
6"
1'
2'
3'

WATER TESTS

Field observations on July 15, 2005, revealed that the downspouts in Columns 1, 4, 7, and 10 have apparently failed. Original specifications indicate that these downspouts were of cast-iron construction. Water was found leaking from the horizontal base joints at each of these columns. This appears to be a chronic problem because the constant presence of water on the marble paving at the base of these columns is supporting the growth of algae.

The columns with downspouts have other evidence of internal water saturation. Generally, at the inclusions and imperfections in the marble drums of the columns, stains and lime run streak downward. Staining and lime run (calcium carbonate) are also visible streaking down from the horizontal joints between the drums.

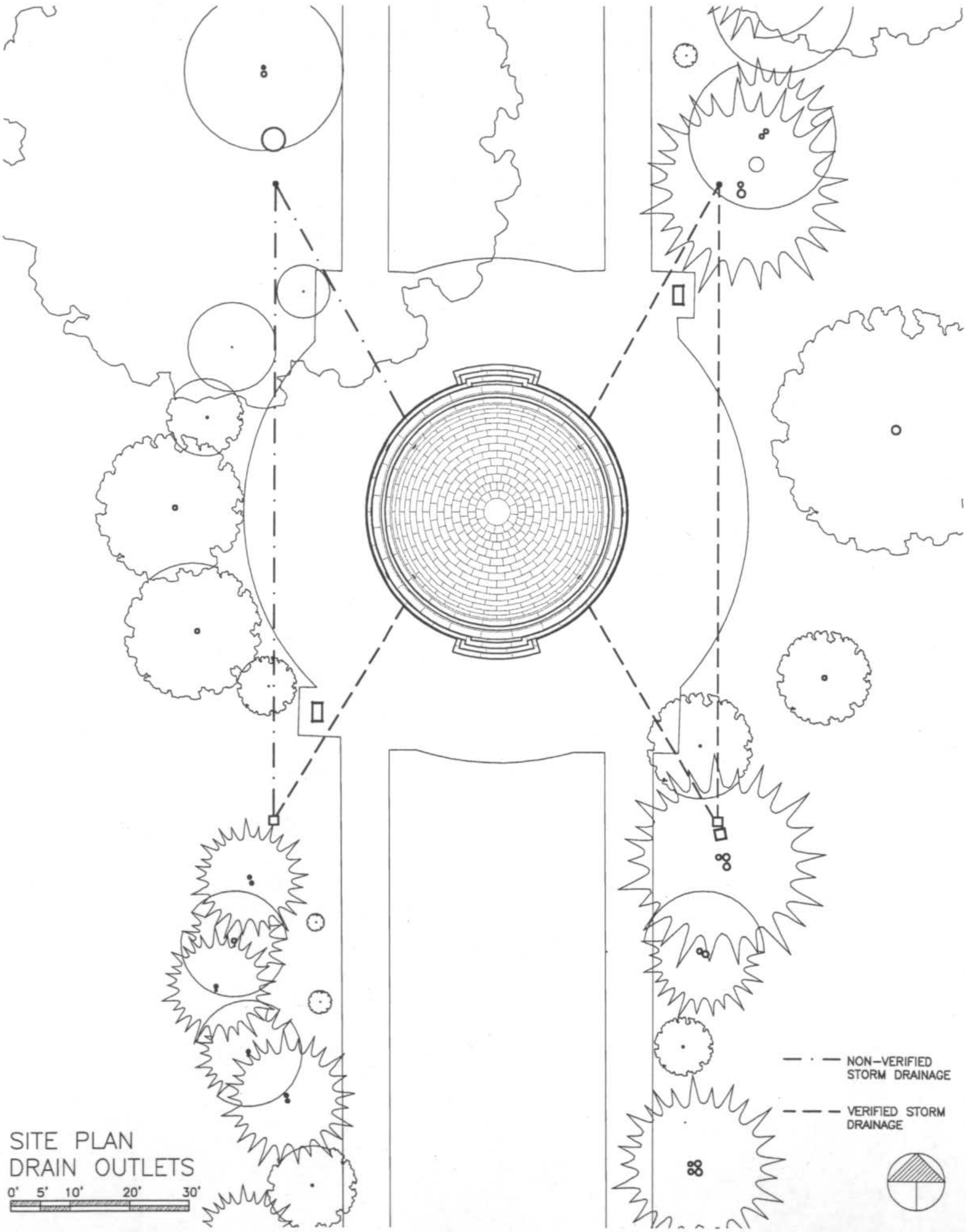
Column 12 is generally saturated with water. This column may have an abandoned electrical conduit riser that is acting as a conductor for water.

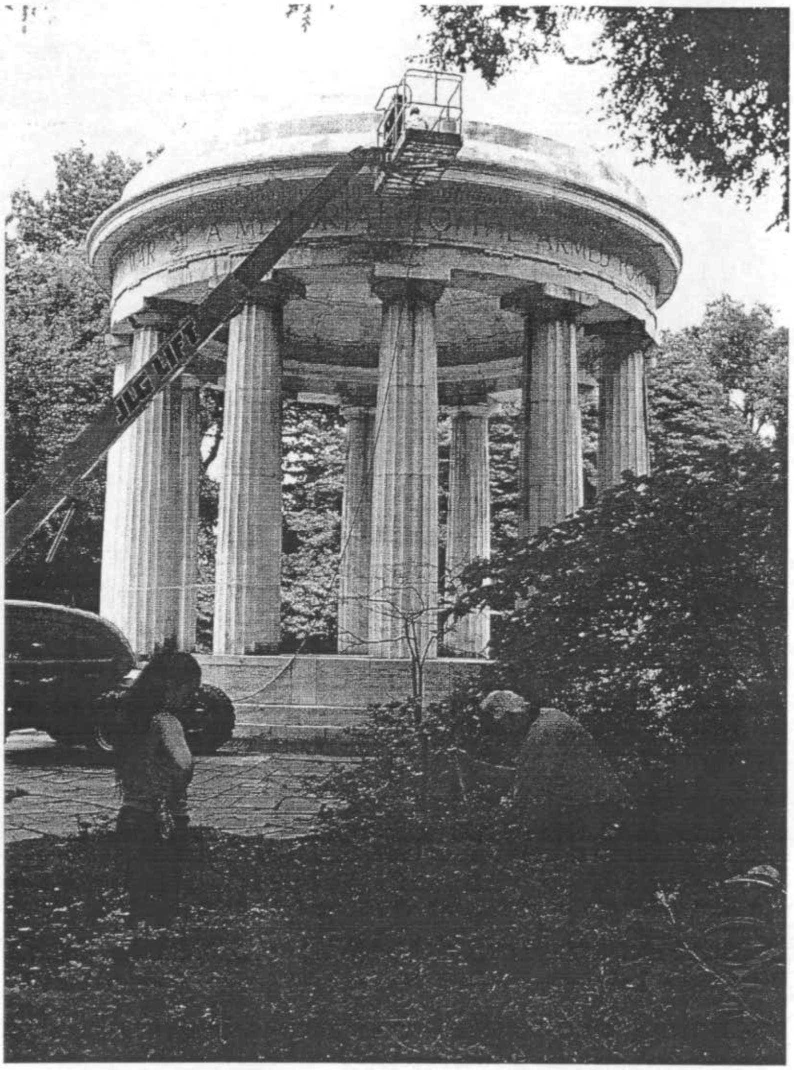
On July 15, at 12:50 p.m., in hot, humid weather (overcast with sun, 80 degrees F), a continuously flowing water hose was inserted in the downspout outlet above Column No.10 (southwest quadrant). After removing six to twelve inches of soil and mulch from the grate of the catch basin located approximately twenty yards to the southwest of the memorial, water was observed to be flowing freely through the catch basin. Water came into the catch basin on the diagonal, directly sighted from Column No.10. No moving water was observed at the catch basin located to the southeast of the memorial.

A continuously flowing water hose was inserted in the downspout outlet above Column No.7 (southeast quadrant). After removing the grate of the catch basin located approximately twenty yards to the southeast of the memorial, water was observed to be flowing freely through the catch basin. Water came into the catch basin on the diagonal, directly sighted from Column No.7. No moving water was observed at the catch basin located to the southwest of the memorial.

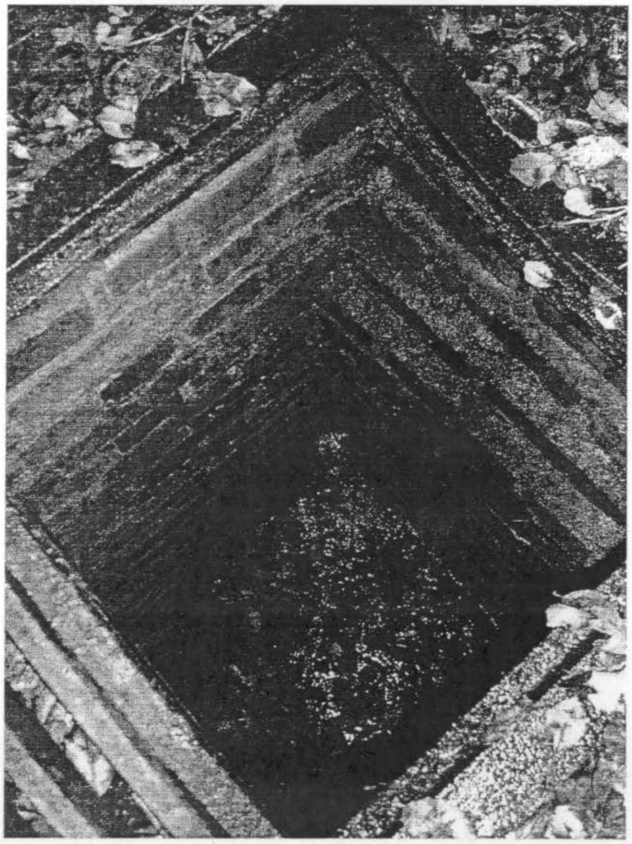
A continuously flowing water hose was inserted in the downspout outlet above Column No.4 (northeast quadrant). Water was heard running in the manhole located approximately twenty yards to the northeast of the memorial; and after a ten to fifteen minute delay water was observed to be flowing freely at the catch basin located approximately twenty yards to the southeast of the memorial. Water came into the catch basin from the north, directly sighted from the manhole located to the northeast of the memorial.

A continuously flowing water hose was inserted in the downspout outlet above Column No.1 (northwest quadrant). A capped concrete distribution box was located six to twelve inches below grade, approximately twenty yards to the northwest of the memorial. It was not possible to determine if water was flowing into the distribution box (see drawing).


SITE PLAN
DRAIN OUTLETS
0' 5' 10' 20' 30'
NON-VERIFIED STORM DRAINAGE
VERIFIED STORM DRAINAGE



Tony Donald of the National Park Service and Nancy Rankin of John G. Waite Associates, Architects look for a site drainage structure to the northwest of the Memorial, as Binh Nguyen of the National Park Service directs water through the internal downspout at column 1. A series of water tests were conducted to determine how the Memorial's stormwater drainage system operated. [JGWA, 2005]



Water tests demonstrated that the downspouts in columns 7 and 10 drained directly to these catch basins located to the southeast and southwest of the Memorial, respectively. [JGWA, 2005]

PART 1

CULTURAL LANDSCAPE ASSESSMENT

This section of the report documents and describes the appearance and condition of the site and its landscape characteristics that comprise the cultural landscape surrounding the D.C. War Memorial. On June 30 and July 1, 2005, Elmore Design Collaborative, Inc., Historical Landscape Architects, visited the site with John G. Waite Associates Architects to assess and photographically document existing conditions. This site visit was conducted prior to the identification and delivery of detailed site maps that extended beyond the immediate limits east and west of the flagstone walkways represented on the map prepared for the HABS report. As a result, identification and verification of specific vegetation beyond the limits of this map was not possible. However, a detailed list of existing vegetation within the project area was established.

SPATIAL ORGANIZATION

The D.C. War Memorial is located in the southwest quadrant of Washington, D.C. in West Potomac Park, north of the Tidal Basin. The wooded site lies between Independence Avenue to the south and the service drive along the Reflecting Pool to the north. The horse stables for the United States Park Police (Horse Mounted Patrol Division) separate the Memorial from the Korean War Veterans Memorial further to the west. The site's context has evolved since its inception with the development of additional war memorials.

For purposes of this assessment, the site directly associated with the D.C. War Memorial, or core landscape, measures approximately 5.3 acres (378 feet deep and 600± feet wide), which is the area represented on the updated 1990 surveys.[1] In reality, the site extends west to the police stables and east to the public restrooms. The project area is wooded with trees ranging in size between 2" and 57" in diameter. Shrubs, herbaceous plants, and vines add to the setting. The vegetation has grown, matured, and changed over time. The site is organized around the Memorial with wooded areas to the east and west. The overall spatial organization has remained the same since inception.

Contributing features: The spacial organization of the memorial and the north and south walks, with the wooded areas to the east and west, is a contributing feature.

CIRCULATION

The only means of designated access is by foot from the sidewalk along Independence Avenue and from the service drive running south of the Reflecting Pool. The arrival sequence has not changed since its inception. No vehicular access or circulation is provided. However, service and maintenance vehicles do approach the Memorial by driving on the walks.

Pedestrian Access

Flagstone walks provide the designated pedestrian access into the site. Dirt trails have developed and provide access from the wooded areas to the east and west of the Memorial; these trails are unacceptable and visually intrusive.

Flagstone Walks

The flagstone walks are designed in a boulevard-type layout with two parallel walks separated by a central panel of turf. This design prevents a direct, axial approach to the Memorial. The walks are paved with cut, uniformly colored Pennsylvania flagstone laid in a random pattern, except where some repairs have been made. Individual stones vary in size from 5 ½" x 5 ½" to 33 ½" x 47 ½". Many stones are broken and colored concrete has been used in several locations to replace missing stones. Many of the joints are filled with concrete.

From the south, the exposed aggregate sidewalk along Independence Avenue intersects a flagstone "terrace" that enables visitors to stand and view the Memorial while providing sufficient room for others to pass. A continuous grass strip follows Independence Avenue between the north curb and the sidewalk and terrace. This terrace measures 52'-7" wide by 20'-10" and 21'-9" deep. The joints between the stones are even and filled with concrete. Roots from a large elm tree at the northeast corner are causing the pavement to shift and crack. From the terrace, visitors walk north along the flagstone walks, which measure between 7'-8 ½" wide and 7'-11" wide and 133' long. Weeds are infiltrating the concrete-filled joints between the stones, causing the joints to expand and the walks to deteriorate. Archival research indicates that the flagstones on the parallel walks are laid over a gravel base.[2]

A broad walk encircles the Memorial and provides access between the approach walks, to the marble stairs on the north and south sides, and around the Memorial. This walk consist of two walks: an outer loop that measures 21' wide and the inner loop that is approximately 8'-4" wide. The outer loop is paved with random rectangular stones set on a gravel base, while the inner loop has an ornate design with diamond, rectangular, and trapezoid shaped stones, all set on a concrete base. Previous repairs are evident because the pattern of cut stone varies. In July 1937, a map was created that shows the inner walk is concrete and the outer walk does not exist.[3] An August 1939 map graphically shows the inner walk with its intricate pattern of cut flagstone and an outer loop to be paved with 2" random flagstone and 2" wide joints filled with topsoil placed between the stones.[4] The layout remains the same, but the joints are now filled with concrete. Currently, a definite edge between the inner and outer loops of flagstone paving is seen. Weed infiltration exists throughout the outer loop with gravel base. Few to no weeds exist on the inner loop with its concrete base. Several areas of the older paving have heaved and are uneven with the adjacent paving.

Transitional paving between the straight approach walks and the circular walk include square corners adjacent to where the walks meet one another. The southwest and northeast corners were widened 3' to accept pedestal mounted interpretive waysides.

The walks leading north toward the service drive and the Reflecting Pool are the same design and style as their southern counterparts. These walks measure 8' wide and 134' long. Several previous repairs in this flagstone are noticeable because different sizes of stones were used. Hereto, concrete was used to in-fill several missing pieces of stone. The northern terminus of these walks is a narrow concrete pad that abuts the bituminous asphalt paving of the service drive; while drawings indicate that the northern terminus may have been designed in a similar manner to that of the southern terminus, there is currently no information available that confirms if this feature was ever constructed.

Contributing features: The alignment and location of all of the flagstone walks and southern terrace are contributing features. The material in the joints is non-contributing.

Wear Trails

Wear trails are unimproved pedestrian dirt paths that are created because the existing walks do not provide the desired route. Deterioration occurs when these trails become wider and more heavily used. The character and quality of the landscape diminishes as wear trails develop, which is a problem at the D.C. War Memorial.

Several wear trails exist that provide access through the plantings to and from the east and west and one major north/south trail west of the Memorial. The latter is a combination trail used by both pedestrians and vehicles. Two trails from the west approach the flagstone walks - one trail on the south approach walk and one on the north walk. The combination trail begins at the crosswalk on Independence Avenue, directly north of West Basin Drive, where a map and several directional signs help direct pedestrians in this area. Another trail provides a sweeping link between the Memorial and the restrooms to the northeast. All of the trails cut through the woods and detract from the Memorial's natural setting.

Contributing features: The wear trails are not contributing features.

TOPOGRAPHY

The topography around the Memorial is relatively level, with the area to the north being slightly higher than the area to its south. Visual and graphic evidence indicates that the Memorial sits at elevation 12.55 and is slightly higher than the surrounding terrain. The elevation at the top of the curb along Independence Avenue varies between 10.02 and 10.28, and finished grades at the service drive to the north are approximately 12.5 feet in elevation. The southern walks slope to the south and their panel of turf is crowned in the middle and slopes east and west. The northern walk and panel of turf have a low area about three-quarters of the way to the service drive. This depression is visible in both the lawn and the eastern walk, which is raised slightly above grade to maintain accessibility. The walk on either side of the depression has been rebuilt, with the eastern side on a concrete base and the western side with smaller stones set in a similar, but not the same, pattern.

The topography in the woods east and west of the Memorial is generally level. Most areas have positive overland flow but not all. These areas seem to permit water to pond if sufficient rain falls.

Contributing features: The topography is a contributing feature.

LAND USE PATTERNS

Existing land use patterns are consistent with the originally intended land use patterns, with the exception that concerts are no longer performed here. The Memorial and flagstone walks survive in tact, albeit in a deteriorated condition. This axis or corridor is the main physical and visual link to the Memorial. The wooded grove with its tall trees and high canopy to the east and west also survive and provide the desired shade that was originally intended. Tall shrubs and small ornamental trees along the walks and roads restrict views and limit pedestrian access between the woods and the Memorial.

This site originally was intended as a memorial and outdoor concert facility for the United States Marine Band. Plantings of shrubs have removed the seating area around the Memorial, and it is no longer used as a bandstand.

Today, much larger and grandiose memorials located on The Mall dwarf the D.C. War Memorial. This site has become a pass through space between Independence Avenue and the service drive along the Reflecting Pool. Pedestrians walking along Independence Avenue and the service drive may pause momentarily to inquire about the marble monument, but they do not stay long. Other visitors walk along wear trails to expedite their route between desired locations, such as to and from the public restrooms and West Basin Drive. Nonetheless, the wooded areas to the east and west provide a shady respite that is directly counter to the open and sunny axis created as part of the original design.

Contributing features: The existing land use patterns are contributing features. The former use as a bandstand should be restored.

VIEWS AND VISTAS

On September 17, 1931, Architect Frederick H. Brooke wrote to William A. Delano and said, "We all want to make a grove about the Memorial which shall be entirely informal but since this is a public monument, we are convinced that it must be clearly seen from the adjacent roadways and easily approached by perhaps sizable crowds."[5] In the early planning stages, much discussion and numerous letters, some of which were politely heated, discussed and argued for an appropriate setting for the Memorial. Some people argued to construct the Memorial in a wooded setting, while others argued for an open vista with woods on both sides. In the end, trees were removed between Independence Avenue and the service road to create a formal axis and to open up views to and from the Memorial along the 19th Street axis. It was decided that trees on both sides of the approach walks would reinforce and frame the views and vistas and that the trees adjacent to the Memorial would be intermittently planted with new trees to provide more shade for concert audiences. Unimpeded and restrictive views and vistas exist. Open north/south views are found along the axis between the Memorial and the roads to the north and south. Restrictive views and vistas exist within the wooded areas to the east and west because of tree trunks and the mature hollies and tall azaleas on either side of the flagstone walks.

Contributing features: The open north/south views and vistas are contributing features. The restricted views within the wooded areas are contributing, although the restrictions exceed the designer's original intent.

VEGETATION

While the Memorial is the visually enticing feature on the site, the vegetation plays an aesthetic and utilitarian role. Much discussion took place during the development of the original landscape plan for maintaining or removing existing trees to provide north and south views to and from the Memorial. In the end, trees were removed to accommodate the walks and views to the north and south. Archival research suggests that the woods to the east and west were to remain and to provide shade for audiences listening to open air band concerts in the Memorial. The wooded area also provided partial views to and from the Memorial. Today, the project area remains wooded except for the north/south axis with the Memorial and the boulevard-type walks and panels of lawn. The trees to the east and west provide shade and intermittent views to and from the Memorial.

During the site visit, a running list of existing plant material was created and includes trees, shrubs, herbaceous, and vines. See Appendix E for the complete list of identified plant material. Unfortunately, no map of the project area existed at the time of our visit that specifically identified and verified all of the existing vegetation. However, the trees and shrubs illustrated on the HABS drawing were verified and identified.

Historic Trees

A 1937 survey map documented the existing vegetation in the area immediately around the Memorial. Individual trees and their sizes were noted. This map was compared to the HABS map and the "Existing Conditions Survey" that was updated in December 1990.[6] These maps show the existing trees and the 1990 map documents the names and size of each tree. It appears that 38 trees in the area documented by all three maps existed in 1937 and include Ailanthus, beech, elm, holly, oak, and Sweet Gum. See map entitled "Vegetation Assessment – Historic Trees, [L-1]" for the location of each historic tree.

Contributing features: The historic trees are contributing features.

Trees

The existing deciduous and evergreen trees identified include Ailanthus, beech, birch, dogwood, elm, holly, locust, maple, mulberry, oak, pine, Eastern Redbud, and Sweet Gum. This list differs a bit from the trees documented on the earlier maps. See map entitled "Vegetation Assessment – Existing Trees, [L-2]" for the location of each species as they existed in 1990 and along the axis as it existed during our site visit. Common problems were observed and include girdling roots, exposed roots, mechanical damage, and vandalism. Several of the larger trees are cabled to prevent storm damage and to retain their shape and large limbs. Newly planted trees include the Flowering Dogwoods along the walks to the Memorial, beech trees to the south of the stables, and several species planted throughout the project area to maintain and fill in the woods. Tree removal has been done, though for unknown reasons. A large diameter stump exists to the west of the Memorial. For the most part, the woods are open and have little underbrush.

The layout and placement of the existing trees was assessed and no definitive pattern was discovered. Rather, it appears that a random pattern and placement exists, which is consistent with the designer's original intentions. In 1931, all of the underbrush, which consisted mostly of dogwoods, was to be removed; later, in 1939, the Public Works Admininstration authorized planting dogwoods in the vicinity of the memorial.[7] A still later planting of dogwoods in a formal alignment along the walks still exists; and azaleas exist in several locations. This formal planting of dogwoods and use of azaleas differs from the designer's original intentions.

Contributing features: The mature trees are contributing features. The recently planted trees in random locations are non-contributing, but in keeping with the original intent. The formal arrangement of dogwoods along the walks and the planting of azaleas is non-contributing.

Existing Shrubs

The inventoried shrubs located along the flagstone walks, Independence Avenue and in clusters beneath the tree canopy include azalea, Bottlebrush Buckeye, privet, Mockorange, and Cherry Laurel. This list varies a bit from the shrubs documented on earlier maps, which also included privet and Mahonia. See map entitled "Vegetation Assessment – Existing Shrub, [L-3]" for the location of each species as they existed in 1990. Most of the azaleas along the flagstone walks are several years old and many are in a declined state of condition owing to deferred maintenance, soil compaction, and increased shade from the overhanging tree canopy. It is reported that Lady Bird Johnson had these azaleas planted. However, no archival references have been found to confirm this oral history. Other groupings of azaleas with red and white flowers are located along Independence Avenue. These appear to be in better health owing in part to solar access and limited soil compaction caused by pedestrians. Archival research located a Planting Plan, dated March 1987, that includes 3,165 azaleas to be planted.[8] Unfortunately, it is unclear how much or if any of this plan was implemented. Clusters of Bottlebrush Buckeye exist today and seem to thrive in the shade and were in flower during our visit.

Contributing features: There is insufficient information to determine if the existing shrubs are contributing features.

Existing Herbaceous

A variety of herbaceous plantings exist, of which most are weeds and volunteer introductions. However, many of these plants produce flowers that add seasonal interest and variety. None of these plants are identified in archival documentation. See Appendix E for the complete list of identified plant material.

Contributing features: There is insufficient information to determine if the existing herbaceous plantings are contributing features.

Vines

Eight different vines exist including Virginia Creeper, Trumpet Vine, Bittersweet, and Poison Ivy. All of these plants are healthy and appear to be volunteer species. None of these plants are identified in archival documentation. See Appendix E for the complete list of identified plant material.

Contributing features: There is insufficient information to determine if the vines are contributing features.

Invasive Species

Several invasive species listed on the National Park Service's web site were identified. All of these plants have prolific spreading and reproduction capabilities. These plants typically dominate their location and crowd out more desirable species. Ailanthus is documented on the historic maps and did exist when the Memorial was built. None of the invasive perennials or vines is listed on the historic maps.

Contributing features: The Ailanthus is a contributing feature, but invasive. There is insufficient information to determine if the other invasive species are contributing.

BUILDINGS AND STRUCTURES

While the Memorial is the main building on this site, two other buildings exist on or adjacent to this site including the public restrooms and the horse stables for the United States Park Police (Horse Mounted Patrol Division). The restrooms are a modern building with public facilities. It sits along the south side of the service drive, northeast of the Memorial. It is one story high, tucked under existing trees, is ADA and universally accessible, and has benches and drinking fountains for additional visitor facilities. The horse stables, on the other hand, are not open to the public and are surrounded with a perimeter fence. Several buildings, paddocks, and parking areas comprise this facility. A planted buffer of White Pine trees stands immediately east of the fence. As White Pine trees mature they lose their lower branches, which is happening to these trees. As a result, their screening capability is weakening. Vehicular access is provided from the service drive. Security gates with signs deter public access.

Contributing features: The DC War Memorial is a contributing feature. The restrooms and stables are non-contributing features to this site.

SMALL-SCALE FEATURES

Small-scale features located about the site include drinking fountains, signs, a commemorative plaque, a small square marker, benches, trash receptacles, underground utilities, and above ground electrical transformers.

Drinking Fountains

A public drinking fountain exists along the exposed aggregate walkway adjacent to Independence Avenue and east of the flagstone walk. According to the 1937 survey, two water fountains existed - one to the north and south of the approach walks near Independence Avenue and the service drive. The existing fountain to the south appears to be in the same location as its predecessor. Archival research has not documented when the early fountains were installed, removed, and when the present southern fountain was installed.

Contributing features: The drinking fountain is non-contributing, but consistent with the original intent.

Signs

Several types of signs exist including interpretive, caution, directional, and a map. Two pedestal-mounted interpretive signs are located at the southwest and northeast corners of the circular walk. The flagstone walks were widened 3' to accommodate these signs, which are recent additions to the landscape. One pole mounted caution sign is located adjacent to the service drive. This sign warns pedestrians that U.S. Park Police and maintenance vehicles use the service road. The directional signs and map are located southwest of the Memorial, directly across Independence Avenue from the West Basin Drive. A crosswalk is located here, as well as a wear trail through the west grounds of the Memorial site. The directional signs have a brown background with white letters and a white boarder. The map is mounted within a pressure treated wood frame that extends into the ground.

Contributing features: The signs are non-contributing, but are an expected part of historic/memorial sites today.

Commemorative Plaque

The 1990 updated survey indicates that a single commemorative plaque existed to the northeast of the Memorial. This plaque was not seen during our site visit. The Planting Plan, dated March 1987, indicates that this commemorative plaque was installed on May 19, 1968, the 50th anniversary of the American Legion.[9]

A small square marker was found beneath the trees to the southeast of the Memorial. This marker, whose purpose is unknown, measures 5" square and retains a small potion of its plaque. This marker and plaque appear similar to other markers used elsewhere in the city at the base of trees to memorialize World War I veterans.

Contributing features: The plaque, if it still existed, would be non-contributing. There is insufficient information to determine if the marker is a contributing feature.

Site Furniture

A 1939 photograph documents the use of movable benches, known as the "Washington Bench," during an evening concert (Fig. 19). None of these wood benches remain.

Two trash receptacles are located at the public restrooms. The receptacles are simple, topless, and have ornamental ribs around their circumference.

Contributing features: The trash receptacles are not contributing features.

Utilities

The existing on-site utilities include above and below ground services. The above ground utilities include electrical transformers, junction boxes along the service drive to the east and west of the Memorial, and hose bids. The below ground services, according to the 1990 survey, include a small network of potable water lines connecting to the drinking fountains, drainage structures, and drainage pipes for stormwater management. The drainage lines were installed to carry roof runoff away from the Memorial in the northeast and southwest directions. The 1937 survey documents three power poles with overhead wires, one electric manhole, one new manhole (purpose unknown), one telephone manhole, water valves but no pipes, and "Mueller's" in various locations. In September 1938, the original hose sprinklers (hose bibs) were installed.[10]

The electrical panel boxes to the northwest of the memorial, along the mall pathway, were not secured and locked at the time of this survey.

Contributing features: There is insufficient information to determine if the utilities are contributing features.

GENERAL

Based on the "Classified Structures user's Guide Condition Definitions," the landscape of the DC War Memorial is in fair condition. Problem issues in the landscape, such as the introduction of the formal dogwood plantings, the azalea bushes, and the lack of maintenance, are relatively easy to address. The changes required to bring the landscape to a good condition, and to a condition that will support the use of the Memorial as a bandstand, are subtractive.

NOTES

1. Maps entitled "Existing Conditions Survey" prepared by Dewberry and Davis, 8401 Arlington Boulevard, Fairfax, VA 22031, for the United States Department of the Interior, National Park Service – National Capital Region, Office of Design Services, Project Title – Ashwoods, located within the National Capital Park Central, updated December 1990, Drawing Number 801, 80953, Sheet 22A of 23 and Drawing Number 801, 83067, Sheet 23A of 37.

2. See map entitled "Construction Details – Proposed Rehabilitation of D.C. War Memorial" prepared by the United States Department of the Interior, National Park Service, Branch of Planning, National Capital Parks Office, Drawing Number N.C.P. 3027, Sheet 2 of 2, dated August 29, 1939, drawn by D.L.K. – C.Z.P.

3. This map is entitled "D.C. War Memorial", scale 1"=20', used datum, dated July 31, 1937. This map is numbered 65.45-26.

4. This map is entitled "Construction Details – Proposed Rehabilitation of D.C. War Memorial," by the United States Department of the Interior, National Park Service, Branch of Planning, prepared by National Capital Parks Office, and drawn by D.L.K. – C.Z.D., dated August 29, 1939.

5. Letter: Frederick H. Brooke to William A. Delano, September 18, 1931, National Archives, Record Group 79, Records of the National Park Service, Subject Files 1924-51, 1430, Box 35, File 1430/D.C. Memorial, May 27, 1927, to Aug. 31, 1939.

6. Maps entitled "Existing Conditions Survey" prepared by Dewberry and Davis, 8401 Arlington Boulevard, Fairfax, VA 22031, for the United States Department of the Interior, National Park Service – National Capital Region, Office of Design Services, Project Title – Ashwoods, located within the National Capital Park Central, updated December 1990, Drawing Number 801, 80953, Sheet 22A of 23 and Drawing Number 801, 83067, Sheet 23A of 37.

7. Letter: U.S. Grant III to Major General B. F. Cheatham, June 10, 1931, National Archives, Record Group 79, Records of the National Park Service, Subject Files 1924-51, 1430, Box 35, File 1430/D.C. Memorial, May 27, 1927, to Aug. 31, 1939. E. K. Burlew, First Assistant Secretary and Budget Officer, Department of the Interior, to Arno B. Cammerer, Director, National Park Service, July 13, 1939. RG 79, Records of the National Park Service, National Capital Region Subject Files, 1924–1931, Box 35, File 1430/D.C. Memorial, May 27, 1927 to August 31, 1939, NA-CP.

8. Map entitled "Planting Plan, Ash Woods Azalea Planting," prepared for the United States Department of the Interior, National Park Service, National Capital Region, Office of Design Services, prepared by Roise, drawn by Neal, Drawing Number 801-80912, dated March 1987, Sheet 1 of 1.

9. Map entitled "Planting Plan, Ash Woods Azalea Planting," prepared for the United States Department of the Interior, National Park Service, National Capital Region, Office of Design Services, prepared by Roise, drawn by Neal, Drawing Number 801-80912, dated March 1987, Sheet 1 of 1.

10. Letter: Secretary of the Interior to Frank B. Noyes, June 30, 1939, National Archives, Record Group 79, Records of the National Park Service, Subject Files 1924-51, 1430, Box 35, File 1430/D.C. Memorial, May 27, 1927 to Aug. 31, 1939.

PART 1

CULTURAL LANDSCAPE REPORT

ANALYSIS OF INTEGRITY

Integrity evaluates the authenticity of a property's historic identity and the degree to which the existing physical characteristics of the property evokes its appearance during its selected period of significance. Integrity measures the extant characteristics against its historical characteristics and how they relate to significance. Essentially, a landscape with integrity must retain sufficient portions of its character-defining features.

The *National Register of Historic Places* identifies seven aspects or qualities of integrity, which include:

- *Historic location*: the boundaries of the site during the period of significance;
- *Design*: the visual pattern/composition of features that distinguish the property during its period of significance;
- *Setting*: the relationship between the landscape and the other features or elements that comprised its historic boundaries;
- *Materials*: the natural or man-made features from which the landscape's individual features are made;
- *Workmanship*: the standard applied to the built features of the landscape and the appropriateness of repairs undertaken since its period of significance;
- *Feeling*: the impression produced by the viewer and the cumulative effect of the above five aspects to create a sense of past place and time; and
- *Association*: the degree to which the landscape remains closely connected to its history as a means of function.

While not all aspects may be present in an historic landscape, they all must be considered to determine if the landscape retains enough of its historical features to convey the appearance of its selected period of significance.

Historic Location

The historic location survives intact, though contextual changes have slowly been encroaching. Nonetheless, the historic core landscape and its immediate surrounding landscape maintain a high degree of its integrity of location.

Design

The overall design has not changed. Flagstone paving was added over concrete and gravel walks and minor additions were made to accommodate interpretive signs. Dogwood trees and many azaleas were added and volunteer vegetation was permitted to grow, all of which changed the appearance of the landscape. Despite these changes, the essence of the original landscape survives. The essential physical features of the design remain discernible and the spatial organization of these features does support the site's historic integrity.

Setting

The Memorial was set on a north/south axis within a wooded landscape that extends east and west. Today, the axis and adjacent wooded landscape survives. Spatial arrangement of the mature and recently planted trees within the woods is informal and consistent with the original setting. However, a formal arrangement of dogwoods along both sides of the axis and the planting of azaleas about the Memorial are incompatible with the original design and setting. These incompatible plantings, along with volunteer vegetation, can be removed, thus restoring the integrity of setting. Another result of such removals includes the restoration of viewsheds and casual pedestrian circulation between the Memorial and its adjacent wooded areas.

Materials

The flagstone walks with concrete and gravel bases are historic and have high integrity. However, they are in poor condition. These walks can be restored using the same paving material, though the base and sub-base materials should be improved structurally to support the weight of vehicles.

Workmanship

The workmanship to construct the Memorial's landscape was basic and straightforward. Unfortunately, the workmanship, some materials (concrete used as in-fill), and the level of care used to repair and restore the walks did not match the original. All of these changes are reversible.

Feeling

The feelings produced by the Memorial were, are, and always will be inspiring. The present feeling of the historic core landscape does not support the landscape's historic integrity because of the dogwoods and azaleas that were planted and the volunteer vegetation that has been permitted to grow. The "feeling" in this landscape can be restored by removing the formally planted dogwoods, azaleas, and volunteer vegetation, and by implementing an appropriate maintenance program on the mature trees.

Association

This Memorial was built as a monument to D.C. residents that died in WWI and as a bandstand with the audience sitting under the mature trees. It maintains a high degree of association as a memorial, but a low degree of association as a bandstand for its lack of recent use in this capacity. Also, the woods immediately surrounding the bandstand largely are inaccessible because of the azaleas, dogwoods, and volunteer vegetation.

Summary Statement of Integrity

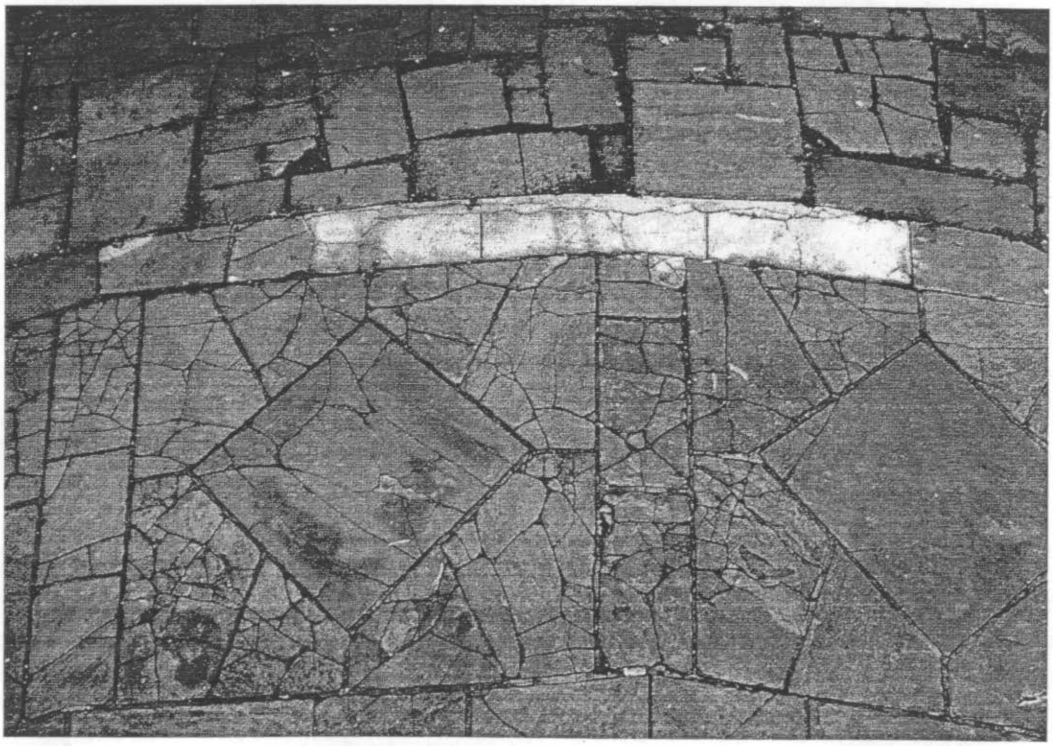
This historic landscape maintains a high degree of integrity. Through removals and maintenance, the original design intent can be re-established. Upon restoration and the implementation of an appropriate maintenance program, this landscape will once again invite and impress visitors.

PART 1

CULTURAL LANDSCAPE ASSESSMENT

PHOTOGRAPHS

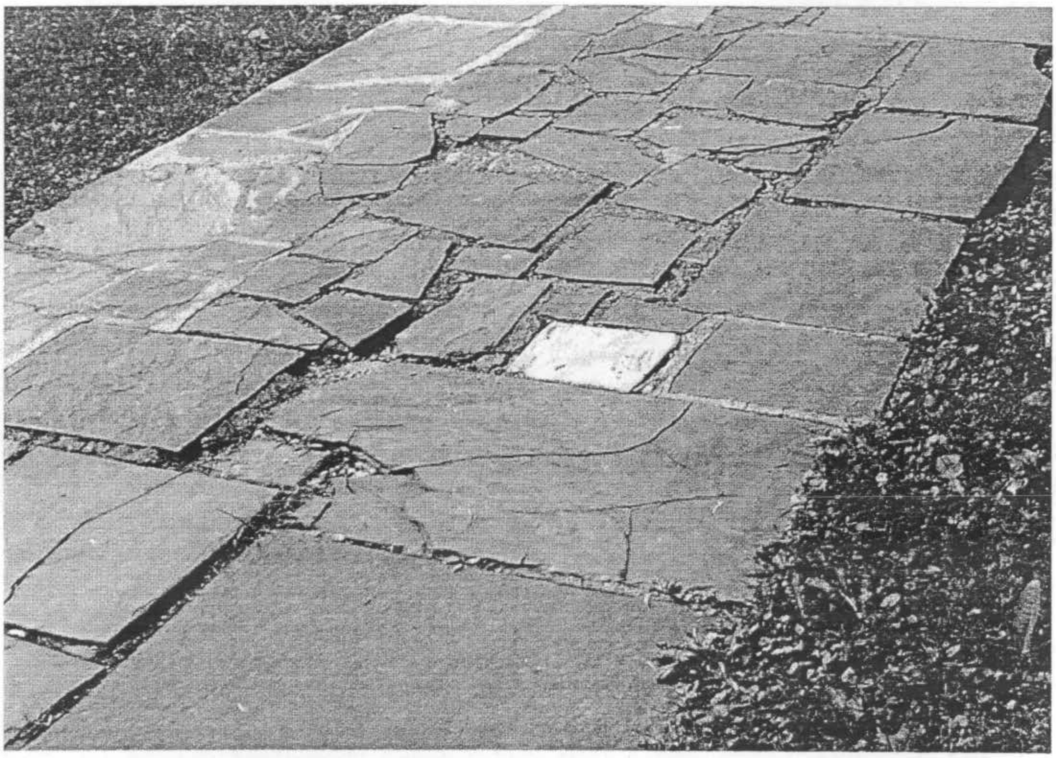
The outer walk with gravel base has weed infiltration, while the inner walk on concrete does not. [EDC, 2005]



The inner walk has an ornate pattern, while the outer walk is paved with random-cut flagstones.. Note the broken stones due to vehicular traffic. [EDC, 2005]

Looking south at the flagstone walks from the Memorial. [EDC, 2005]

Looking north at the flagstone walks from the Memorial. [EDC, 2005]



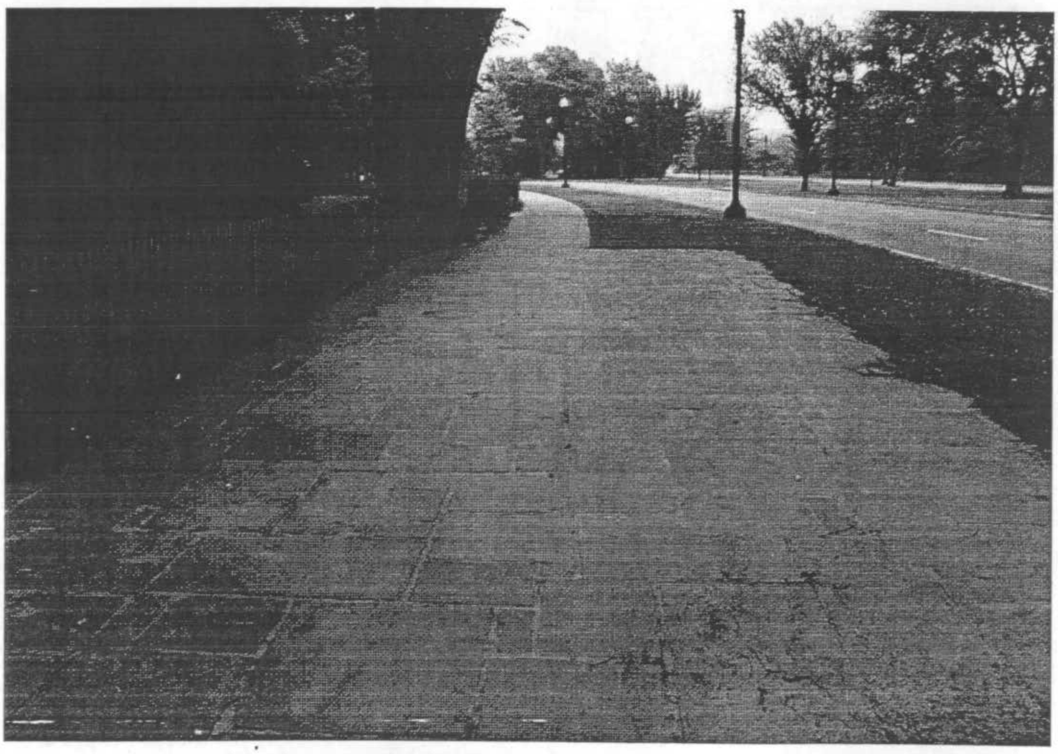
Concrete has been used to fill in missing flagstones. [EDC, 2005]

This walk was relaid with small flagstones in a slightly different pattern than original. [EDC, 2005]

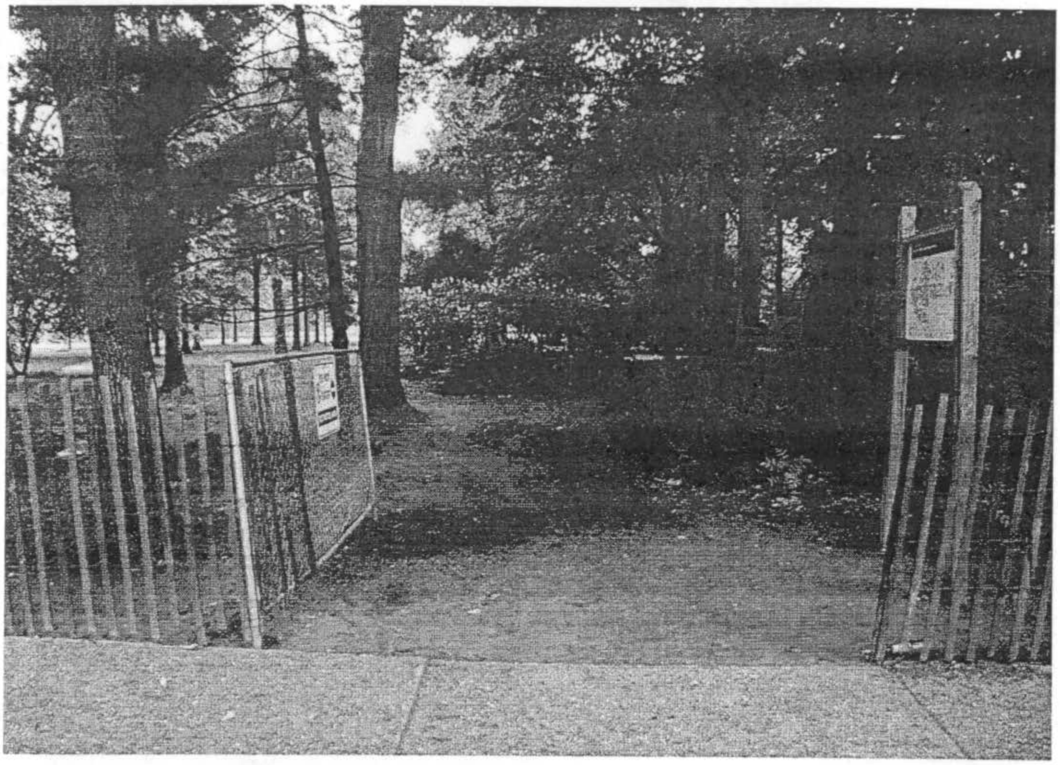
Weed infiltration along the flagstone walks. [EDC, 2005]

The roots of this large elm tree are starting to damage the flagstone walk. [EDC, 2005]

Exposed aggregate walk along Independence Avenue. [EDC, 2005]



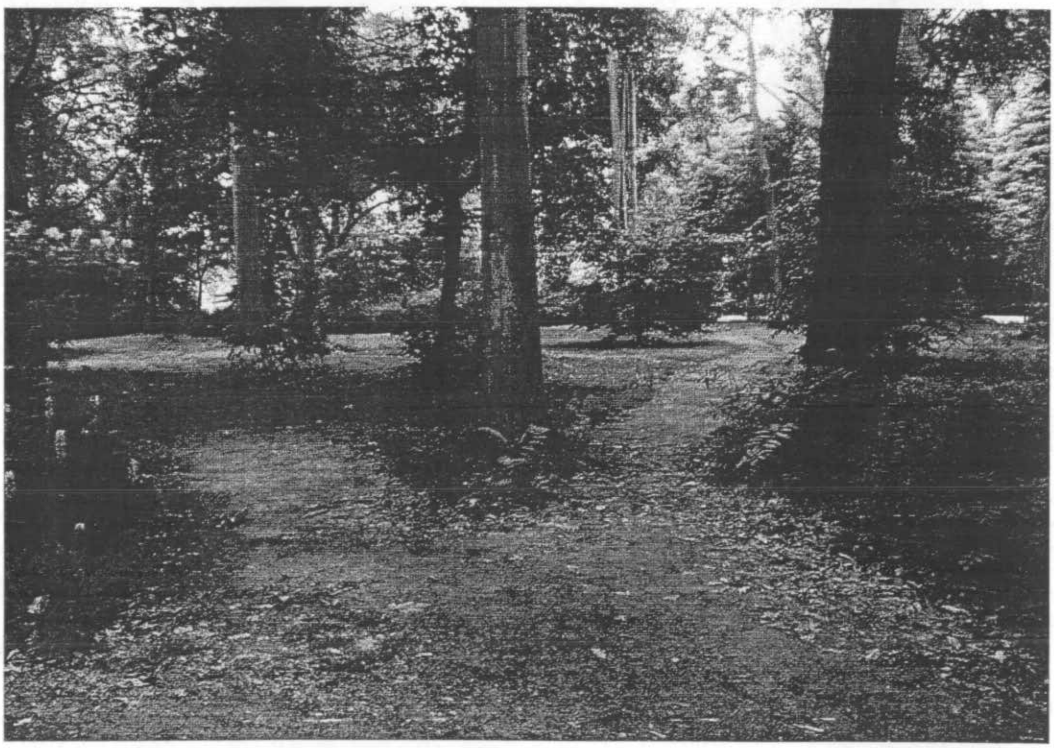
Flagstone terrace along Independence Avenue. [EDC, 2005]



A major wear trail begins at the crosswalk along Independence Avenue and north of West Basin Drive. [EDC, 2005]

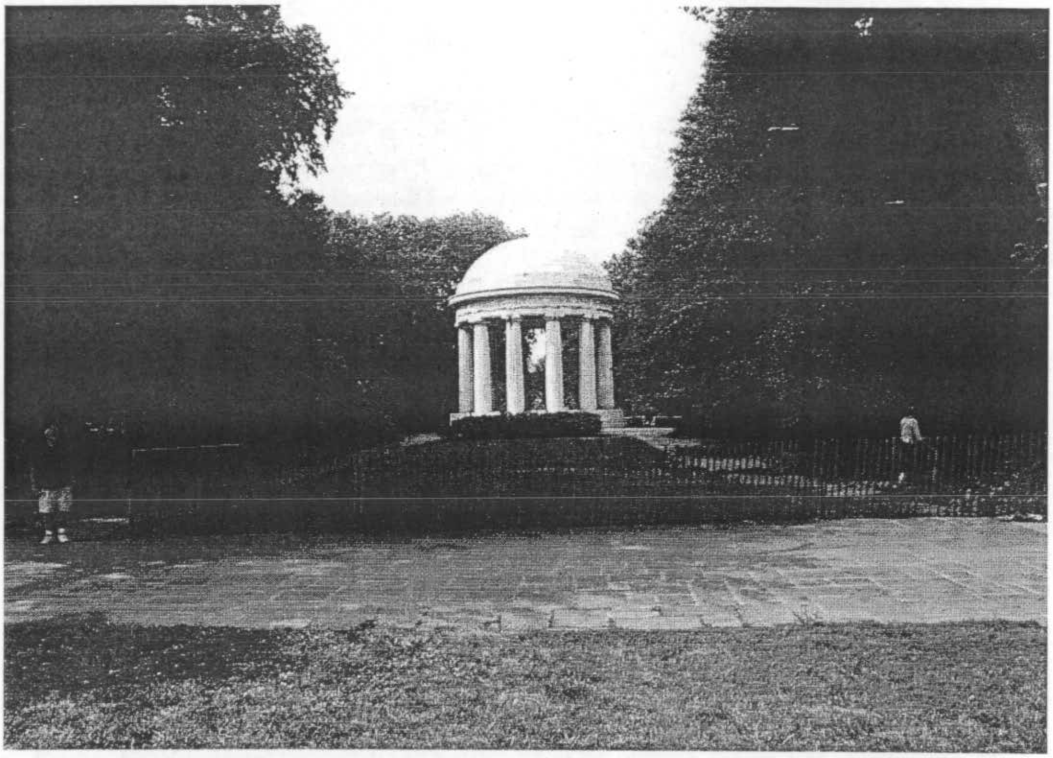
Wear trail between the Memorial and the public restrooms. [EDC, 2005]

West trail connecting the flagstone walk with the woods to the west. [EDC, 2005]



This wear trail, in the west woods, divides and goes in two directions. [EDC, 2005]

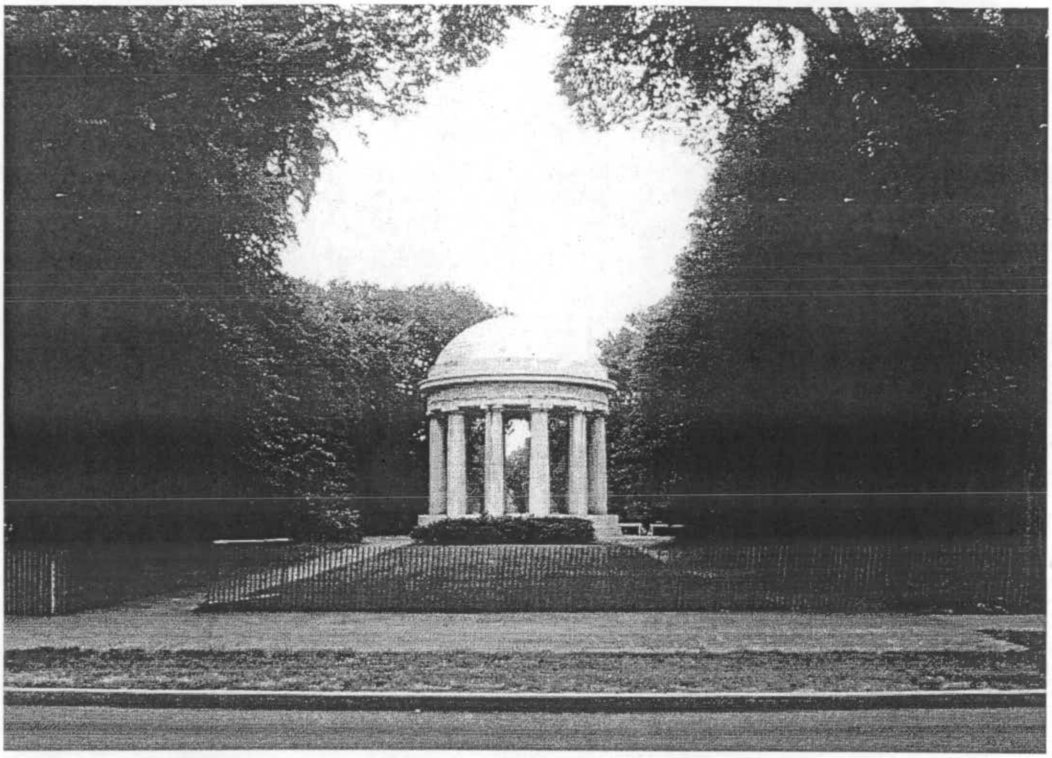
Wear trail leading to the public restrooms. [EDC, 2005]



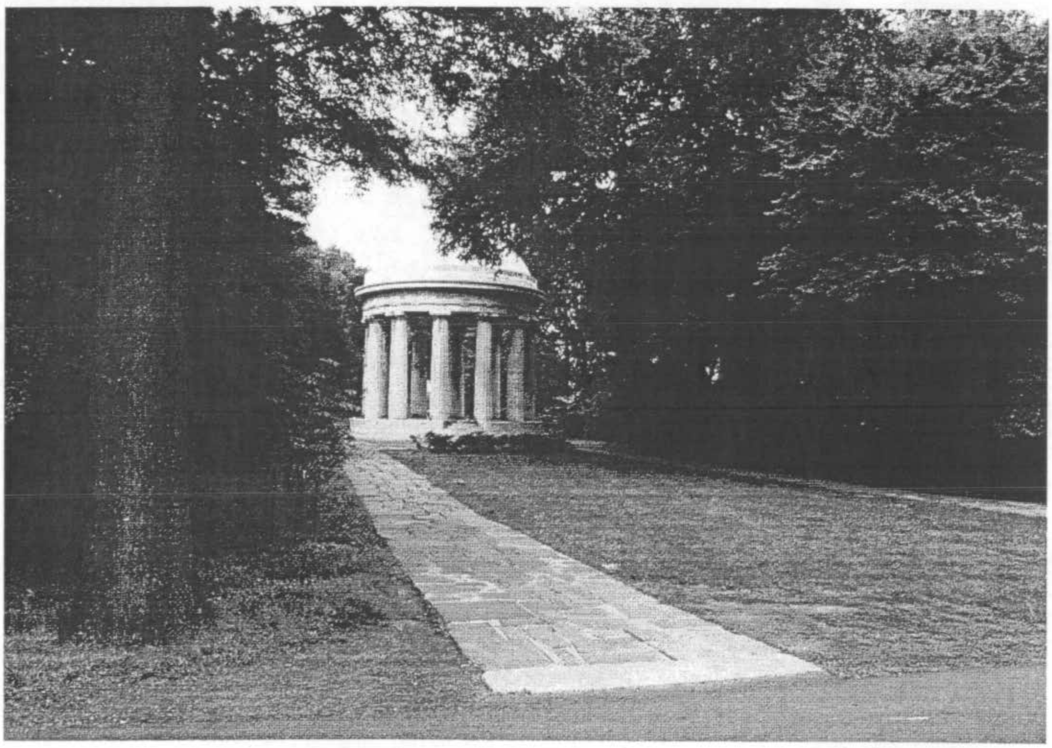
Topography across the site is relatively level. [EDC, 2005]

Topography in the wooded areas is relatively level. [EDC, 2005]

Extisting land use patterns are historically consistent with an open north/south axis and woods to the east and west. [EDC, 2005]

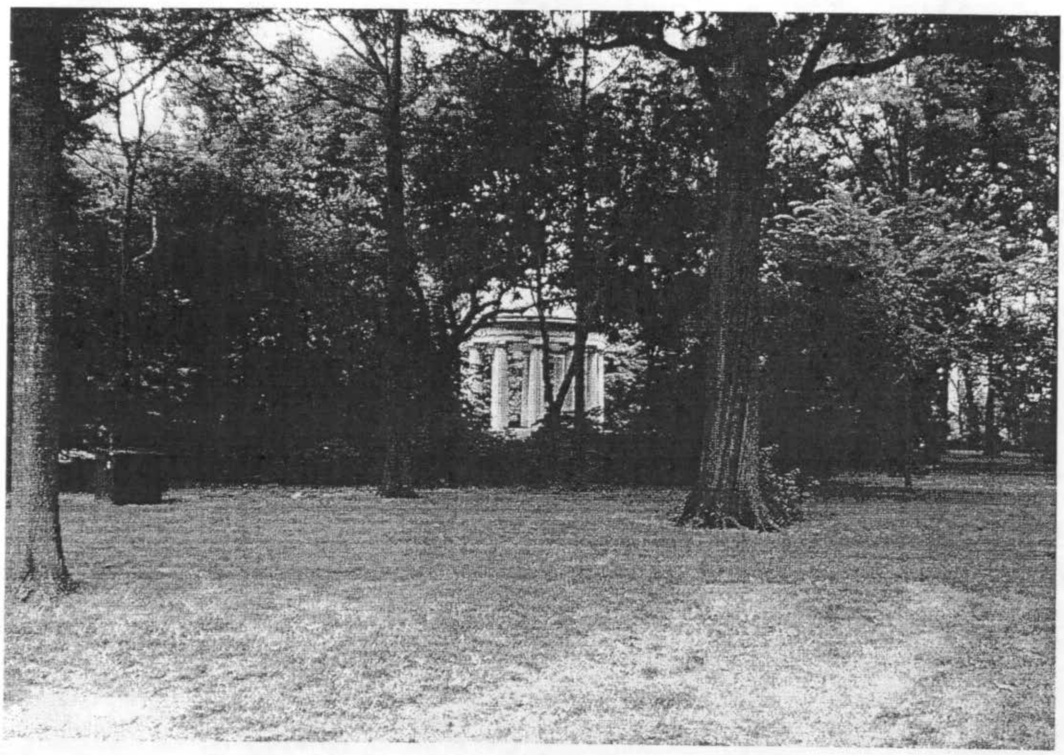


Open view of the Memorial from Independence Avenue. [EDC, 2005]



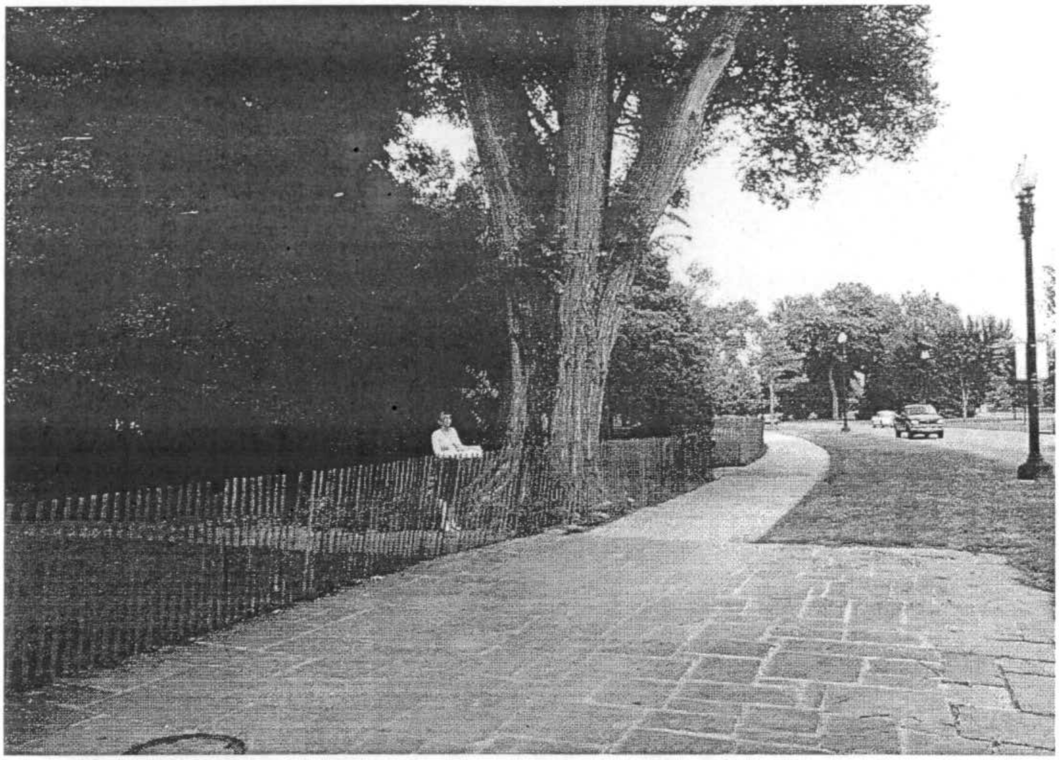
Open view of the Memorial from the service drive. [EDC, 2005]

Azaleas and low tree branches restrict views to the Memorial from the woods. [EDC, 2005]



Hollies, azaleas, and low tree branches restrict views to the Memorial from the woods. [EDC, 2005]

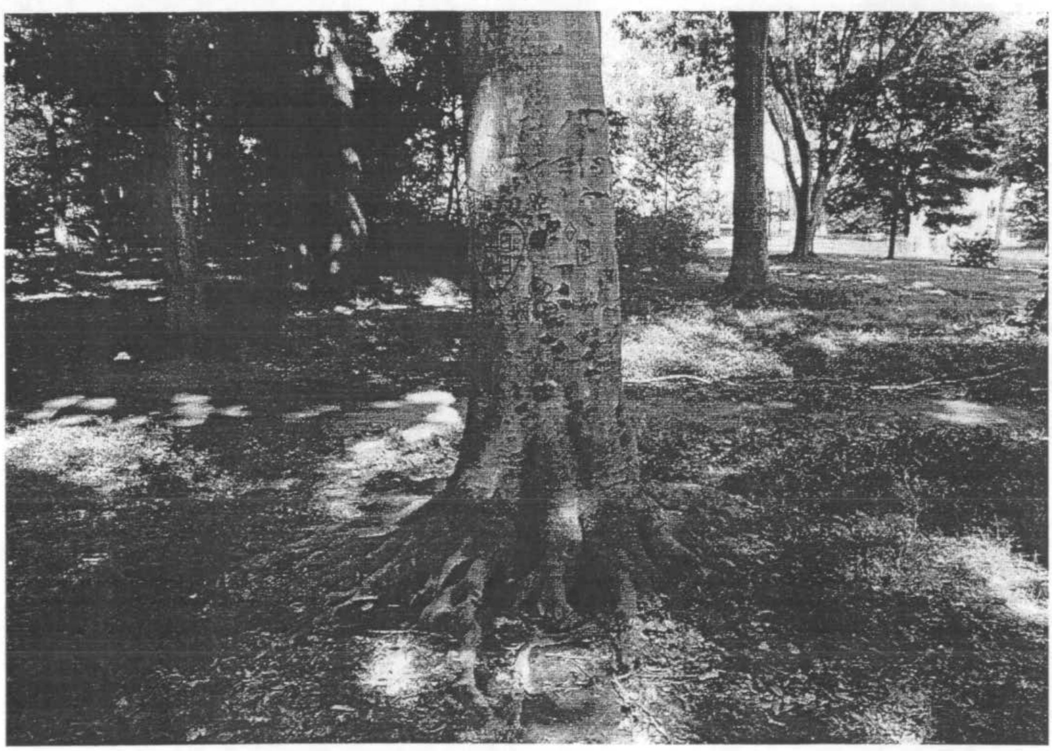
Typical view within most of the wooded area. [EDC, 2005]



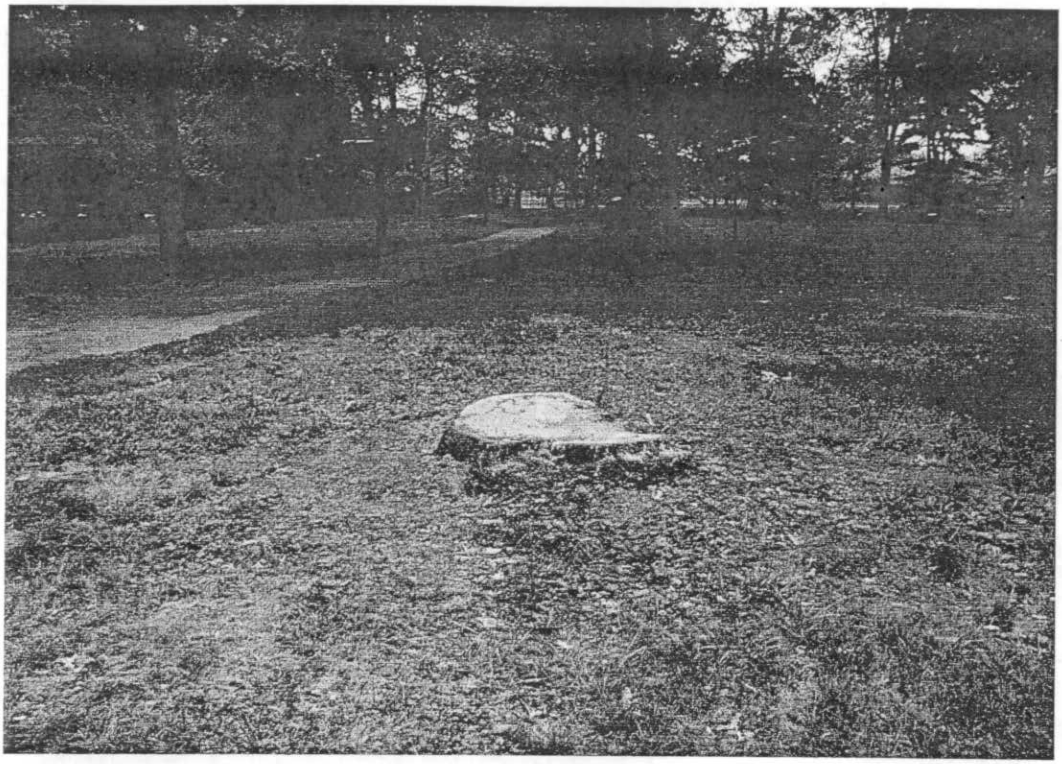
57" historic elm tree near Independence Avenue. [EDC, 2005]

White pine screen to the east of the stables. [EDC, 2005]

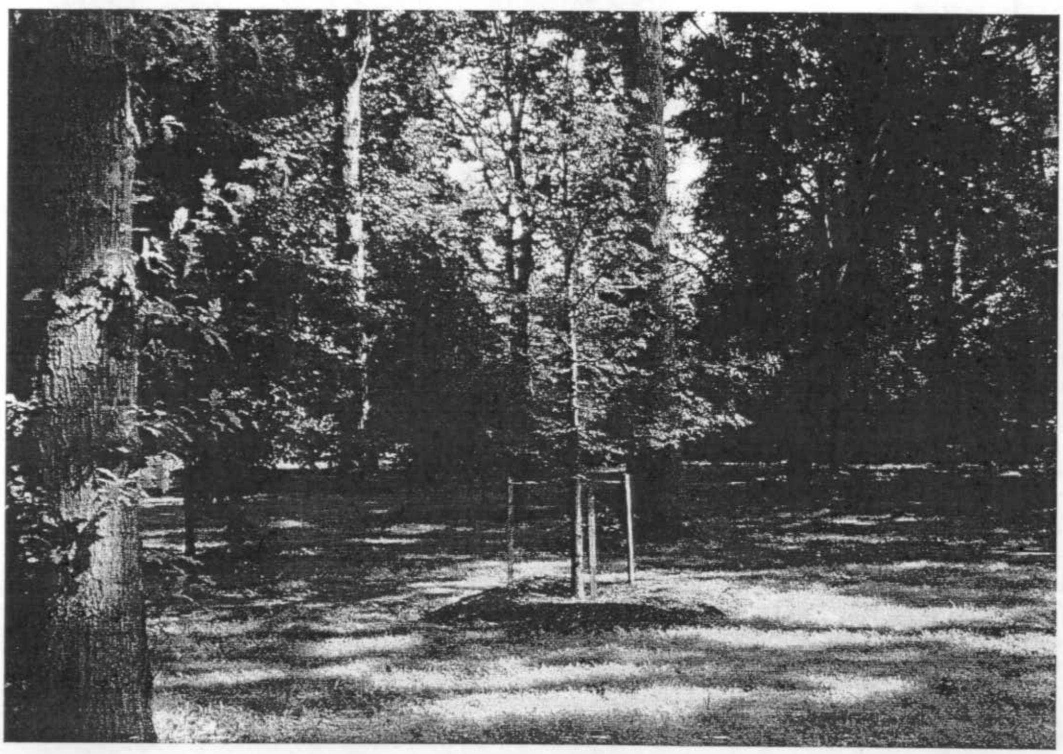
Mechanical damage to some trees does exist. [EDC, 2005]



Vandals have carved graffiti into the beech trees. [EDC, 2005]



This large stump indicates that some trees are being removed as needed. [EDC, 2005]

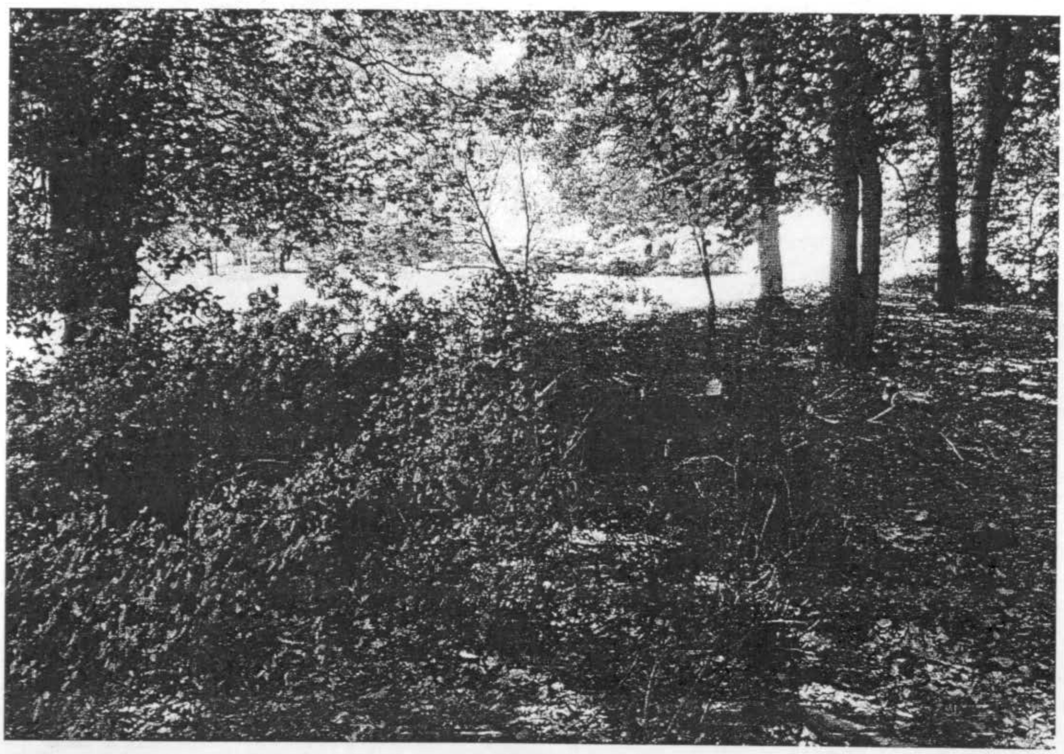


New trees are being planted in random patterns. [EDC, 2005]

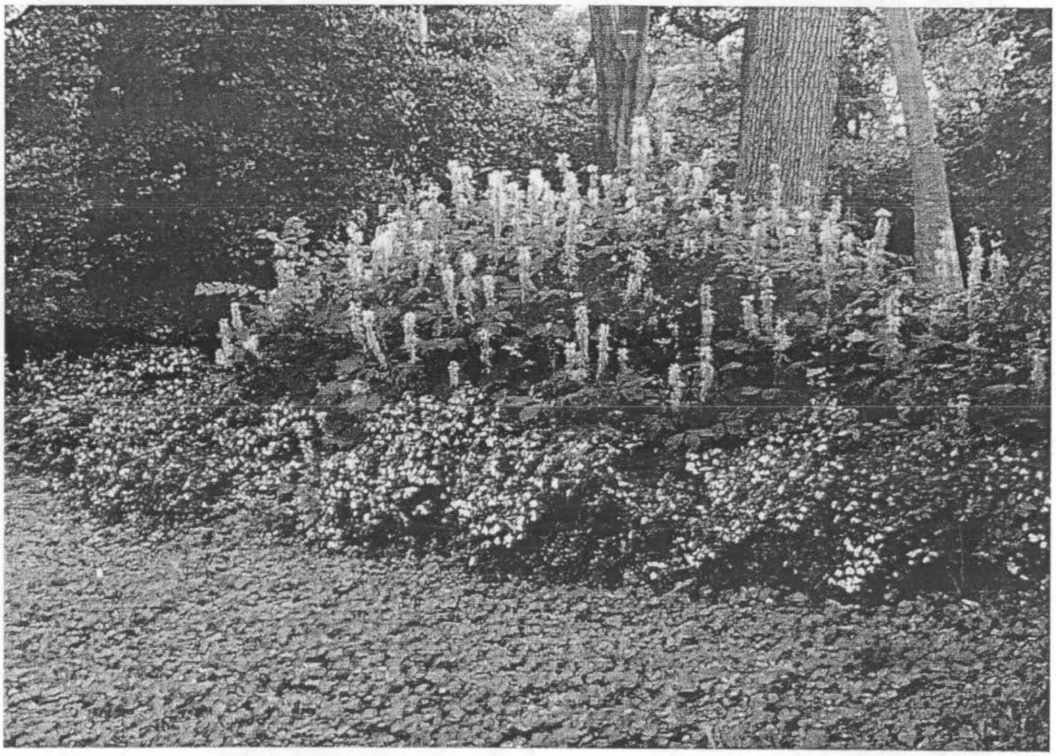
Flowering dogwoods are planted in a formal display along the flagstone walks. [EDC, 2005]

Hollies overhang the flagstone walks south of the Memorial. [EDC, 2005]

Azaleas located north of the Memorial are in poor condition. [EDC, 2005]

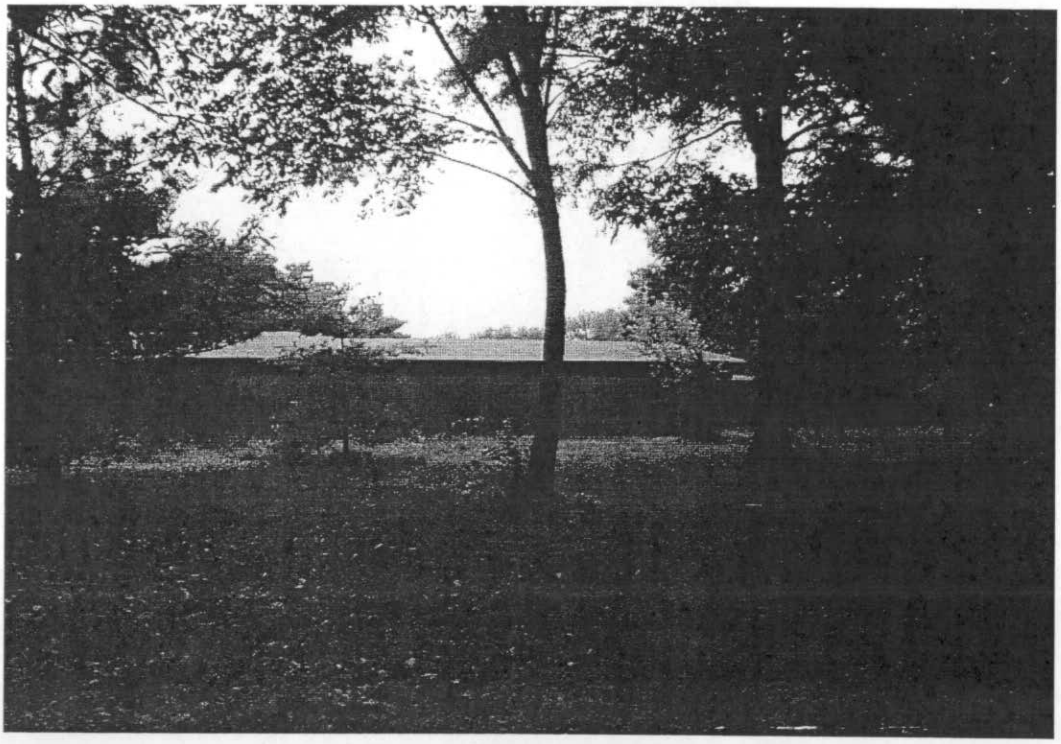


The azaleas are shaded by the trees above and are in poor to fair condition. [EDC, 2005]



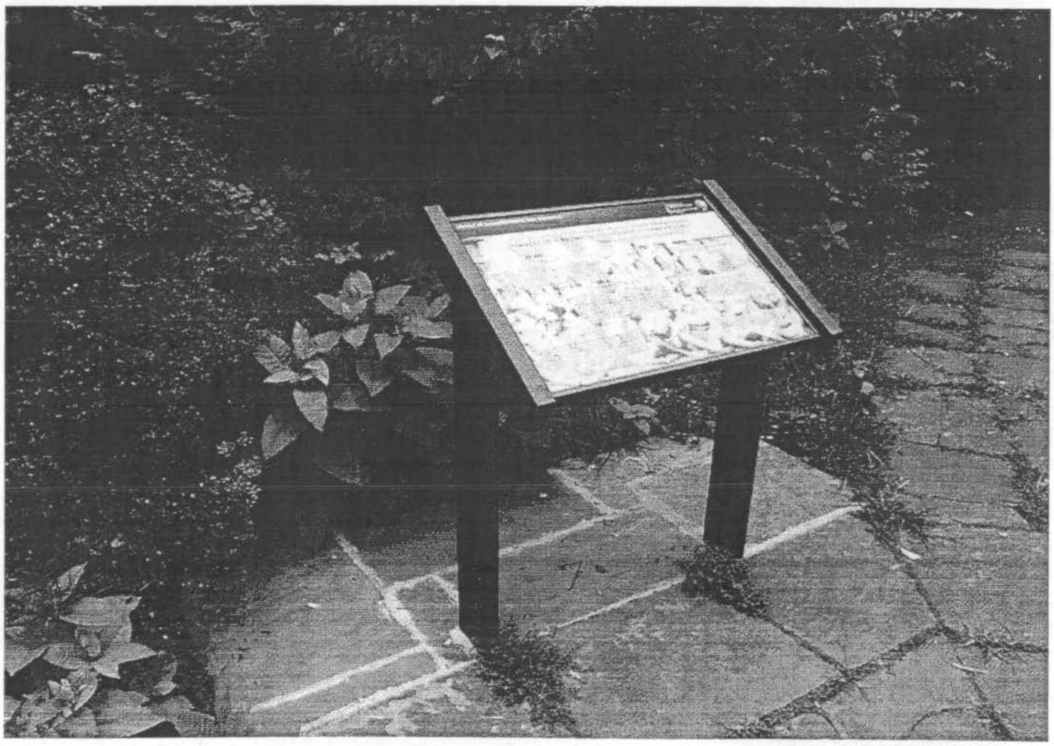
Flowering azaleas and bottlebrush buckeye. [EDC, 2005]

Public restrooms along the service drive, northeast of the Memorial. [EDC, 2005]



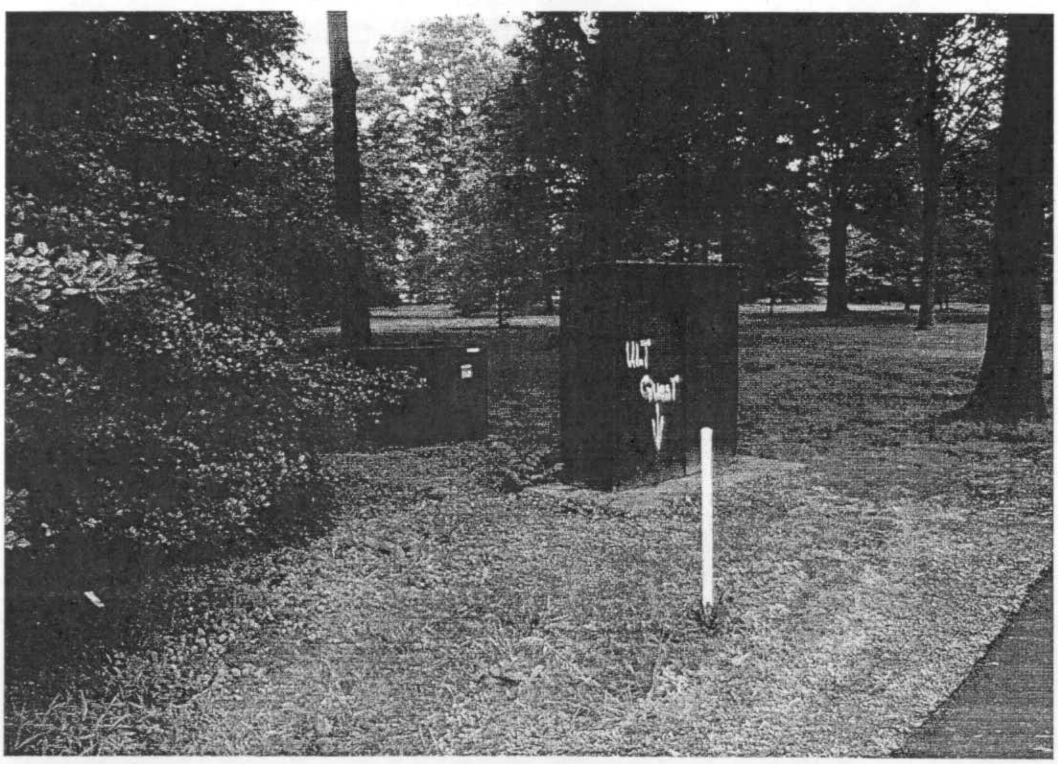
The horse stables for the U.S. Park Police Horse Mounted Patrol Division, located west of the Memorial. [EDC, 2005]

Directional sign and a freestanding map near Independence Avenue, north of West Basin Drive. [EDC, 2005]



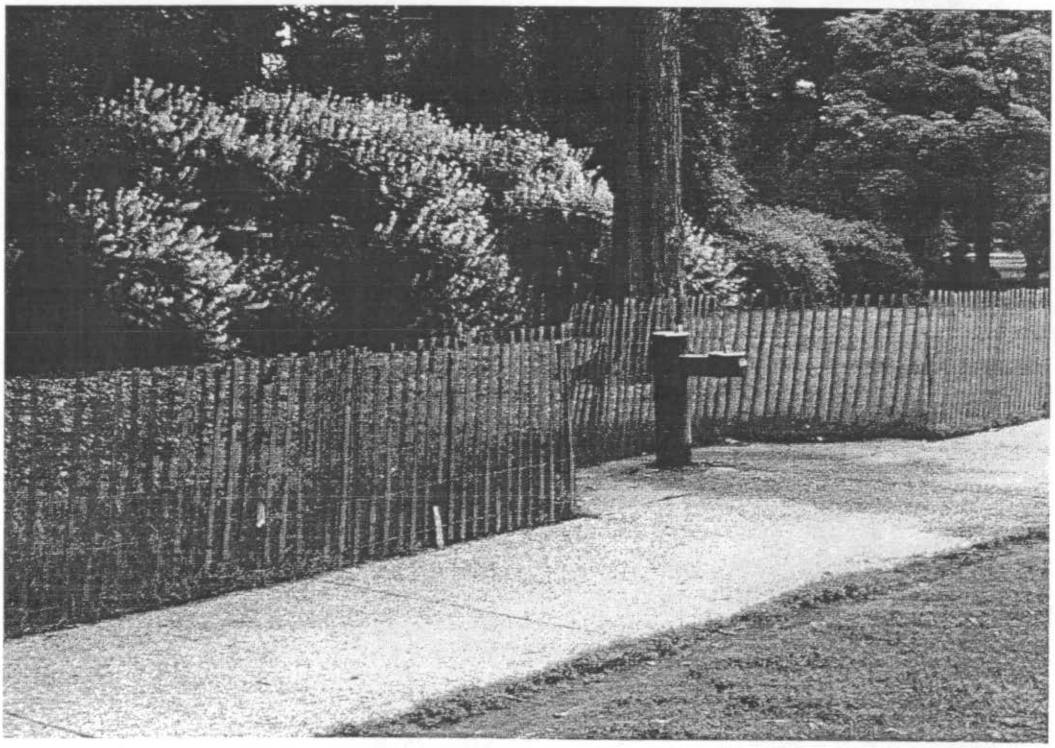
One of two pedestal mounted interpretive waysides located near the Memorial. [EDC, 2005]

Caution sign located between the flagstone walks at the service drive. [EDC, 2005]



Electrical transformers located northwest of the Memorial. [EDC, 2005]

5" square concrete marked with remnant piece of plaque, located in the trees southeast of the Memorial. [EDC, 2005]



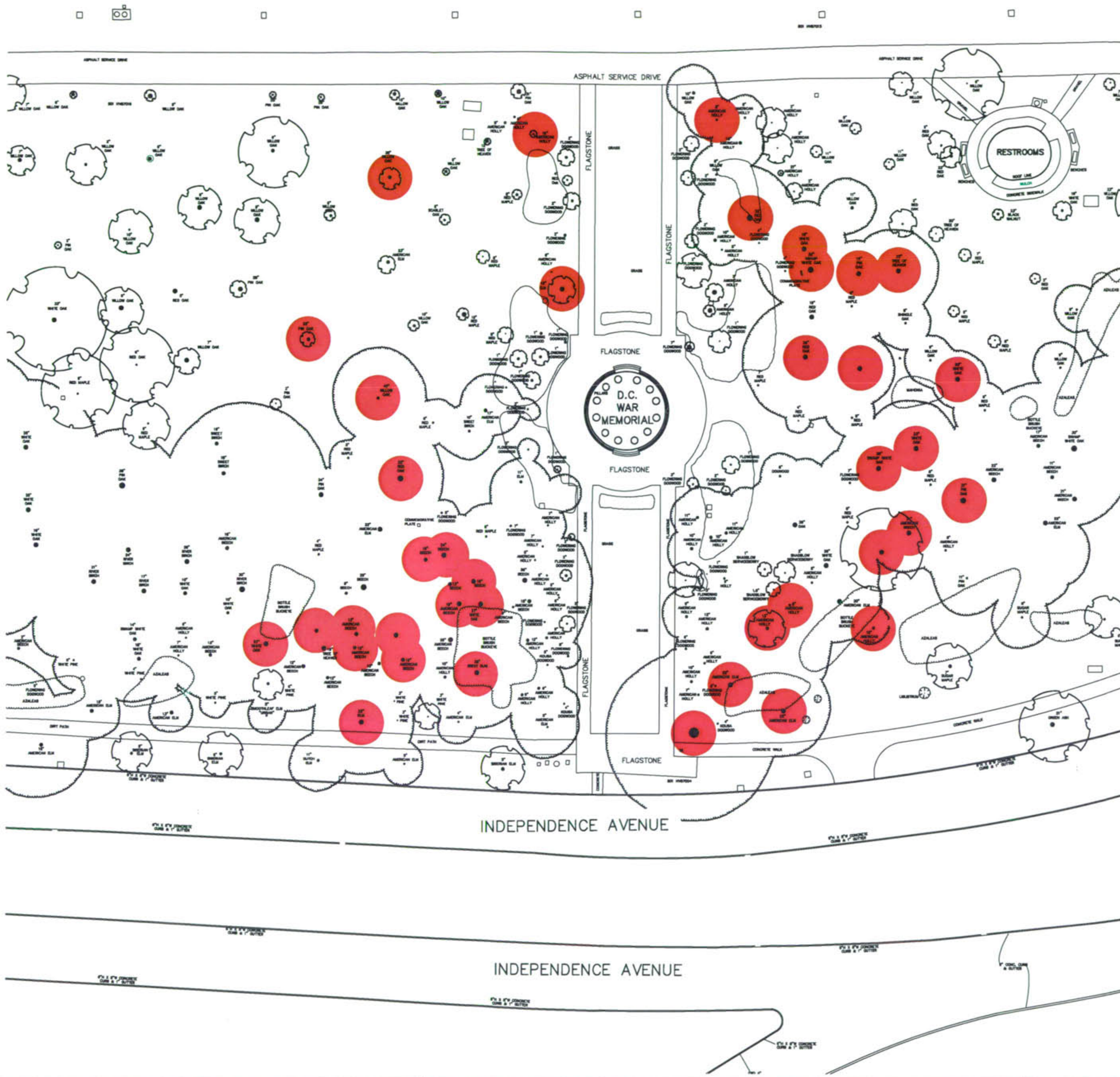
Water fountain along the walkway north of Independence Avenue. [EDC, 2005]

Water fountain, trash receptacle, and benches at the public restrooms. [EDC, 2005]

PART 1

CULTURAL LANDSCAPE ASSESSMENT

LANDSCAPE ASSESSMENT MAPS



LEGEND

HISTORIC TREES

DC WAR MEMORIAL

WEST POTOMAC PARK, BETWEEN INDEPENDENCE AVENUE & THE REFLECTING POOL
WASHINGTON, DC

UNITED STATES DEPARTMENT OF INTERIOR

NATION PARK SERVICE – NATIONAL CAPITAL REGION
WASHINGTON, DC

ELMORE DESIGN COLLABORATIVE, INC.
Landscape Architecture: Site Planning & Design
Cultural Landscape Preservation
1655 Main Street, Suite 302, Springfield, MA 01103
Tel. 413-827-7071 Fax. 413-827-7053
E-Mail tje@elmore-design.com

N

sheet title: **VEGETATION ASSESSMENT – HISTORIC TREES**

TREES FOUND ON BOTH THE 1937 AND 1990 MAPS

scale: 1" = 30'-0"

0 15' 30' 60'

date: AUGUST 31, 2005

sheet: L-1

LEGEND

- AILANTHUS
- BEECH
- BIRCH – RIVER, SWEET
- DOGWOOD – FLOWERING, KOUSA
- ELM – SIBERIAN, AMERICAN
- HOLLY – AMERICAN
- MAPLE – SUGAR, RED
- OAK – WHITE, PIN, WILLOW, SHINGLE, RED, SCARLET,
- PINE – WHITE

DC WAR MEMORIAL

WEST POTOMAC PARK, BETWEEN INDEPENDENCE AVENUE & THE REFLECTING POOL
WASHINGTON, DC

UNITED STATES DEPARTMENT OF INTERIOR

NATION PARK SERVICE – NATIONAL CAPITAL REGION
WASHINGTON, DC

ELMORE DESIGN COLLABORATIVE, INC.
Landscape Architecture: Site Planning & Design
Cultural Landscape Preservation
1655 Main Street, Suite 302, Springfield, MA 01103
Tel. 413–827–7071 Fax. 413–827–7053
E-Mail tje@elmore-design.com

N

sheet title: ***VEGETATION ASSESSMENT – EXISTING TREES***

scale: 1" = 30'-0" 0 15' 30' 60'

date: AUGUST 31, 2005

sheet: L-2

LEGEND

- AZALEA
- BOTTLEBRUSH BUCKEYE
- PRIVET
- MAHONIA

DC WAR MEMORIAL

WEST POTOMAC PARK, BETWEEN INDEPENDENCE AVENUE & THE REFLECTING POOL
WASHINGTON, DC

UNITED STATES DEPARTMENT OF INTERIOR

NATION PARK SERVICE – NATIONAL CAPITAL REGION
WASHINGTON, DC

ELMORE DESIGN COLLABORATIVE, INC.

Landscape Architecture: Site Planning & Design
Cultural Landscape Preservation
1655 Main Street, Suite 302, Springfield, MA 01103
Tel. 413-827-7071 Fax. 413-827-7053
E-Mail tje@elmore-design.com

N

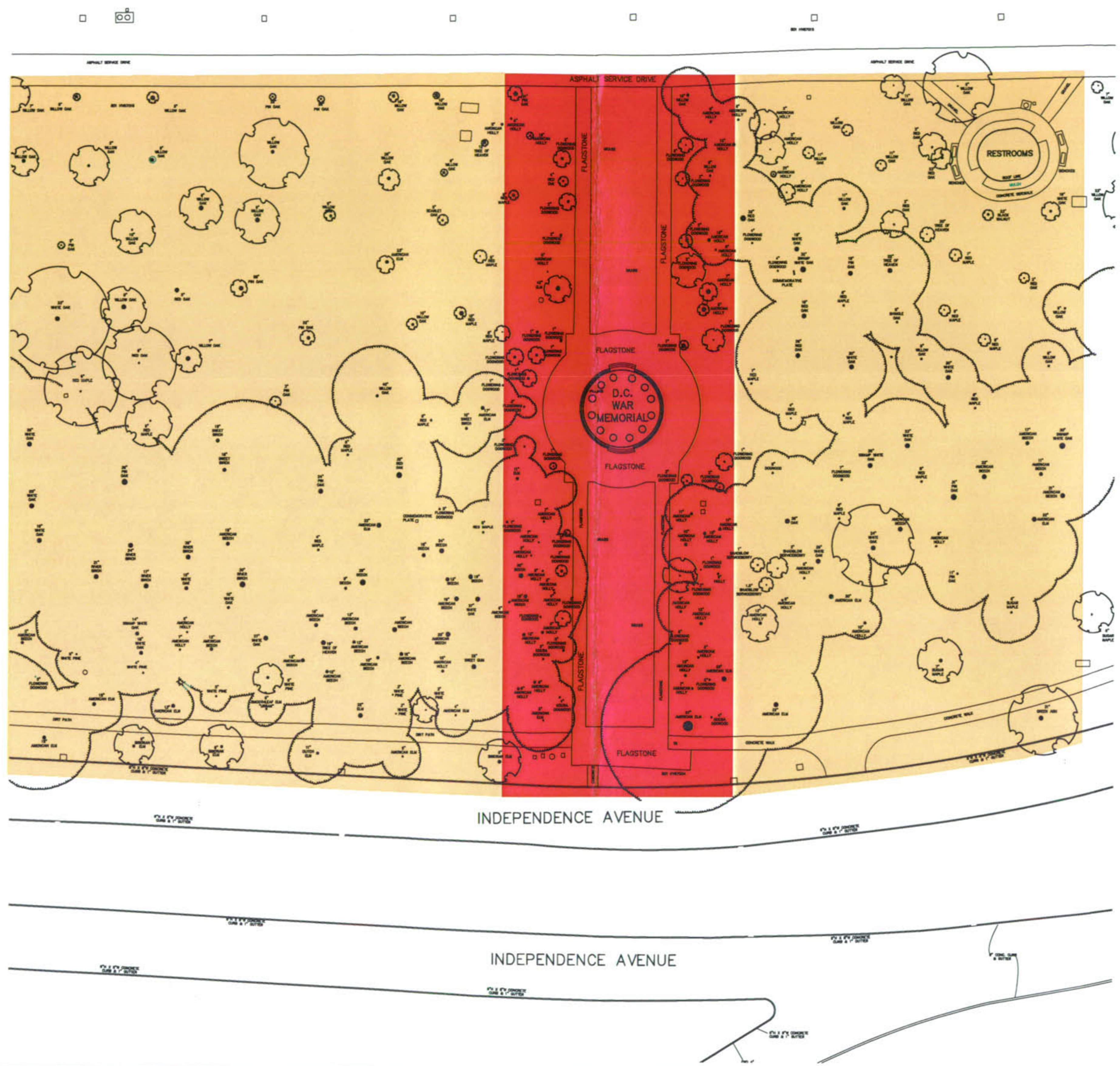
sheet title: **VEGETATION ASSESSMENT – EXISTING SHRUBS**

scale: 1" = 30'-0"

0 15' 30' 60'

date: AUGUST 31, 2005

sheet: L-3



LEGEND

HIGH INTEGRITY WITH FEATURES THAT NEED TO BE REMOVED AND OTHERS THAT NEED TO BE RESTORED

HIGH INTEGRITY

DC WAR MEMORIAL
WEST POTOMAC PARK, BETWEEN INDEPENDENCE AVENUE & THE REFLECTING POOL
WASHINGTON, DC

UNITED STATES DEPARTMENT OF INTERIOR
NATION PARK SERVICE – NATIONAL CAPITAL REGION
WASHINGTON, DC

ELMORE DESIGN COLLABORATIVE, INC.
Landscape Architecture: Site Planning & Design
Cultural Landscape Preservation
1655 Main Street, Suite 302, Springfield, MA 01103
Tel. 413-827-7071 Fax. 413-827-7053
E-Mail tje@elmore-design.com

N

sheet title: *ZONES OF RELATIVE LEVELS OF INTEGRITY*

scale: 1" = 30'-0" 0 15' 30' 60'

date: AUGUST 31, 2005

sheet: *L-4*

PART II

TREATMENT AND USE

GENERAL

Following a long period of neglect and deferred maintenance, the DC War Memorial came to the attention of the public following the dedication of the World War II Memorial on the National Mall in 2004. The DC War Memorial, located immediately southwest of the World War II Memorial, became the subject of renewed interest with increasing numbers of visitors in the area.

Soon thereafter a concentrated effort was made to clean the DC War Memorial, remove vegetation from the structure, and point the masonry with immediately available resources. National Park Service planning for the long term preservation and conservation of the Memorial began with the preparation of measured drawings by the Historic American Building Survey and with the commissioning of a Historic Structure Report.

In the period from March 17, 2005 through July 15, 2005, the structure was surveyed by a team of preservation architects from John G. Waite Associates, Architects of Albany, New York, structural engineers from Robert Silman Associates of Washington, DC, historic landscape architects from The Elmore Design Collaborative of Springfield, Massachusetts, and a stone conservator from Masonry Stabilization Services Corporation of Lawrence, Kansas. The building was found to be in relatively good condition despite the absence of regular maintenance; this can largely be attributed to the high quality of its original design and construction.

ULTIMATE TREATMENT AND USE

The ultimate treatment and use of the structure should follow the National Park Service's master planning objectives for the war memorials at the west end of West Potomac Park. The DC War Memorial should remain as a memorial to those members of the armed forces from the District of Columbia who gave their lives in service to their country during World War I.

The originally conceived use of the Memorial as a bandstand should be realized. This use allows the structure to serve both a functional and commemorative purpose. Regular use of the structure will help to ensure the building's viability and continued recognition; and regular use will require constant and ongoing maintenance, thereby, contributing to its long term preservation.

The treatment of the structure should, at a minimum, adhere to the Secretary of the Interior's Standards for the Treatment of Historic Properties, and greater recognition should be sought through National Historic Landmark designation.

A thorough program of masonry conservation should be completed, including cleaning, pointing, and repairs. Storm water drainage systems for the building and site should be renewed. Lighting for the building should be re-assessed. Pathways between Independence Avenue and the Reflecting Pool should be restored. And, the historic character of the surrounding landscape should be re-established so that band concerts can once again be held at the Memorial with adequate space for the audience.

REQUIREMENTS FOR TREATMENT AND USE

The Secretary of the Interior's Standards for the Treatment of Historic Properties allows for preservation, rehabilitation, restoration, and reconstruction treatments for historic buildings and landscapes. These standards help to guide compliance with legal mandates and regulations, while maintaining the historic integrity of the property.

At the DC War Memorial preservation of the historic elements should be of the highest priority, with restoration required for those elements that have been subject to deterioration and modification over time. This approach is required to maintain the historic character of the building and site.

Concessions to building code and accessibility requirements should be tempered by the impact that such requirements may impose on the historic character of the Memorial. While access to the Memorial in the landscape is of principal importance, modifications allowing access to the bandstand platform will only detract from the special character of a structure that was intended to be a theater-in-the-round. Similarly, modifications to meet the strict regulations of modern building codes can destroy the simple, elegant character of the marble Memorial, if they are not managed with skill and dexterity.

ALTERNATIVES FOR TREATMENT AND USE

The highest and best use for the structure and site is the use for which it was originally designed.

Alternatives for treatment and use include preservation of the existing site without restoration of the landscape; however, this prevents the return of the structure's original function as a bandstand and diminishes the long term viability of the Memorial.

Similarly, standard maintenance procedures and traditional masonry repairs for the structure would allow its continued use; however, significant problems with the Memorial's drainage system require design modifications or advanced intervention to ensure the long term survival of the structure.

RECOMMENDATIONS FOR TREATMENT AND USE

The recommendations for the future conservation and treatment of the building and site include the following:

1. Clean the marble construction of the Memorial using chemical and water treatments for the removal of soil, stains, biological growth, insect infestation, bird excreta, and gypsum deposits. This cleaning should be carried out in combination with controlled, mildly abrasive treatments for the removal of calcium carbonate deposits.

2. Undertake additional testing to determine the most effective treatment for the removal of the biological agent causing the bright orange and yellow discoloration within the marble.

3. Conduct additional probes to determine the nature and condition of the bronze tension ring reinforcement (shown in the 1931 section of the dome seen in Figure 13) in the marble tile construction of the outer dome.

4. Remove and reset individual pieces of displaced marble.

5. Pin broken stones.

6. Repoint the marble construction.

7. Perform dutchman repairs where stone is missing or has been improperly repaired with mortar or flash patching.

8. Install new lead gutter and flashings to replicate the original sheet metal construction.

   Alternate: Install lead flashing and a drip edge over the capstones at the base of the outer dome, and over blocking in the original gutter at the projecting cornice. This recommendation eliminates the original design deficiency that created an intersection of the curved flashing reglet with the mortared butt joints of the stonework. Flashing over the gutter also eliminates problems with insufficient gutter depth and drainage pitch. The original design made water infiltration in the masonry construction inevitable over the long term (see drawings). Another advantage of this approach is that water would no longer be conducted through the failed downspouts within the marble columns of the structure, and no disassembly of the marble structure would be required to repair the downspouts. The drawback to this alternative is that water shed from the flashings and drip edges may splash back on the marble base of the Memorial causing discoloration and/or long term deterioration of the marble (see drawing).

9. Replace the electrical panel box within the vault beneath the bandstand, and replace all circuit wiring in the Memorial. Provide adequate receptacles within the vault for the performance use of the bandstand.

10. Replace the cove lighting beneath the lower dome so that the quality of light is more sympathetic with the original design intent.

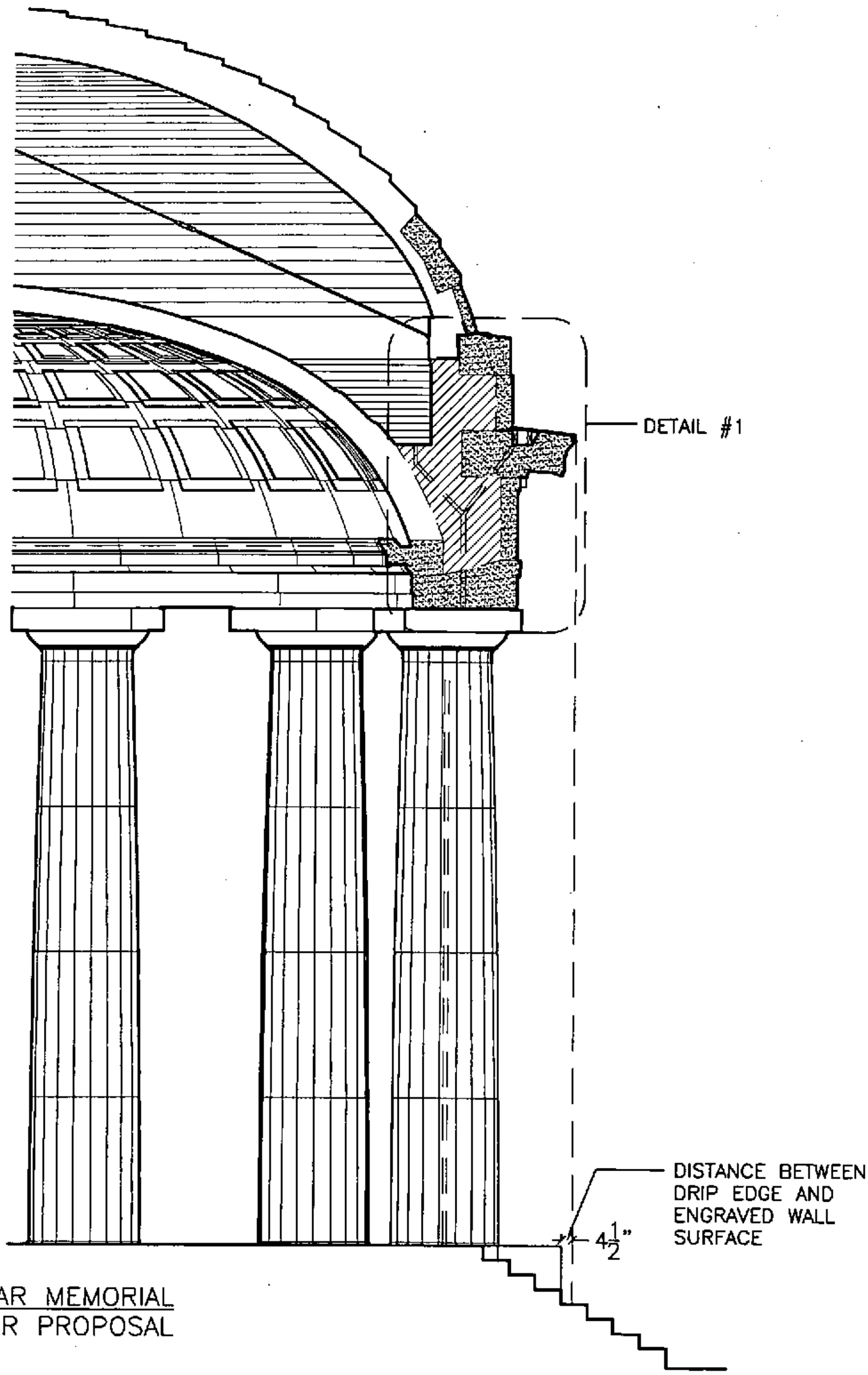
11. Provide new underground telephone service to the vault beneath the bandstand.

12. Properly cut and support an opening for an access panel in the north wall of the brick vault beneath the bandstand. Install a code compliant access door.

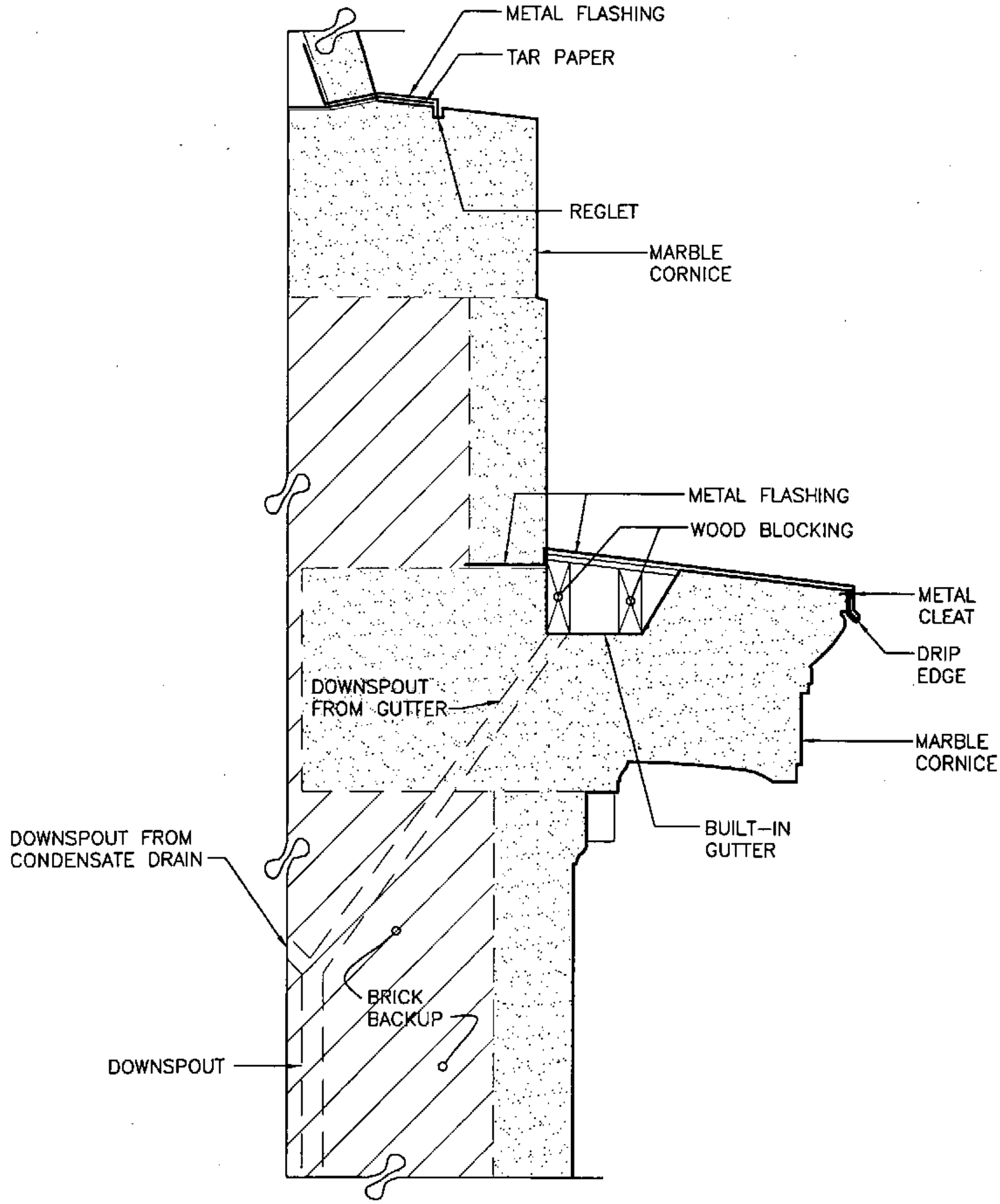
13. Provide a new floor access panel in the center of the bandstand to replicate the original decorative access panel that was stolen.

14. Rebalance the counterweighted marble ceiling access panel in the lower dome.

15. Clean out the valley and condensate drains in the attic space between the upper and lower domes.



DC WAR MEMORIAL
GUTTER PROPOSAL



DC WAR MEMORIAL
GUTTER PROPOSAL – DETAIL #1

16. Within the attic space, dry brush and point the brick construction of the drum for the upper dome.

17. Fix the wire screens in place at the four air vents in the upper dome.

18. Vehicular access should continue to be provided along the north-south paved axis between Independence Avenue and the Reflecting Pool, and not through the woods.

19. The stone paving along the north-south access route between Independence Avenue and the Reflecting Pool should be removed, and a new reinforced concrete base should be installed that can accommodate vehicular traffic. New stone paving should be laid over the base, matching the original flagstone paving in pattern, color, texture and size. The level of the paving should be set to its historic elevations adjacent to the Memorial to cover the exposed tooling marks on the marble and to re-establish the correct riser height for the first step of the marble stairs ascending to the bandstand.

20. The lawn areas should be restored with proper slopes following restoration work on the Memorial.

21. The site drainage should be carefully mapped and restored. If the built-in gutters are to remain functional, new downspouts and drainage piping should be provided. This may require significant disassembly of the four marble columns with internal downspouts and excavation beneath the bandstand platform.

22. The azaleas and the dogwoods planted in formal alignment should be removed.

23. Trees and planting that shade the Memorial and encourage biological growth should be trimmed to help prevent the recurrence of biological growth.

24. A new memorial marker system should be established for the trees, re-establishing the original intent of memorial plantings.

25. A project specific maintenance manual should be developed for the long term care of the Memorial and site.

EVALUATION OF IMPACT ON LANDSCAPE

It is felt that the recommendations developed to repair and restore the Memorial will have a low impact on the landscape, because:

1. Vehicular access can and should be provided along the north/south axis and not through the wooded area.

2. The flagstone walks presently are in poor condition. They should be restored after the restoration is completed. The walks should be rebuilt with a heavy reinforced concrete base and with a flagstone pattern the matches the color, texture, and size of the original design.

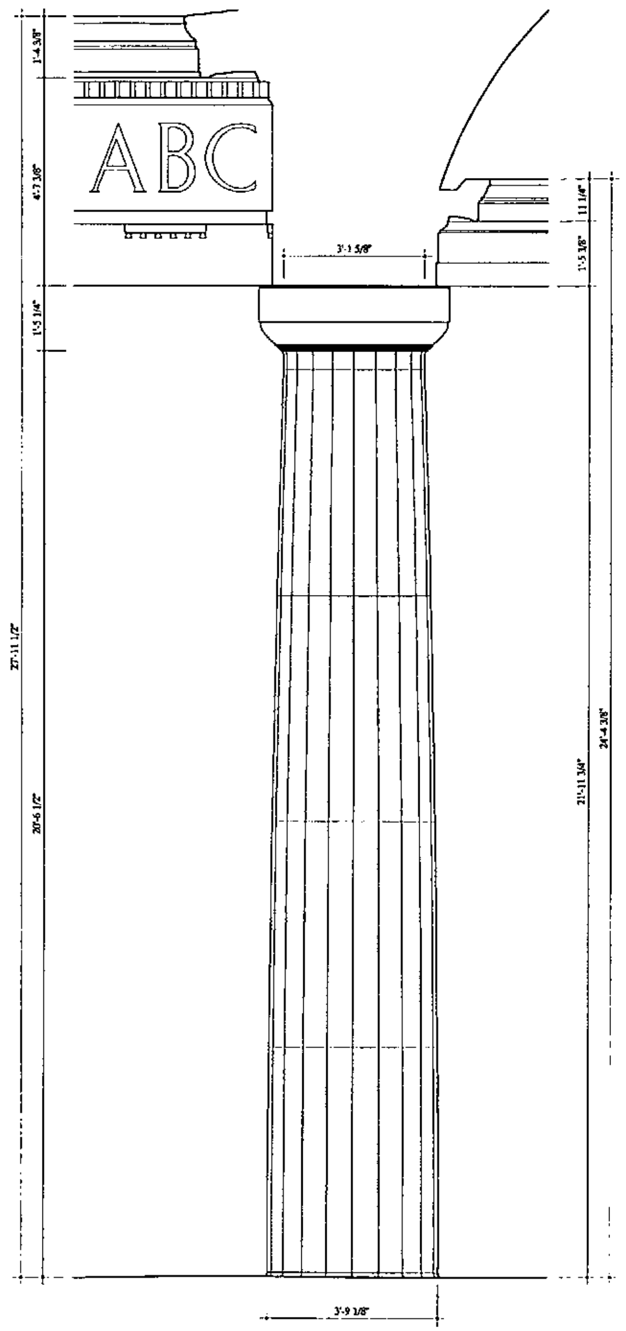
3. The lawn areas are in poor condition. These too should be restored with the proper slopes after the work on the Memorial is complete.

4. All possible drainage work within the axis can be done prior to the walks and lawns areas being restored.
5. The dogwoods planted in a formal alignment and the azaleas should be removed.

APPENDIX A

HISTORIC AMERICAN BUILDING SURVEY
DC-857
DRAWINGS

DISTRICT OF COLUMBIA WAR MEMORIAL



ORDONNANCE

3/4" = 1'-0" 1:16

FEET 3/4" = 1'-0"

CENTIMETERS 1:16

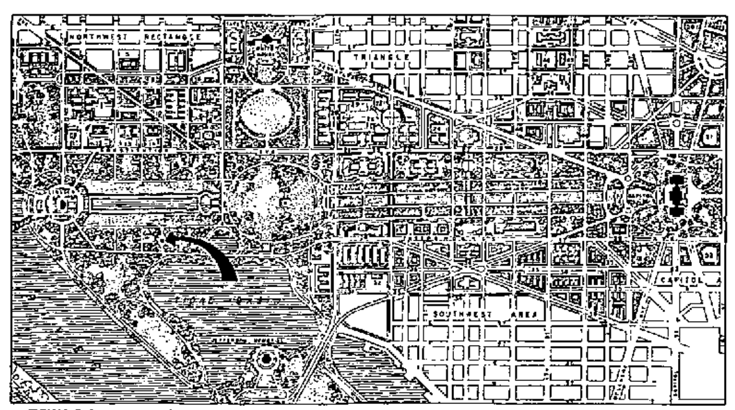
THE DISTRICT OF COLUMBIA WAR MEMORIAL WAS BUILT TO COMMEMORATE THE CITIZENS OF THE DISTRICT OF COLUMBIA WHO SERVED IN WORLD WAR I. AUTHORIZED BY AN ACT OF CONGRESS IN 1924, FUNDS TO CONSTRUCT THE MEMORIAL WERE PROVIDED BY THE CONTRIBUTIONS OF BOTH ORGANIZATIONS AND INDIVIDUAL CITIZENS OF THE DISTRICT. CONSTRUCTION OF THE MEMORIAL BEGAN IN THE SPRING OF 1931, AND THE MEMORIAL WAS DEDICATED BY PRESIDENT HERBERT HOOVER ON ARMISTICE DAY OF THAT YEAR. IT WAS THE FIRST WAR MEMORIAL TO BE ERECTED IN WEST POTOMAC PARK, AND REMAINS THE ONLY LOCAL D.C. MEMORIAL ON THE NATIONAL MALL.

DESIGNED BY WASHINGTON ARCHITECT FREDERICK H. BROOKE, WITH THE ASSISTANCE OF WASHINGTON ARCHITECTS HORACE W. PEASLEE AND NATHAN C. WYETH, THE DISTRICT OF COLUMBIA WAR MEMORIAL IS IN THE FORM OF A 47'-TALL CIRCULAR, DOMED, DORIC TEMPLE. RESTING ON CONCRETE FOUNDATIONS, THE 4'-HIGH MARBLE BASE DEFINES A PLATFORM, 43'-5" IN DIAMETER, INTENDED FOR USE AS A BANDSTAND. INSCRIBED ON THE BASE ARE THE NAMES OF THE 499 DISTRICT OF COLUMBIA CITIZENS WHO LOST THEIR LIVES IN THE WAR, TOGETHER WITH MEDALLIONS REPRESENTING THE BRANCHES OF THE ARMED FORCES. TWELVE 22'-TALL FLUTED DORIC MARBLE COLUMNS SUPPORT THE ENTABLATURE AND DOME.

THE DOCUMENTATION OF THE DISTRICT OF COLUMBIA WAR MEMORIAL WAS UNDERTAKEN BY THE HISTORIC AMERICAN BUILDINGS SURVEY / HISTORIC AMERICAN ENGINEERING RECORD / HISTORIC AMERICAN LANDSCAPES SURVEY (HABS/HAER/HALS) DIVISION OF THE NATIONAL PARK SERVICE (NPS), JOHN A. BURNS, ACTING CHIEF. THE PROJECT WAS SPONSORED BY THE NATIONAL MALL AND MEMORIAL PARKS (NMMP), NPS, VIKKI KEYES, SUPERINTENDENT. PROJECT PLANNING WAS COORDINATED BY PAUL DOLINSKY, CHIEF, HABS; AND BY TONY DONALD, ARCHITECT, NMMP. THE FIELD WORK WAS UNDERTAKEN AND THE MEASURED DRAWINGS WERE PRODUCED BY PROJECT SUPERVISOR MARK SCHARA, HABS ARCHITECT; AND BY HABS ARCHITECTS PAUL A. DAVIDSON AND ANDREA K. RIGHI. THE HISTORICAL REPORT WAS WRITTEN BY HAER HISTORIAN KRISTEN M. O'CONNELL. THE LARGE FORMAT PHOTOGRAPHY WAS UNDERTAKEN BY HABS PHOTOGRAPHERS JACK E. BOUCHER AND JAMES W. ROSENTHAL. ASSISTANCE WAS PROVIDED BY THE NMMP MAINTENANCE STAFF.

PLANT LIST

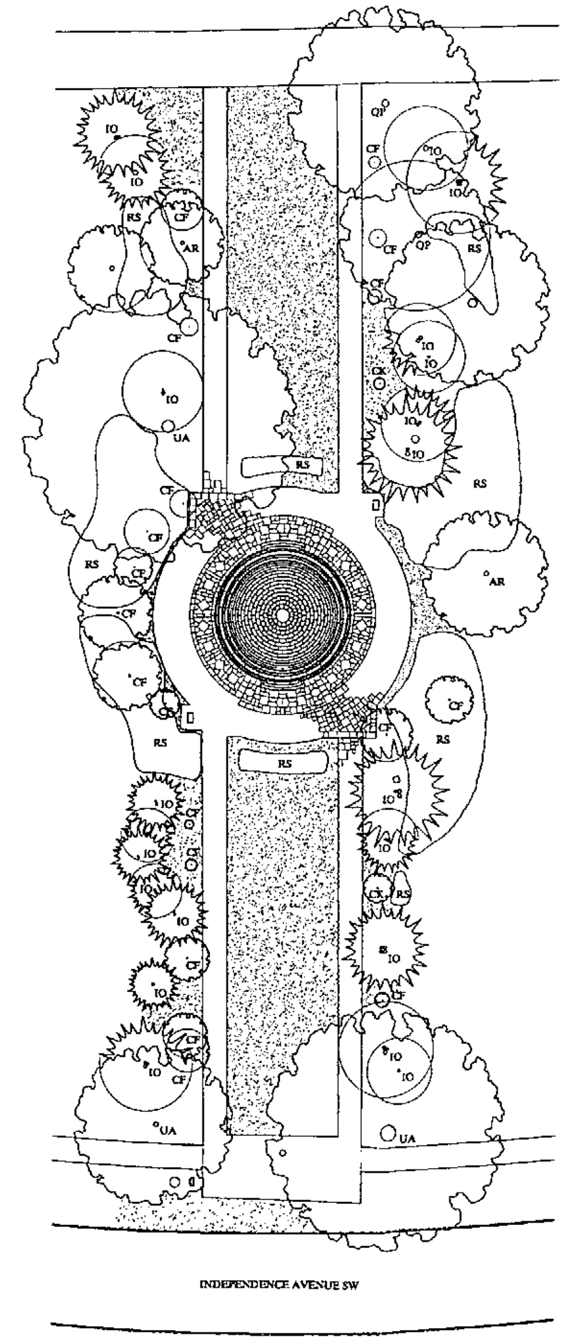
KEY	BOTANICAL NAME	COMMON NAME
AR	*ACER RUBRUM*	RED MAPLE
CF	*CORNUS FLORIDA*	FLOWERING DOGWOOD
CK	*CORNUS KOUSA*	KOUSA DOGWOOD
IO	*ILEX OPACA*	AMERICAN HOLLY
QP	*QUERCUS PHELLOS*	WILLOW OAK
RS	*RHODODENDRON SPECIES*	AZALEA
UA	*ULMUS AMERICANA*	AMERICAN ELM



NATIONAL CAPITAL PARK AND PLANNING COMMISSION, 1941 LIBRARY OF CONGRESS

LOCATION MAP

NO SCALE

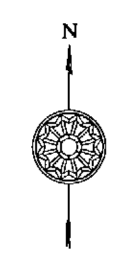


SITE PLAN

1" = 20'-0" 1:240

FEET 1" = 20'-0"

METERS 1:240



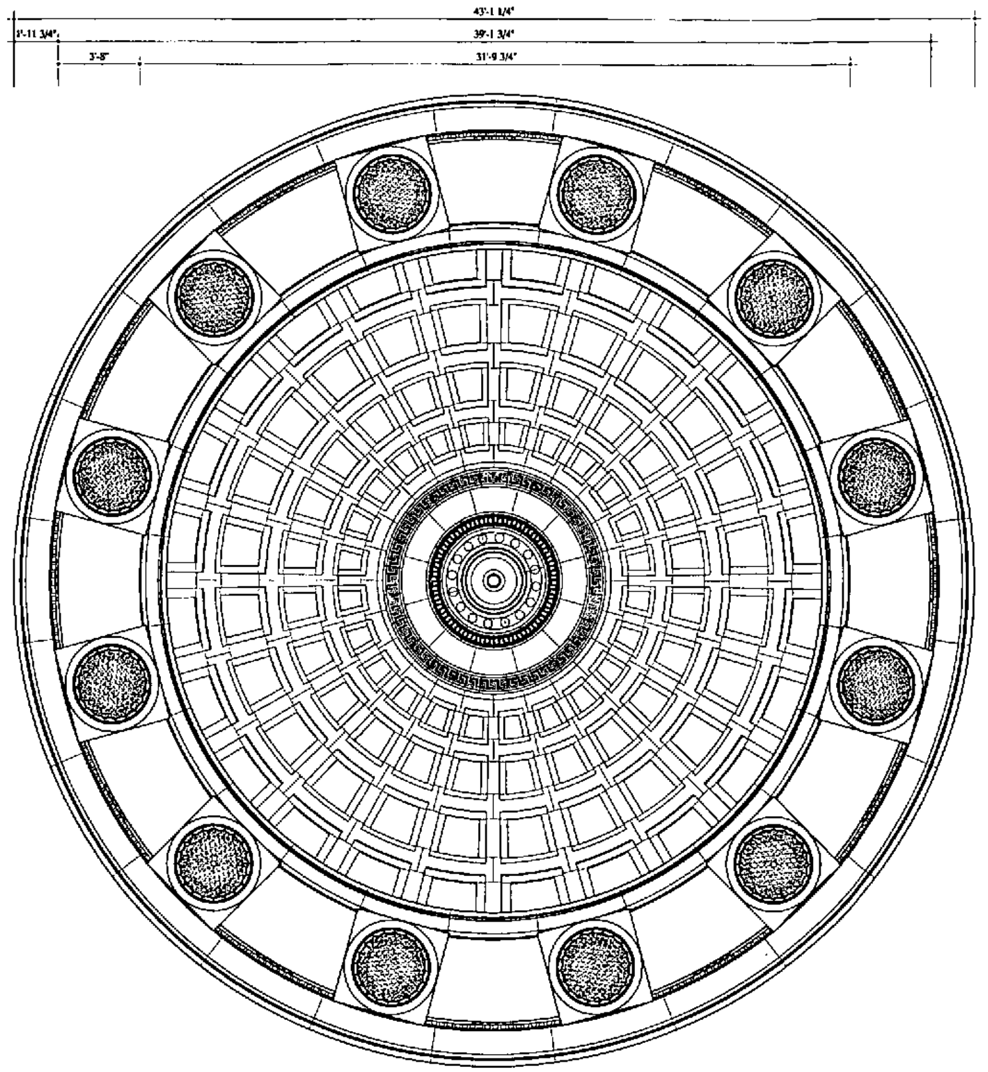
DRAWN BY: PAUL A. DAVIDSON \ ANDREA K. RIGHI \ MARK SCHARA

DISTRICT OF COLUMBIA WAR MEMORIAL PROJECT, 2004-05
NATIONAL PARK SERVICE
UNITED STATES DEPARTMENT OF THE INTERIOR

DISTRICT OF COLUMBIA WAR MEMORIAL
WEST POTOMAC PARK WASHINGTON DISTRICT OF COLUMBIA

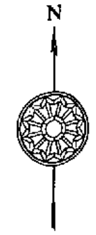
SHEET 1 OF 6 SHEETS

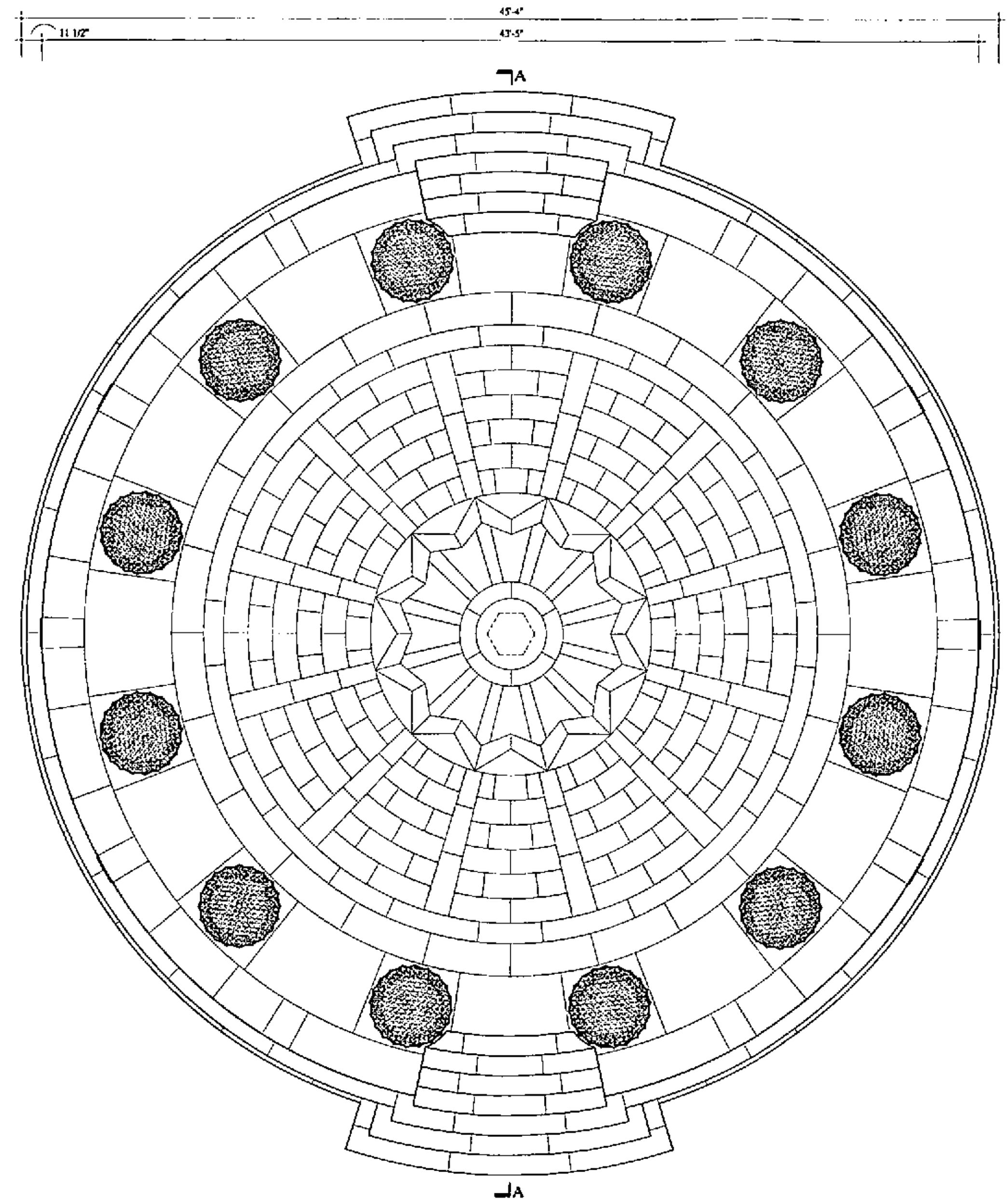
HISTORIC AMERICAN BUILDINGS SURVEY
DC-857



REFLECTED CEILING PLAN

3/8" = 1'-0" 1:32





PLAN

3/8" = 1'-0" 1:32

HISTORIC AMERICAN BUILDINGS SURVEY
DC-857

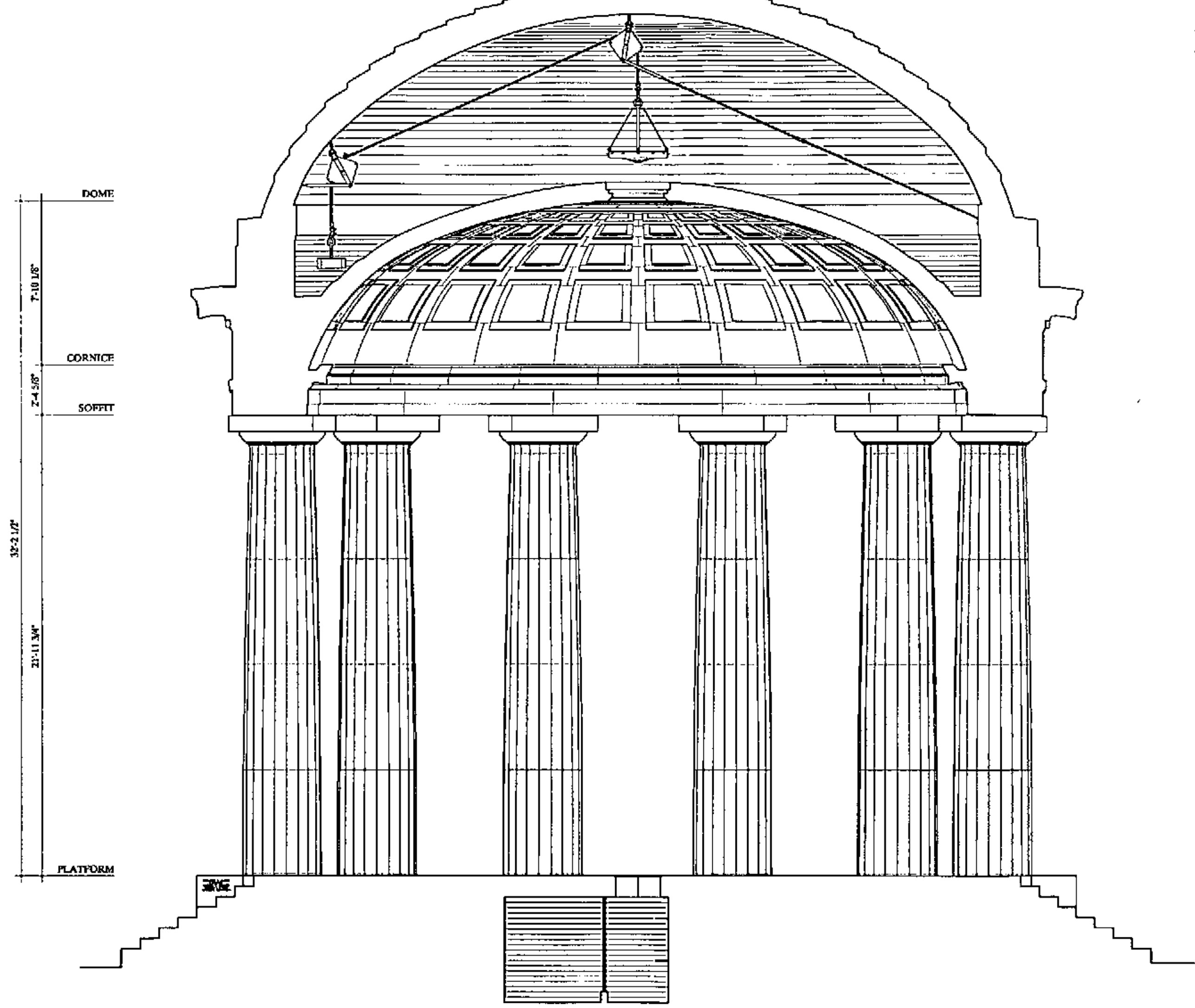
SHEET 2 OF 6 SHEETS

DISTRICT OF COLUMBIA WAR MEMORIAL

WEST POTOMAC PARK WASHINGTON DISTRICT OF COLUMBIA

DRAWN BY: PAUL A. DAVIDSON \ ANDREA K. RIGHI \ MARK SCHARA

DISTRICT OF COLUMBIA WAR MEMORIAL PROJECT, 2004-05
NATIONAL PARK SERVICE
UNITED STATES DEPARTMENT OF THE INTERIOR

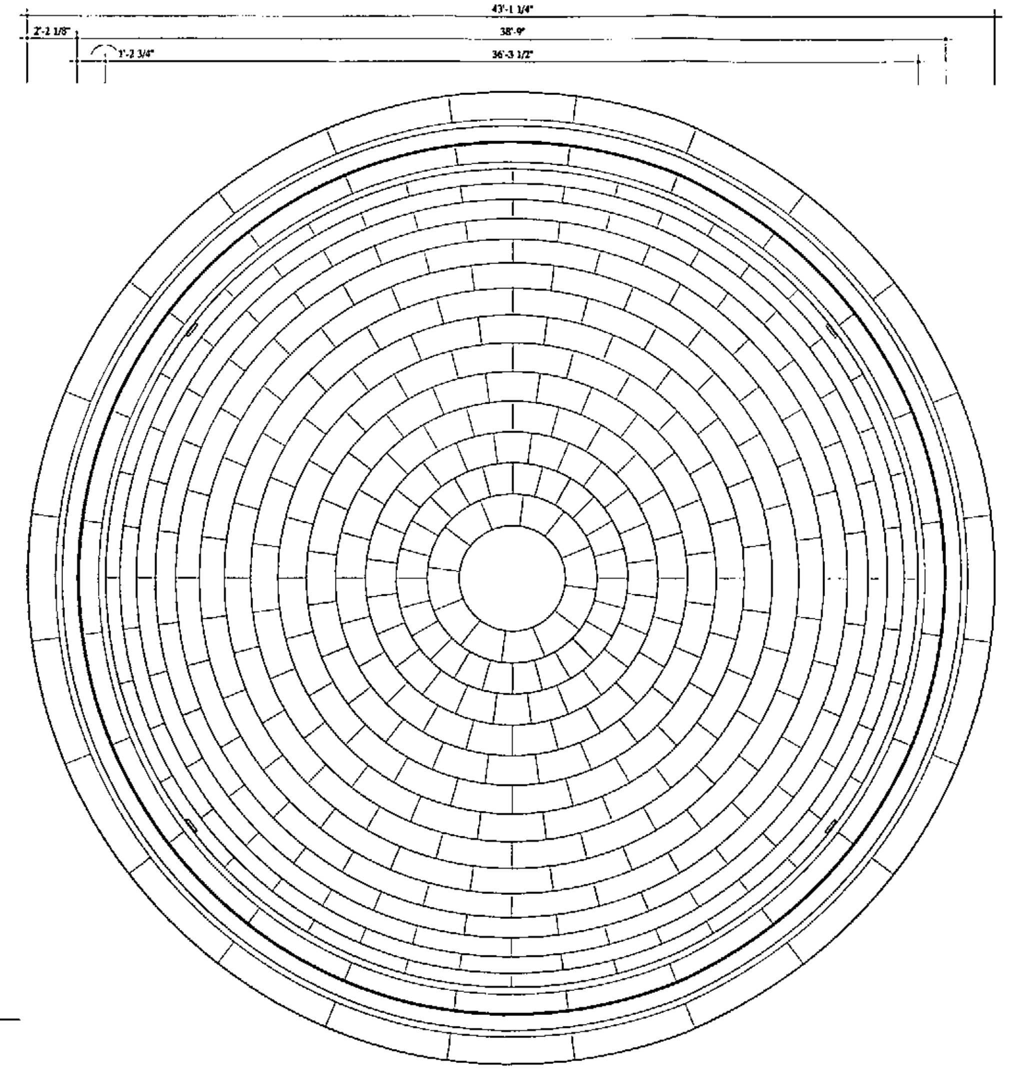


SECTION A-A

3/8" = 1'-0" 1:32

0 1 2 3 4 5 10
FEET 3/8" = 1'-0"

NOTE: KEYSTONE AND KEYSTONE-LIFTING MECHANISM SHOWN IN ELEVATION AND ALIGNED WITH AXIS OF SECTION



ROOF PLAN

3/8" = 1'-0" 1:32

0 1 2 3
METERS 1:32

N

DRAWN BY: PAUL A. DAVIDSON \ ANDREA K. RIGHI \ MARK SCHARA

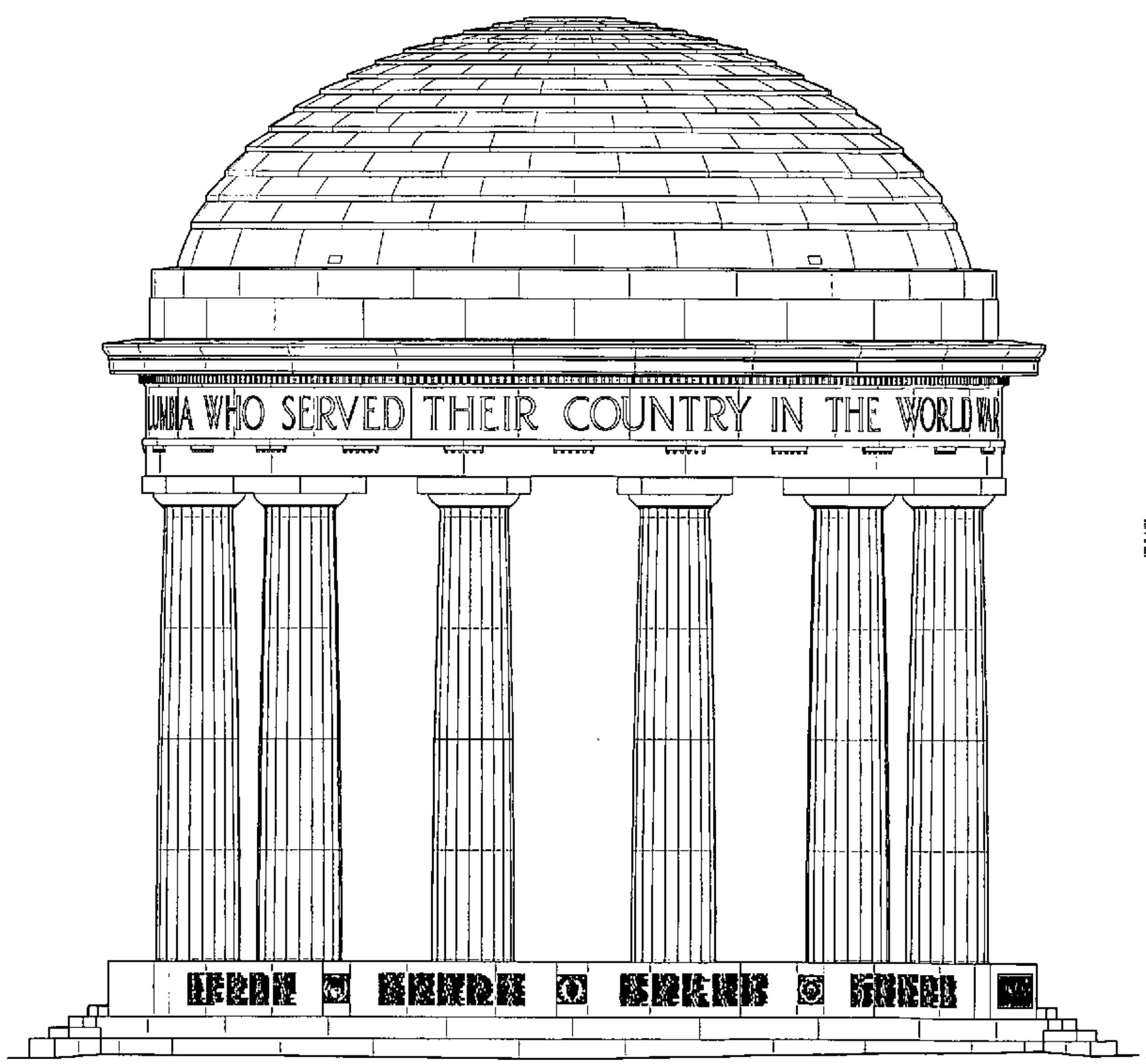
DISTRICT OF COLUMBIA WAR MEMORIAL PROJECT, 2004-05
NATIONAL PARK SERVICE
UNITED STATES DEPARTMENT OF THE INTERIOR

DISTRICT OF COLUMBIA WAR MEMORIAL

WEST POTOMAC PARK WASHINGTON DISTRICT OF COLUMBIA

SHEET 3 OF 6 SHEETS

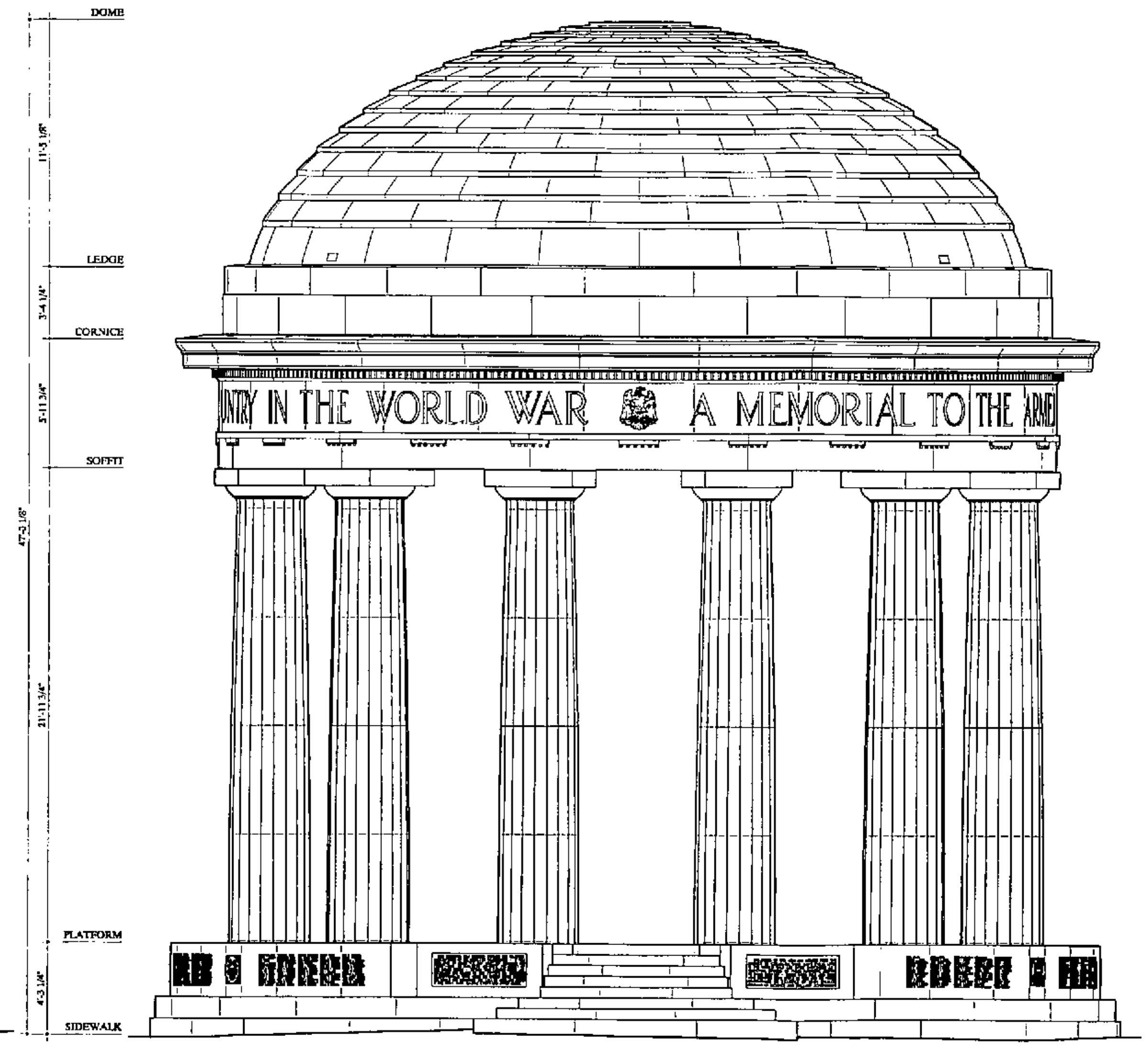
HISTORIC AMERICAN BUILDINGS SURVEY
DC-857



EAST ELEVATION

3/8" = 1'-0" 1:32

0 1 2 3 4 5 10
FEET 3/8" = 1'-0"



NORTH ELEVATION

3/8" = 1'-0" 1:32

0 1 2 3
METERS 1:32

DRAWN BY: PAUL A. DAVIDSON \ ANDREA K. RIGHI \ MARK SCHARA

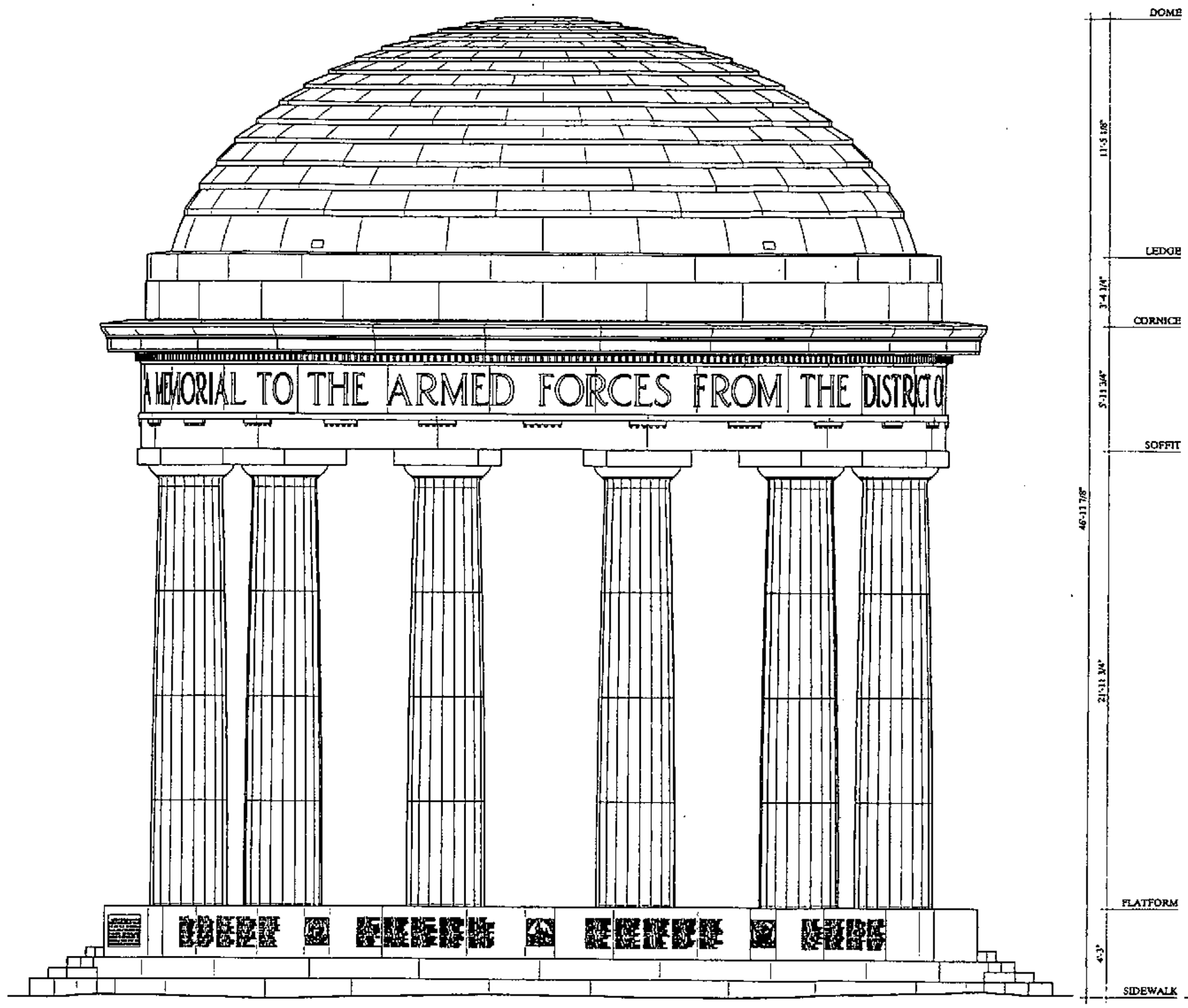
DISTRICT OF COLUMBIA WAR MEMORIAL PROJECT, 2004-05
NATIONAL PARK SERVICE
UNITED STATES DEPARTMENT OF THE INTERIOR

DISTRICT OF COLUMBIA WAR MEMORIAL

WEST POTOMAC PARK WASHINGTON DISTRICT OF COLUMBIA

SHEET 4 OF 6 SHEETS

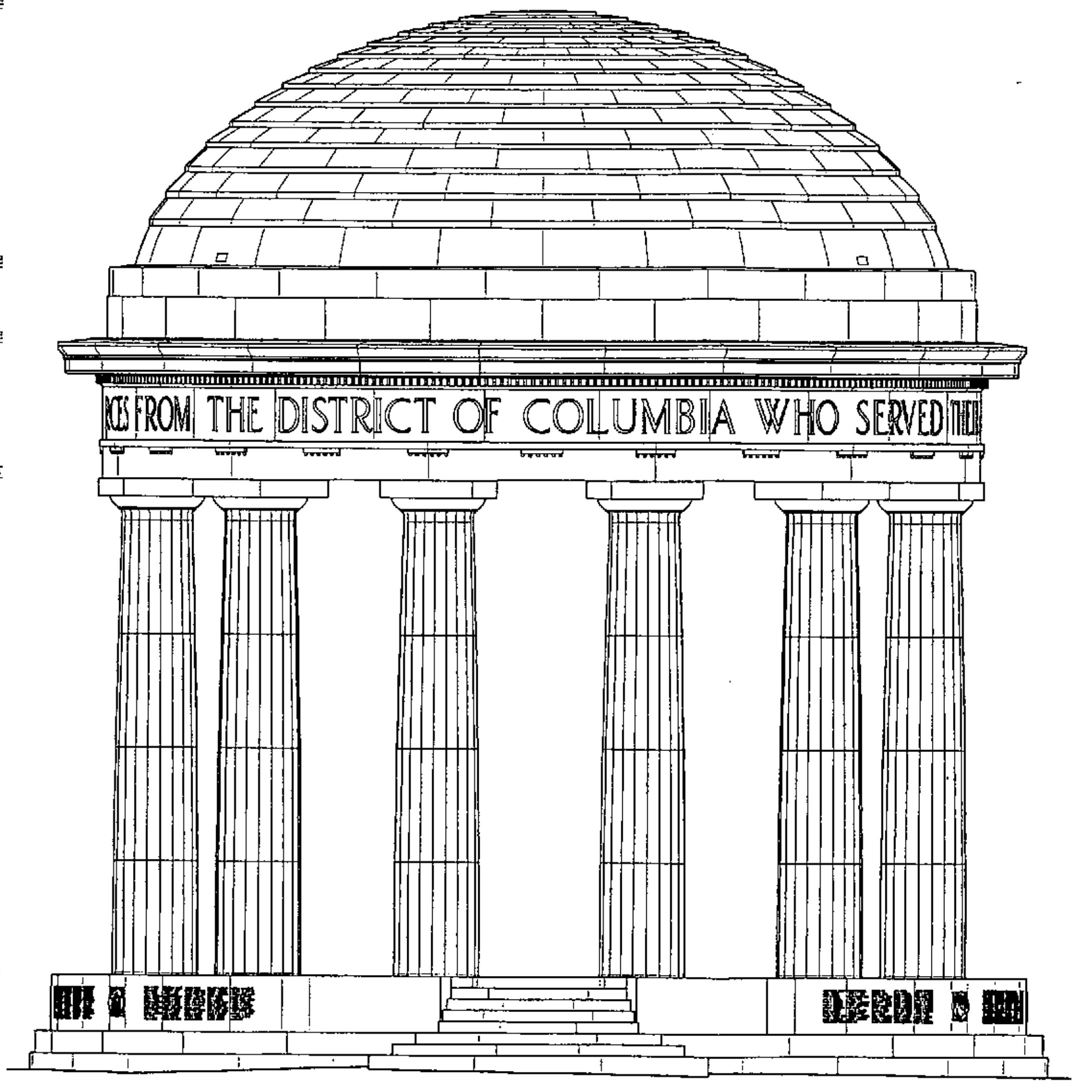
HISTORIC AMERICAN BUILDINGS SURVEY
DC-857



WEST ELEVATION

3/8" = 1'-0" 1:32

0 1 2 3 4 5 10
FEET 3/8" = 1'-0"



SOUTH ELEVATION

3/8" = 1'-0" 1:32

0 1 2 3
METERS 1:32

DRAWN BY: PAUL A. DAVIDSON \ ANDREA K. RIGHI \ MARK SCHARA

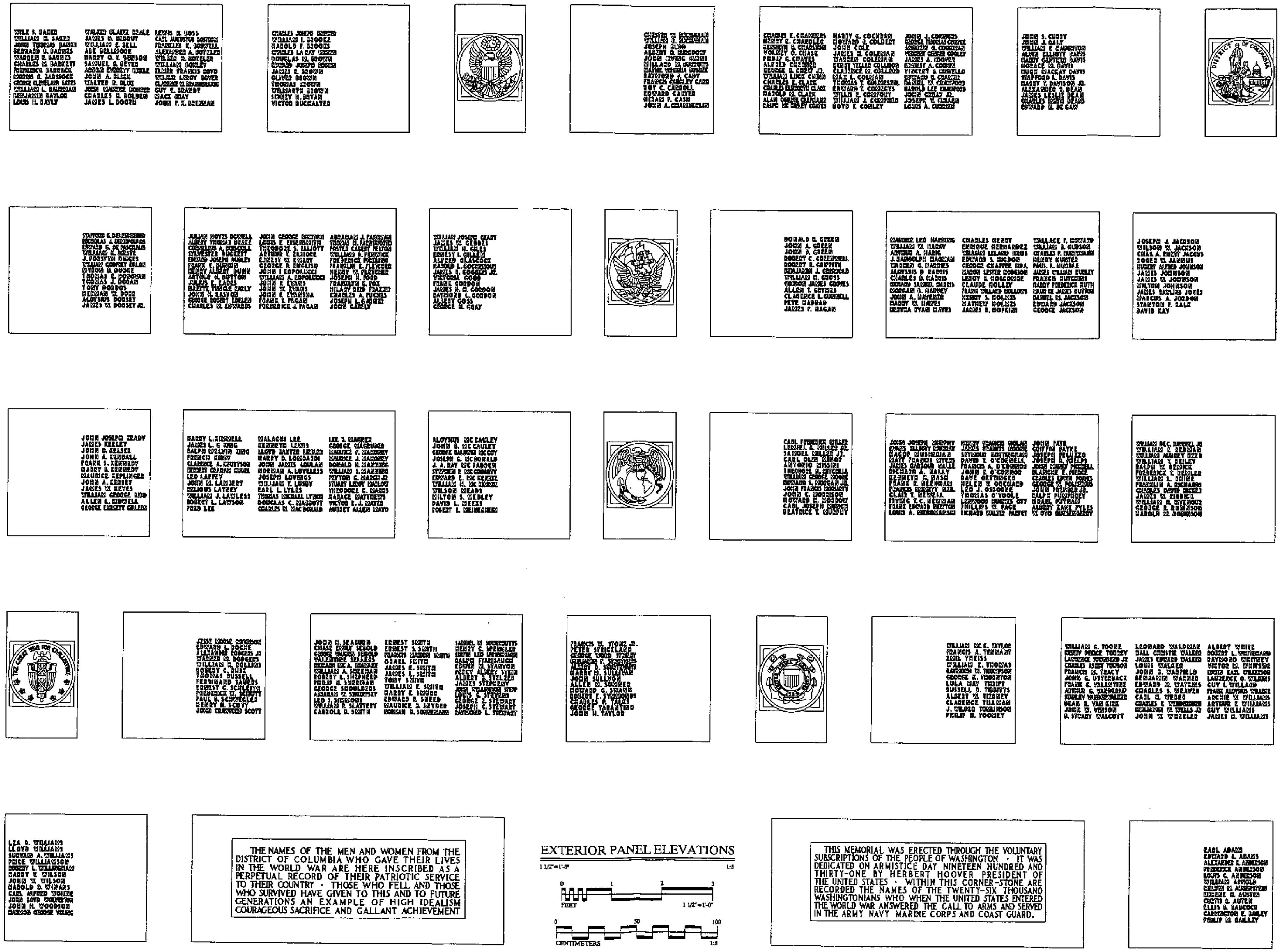
DISTRICT OF COLUMBIA WAR MEMORIAL PROJECT, 2004-05
NATIONAL PARK SERVICE
UNITED STATES DEPARTMENT OF THE INTERIOR

DISTRICT OF COLUMBIA WAR MEMORIAL

WEST POTOMAC PARK WASHINGTON DISTRICT OF COLUMBIA

SHEET 5
OF 6 SHEETS

HISTORIC AMERICAN
BUILDINGS SURVEY
DC-857



DRAWN BY: PAUL A. DAVIDSON \ ANDREA K. RIGHI \ MARK SCHARA

DISTRICT OF COLUMBIA WAR MEMORIAL PROJECT, 2004-05
NATIONAL PARK SERVICE
UNITED STATES DEPARTMENT OF THE INTERIOR

DISTRICT OF COLUMBIA WAR MEMORIAL

WEST POTOMAC PARK WASHINGTON DISTRICT OF COLUMBIA

SHEET 6 OF 6 SHEETS

HISTORIC AMERICAN BUILDINGS SURVEY DC-857

APPENDIX B

SPECIFICATIONS
FOR THE PROPOSED
DISTRICT OF COLUMBIA MEMORIAL
1931

SPECIFICATION

FOR THE

PROPOSED DISTRICT OF COLUMBIA MEMORIAL

TO BE BUILT IN POTOMAC PARK

WASHINGTON, D. C.

F. H. BROOKE, ARCHITECT

N. C. WYETH and H. W. PEASLEE, ASSOCIATE ARCHITECTS

REVISED

MARCH 30, 1928

DECEMBER 18, 1926

MARCH 4, 1931.

BIDDERS TO VISIT SITE:

All bidders are expected to visit the site of the work and to inform themselves as to all existing conditions. Failure to do this will in no way relieve the successful bidder or the contractor from the necessity of furnishing all equipment or materials or performing all labor required for the completion of the work in conformity with these specifications.

No allowance will be made for the failure of a bidder or of the contractor correctly to estimate the difficulties attending the execution of the work.

RESPONSIBILITY FOR EMPLOYEES AND PLANT:

It is understood and agreed that the contractor assumes full responsibility for the safety of his employees, plant, and materials, and for any damage or injury done by or to them from any source or cause.

It is also understood and agreed that the contractor shall save and hold the District of Columbia Memorial Commission free from all claim for damages to any and all persons or property arising from the execution of the work covered by these specifications or modifications of or supplements to the same.

OBJECTIONABLE EMPLOYEES:

The contractor will be required to discharge any employee who, in the opinion of the Architect, is objectionable or incompetent. This shall not be made the basis of any claims for compensation or damages against the District of Columbia Memorial Commission.

FAIR WAGES:

The wages paid by the builders to the workmen employed by them and the hours of labor to be observed as regards the execution of the work shall be those generally accepted in each trade for competent workmen in the District of Columbia.

LEGAL RESTRICTIONS AND PERMITS:

The contractor shall procure at his own expense all necessary licenses and permits and shall give due and adequate notice to those in control of properties which may be affected by his operations of all work which he proposes to do. The

LEGAL RESTRICTIONS AND PERMITS (CONTINUED)

contractor shall conform with all applicable laws, regulations, and ordinances with regard to labor or methods employed on his general operations.

MATERIALS AND WORKMANSHIP:

Wherever not explicitly described all materials and workmanship used or employed in carrying out the work of this contract shall be of the highest grades and qualities used in the best modern practice, and all mechanics, tradesmen, workmen, and other employees shall be trained and skilled in their various trades and occupations.

In all cases where materials and methods which are not explicitly described in these specifications are to be used or employed in this work the contractor shall first submit the names or brands of the materials which he proposes to use and procedure which he will follow to the Architect for approval, and he shall not proceed until approval for such materials and procedure has been obtained.

SUPERVISION AND INSPECTION:

All materials, processes, and operations of manufacture, construction, and erection shall be subject to inspection at all times; and the Architect and his representatives shall always have free access to all parts of the work. They shall be given every facility desired for inspecting processes, materials, and workmanship.

All required tests of materials shall be made by the contractor and their cost shall be included in the prices bid for the work. The Architect, or his representatives, shall have power to reject any articles, materials, or supplies, or workmanship that do not conform to the specifications and the approved plans. Rejected material shall be removed promptly from the vicinity of the work, and workmanship and processes deemed to be faulty shall be corrected immediately upon request. The contractor shall remove, reconstruct, replace, and make good, as directed, all defective materials and workmanship without additional charge, and regardless of any previous approval or acceptance of such defective materials and workmanship.

When the completed structure is ready for final inspection, the contractor shall so notify the Architect in writing, and any defects or omissions the Architect may find during such final inspection shall be made good prior to final acceptance.

SPIRIT AND INTENT OF SPECIFICATIONS:

It is the spirit and intent of these specifications, and of the plans forming part of them, to provide that the work under consideration and all parts thereof shall be fully completed and suitable in every way for the purpose or purposes for which designed. The contractor shall supply all materials and work incidental to, or described or implied as incidental to, the work included under his contract.

In all questions relating to the interpretation of these specifications, or any part thereof, the decision of the Architect shall be final.

DETAIL AND WORKING DRAWINGS:

Additional detail and working drawings will be furnished in amplification of the contract drawings as they may be required. All such additional drawings are to be considered of equal force with those which accompany these specifications. a complete set of the drawings and specifications must be kept at the building at all times during the progress of the work.

SHOP DRAWINGS:

The Contractor shall, upon request, submit shop drawings for the approval of the Architect.

DIMENSIONS:

Figures given on the drawings govern scale measurements, and larger scale governs smaller.

PROTESTS:

If the contractor considers any work demanded of him to be outside the requirements of the contract, or considers any record or ruling of the inspectors or the Architect to be unfair, he shall immediately ask for written instructions or decision, and then file a written protest with the Architect against the same within five days thereafter; otherwise he will be considered as having accepted the record or ruling.

SUB-CONTRACTORS:

Each bidder shall submit with his bid a list of his proposed subcontractors. The Architect will take whatever steps he deems necessary to determine the ability of the proposed sub-contractors to successfully handle the work, or he may require the bidder to furnish such information as may be required.

The right is reserved to reject the proposal of any bidder who can not show that all of the proposed sub-contractors are known always to execute only first-class work, and also are able to successfully handle this work in the manner desired. In this connection the architect may, if he so elects, permit the bidder to alter his list of proposed sub-contractors if by so doing the list becomes satisfactory.

No change in sub-contractors will be permitted without the consent of the architect. The contractor may, however, take the work out of the hands of any or all sub-contractors and complete it himself if for any reason he so desires.

GENERAL DESCRIPTION OF THE WORK:

The work contemplated by these specifications consists generally of a circular building of the open temple form, as a memorial to those members of the armed forces of the United States, from the District of Columbia, who served in the Great War.

The building will be supported by composit piles. Pile caps and floor construction, to be of reinforced concrete. The dome shall be of Guastavino laminated tile construction, with ceiling and outer surface of dome faced with marble.

DESCRIPTION OF SITE:

The building is to be erected in Potomac Park, in the grove of trees to the south of the Reflection Pool of the Lincoln Memorial. The site is to be cleared as required and a road of rough timber laid for hauling from existing highways.

The site is approximately level with an average elevation of about 12 feet (D. C. datum). A boring, dated March 20, 1928, shows hard rock approximately 53 feet below surface.

LAYING CORNER STONE:

The laying of the corner stone will be attended with such ceremonies as are determined by the Commission. The contractor shall cooperate and assist as may be required in this operation.

WORK TO BE DONE:

The work to be done under this contract consists in furnishing all labor, machinery, equipment and material and constructing therewith, in accordance with these specifications, a District of Columbia War Memorial.

The work shall include all necessary excavation; the driving of piles; reinforced concrete construction as shown; the erection of marble-work throughout and dome of Guastavino tile construction; also electrical work for interior lighting; and plumbing work in connection with drainage system for storm water.

CHANGES:

It is understood that the Owner shall have the right during the progress of construction to make any alterations, additions, or omissions that he may desire, to work or material herein specified or shown on drawings. The same shall be carried into effect by the contractor without in any way violating or vitiating the contract, but if such changes are made, the value of same must be agreed upon in writing between Owner, Architect and Contractor. No Omission will be allowed or extra work paid for unless ordered in writing, by the Architect.

SPECIAL WORK NOT INCLUDED:

The Owner reserves the right to have special work not included in the contract, done during the course of the work herein included.

INSURANCE:

The Contractor shall effect fire, lightning and tornado insurance, from time to time, equal to the amount of the payments made on account of the contract, and made payable to the Contractor or Owner, as their interest may appear.

LAYING OUT THE WORK:

The Contractor shall lay out the work from the drawings, to the approval of the Architect, and shall be responsible for any damage that may be sustained by the Owner or others from incorrect location of the building.

He shall employ and pay for the services of a competent engineer to lay out the lines of the building, test the levels of the excavation, floors, etc., and shall submit to the Architect written certificate that said lines and levels are as required by the drawings.

FOREMAN:

The Contractor must have at the building from start to finish a responsible foreman. In addition, the Contractor must give the work his personal supervision. The foreman must be on duty during all working hours. Any instructions or notices given to him shall have the same force as if given to the Contractor in person.

TEMPORARY OFFICE:

The contractor shall maintain a temporary office from the beginning until the completion of his work furnished with a counter, drawings and rack for drawings and proper provision for heating.

WATCHMAN:

Provide watchman as required to properly protect the beginning until completion of the work.

TELEPHONE:

The contractor shall provide and maintain telephone service from the beginning until the completion of the work and the architect shall be allowed free use of the same.

SAMPLES:

Samples of all materials and finish to be used must be submitted to the Architect for approval, whenever asked for, and all materials and workmanship must be equal in every respect to the sample approved.

RAPIDITY OF EXECUTION:

The work shall be carried on with the greatest reasonable rapidity to the satisfaction of the architect.

CUTTING:

All cutting and repairing of work shall be done without extra charge by the Contractor or sub-contractor whose work is to be cut.

PROTECTION:

All materials in or designed for the work shall be at all times suitably housed or protected, particular care being taken of all finished parts.

PRIVY:

The General Contractor shall provide a temporary privy with proper enclosure. This shall be removed on completion of the work and the premises be left in perfect condition.

TEMPORARY WATER SUPPLY:

The Contractor shall make his own arrangements for water supply for building purposes.

CLEANING:

The building and site generally must be kept free from all surplus material, dirt and rubbish at all times.

GUARANTEE:

The Contractor shall be responsible for and shall make good any defects due to faults in labor or material, which may arise or be discovered within one year after the completion of the work and its acceptance by the Architect.

It is understood that the surety bond submitted by the contractor shall support the guarantee.

CONTRACT DRAWINGS:

No. 1 - Elevation, Section, Plan and Foundation Plan. All at quarter inch scale.

No. 2 - Detail of Column and Cornice at one inch scale.

No. 3 - Plan and section of inner dome at one half inch scale.

No. 4 - Developed elevation of base, at one half inch scale.

No. 5 - Plan and section of Dome at one half inch scale.

No. 6.- Plan and section through base at one half inch scale.

EXCAVATION AND GRADING

SECTION 2.

TREES:

Such trees as are designated shall be cut down and their stumps removed. Trees designated to remain shall be enclosed, if necessary, for their protection, and in piling material care shall be taken not to injure them.

GENERAL:

The contractor shall excavate as indicated for the reinforced concrete ring over the piles.

Trenches for concrete work shall be cut to the exact size required, or wood forms of the proper size shall be used.

FILL:

Excavated material shall be piled at the site and used under the concrete work supporting the main floor as fill.

PUMPS:

Provide all necessary pumps and labor to keep the excavation clear of water at all times, until the completion of the foundation work.

GRADING:

Final grading, sodding, etc. will be taken up under a separate contract but on completion all disturbed earth about the building shall be neatly spread and raked.

FLOOR LEVEL:

The existing grade at the site is given as + 12. Allowing 6" for final graded fill about the building and 4 ft. for height of base and 3" wash for marble floor, the floor level at its center would be 16 ft. 9 in.

FOUNDATION PILES:

Foundation piles are to consist of 48 composit piles, 47 feet in length. Wood piles for the lower sections shall have points not less than 8"; butts not less than 13"; to be stripped of bark.

FOUNDATION PILES (CONTINUED)

A line from center of point to center of but shall lie wholly within the body of the pile.

Upper concrete sections of composit piles are to be figured as 20 feet in length. Give the additional cost or credit per foot for lengths slightly different from the above figures. Concrete portion of piles to be not less than 14 inches in diameter at the point; shall be of one - one and one-half - three (1-$1\frac{1}{2}$-3) concrete, and shall have an approved form of splice with the wood sections of the piles.

The concrete portion of the piles shall be so formed that the concrete will be protected from distortion and mixture with the surrounding ground.

The contractor shall not be required to drive the composite piles to a greater resistance than three - one-half (3 -1/2) blows of a #1 Vulcan Hammer to one (1) inch penetration.

CONCRETE WORK

SECTION 3.

SCOPE OF WORK:

Concrete work in addition to concrete portion of piles shall consist of the reinforced ring which caps the piles; the reinforced slab under the marble floor and the concrete fill in connection with the above reinforced ring.

All concrete to be in the proportion of one part Portland Cement, two parts sand and four parts gravel.

PORTLAND CEMENT:

Cement shall conform to the standard specifications of the American Society for testing Materials, for Portland Cement, Serial Designation C9-21. Cement shall be Atlas, Alpha, Lehigh or other approved brand of true well-seasoned Portland cement. Cement received by the contractor in a damaged condition, or which is damaged at the site, shall not be used, but must be removed from the work promptly. Cement shall be "Government Tested".

SAND:

Sand shall be free from injurious amounts of dust, lumps, soft or flaky particles, shale, alkali, organic matter, loam or other deleterious substances. Sand shall range in size from fine to coarse, not less than eighty-five(85) percent passing through a Number four (4) sieve.

GRAVEL:

Gravel shall be clean, hard, strong, durable free from injurious amounts of soft, friable, thin, elongated or laminated pieces, alkali organic or other deleterious matter. Gravel shall be uniformly graded from fine to coarse, not more than ten (10) percent passing through a Number four (4) sieve, the maximum size passing a one and one-eighth (1-1/8) inch ring.

REINFORCING BARS:

Reinforcing bars shall conform to the standard specifications of the American Society for Testing Materials, for Intermediate grade Billet Steel Concrete Reinforcing Bars, Serial designation A 15-14. Bars shall be the full area called for. Bars shall be free from excessive rust when placed in the forms.

REINFORCING BARS (Continued)

Bars shall be set accurately in position called for on drawings, and shall be secured so as to retain their proper position during the placing of the concrete. No rerolled bars will be permitted.

FORMS:

All necessary forms shall be substantially designed and of adequate strength to safely support the concrete. Forms shall prevent leakage of mortar and shall be braced and tied so as to remain true to line and position without bulging, sagging or deformation.

REMOVING OF FROMS:

Before any forms are removed the concrete shall have attained sufficient strength to prevent injury due to such removal. The minimum length of time forms must be kept in place shall be that required by the District of Columbia Building Code. The Contractor will be held responsible for any injury arising from inadequate forms or premature removal of the same. Patching will only be permitted where defects are minor in character.

MEASUREMENTS OF CONCRETE INGREDIENTS:

The amounts of all the ingredients of the concrete including the water shall be determined by volume, and measurements are to be made of the loose material.

One bag of cement weighing 94 pounds net shall be considered to measure one cubic foot. Sand and gravel shall be accurately measured by containers of known volume. The water shall be measured by a tank or vessel which shall have been accurately calibrated and to which an accurate gauge of approved type is attached.

MIXING CONCRETE:

All concrete shall be mixed in mechanical mixers of approved type. Mixing shall continue at least one and one-half (1-1/2) minutes after the last ingredient is added. The amount of water shall be measured by an approved apparatus. No water shall be added after the concrete has left the mixer.

PLACING CONCRETE:

Immediately after mixing the concrete shall be deposited for any section poured. It shall be rammed, spaded, etc., so as to produce a uniformly compacted mass of maximum density and so that the concrete will present a smooth, finished, unbroken surface without exposed gravel, when forms are removed. Concrete floor slab, and where else practicable, concrete shall be deposited full thickness in one operation.

PLACING CONCRETE IN COLD WEATHER:

When the temperature is below forty (40) degrees, the water and aggregate shall be heated and care taken to prevent freezing.

PROTECTION OF CONCRETE:

Protect concrete from premature drying. Unless otherwise approved it shall be kept damp for a period of ten days after pouring.

WATERPROOFING:

Apply five-ply tar and tar-felt membrane waterproofing to the outside of the outer Guastavino shell.

Note: The Guastavino tile is to be drilled and separate anchors installed to engage each piece of marble facing. Waterproofing must take into account these anchors.

WATERPROOFING FELT:

Shall be coal-tar-saturated rag felt conforming to Federal Specification Board Specification No. 81.

PITCH FOR WATERPROOFING:

The coal-tar pitch used in connection with the built-up membrane waterproofing shall conform to the requirements of Federal Specifications Board Specification No. 83.

LAYING WATERPROOFING MEMBRANE:

The surfaces to receive membrane waterproofing shall be thoroughly cleaned and completely protected by a membrane consisting of five layers of coal-tar felt laid in five moppings of hot coal-tar pitch and surfaced with an additional heavy mopping of pitch. The total quantities of material used shall be not less

LAYING WATERPROOFING MEMBRANE (Continued)

than 180 pounds of coal-tar pitch and 76 pounds of coal-tar felt per 100 square feet. The membrane shall be constructed of felt laid shingle fashion, with each sheet of felt overlapping the preceeding sheet by 26 inches if 32-inch felt is used and by 29 inches if 36-inch felt is used. The first layer of felt shall be laid in a heavy mopping of pitch consisting of approximately 25 pounds per 100 square feet of surface. The top layer of felt shall receive a mopping of approximately 40 pounds per 100 square feet.

The sheets shall be laid in the pitch while it is hot, and all layers shall be free from wrinkles, buckles, or blisters. The end laps of sheets shall be not less than 6 inches. Extreme care must be exercised in the laying of the membrane to insure that all layers of felt are entirely coated with pitch. The pitch shall not be heated above 375 degrees F.

DOME CONSTRUCTION:

As indicated on plans, provide interior and exterior Guastavino laminated shells, each with a steel angle inclosing ring and a steel chanel ring at the center of the interior shell.

ANCHORS FOR MARBLE FACING:

Drill into the above shells and securely plug in place with lead wool anchors suitable for securing the marble inner and outer dome facing.

Note that the outside of the upper shell is to be waterproofed.

BRICKWORK.

Note brick backing behind exterior frieze.
Bricks to be common, hard-burned, brick.
Mortar same as for marble.

EXTERIOR MARBLE

SECTION 4.

SCOPE OF WORK:

The Memorial building, inside and out, shall be faced with marble.

MARBLE:

All marble shall be of the very best quality, selected, the best the quarry can produce and equal in every respect to the marble used in the construction of the Memorial to the Women of the Civil War.

All marble shall be thoroughly seasoned, absolutely sound, and of uniform color. It shall contain no staining material and shall be free from knotty spots, spalls, chips, stains, discolorations, or other defects which may impair its strength or durability or mar its appearance.

All stones used as beams, lintels, and slabs, which will be subject to transverse strains shall be especially selected for soundness and strength and shall be capable of sustaining their super-imposed loads with an ample factor of safety.

The first bid shall be submitted on the basis of marble supplied from the Vermont Marble Co.'s quarries, and additional bids are requested on white Georgia marble from the Taite quarry and for any other light-colored marble which the bidder considers equal and similar to the two previously mentioned.

MORTAR:

The mortar used in setting all stone work shall be composed of one part Portland cement and three parts sand with sufficient lime added to produce proper workability. The amount of lime shall be the minimum required to retard the setting of the mortar sufficiently and to produce proper workability.

The mortar used for pointing shall be composed of one part Portland cement and one part sand.

The Portland cement shall be white, nonstaining Portland cement conforming to requirements of Federal Specification Board Specification No. 1a.

The sand shall be white sand of suitable size and gradation for the mortar required and shall be clean and free from impurities.

The lime shall conform to the requirements of Federal Specification Board Specification No. 249.

All mortar shall be carefully proportioned and thoroughly mixed in a machine mixer or by hand in water-tight boxes.

MORTAR (Continued):

The dry materials shall be thoroughly incorporated before the water is added and no mortar shall be used more than one hour after mixing. Retempering of mortar will not be permitted.

Any mortar mixed or used during freezing weather shall be composed of materials which have been heated previous to the mixing and the mortar shall be protected after being placed in the work to prevent any possibility of freezing. All operations in connection with the use of mortar during freezing weather or when the temperature is below 40 degrees F. shall be carried out as approved by the architect.

ANCHORS AND DOWELS:

All projecting stone and all stones not securely bonded in place shall be anchored or tied as required.

Dowels to be brass or bronze. No iron to be used. See also Anchors for marble facing, page 15.

CARVING:

The contract shall include only the carving of the inscription and and insignia on the main frieze of the building. This inscription shall be incised and shall be in strict accordance with the detail drawings.

The insignia shall be in relief and shall follow a model which shall be supplied by this contractor.
Boasting for carving insignia to be left on one stone of frieze. See "Cornice", page 21.

DRESSING:

All marble shall be finished with a fine-sand finish. The last operation of finishing the surface shall be done by hand.

ASHLAR:

All ashlar shall be pointed as shown and anchored and bonded as indicated.

JOINTS:

Joints generally shall be 3/16 inch in width.

SAMPLES:

Approved samples shall be kept at the architect's office and all marble in the building shall be equal to this sample, in color and freedom from excessive veining.

BEDS:

All stones shall be so cut that they will set in the the work on their natural bed with the stratification level. The beds for all marble shall be accurately sawed to true planes and no concave surfaces will be allowed. The dressing of beds shall be done so as not to injure the edges or angles.

MOULDINGS:

All moldings shall be cut with straight lines and shall conform to templates, cut strictly in accordance with the full-size drawings. They shall be so cut that absolutely unbroken lines will be formed by members running through from block to block when set in the wall.

STORAGE:

Marble shall be stored above ground on wood platforms furnished and maintained by the contractor. It shall be protected both before and after setting from stain and soil of every kind.

SCAFFOLDING:

All scaffolding for this work shall be furnished and erected by the contractor and shall be constructed in the best manner and of ample strength. The scaffolding shall be so arranged that all work may be inspected at any time with convenience and safety and shall be entirely removed when so directed.

CENTERS:

The contractor shall furnish, erect and maintain all necessary centers of ample strength and sound construction.

FITTING:

The marble work shall be accurately and completely cut and dressed before being delivered at the site, except the necessary refitting of joints and faces and those portions which are to be carved. The refitting shall be done by skilled stonecutters at the building, and the foreman of the stonecutters shall be retained at the building from the time the first stone is delivered until the entire stonework has been completed and accepted, excepting only at such times as the work may be discontinued, and shall not be discharged except for good and

FITTING (CONTINUED)

sufficient reasons approved by the architect. The contractor shall employ at the building a sufficient number of stonecutters to execute the work with such speed as may be necessary and to continue the work uninterruptedly.

SETTING:

All marble shall be accurately set to form true and level lines with uniform joints, and shall be equal in every respect to the workmanship of the marble work of the Memorial to the Women of the Civil War. Each stone shall be thoroughly cleaned and shall be wet before being set. Each stone shall be set on its natural bed in a full bed of mortar. In setting each stone sufficient mortar shall be placed under the center of the stone to fill out to the edges of the stone on all sides when the stone is struck with a wooden mallet or ram. Any stone which does not find a proper and accurate bed shall be removed, cleaned, and reset upon a new bed of mortar. All joints at the back of the stone shall be solidly filled with mortar. All stones shall be lifted with derricks and Lewises or tongues, and all Lewis or other holes shall be on such parts of the stones as will be built in. All anchors shall be set in position as the courses are laid, and all anchors holes shall be filled solidly with mortar. Heavy blocks shall not be set in position until mortar of the blocks below has become set. Projecting courses, such as cornices, belt courses, and other large projections shall be propped in position until the anchoring and the walls above are in position and set. All stones shall be carefully selected for matching and location in the work.

ANCHORING:

All anchors to be securely bedded in the backing. All ashlar to be anchored at the top of each stone. Provide also anchors for all projecting cornices. There shall be two anchors for stones eighteen inches or more in length and one anchor for smaller stones. This applies to the roof facing also.

POINTING:

All exposed joints shall be pointed as soon as set in place, with the pointing mortar specified. Joints shall be filled solid and neatly struck flush with the face of the stone.

CLEANING:

After the marble work has been pointed, all surfaces throughout shall be carefully cleaned with stiff brushes and

CLEANING-(CONTINUED)

be removed. No acids or steel brushes will be allowed in cleaning down the marble work. All superflouous martar shall be removed and any necessary redressing or replacing of marble work shall be done before the cleaning is commenced; and at the completion of the cleaning down, the whole of the stone work shall be in perfect condition.

CORNER STONE:

Shall be of the size indicated on the drawings. It shall be selected for soundness, strength of grain, whiteness and minimum veining. A pocket one foot deep, one and one-half feet long and one foot high shall be cut into this stone from the back. A four inch thick cover of marble shall be supplied to close this pocket after filling.

STEPS:

Shall be cut from solid blocks and shall be pitched and jointed as shown. Each step shall over-lap the one below not less than two inches.

FLOOR:

The Memorial floor shall generally be of 4" thick slabs of marble of the colors indicated and sizes shown. The slabs under the columns shall have surface on which columns rest raised 3/4 of an inch and identical in shape with the column base. These latter shall be 12" thick and the slabs between the columns 6" thick.

Floor shall have pitch outward 1/8" to the foot.

COLUMNS:

All columns shall be built up of four drums as shown. Caps shall follow strictly the details. The entasis must form true curves without projections or depressions at the drum joints. The drums shall be doweled together with 3/4 inch dowels not less than two dowels to each joint. All columns shall be fluted, and the fluting shall form true and accurate lines with all arrises sharp and true. Columns shall be bored for conduit and rain conductors, as indicated.

CUTTING: Note the cutting of cornice stones as required for lead sleeves from gutter outlets. Include also cutting of reglet in upper surface of exterior cornice for securing gutter lining.

LEADER TERMINALS:

Note four stones of outer base course to form terminals as indicated, for rain leaders and discharge storm water at grade. These stones shall have projecting spouts as shown.

CORNICE:-

All cornices shall be moulded and ornamented as shown, strictly following full size details. All projecting courses shall have ample bearing. Exterior Cornice shall have gutter. Cut raglet as shown for gutter linings. Interior cornice shall have gutter for indirect lighting. This contractor shall cooperate with the electrician for lighting installation. Note: Stone in exterior frieze directly over stairway is to have 3" deep boasting (over its center portion) for carving of insignia.

COPING ABOVE CORNICE:

Shall be of size and character shown. The top of the coping shall be cut with a wash. Cut reglet as required for sheet-metal gutter lining.

CEILING AND ROOF FACING:

Note sunk panelling on inside of dome and marble tiling on outside; latter to be graduated, as indicated, in size and convexity and holes drilled for anchors.

BASE OF BUILDING:

The marble base course shall be of the sizes shown. The outer course shall carry entirely around the building and be extended at the two entrances to form the lowest step. The base courses shall be supported as indicated on the reinforced concrete construction. Note that eight small panels at intervals are to have 3" deep boasting for carving. Note also the four terminal stones for hidden rain leaders.

BRONZE

SECTION 5.

BRONZE:

Include as indicated the central floor ornament of bronze cast in low relief. This ornament will in reality form a frame and lid (with approved lock) for the electrician's main feed box and switch box.

Include model to be approved by architect.

SHEET METAL WORK

SECTION 6.

SHEET METAL WORK:

All sheet metal gutter lining and outlet boxes shall be of Hoyts Hard Lead, made from sheets weighing not less than six pounds to the square foot.

Include for main cornice a square gutter of Hoyts Hard lead pitched to leader outlets. The gutter lining shall be carried up on roof side to first joint of coping above gutter and securely calked and leaded in. On the outer edge it shall be securely calked and leaded into a reglet cut in the top of the cornice.

SHEET METAL WORK (CONTINUED)

Include lead circular sleeves with locked and soldered seams from the gutter outlets to the cast-iron leaders. These sleeves shall taper from a 4" diameter at the gutter outlet to the 3" diameter of the leaders. Equip outlets with with boxes as required and removable extra heavy brass bar strainers.

CORNER STONE BOX:

The contractor shall furnish a copper box for the corner stone. This copper box shall be of size as directed and shall be of 18-ounce copper with all seams locked and soldered.

PLUMBING

SECTION 7.

SCOPE OF WORK:

This work shall include drainage for storm water.

All work shall be installed in accordance with the rules and regulations governing such work in the District of Columbia.

PIPE AND FITTINGS:

All cast iron pipe shall be uncoated, extra heavy cast iron pipe and fittings.

All pipe shall conform to the requirements of the Federal Specification Board Specifications No. 448.

SCHEDULE:

The four rain leaders are to be 3" cast iron-pipe throughout the length of the columns and for the elbows to the leader terminal stones of the base. The ends of these elbows shall not be visible.

ALTERNATE:

Give alternate for rain leaders to be 3" Bureau of Standards, Class A brass pipe.

ELECTRICAL WORK

SECTION 8.

SCOPE OF WORK:

The contractor shall arrange with the Potomac Electric Power Co. to bring their service within the building, and shall pay all necessary charges, etc., including all permits in connection with the installation of this service. This is also intended to cover such miscellaneous items as ground wires, meter arrangements, etc.

MATERIALS:

Where complete details are not given in these specifications, the material shall conform to the requirements of the District of Columbia Electrical Code, and the National Electrical Code.

WORKMANSHIP:

All work shall be done in strict accordance with these specifications and where details are not covered, the District of Columbia Electrical Code and the National Electrical Code shall be followed. The work shall also comply with the regulations of the National Board of Fire Underwriters.

FUSE BOX:

Under the center of the floor install, as directed, a fuse box of Marine type. Fuse box shall contain removable fuses, which shall take the place of a main switch.

WIRING SYSTEM:

The wiring for lighting shall be of the three-wire system for the current supplied to that locality.

SWITCHES:

Install for lighting one 30 ampere, 2-pole, rotary switch of Marine type.

OUTLETS:

Provide hidden outlets spaced every two feet, in the gutter of the interior cornice, with approved reflectors for indirect lighting.

CONDUITS:

Conduits shall be of the rigid type. They shall run through the columns and under the floor as required. All Conduits shall be best quality steel tubing and shall be galvanized and also protected by additional coating of clear enamel. They shall be

[illegible]

MARCH 18, 1931.

ADDENDA

ALTERNATE IN CONNECTION WITH FOUNDATION PILES (Page 10).

Give additional cost or deduction if all-concrete piles are used instead of composit concrete and wood piles.

ADDENDA TO "WATERPROOFING" (Page 14)

Parge lower Guastavino shell on top with mortar to a smooth surface for drainage; form a cement gutter at the spring of the inner dome; pitch to four gutter outlets; connect by lead sleeves to four rain conductors; thoroughly cover top of inner dome and gutter with asphalt.

ADDENDA TO "ROOF FACING" (Page 21)

The exterior marble facing shall be set in elastic cement. Elastic cement shall carry manufacturer's guarantee as to lasting quality and non-staining properties. Caulking compound as manufactured by the Johns-Manville Company will be approved.

ADDENDA TO "BRONZE" (Page 22)

It is proposed to abandon the anchoring of exterior marble face of dome, as specified on Page 19. Instead, four lower marble courses of dome shall have 7/8" bronze rings at the horizontal joints and slots cut for same.

Steel angle rings at the spring lines of inner and outer domes are to be heavily copper-plated.

APPENDIX C

"THE DISTRICT OF COLUMBIA WAR MEMORIAL"
FREDERICK H. BROOKE

D.C. War Memorial

File

THE DISTRICT OF COLUMBIA WAR MEMORIAL

Soon after the armistice, the idea of a District of Columbia War Memorial originated with Mrs. Frank B. Noyes, who proposed to replace the delapidated wood band-stand which stood at the East end of the Polo Field with a marble building. One of the objections to the old building was that band music was often lost to motorists if the wind was blowing. From the first the necessity of some amplifying machinery was recognized.

Early studies took the form of an open temple, using the Corinthian order and a low dome. (Photos 1 and 2).

Bids for this structure were obtained in 1919 from four leading builders. The lowest figure at that time was $55,700.

Although it was to occupy Government property, the building was to be a District of Columbia Memorial and its cost had to be met by public subscription.

In January 1920, Senator Brandagee, of the Library Committee of the Senate, offered the Joint Resolution creating a Memorial Commission of eleven members with authority to build "a memorial to those members of the Military and Naval forces of the United States from the District of Columbia who served their country in the Great War". The site was to be selected by the Chief of Engineers of the U. S. Army and approved by the Commission of Fine Arts, which Commission also was to approve the Memorial design. This bill was passed by Congress June 7, 1924.

The Fine Arts Commission abandoned the idea of a memorial at the end of the Polo Field and chose a site in the grove south of the Reflection Pool and on the axis of eighteenth street. (Photograph 3).

The Commission favored a heavier type of memorial and suggested using the Greek Doric order.

Since the Memorial was now definitely to become a reality, I informed the Commission that Nathan C. Wyeth and Horace W. Peaslee had agreed to act as my associates in preparing the plans.

Meanwhile, there had been a certain amount of discussion as to the acustics of a circular open building and almost no definite data was obtainable. Carl Engle, music librarian of the Library of Congress, and Dr. Kyle, of the Acustical Division of the Bureau of Standards, could offer no real information. Mr. Wallace Goodrich, of the New England Conservatory of Music, was most considerate in supplying information as to the Parkman Bandstand on Boston Common but his advice to have a flat ceiling and wood floor was not consistant with our type of memorial. I was urged to make a memorial shell or sounding board, as being best for out-door concerts in 1927. A meeting was called at Mrs. Eustis house, where a number of prominent Washingtonians, including Nicholas Longworth, spoke in opposition to our form of building for music. Fortunately, I had in my pocket a letter from John Philip Sousa and the picture of a band stand used for his concerts at the Buffalo Exposition. Sousa wrote "In my experience, which embraces band stands in America, Europe, Africa and Australia, I found the most satisfactory ones were those built for the Exposition at Buffalo. (Reproduction No. 4). Although of terra cotta, the Buffalo band-stand was substantially of the same type as ours. Sousa also gave us valuable information as to the floor space necessary for seventy-five men, the maximum number in the Marine Band.

Since we obviously could not please both sides, we determined to adhere to the circular memorial idea and, if the building proved satisfactory for band concerts, so much the better. I might add that after his first experiments with the Marine Band in the D. C. War Memorial, the leader, Lieut. Branson, phoned me to express his delight with the acustics and equipmant of the Memorial. He had posted himself at various points during the concert and was most enthusiastic.

To return to the Memorail drawings, in 1926 we still had an idea that some sort of permanent amplifying apparatus should be installed in the building as had been done, apparently successfully, at the Parkman bandstand in Boston. Consequently our studies showed apertures at the base of the dome, behind which the horns might be installed. Photographs Nos. 5 and 6, of a plaster model at one-half inch scale made in 1926 show these apertures. Also the 1/4" sketch, which was approved by the Fine Arts Commission in May 1925, showed some provision for horns. (See sketch)

Figures were obtained in 1926 from the same four builders and the lowest bid was $146,239, with the liklihood of an additional $12,000 to the Western Electric Company for an amplifying apparatus.

In the same year a campaign to raise the necessary funds was started and in about three years $135,000 was subscribed (See Campaign circular No. 7). Finally, in 1930, William Green, of the A. F. of L. was helpful in pledging labor to a substantial contribution and the fund was considered adequate to start building.

By this time the permanent amplifying apparatus had been abandoned, since the Government bands have their own trucks with equipment for amplifying.

A new problem arose over the placing of the names of the "men and women in the armed forces of the United States" who had met death in the war. It had been believed that the inside of the dome was the logical place for the names but this location was abandoned as being too far from the eye. Various sketches were made showing tablets on the inside of the columns, see photos. 8 and 9. Finally it was decided to change the base from steps to a circular drum and place the names of the war dead there. See photo 10. This scheme was approved by the Fine Arts Commission in February of 1931. (See drawing).

The design now having been fully decided, plans and specifications were prepared and six builders were asked to bid. Of these, Baird & Company were the lowest bidders and were awarded the work. Their bid of March 31, 1931 was $137,135.

Since the Memorial was to commemorate all residents of the District of Columbia who fought in the armed forces of the United States in the Great War, lists aggregating 26,048 men and women were obtained from Army, Navy, Marine Corps and Coast Guard records. The final list was typed on 100 percent cotton paper supplied by the paper division of the Bureau of Standards and guaranteed to be the most permanent paper known. The list was then sealed in a copper box and the box filled with nitrogen, as a precaution against decay, after the air had been exhausted. The box was finally placed in the corner stone of the Memorial and sealed up.

During the World War, National Guardsmen from the District of Columbia saw service, mostly, in the Twenty-ninth, Forty-first, Forty-second and Ninety-third Divisions. Washingtonians inducted, under the Selective Service Act, into the National Army were, for the most part, assigned to the Seventy-ninth Division. In these and other Divisions they fought in such memorable campaigns as the Meuse-Argonne, St. Mihiel, and in the Champagne.

The District of Columbia furnished 6,000 men to the Navy during the World War. They were widely distributed and took part in practically every branch of the service. They were represented on twenty-eight battle ships; took part in convoy, transport and transportation duty, mine laying and sweeping, served on the Cyclops - lost without a trace - on the Nicholson and Lydonia, credited with sinking enemy sub-marines, and manned the naval guns in France.

Marines, as part of the Second Division, fought through the above campaigns and at Chateau-Thierry.

The selection of the names of the District of Columbia war dead was a matter of considerable difficulty. The American Legion list of men, to whom memorial trees were planted on 16th Street, numbered 536. Lists from records of the Army, Navy and Marine Corps numbered 448. Furthermore, 344 names appeared on one or the other list, not on both. Obviously the Memorial Commission could not accept any existing list and the Chairman, Mr. Frank B. Noyes, appointed a Committee of five, including Gist Blair, General Stephan, Dr. MacNeil, Col. Nevitt and F. H. Brooke, to select the names. The Committee adopted the two rules; (1) The person must have died while in active service, prior to the official ending of the World War, or to have been discharged for physical disability and died prior to Nov. 11, 1918 and (2) the person must have been an actual resident and citizen of the District of Columbia prior to his entry into the service.

The service lists were checked and corrected by reference to War Department service cards and the public asked to cooperate by suggestions or corrections. The Committee lists were printed three times in the local papers. Finally four hundred and ninety-nine war dead, of whom seven were women, were approved and eventually sand blasted on the memorial, together with the insignia of the four branches of the service, the seal of the District and the reverse of the War Medal (Drawing). Inscriptions commemorating the war dead and the dedication of the building by President Hoover on Armistice Day 1931 were inscribed on either side of the North steps.

Now to come to the erection of the Memorial, in 1928 test borings made at the site showed but four feet of surface earth, down to the water line. Below sand, clay and river mud were encountered to a depth of 53 feet, where rock was found. It was determined to use the composit type of pile, 47 feet long, having lower sections of wood averaging 10½ inches in diameter and the upper sections (16 feet in length) of concrete. Of these piles four support each of the twelve columns and one the small electrical chamber. On the piles rests a twelve-sided ring, 5 feet wide braced by concrete cross beams.

In order to use the most permanent marble obtainable, the Bureau of Standards was consulted and Mr. Kessler, of that institution, favored Vermont marble in general and the Danby quarries in particular. He showed photographs of Vermont marble of tomb-stones dating from 1776, 1787 and 1797, where the original marble was evidently in a good state of preservation.

On a circular platform 4 feet high stand the twelve columns 3' 10" in diameter and 22 feet high. The columns are just under 5¾ diameters high and built of four drums. They have twenty flutes. Four are bored for 3" brass drain-pipes which conduct storm water from the main gutter to dry wells 30' distant from the building.

The top of the dome is 46½ feet from the ground. This height was studied on the site in silhouette to ascertain the relation of the dome to the neighboring trees.

The dome construction is one of an inner and outer shell of Guastavino laminated construction. The marble ceiling was erected on wood centers with 6" cramps (1650) built into the masonry. The lower Guastavino shell was build around these projecting cramps. In reverse fashion the outer Guastavino shell held dowels which anchor the outer marble dome. Between the inner and outer shell is a space 7' 6" high at the center. A counter-weighted center marble disc gives access to this space.

In the center of the Memorial floor an aluminum circular panel with eagle and stars in low relief is hinged to give access to a 4'x8" shallow pit for the transformer, electrical switches, etc. Electrical outlets for concealed lighting of the Memorial ceiling are placed at 2 foot intervals in the interior cornice. Conduit for flood lighting extends to four connection boxes 50 feet distant and to a telephone station at the South side of the terrain.

A grove of old willows enclosed the site chosen for the Memorial and while these trees were useful as a back-ground they were neither by position or character suitable to a symetrical entourage. In the spring of 1931, Mr. Greenleaf, after studying the site at Colonel Grant's request, favored a North and South vista about seventy-five feet wide, which should widden at the Memorail into a circular form approximately 120 feet in diameter.

This arrangement suggested double paths flanked by symmetrical tree planting and enclosing grassed areas on the North and South axes of the Memorial. To accomplish this setting, a Memorial Grove Committee was appointed, with General B. F. Cheatham as Chairman (See booklet). From funds subscribed for the Grove, we were able to move and transplant about the Memorial six large elm trees and eight smaller trees, all of which were furnished by Mr. Lanham from 14th Street, where the approach to the Highway Bridge was to be changed, and from the District nurseries at Fort duPont, Md. Four or five of the larger trees are marked by bronze plates as individual memorials.

For the Memorial altogether 83 drawings were made, a 1/4" plaster model and a life size silhouette. The total cost, including landscape work, tree planting, etc., was $155,464.47, see statement of December 15, 1931.

APPENDIX D

REPORT BY WILLIAM R. FAILOR

1968

8/16
[handwritten initials]

D66
~~D5819~~-NCR(NCP-C) July 16, 1968

Memorandum

To: Regional Director

From: Superintendent

Subject: Request for Engineering Study

In response to a request from this Office, personnel of the Division of Central Repair and Services have inspected the D.C. War Memorial, and have determined that serious structural deficiencies exist.

The most serious of these involve leakage of rain water through joints in the masonry. This leakage causes stains on the external stone surfaces, has built up mineral deposits in several places, and may ultimately lessen the structural strength of the memorial. Seams and expansion joints on the hidden gutter have deteriorated, adding to this problem. There is also considerable spalling on the stonework.

Because of the possibility of serious damage, and in order to take full advantage of recent developments in caulking materials and techniques, we recommend that an engineering study be made by the Washington Service Center of this structure as soon as possible with a view to having the required masonry work performed under contract.

It has been determined that the gutter work is within the capabilities of the Brentwood shop. In order to expedite this phase of the project and eliminate unsightly staining of the marble as soon as possible, we have issued a work order for the rehabilitation of the gutter. This work will include installation of adequate expansion joints, resoldering seams, and any other necessary metal work.

William R. Failor

cc:
Files NCR-C
Files NCR
Mr. Sawyer
EWSawyer:llw

D66-NCR(CM)

August 21, 1968

Memorandum

To: Superintendent, NCP-Central
Through: 1. Regional Chief, Division of Maintenance
2. Assistant Regional Director, Operations

From: Staff Architect

Subject: Existing deficiencies at the D. C. War Memorial

On top of the entablature, at the base of the dome, there was installed a sheet bronze trough type rain gutter. This gutter is 8 inches wide and 1 inch deep at the shallow points, and 2 inches deep at the drains. These gutters are shallow of necessity to prevent the accumulation of leaves. With this type of gutter they will dry and blow off. The original drawing shows a much deeper type of gutter.

This bronze gutter is made up of 3 foot lengths soldered together. The original soldering job was of poor quality, in that the work was either done on a cold or soiled surface. Both conditions cause a poorly soldered bond. Most of the joints have parted. Water easily flows through these openings and is absorbed into joints and the marble of the building below. These metal gutter joints should be thoroughly cleaned down to the shiny surface. Then, lay lead covered 3 inch wide copper strips over these joints with a good soldering connection along each edge of the strips. It has been found that this method permits a slight amount of expansion through superficial buckling of the copper strips, thereby preventing cracks in the solder.

The copper counterflashing is in poor condition and appears not to have been properly installed. It is corroded and does not fit into a tightly sealed joint in the masonry at the top of the flashing. Also, the counterflashing side joints do not have a sufficient amount of overlap and have parted. Some of the joints merely butt and were not soldered. The counterflashing is about 4 inches wide. It should be completely removed and replaced with enough material to provide complete coverage with side laps of 4 inches and they should be sealed.

About 3 feet above the gutter there is an offset ledge at the base of the exterior dome (there is an inner and outer dome). This ledge is not constructed according to the working drawings, i.e. with a solid piece of marble extending back to the dome; instead it is only marble faced with a 4 inch wide lead cap behind the facing covering brick backup. This lead cap is in fairly good condition in that only about 10 percent or less of the connecting joints are corroded. However, the caulking which abuts against the marble on either side of this lead cap, for the most part, has deteriorated and admits water. These defective lead joints should be resoldered and the joints between the marble and the lead recaulked.

There are four drains in the gutter trough to which 3 inch drainpipes are connected. These drainpipes pass down through a 6 inch diameter hole drilled in the center of the northeast, southeast, southwest and northwest columns only. The drains are covered with a slotted type grille which readily permits the passage of fallen leaves. These leaves tend to clog the drainpipes within the columns and the drain lines below grade. A different type of grille cover should be welded to the existing grilles. It should consist of a copper plate 1/16 of an inch thick with 1/2 inch diameter holes spaced and aligned over the existing slots in the grilles now in use. This would prevent broad leaves from floating down through the slots.

The drains in the gutters did not appear to be clogged. However, the columns that contain drain lines appear to contain seepage water that comes out of the horizontal joints between the stacked sections of the columns and through the marble itself. The source of this water evidently comes from a column of water that stands within the 6 inch in diameter pipe chase most of the time. This also indicates that the metal lining or drainage pipes within the pipe chase are leaking because of corrosion or rupture due to freezing. Apparently these pipes are clogged and have deteriorated causing this leakage.

This is a serious condition in that it is very difficult to correct. After close inspection of the working drawings of the building, it would appear that the only way the metal drainpipe in the columns could be replaced would be to dismantle some marble masonry so that the existing pipe could be withdrawn and new lengths of pipe inserted in place.

It has been deemed advisable to set up a water pressure test within the columns that have hollow cores. This test would determine whether the enclosed pipes are actually leaking and to what degree. It would also determine the location and rate of leakage through the marble masonry and the masonry joints.

Shop Project Coordinator Sulcer has suggested a way to remedy this problem. The suggestion has been considered and analyzed by this office. It sounds practical and should work. The suggestion is as follows:

After the drains have been cleared and free flow has been established, insert a 2 inch diameter flexible plastic tube. Extend this tubing from the gutter drain down below grade to where the 3 inch diameter down drain joins the 4 inch diameter lateral drains that carry the water over to the distant manholes (about 40 feet out from the Memorial). The tubing could be firmly fastened to the bottom of the drain hopper in the gutter and to the 4 inch diameter pipe with transition piece and cemented on set screw type of clamping collar to insure water tightness. If this were successful it would stop the water from seeping into the marble cornice, columns and into the interior of the attic. It would be worth a try.

If this procedure is impossible, after the drain lines have been thoroughly reamed out and free flow of water established, a low voltage, waterproof heating cable could be dropped down through the drain lines in order to prevent freezing in winter. All other times when water is permitted to flow down freely through these bored holes, there may be some lateral seepage, but it would probably be superficial. The hydrostatic pressure problem that we now have would not exist, and the water would drop rapidly with nothing to impede it. The four drain lines that lead out from the down drains in the columns out to the four manholes which are interconnected are also stopped up with earth and decomposed vegetation. They must be cleared also before proper drainage can be established.

The main 8 inch diameter drain line that extends from the manhole connections to the Tidal Basin outfall is also clogged. This 8 inch line has at least four distinct angle turns. These turns are made without manholes. Standard practice dictates that at all pronounced turns in sewer lines a manhole must be constructed. This is necessary to make possible the cleanout operation without damaging the walls of the pipe.

When all of these steps are taken, precipitation water will flow freely from the rain gutter all the way to the Tidal Basin outfall without blockage.

Upon close inspection of the condition of the marble masonry throughout the Memorial, it has been noted that most of the mortar in the joints between the individual pieces of marble has deteriorated. It has either dropped out or shrunk away from the masonry. This condition freely admits large quantities of water in rainy weather and during freezing weather this moisture condition becomes detrimental to the stability of the structure.

All of the masonry joints should be cleaned out to a depth of at least 1½ inches, and all easily removed material from depths beyond that. A recaulking job is urgently needed. A sealant that remains flexible under any type of weather condition should be used, such as a polysulfide type produced by the Thiokol Chemical Corporation. There are a number of them on the market and any one which produces the desired result would be acceptable. Primary considerations must be that the new sealant used must be of long life, the correct matching color and must remain flexible during its long life.

It has been noticed that there are some cracks opening up along the veins in the marble. There has also been some spalling around joints. These fissures and spalls should be filled with a matching color marble dust mortar.

After all the joints have been properly attended to and all of the existing stalactites removed, wash the whole building down thoroughly with brushes. Then after it dries completely, spray the entire exterior with a clear water repellent resinous base silicone treatment. This product should be applied at the rate of 1 gallon for every 150 sq. ft. This Memorial has never before received a coat of water repellent, so that this application will eliminate the formation of stalactites that are now in evidence.

The roof of this Memorial is formed by means of two concentric domes, the inner dome and outer dome. The inner dome forms the ceiling, and the outer dome forms the roof. The top of the ceiling dome is about 30 feet above the floor and the under side of the roof dome is about 8 feet above the center of the ceiling dome. In cross section the area formed by the two domes intersect on top of capitols of the columns and just behind the entablature.

Entrance to this space is difficult and is possible only by erecting tubular scaffolding up to the center of the ceiling dome where there is located a circular marble panel about 4 feet in diameter. This panel weighs an estimated 3 or 4 hundred pounds, and when the ceiling is closed it rests on a marble ledge. There is a steel ring to which clip angles are welded, surrounding and fastened to this marble panel.

It would be extremely difficult to move this access panel except for the fact that fastened to the top of the panel there is a counterbalancing mechanism. Even so it takes all the strength of a strong man or two to raise the panel and make the counterbalance function (see the enclosed photographs). This counterbalancing scheme was not shown on any of the original drawings which has lead us to conclude that it was an after thought. There are n o drawings in the files relative to it. There is no previous record of this installation, so we did not know exactly how to gain access to this attic space. We did know, however, that this panel was movable.

After gaining access to the attic, the counterbalance was oiled and greased. This helped some to make it move more easily. We found the upper surface of the inner dome in excellent condition with a heavy coating of tar waterproofing.

The under side of the outer dome is lined with hollow structural clay tile, and is also in excellent condition. Even though the joints in the exterior marble roof covering have deteriorated, no water has penetrated through this tile lining. This is probably due to a good waterproof membrane under the exterior marble covering on the dome.

However, there is real moisture trouble on the inside of the entablature. The marble entablature is backed up with brick which has received a heavy coat of tar. While the tar was hot, a layer of asphalt felt was pressed against it vertically and another coat of hot tar was added. In spite of all these precautions to prevent leaks, and with no intention of endeavoring to blame or criticize, this work was not properly done. The water should have been stopped at the outside surface of the structure before it penetrated this far. It is obvious that the first coat of hot tar was applied while the brickwork was saturated with water. Therefore, little or no bond was obtained. The surface should have been dried out with artificial heat (possibly electric heaters). Even though this would have been done, if there was hydrostatic pressure within the marble, open joints and brickwork itself, this would provide reason enough to push the tar and asphalt felt right off this surface. This is precisely what has happened.

At the intersection of the outer and inner dome, the cross section in the drawings show an acute angle. This angle is filled with a soft pulpy material, probably window putty, which was the best available caulking material at the time of construction. This putty is saturated with water, and in some places it is submerged in water standing about an inch in depth. High watermarks indicate that the water has been as deep as 6 inches. With this condition existing, imagine the amount of drainage that is taking place down throughout the structure and the amount of damage that is progressing with the freezing and thawing during the winter months.

This condition, of course, would disappear if the previous recommendations relative to gutter, drain lines, joint caulking and siliconing were carried out. It is further recommended that all of the soft pulpy material be cleaned out to allow air to circulate freely in this area even after the leaking is stopped. This pulpy material is apparently about a foot deep.

The original drawing shows 10 much larger size vents (1 foot by 3 feet) in the upper dome for ventilation of the attic space, and they were a design feature. Actually there were only four vents built in, and they are about 6 inches by 12 inches with a small holed grille over the opening which has further reduced the ventilation possibilities. While the 10 large vents are not needed, the existing four should be enlarged to about 1 foot by 2 feet with a more open type of grille. This would greatly improve the ventilation in this space. Considering the architectural scale of the building, this could be done with no detrimental effect to the classic design.

It is recommended that all of this work be performed by the Park Service maintenance forces, except that portion that would come under the heading of masonry. This work is not difficult, it is just that there is such a great volume of it. Doing this job properly would place an undue burden on the small number of masonry shop employees. It would be better to let a contract for the entire masonry portion of this rehabilitation work.

In the interest of structure preservation, this work should all be accomplished about the same time. Doing part of it at a time would only tend to undo the work of another trade. This is because all of these elements of deterioration are interrelated. We urge that this work proceed as soon as possible.

(Sgd.)

William A. Dennin

cc:
~~NCR Surname Copy~~
NCR File Copy
Mr. Dennin
Mr. Kloske

REKloske:efm 8/20/68

Enclosures

AUG 21 4 53 PM '68
NATIONAL CAPITAL REGION
NPS

SENT

F.E.

APPENDIX E

EXISTING VEGETATION
ELMORE DESIGN COLLABORATIVE
2005

PLANTS FOUND IN THE WOODED AREA WEST OF THE MEMORIAL

Botanical Name	Common Name
Trees	
Betula nigra	River Birch
Cornus florida	Florida Dogwood
Cornus kousa	Kousa Dogwood
Fagus grandifolia	American Beech
Ilex opaca	American Holly
Ilex ssp.	Holly
Liquidambar styraciflua	Sweet Gum
* Morus alba	Mulberry
Pinus strobus	White Pine
Quercus palustris	Pin Oak
Quercus phellos	Willow Oak
Quercus prinus	Chestnut Oak
Quercus robur	English Oak
Quercus rubra	Red Oak
Quercus ssp.	White Oak
Robinia pseudoacacia	Black Locust
Ulmus americana	Elm
* Ulmus parviflolia	Chinese Elm
Shrubs	
Aesculus parviflora	Bottlebrush Buckeye
Philadelphus ssp.	Mockorange
Prunus laurocerasus	Cherry Laurel
Rhododendron Hybrids	Azalea
Perennials	
* Artemsia vulgaris	Mugwort
Carex spp.	Sedge
* Datura metaloides	Jimson Weed
Dianthus deltoides	Maiden Pink
Fragaria virginiana	Wild Strawberry
* Glechoma heracea	Ground Ivy
Phytolacca americana	Pokeweed
* Plantago major	Broadleaf Plantain
Polygonum pensylvanicum	Smartweed
* Rumex crispus	Dock
Viola odorata	Sweet Violet

PLANTS FOUND IN THE WOODED AREA WEST OF THE MEMORIAL - CONTINUED

	Botanical Name	Common Name
	Vines	
*	Ampelopsis brevipedunculata	Porcelain Berry
	Campsis radicans	Trumpet Vine
*	Celastrus orbiculata	Bittersweet
*	Hedera helix	Ivy
	Parthenocissus quinquefolia	Virginia Creeper
*	Rhus radicans	Poison Ivy
*	Solanum dulcamara	Deadly Nightshade
	Vitis ssp.	Grape Vine

* ***Denotes Invasive Species***

Source: http://www.nps.gov/plants/alien/list/nationalparks.htm

PLANTS FOUND IN THE WOODED AREA EAST OF THE MEMORIAL

	Botanical Name	Common Name
	Trees	
	Acer rubrum	Red Maple
	Acer saccharum	Sugar Maple
*	Ailanthus altissima	Tree of Heaven
	Cercis canadensis	Eastern Redbud
	Cornus florida	Florida Dogwood
	Fagus grandifolia	American Beech
	Fraxinus pennsylvanica	Green Ash
	Ilex opaca	American Holly
	Liquidambar styraciflua	Sweet Gum
*	Morus alba	White Mulberry
	Quercus palustris	Pin Oak
	Quercus phellos	Willow Oak
	Robinia pseudoacacia	Black Locust
	Ulmus americana	Elm
	Shrubs	
	Aesculus parviflora	Bottlebrush Buckeye
	Rhododendron Hybrids	Azalea Hybrids
	Perennials	
*	Ambrosia artemisiifolia	Ragweed
	Oxalis acetosella	Wood Sorrel
*	Plantago major	Broadleaf Plantain
	Potentilla ssp.	Cinquefoil
*	Taraxacum officinale	Dandelion
*	Trifolium repens	White Clover
	Viola odorata	Sweet Violet
	Vines	
*	Hedera helix	Ivy
	Parthenocissus quinquefolia	Virginia Creeper

* ***Invasive Species***

Source: http://www.nps.gov/plants/alien/list/nationalparks.htm

APPENDIX F

LIST OF NAMES ON BASE OF MEMORIAL

NAMES ON THE BASE OF THE MEMORIAL

The following is the list of names inscribed on the base of the District of Columbia War Memorial. The 499 Washington residents died while in military service in World War I.

EARL ADAMS
EDWARD L. ADAMS
ALEXANDER K. ANDERSON
FREDERICK ANDERSON
LOUIS C. ANDERSON
WILLIAM ARNOLD
MELVIN M. AUGENSTEIN
EUGENE H. AUSTIN
CURTIS R. AUTEN
ELLIS B. BABCOCK
CARRINGTON E. BAILEY
PHILIP M. BAILLEY
WILK S. BAKER
WILLIAM H. BAKER
JOHN THOMAS BANKS
BERNARD B. BARNES
WARREN R. BARNES
CHARLES M. BARNETT
FREDERICK BARRACK
MORRIS R. BARSSOCK
GEORGE CLEVELAND BATES
WILLIAM L. BAURMAN
BENJAMIN BAYLOR
LOUIS H. BAYLY

WALKER BLAINE BEALE
JAMES D. BEBOUT
WILLIAM E. BELL
ABE BELLMORE
HARRY O. T. BENSON
SAMUEL B. BEYER
ARTHUR EVERETT BIRKLE
JOHN A BLIGH
WALTER R. BLUE
JOHN MAURICE BOHRER
CHARLES H. BOLDEN
JAMES L. BOOTH
LEWIS H. BOSS
CARL AUGUSTUS BOSTROM
FRANKLIN K. BOSWELL
ALEXANDER A. BOTELER
WILBER H. BOTELER
WILLIAM BOXLEY
ELMER FRANCIS BOYD
WILBUR LEROY BOYER
CLARENCE M. BRANDENBURG
GUY E. BRANDT
MACK BRAY
JOHN F. X. BRENNAN

CHARLES JOSEPH BREWER
WILLIAM I. BROOKE
HAROLD F. BROOKS
CHARLES LA RAY BROWN
DOUGLAS M. BROWN
EDWARD JOSEPH BROWN
JAMES R. BROWN
OLIVER BROWN
THOMAS BROWN
WILMARTH BROWN
SIDNEY H. BRYAN
WICTOR BUCHALTER

CHESTER W. BUCHANAN
WILLIAM R. BUCHANAN
JOSEPH BUDD
ALBERT O. BURGDORF
JOHN IRVING BURNS
MILLARD M. BURROWS
MATTIE VIRGINIA BUSHEE
RAYMOND R. CADY
FRANCIS QUIGLEY CARR
ROY C. CARROLL
EDWARD CARTER
HIRAM F. CASH
JOHN A. CHAMBERLIN

CHARLES E. CHAMBERS
HENRY E. CHANDLER
KENNETH B. CHARLTON
VOLNEY O. CHASE
PHILIP G. CHAVES
ALFRED CHERNER
GEORGE B. CHEW JR.
WILLIAM LUCK CHINN
CHARLES E. CLARK
CHARLES ELSWORTH CLARK
HAROLD M. CLARK
ALAN OGILVIE CLEPHANE
RALPH MCKINLEY COATES

HARRY K. COCHRAN
HOWARD R. COLBERT
JOHN COLE
JAMES H. COLEMAN
WARREN COLEMAN
HENRY TELLER COLLISON
CLARENCE M. COLLORD
MAX L. COLMAN
THOMAS T. COLMESNIL
EDWARD T. COMEGYS
WILLIS E. COMFORT
WILLIAM J. COMPHER
BOYD F. CONLEY

JOHN J. CONNORS
GEORGE THOMAS CONTEE
ANDREW H. COOKMAN
VINCENT GENGER COOLEY
JAMES A. COOPER
ERNEST A. CORBIN
VINCENT B. COSTELLO
EDWARD R. CRAMER
DANIEL W. CRAWFORD
HAROLD LEE CRAWFORD
JOHN CRILLY JR.
JOSEPH V. CULLEN
LOUIS A CURRIER

JOHN S. CURRY
JOHN J. DALY
WILLIAM F. DAUGHTON
ALVIN ELLIOTT DAVIS
HARRY GENTHER DAVIS
HORACE M. DAVIS
HUGH MACKAY DAVIS
STAFFORD L. DAVIS
HARRY T. DAVISON JR.
ALEXANDER R. DEAN
JAMES LESLIE DEAN
CHARLES SMITH DEANS
EDWARD H. DE GAW

STAFFORD G. DELESDERNIER
NICHOLAS J. DEMOPOULOS
EDWARD G. DE PASCHALIS
WILLIAM K. DIESTE
J. FORSYTH DIGGES
WILLIAM GODFREY DILLON
MYRON D. DODGE
THOMAS E. DONOVAN
THOMAS J. DORAN
TONY DORDOS
HERMAN W. DORR
ALOYSIUS DORSEY
JAMES W. DORSEY JR.

JULIAN NOYES DOWELL
ALBERT THOMAS DRAKE
CORNELIUS A. DRISCOLL
SYLVESTER DUCKETT
EDWARD JOSEPH DUDLEY
FRANK E. DUNKIN
HENRY ALBERT DUNN
ARTHUR H. DUTTON
JULIUS E. EADES
ELLETTE TUNCLE EARLY
JOHN H. EASTON
GEORGE ROBERT EDELEN
CHARLES M. EDWARDS

JOHN GEORGE EGERTON
LOUIS E. EISENSMITH
THODORE S. ELLIOTT
ARTHUR T. ELMORE
ERNEST W. EMERY
GEORGE D. ENGLISH
JOHN I EOPOLUCCI
WILLIAM A. EOPOLUCCI
JOHN F. EVANS
JOHN W. EVANS
JOHN F. EVANSHA
FRANK T. FAGAN
FREDERICK J. FAGAN

ABRAHAM J. FAINMAN
THOMAS H. FARNSWORTH
FOSTER CABERT FELTON
WILLIAM D. FENWICK
FREDERICK FICKLING
FRANKLIN E. FLETCHER
HENRY W. FLETCHER
JOSEPH H. FORD
FRANKLYN G. FOX
HILARY REID FRAZIER
CHARLES A FUCHES
JOSEPH L. GARNER
JOHN GATELY

WILLIAM JOSEPH GEARY
JAMES W. GEDDES
WILLIAM H. GILES
ERNEST I. GILLEM
ALFRED GLASCOCK
HAROLD L. GOCHENOUR
JAMES R. GOGGINS JR.
VICTORIA GOOD
FRANK GORDON
JAMES N. H. GORDON
RAYMOND L. GORDON
ALBERT GOSS
GEORGE H. GRAY

DONALD R. GREEN
JOHN A. GREEN
JOHN D. GREEN
ROBERT C. GREENWELL
ROBERT R. GRIFFITH
BENJAMIN J. GRISWOLD
WILLIAM H. GROSS
GORDON JAMES GROVES
ALLEN T. GRYMES
CLARENCE L. GUNNELL
PETE HADDAD
JAMES F. HAGAN

MAURICE LEO HARDING
WILLIAM W. HARDY
ARTHUR A. HARIG
J. RANDOLPH HARMAN
WARREN G. HARRIES
ALOYSIUS D. HARRIS
CHARLES D. HARRIS
RICHARD SAMUEL HARRIS
MORGAN B. HARVEY
JOHN A. HAVENER
HARRY W. HAWES
BERTHA RYAN HAYES

CHARLES HENRY
ENRIQUE HERNANDEZ
WILLIAM LELAND HIBBS
EDWARD S. HIGDON
GEORGE CHAFFEE HILL
MARON LESTER HODGSON
LEROY B. HOLCOMBE
CLAUDE HOLLEY
FRANK WILLARD HOLLOWS
HENRY S. HOLMES
MATHEW HOLMES
JAMES R. HOPKINS

WALLACE F. HOWARD
WILLIAM B. HUDSON
CHARLES F. HUNTEMANN
HENRY HUNTER
PAUL L. HURDLE
JAMES WILLIAM HURLEY
FRANCIS HUTCHINS
HARRY FREDERICK HUTH
MAURICE JAMES HUTTON
DANIEL M. JACKSON
EDWARD JACKSON
GEORGE JACKSON

JOSEPH J. JACKSON
WILSON W. JACKSON
CHAS. A. RHETT JACOBS
ROGER W. JANNUS
HUBERT ALFRED JOHNSON
JAMES JOHNSON
JAMES W. JOHNSON
MILTON JOHNSON
JAMES RAWLINS JONES
MARCUS A. JORDON
STANTON F. KALK
DAVID KAY

JOHN JOSEPH KEADY
JAMES KEELEY
JOHN O. KELSER
JOHN A. KENDALL
FRANK S. KENNEDY
HARRY B. KENNEDY
MAURICE KEPLINGER
JOHN A. KERSEY
JAMES W. KEYES
WILLIAM GEORGE KIDD
ALLEN L. KIDWELL
GEORGE EMMETT KILLEEN

HARRY L. KIMMELL
JAMES L. G. KING
RALPH MELVIN KING
FRENCH KIRBY
CLARENCE A. KNUDTSON
HERBERT GRAHAM KUBEL
LEO LAFFEY
JOHN M. LAMBERT
RELIOUS LATNEY
WILLIAM J. LAWLESS
ROBERT L. LAWSON
FRED LEE

MALACHI LEE
KENNETH LEWIS
LLOYD BAXTER LIEBLER
HARRY D. LOMBARDI
JOHN JAMES LOULAN
NORMAN A. LOVELESS
JOSEPH LOVINGS
WILLIAM T. LUSBY
EARL L. LYLES
THOMAS MICHAEL LYNCH
DOUGLAS C. MABBOTT
CHARLES W. MAC DONALD

LEE. B. MAGNER
GEORGE MAGRUDER
MAURICE F. MAHONEY
MAURICE J. MAHONEY
DONALD H. MANNING
WILLIAM S. MANNING
PEYTON C. MARCH JR.
STUART LEROY MARLOW
THEODORE C. MARRS
HARACE MATTHEWS
VICTOR E. J. MAYER
AUBREY ALLEN MAYO

ALOYSIUS MC CAULEY
JOHN B. MC CAULEY
GEORGE BALDWIN MC COY
JOSEPH G. MC DONALD
J. A. RAY MC FADDEN
STEPHEN P. MC GROARTY
EDWARD E. MC KENZIE
WILLIAM H. MC KIMMIE
WILSON MEADS
MILTON S. MEDLEY
DAVID L. MEEKS
ROBERT E. MEINEKHEIM

CARL FREDERICK MILLER
LEMUEL B. MILLER JR.
SAMUEL MILLER JR.
CARL OLIN MINOR
ANTONIO MISSINI
THEODORE N. MITCHELL
WILLIAM GEORGE MOORE
EDWARD S. MORGAN JR.
JOHN FRANCIS MORIARTY
JOHN C. MORRISON
HOWARD H. MORROW
CARL JOSEPH MUNCH
BEATRICE T. MURPHY

JOHN JOSEPH MURPHY
EVANS ELLIOTT MURRAY
HAGOP MUSHEKIAN
MATT FRANCIS MYERS
JAMES BARBOUR NALLE
RICHARD A. NALLY
KENNETH H. NASH
FRANK R. NEEDHAM
FRANCIS EMMETT NEIL
CLAIR T. NEWELL
IRVING T. C. NEWMAN
FRANK EDWARD NEWTON
LOUIS A. NIEDOMANSKI

HENRY FRANCIS NOLAN
JAMES FRANCIS NOONE
SEYMOUR NOTTINGHAM
DAVID T. O'CONNELL
FRANCIS A. O'CONNOR
JOHN. F. O'CONNOR
DAVE OETTINGER
HELEN V. ORCHARD
LEO J. OSBORNE
THOMAS O'TOOLE
LENWOOD HUGHES OTT
PHILLIPS W. PAGE
RICHARD WALTER PARFET

JOHN PATE
GRIFFIN PAYNE
JOSEPH PELUZZO
JOSEPH B. PHELPS
JOHN MANLY PICKRELL
BLANCHE E. PIERCE
CHARLES EDWIN POATES
GEORGE W. POLHEMUS
JOHN PRENDER JR.
RALPH PUMPHREY
ISRAEL PUTNAM
ALBERT ZANE PYLES
W. OTIS QUESENBERRY

WILLIAM DEC. RAVENEL JR.
WILLIAM F. REDMAN
WILLIAM AUBREY REED
WILLIAM T. REILEY
RALPH W. REMICK
FREDERICK T. REMLER
WILLIAM L. RHINE
FRANKLIN A RICHARDS
CHARLES DAVID RICKER
JAMES W. RIDDICK
WILLIAM H. RITENOUR
GEORGE R. ROBINSON
HAROLD M. ROBINSON

JESSE MORSE ROBINSON
EDWARD L. ROCHE
ALEXANDER RODGERS JR.
WARNER M. RODGERS
WILLIAM H. ROLLINS
ROBERT C. RUSK
THOMAS RUSSELL
FERDINAND SAUERS
ERNEST C. SCHLEITH
FREDERICK W. SCHUTT
PAUL B. SCHWEGLER
HENRY H. SCOTT
JOHN CRAWFORD SCOTT

JOHN H. SEABURN
CHASE EMILY SEBOLD
GEORGE VAUGHN SEIBOLD
VALENTINE SELLERS
RICHARD MC A. SHAMLEY
WILLIAM A. SHEEHAN
ROBERT L. SHEPHERD
PHILIP H. SHERIDAN
GEORGE SHOULDERS
ABRAHAM W. SIDKOWSKY
LEO I. SIMMONS
WILLIAM P. SLATTERY
CARROLL B. SMITH

ERNEST SMITH
ERNEST S. SMITH
FRANCIS MARION SMITH
ISRAEL SMITH
JAMES E. SMITH
JAMES L. SMITH
TONY SMITH
WILLIAM F. SMITH
HARRY F. SMURR
EDWARD P. SNEED
MAURICE B. SNYDER
NORMAN H. SONNEMANN

SAMUEL W. SOWERBUTTS
HENRY C. SPENGLER
EDWIN LEO SPRINGMANN
RALPH STAMBAUGH
EDWIN M. STANTON
PERCY ALBERT STEIN
ALBERT B. STELZER
JAMES STEPHENY
JOHN WELLINGTON STEPP
LOUIS G. STEVENS
GEORGE E. STEWART
JOSEPH C. STEWART
RAYMOND L. STEWART

FRANCIS W. STONE JR.
PETER STRICKLAND
GEORGE WORD STRIEBY
BENJAMIN F. STROTHERS
ALBERT D. STURTEVANT
HARRY M. SULLIVAN
JOHN SULLVON
ALLEN M. SUMNER
HOWARD G. SWANN
ROBERT E. SYMMONDS
CHARLES P. TALKS
GEORGE TARANTINO
JOHN H. TAYLOR

WILLIAM MC K. TAYLOR
FRANCIS A. TENNANT
EMIL THEISS
WILLIAM E. THOMAS
RAYMOND W. THOMPSON
GEORGE K. THORNTON
LULA MAY THRIFT
RUSSELL D. TIBBITTS
ALBERT W. TIERNEY
CLARENCE TILLMAN
J. WILDER TOMLINSON
PHILIP H. TOOMEY

WILLIAM G. TOONE
HENRY PEIRCE TORREY
LAWRENCE TOWNSEND JR.
CHARLES ASHBY TOWSON
FRANCIS M. TRACY
JOHN G. UTTERBACK
FRANK C. VALENTINE
ARTHUR G. VANDERLIP
STANLEY VANDERWALKER
DEAN R. VAN KIRK
JOHN W. VINSON
B. STUART WALCOTT

LEONARD WALDMAN
HALL CHRISTIE WALKER
JAMES EDWARD WALKER
LOUIS WALKER
JOHN B. WARFIELD
BENJAMIN WARNER
EDWARD M. WATKINS
CHARLES S. WEAVER
CARL H. WEBER
CHARLES F. WEDDERBURN
BENJAMIN W. WELLS JR.
JOHN W. WHEELER

ALBERT WHITE
ROBERT L. WHITEHAND
RAYMOND WHITNEY
VICTOR M. WHITSIDE
EDWIN EARL WILKERSON
LAURENCE O. WILKINS
GUY I. WILLARD
FRANK ALOYSIUS WILLEKE
ARCHIE W. WILLIAMS
ARTHUR F. WILLIAMS
GUY WILLIAMS
JAMES H. WILLIAMS

LEA D. WILLIAMS
LLOYD WILLIAMS
SURVAIN A. WILLIAMS
PRICE WILLIAMSON
ROBERT L. WILLINGHAM
HARRY V. WILSON
JOHN W. WILSON
HAROLD D. WINANS
CARL ALFRED WOLINE
JOHN BOYD WOLVERTON
JOHN H. WOODSON
HARMON GEORGE YOUNG

APPENDIX G

STRUCTURAL REPORT

ROBERT SILMAN ASSOCIATES, PLLC
2005

ROBERT SILMAN ASSOCIATES, PLLC

STRUCTURAL ENGINEERS
1053 31st STREET, NW, WASHINGTON, DC 20007
PHONE (202) 333-6230 • FAX (202) 318-3015

TO: John G. Waite Associates
64 Fulton Street, Suite 402
New York, NY 10038

ATTN: Clay Palazzo / Nancy Rankin

DATE: **July 11, 2005 Rev. Oct. 10, 2005**	JOB NO.: **W1543**
PROJECT: **DC War Memorial**	
LOCATION: **Washington, DC**	
CONTRACTOR:	
OWNER: **National Park Service**	
WEATHER: **Sunny, Cool**	
PRESENT AT SITE: **John Matteo, Courtney Fint, Clay Palazzo, Nancy Rankin, Chelle Jenkins**	

THE FOLLOWING WAS NOTED:

Summary

On March 31, 2005 Robert Silman Associates conducted an initial condition survey of the DC War Memorial, located in West Potomac Park near Independence Avenue a few hundred yards east of the Lincoln Memorial. The memorial was constructed in 1931 and was designed by architect Frederick H. Brooke. It is a circular Doric temple form with a diameter of 44 feet and a height of 47 feet and is constructed largely of Vermont marble (Photo 1). This report describes the general construction of the memorial, summarizes structural conditions observed and provides preliminary recommendations. The general descriptions below are followed by detailed evaluations, section by section.

Photo 1. DC War Memorial

General System Description

The memorial presents a marble-clad domed roof with separate marble-clad domed ceiling, both of which are supported by Guastavino tile domes set immediately inboard of the marble. The Guastavino domes define an attic space which is accessible from a central oculus in the ceiling. Steel L-rings are located at the bases of the tile domes where they meet the inner brick portion of the entablature and cornice. The L-rings apparently were intended to resist the thrust loads from the domes. These elements are shown in the historic plan and section of the memorial (SSK-1). Supporting the brick and marble entablature are twelve marble columns. Four of the columns are indicated on original drawings to have borings through their centers to accommodate downspouts from the cornice gutter. Each column is supported by a continuous concrete pile cap with four piles per column. The concrete pile cap also supports a reinforced concrete two-way floor slab.

General Conditions Description

At the roof level, some marble pieces show minor shifting with some general surface deterioration. Larger localized cracking of marble pieces and mortar loss were observed at several locations on the memorial, especially at the soffits between columns (SSK-2). Mineral deposits were observed on the surface of a column containing a downspout, indicating that water is (or was) likely not being properly conveyed to the ground. Also in the vicinity of a downspout, a section of the cornice had cracked significantly and seemed to be at least partially detached from the structure.

The Guastavino tile domes were observed by entering the attic space through the oculus of the inner dome. The tiles of the outer dome appeared to be in good condition with little to no movement or mortar loss. The top surface of the inner dome was obscured by a bituminous surface coating. The domes were analyzed structurally for a dead load of 70 psf and a live load of 20 psf in order to determine the effect on the supporting structure, particularly the L-ring. It was found that the L-rings, noted as L6x6x1/2" on original construction drawings, are adequate to support the imposed thrusts from both of the domes if fully intact. These calculations are summarized below.

Within the interior attic space, the upper steel L-ring was observed on July 15, 2005 through a probe, and appeared to be in relatively good condition; the steel presented a nearly fully intact section with only some minor surface rust. Significant displacement was observed from within the attic space within the area of brick masonry between the underside of the Guastavino tile dome and the waterproofing layer (approximately where the brick is coated with a bituminous material. See Photo 5). The observed masonry displacement may be the result of a number of possible phenomena, given the generally loose connectivity of this upper, non-structural portion of brick masonry at the interior, backside of the drum. Possibilities may range from simple thermal cycling to the effects of freeze-thaw cycling of saturated masonry. A failure of the drainage and water-shedding systems may have resulted in long term moisture entrapment within the masonry. This extended presence of moisture may be the source of a number of problems, which could range from deteriorating ferrous masonry ties or embedded elements to basic freeze-thaw cycling. No direct evidence of deteriorating ferrous elements within the masonry was uncovered in this investigation.

The platform level concrete slab was observed from the crawlspace under the floor, accessible from a manhole and vault in the center of the memorial. The visible concrete beams appeared to be in good condition. The outer concrete footing and piles could not be observed. Some minor deterioration and exposed rebar were observed at the underside of the platform slab.

Detailed Evaluations

Roof

Localized movement was observed in some of the marble roof pieces (Photo 2). The Guastavino tile dome which supports the marble roof was observed from the interior attic space and appeared to be in good condition with little movement or mortar loss. It is unclear what may have caused the shifting of the roof marble, however, the long term entrapment of moisture within the setting bed or collar joint between the marble and Guastavino vault structure could certainly have induced movements in response to freeze-thaw cycling. The shifting could also be in response to minor shifting of the Guastavino dome, however, as noted above, there was no cracking or apparent displacement observed from within the attic. Another possible influence on the marble roof tiles is the presence of 4 – 7/8"

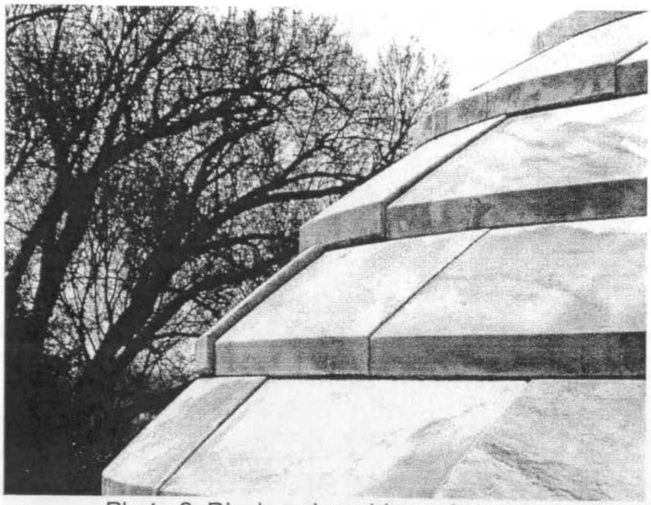


Photo 2. Displaced marble roof pieces.

diameter bronze rings which are shown on historic drawings to be set within the marble joints at the lower levels of the dome (SSK-1). Some localized disturbance related to these rings may be occurring, however no consistent pattern was observed which would indicate this as the likely cause.

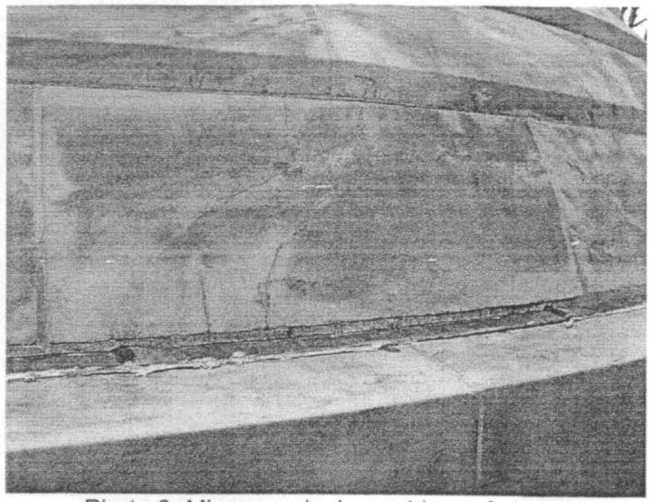


Photo 3. Minor cracks in marble roof piece.

<u>Recommendation</u>: As the marble roof tiles appear to be stable, no immediate action is required structurally. However, consideration should be given to minimizing direct water infiltration and its subsequent entrapment within the roof system. If feasible without damaging the stone, a probe in which a marble roof tile is lifted to expose the substrate may shed more light on what is happening.

Small hairline cracks were observed in the marble roof pieces (Photo 3.) These cracks are most likely due to age and normal wear, and do not appear to affect the structural integrity of the roof.

<u>Recommendation</u>: No immediate action is required structurally, however consideration should be given to possible treatments to best support the longevity of the stone.

<u>Domes and Attic</u>

The visible surface of the outer Guastavino tile dome appeared to be in good condition (Photo 4). The inner dome surface was obscured by a bituminous surface coating. From within the attic space we could observe the general arrangement of support for the upper and lower domes on the entablature. Here, the brick backup wall of the entablature presented nearly continuous efflorescence around the perimeter, a strong indication that water has been passing through the base of the roof dome into the entablature substrate (Photo 5). Significant movement in the brick backup masonry was observed in the vicinity of the L-rings from within the attic space. A probe of the masonry (Photo 6), however, revealed the steel L-rings to have only minor surface rust (Photo 7).

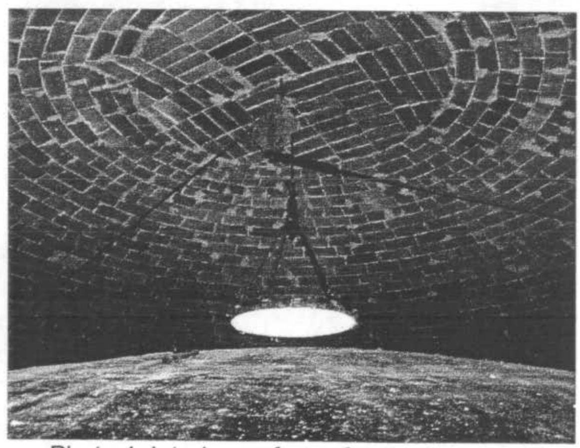


Photo 4. Interior surface of outer dome and counterweighted ceiling oculus.

<u>Recommendation</u>: The infiltration and potential entrapment of water should be minimized by

addressing water penetration and general breathability of the masonry at the exterior in the vicinity of the drum. No immediate structural action is required in this area.

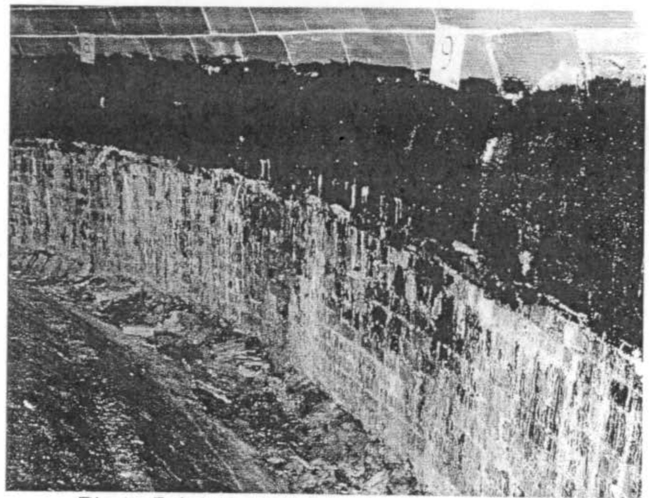


Photo 5. Interior brick backup at entablature

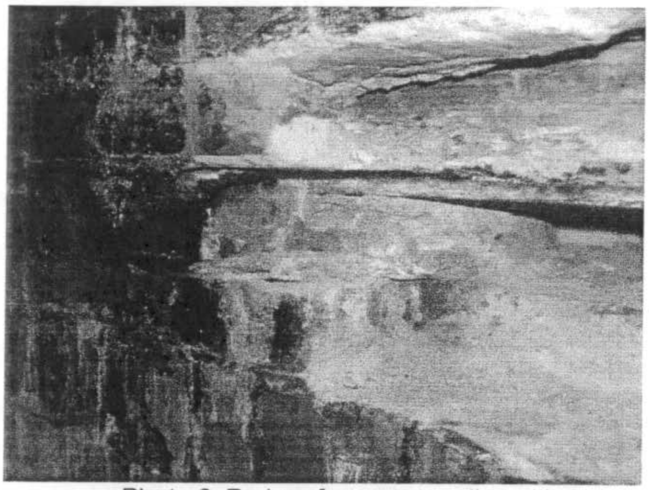


Photo 6. Probe of masonry wall at attic.

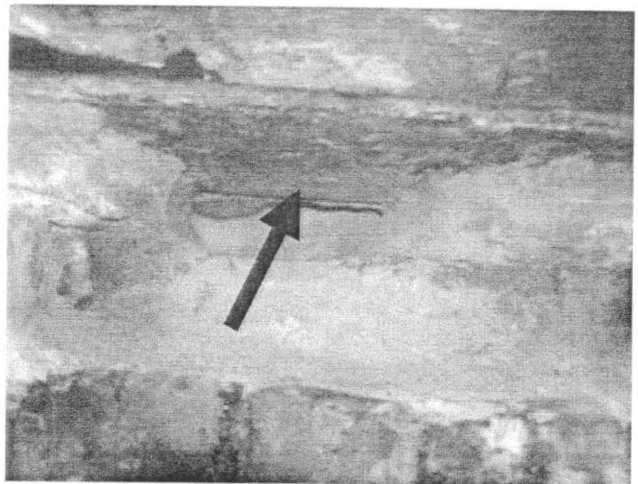


Photo 7. Bottom surface of steel L-ring seen in probe.

Structural Calculations

In domes, meridonial forces occur from the bottom edge of the dome, across the top and to the other bottom edge, or in what would be the North-South direction on a globe. Hoop forces occur on horizontal planes through the dome, or in what would be the East-West direction on a globe. The meridonial and hoop forces in the domes were calculated using Equations 1 & 2.

The maximum meridonial forces, which occur at the maximum angle Φ, were used to calculate the base tension ring force T in the inner and outer domes, using Equation 3.

The tension ring force in the outer dome was calculated at 7.7 kips and in the inner dome was

Meridional Forces: $$N'_{\phi} = -aq\frac{1}{1+\cos\phi} \qquad \text{EQ. 1}$$

Hoop Forces: $$N'_{\theta} = aq\left(\frac{1}{1+\cos\phi} + \cos\phi\right) \qquad \text{EQ. 2}$$

Where a = radius of dome (ft)
q = load (psf)
Φ = angle from vertical to edge of dome

Tension Ring Force: $$T = rN'_{\phi}\cos\phi \qquad \text{EQ. 3}$$

Where r = radius of dome in plan (ft)

10.95 kips. The allowable tensile stress in the steel L-ring, assumed manufactured in 1931, is taken at 18 ksi. Using a gross section area of 5.75 square inches for the L6x6x1/2" the allowable tensile load in each L-ring was calculated as 104 kips. This corresponds to a factor of safety of 13.4 for the outer dome and 9.5 for the inner dome. Thus, the L-rings for both the outer and inner domes are sufficient to support the dome structures. Given the high factors of safety, it is likely that the L-shapes were used more for geometry in receiving the dome materials than for simply resisting the design force.

Entablature

The entablature includes the marble sections between the top of the column and below the dome. In the D.C. War Memorial, there are three elements to the entablature: (1) the cornice; (2) the frieze; and (3) the architrave. (Refer to Photo 8).

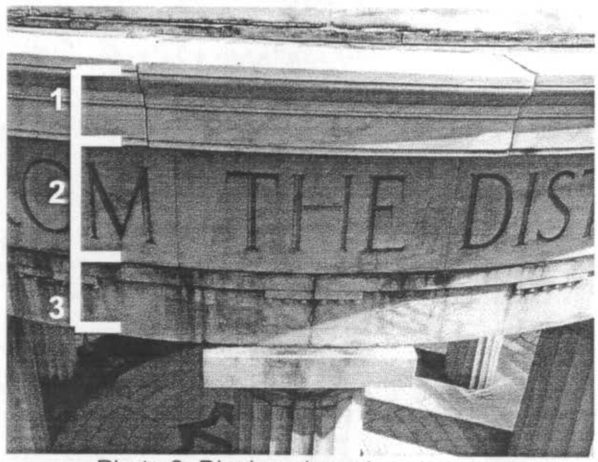


Photo 8. Displaced cornice element.

Cornice

Photos 8-10 show the cracked cornice section located on the west elevation. The crack extends from the right joint to the center of the soffit (Photo 9) to the joint of the dentil unit below (Photo 10). The entire section appears to be sloping downward to the right (Photo 8), and there is significant mortar loss in the joints between adjacent marble pieces (Photo 11). Original drawings indicate that the column below this section is one of four that contain a downspout. It is probable that this downspout is not functioning properly, causing water to become trapped in the gutter and in the masonry assembly itself (Photo 12). In addition, the presence of water in the brick walls adjacent to the steel L-rings could be causing displacement of the masonry due to freeze-thaw cycles or possible ferrous metal deterioration, in turn placing stresses on the exterior marble pieces. As noted previously, no direct evidence of steel rusting was uncovered in this investigation, so our concerns are more focused on general moisture infiltration and entrapment at this time.

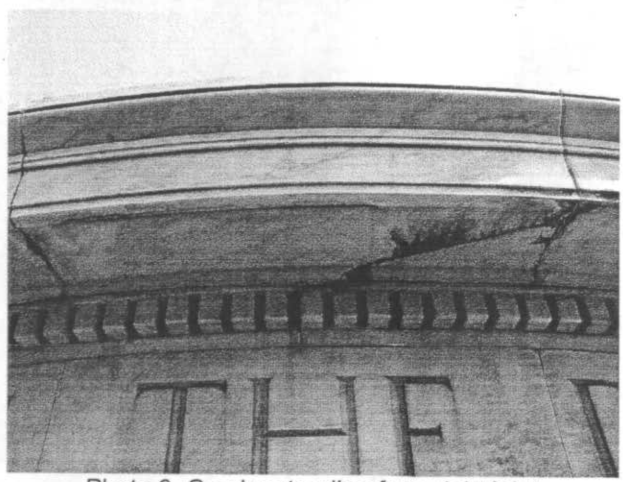


Photo 9. Crack extending from right joint to center of the cornice soffit.

A similar condition occurs in a cornice section on the north elevation (above the word "Memorial" in the frieze.) This crack extends across the top of the section and down its face, terminating where it meets the dentil unit below (Photos 13-14). Original drawings indicate that the column below does not contain a downspout; however, malfunctioning of the drainage system and subsequent water penetration is still the likely cause of this crack.

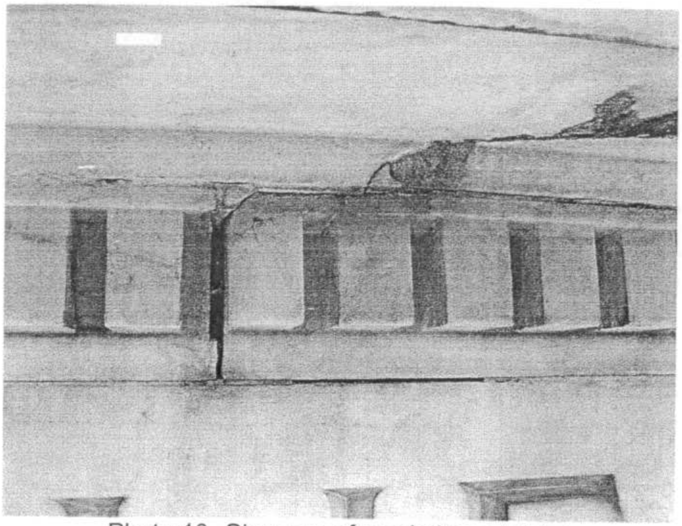


Photo 10. Close-up of crack through joint between dentil units.

<u>Recommendation</u>: As the previously described probe investigation did not reveal ferrous metal deterioration as the source of masonry cracking and displacements, we recommend focusing on water infiltration and entrapment by implementing repairs of the cracks. Though it doesn't appear that any pieces are near falling from the building, it is prudent to provide a connection between the cracked pieces to assure long term stability. A combination of stainless steel pinning and epoxy injection are the likely means of assuring long term stability and minimizing moisture entrapment at the crack interface.

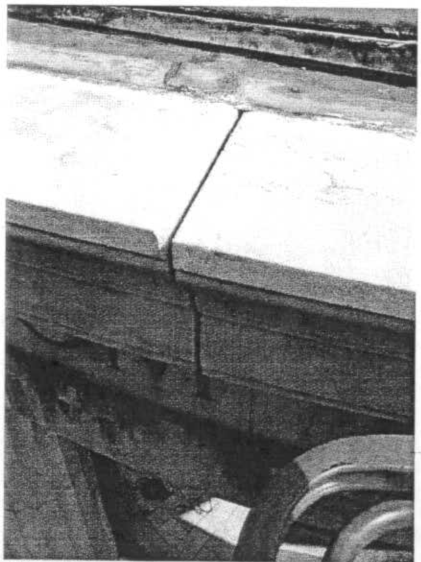


Photo 11. Mortar loss around displaced element.

<u>Architrave</u>

SSK-2 shows the observed locations of cracks in the soffits of the architrave between columns. Three of the architrave pieces exhibited significant cracks, while one had light cracking. Photos 15 and 16 show the cracked soffit at the north side of the structure. The cracks appear to have either a buildup of mineral deposits or a prior repair with some kind of mortar or patching material. As with the cornice, it is most likely that the drainage system is not functioning properly, causing water to soak through the entablature elements and allowing the freeze-thaw cycle to damage the stones. Furthermore, an existing section of the entablature shows a metal strap extending from the interior ceiling cornice through the architrave unit. Corrosion of this metal strap could cause significant cracking in the architrave.

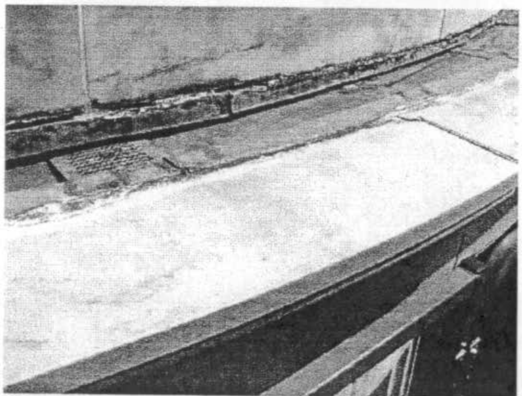


Photo 12. Top of cornice unit showing gutter.

<u>Recommendation</u>: The entire downspout and drain system of the structure should be examined further to determine its deficiencies. These deficiencies should then be repaired in order to prevent continued water penetration of the entablature. After the drainage system is

repaired, the cracked cornice sections should be patched with an appropriate material and the joints repointed to restore stability. Localized pinning and epoxy injection are appropriate treatments to reconnect pieces where stability of one part is in question.

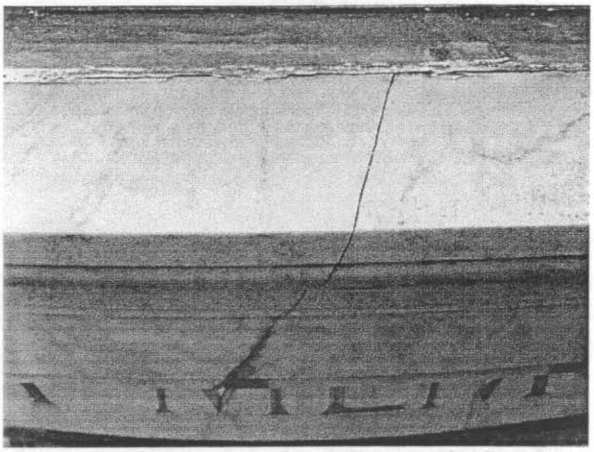


Photo 13. Cracked cornice unit on north elevation.

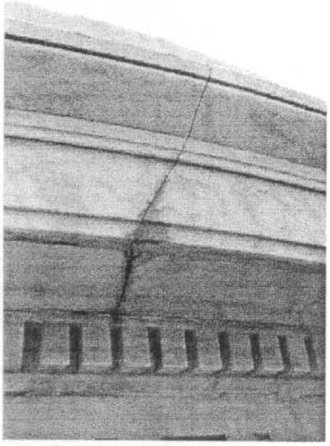


Photo 14. Extent of crack in cornice unit.

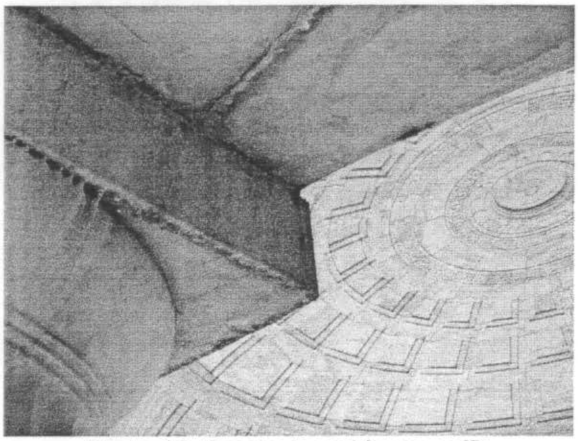


Photo 15. Cracks in architrave soffit.

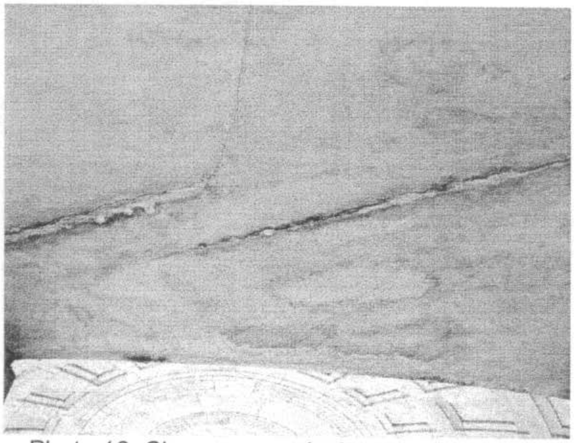


Photo 16. Close-up, cracks in architrave soffit.

Columns

The outer surfaces of certain columns exhibited signs of mineral deposition and staining, as well as small cracks (Photo 15).

Recommendation: No immediate action is required structurally, however consideration should be given to possible treatments to best support the longevity of the stone.

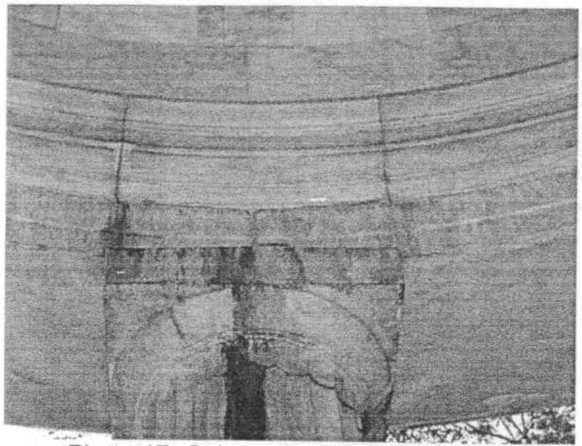


Photo 17. Column Capital with Staining

Foundation

The foundation was observed through a crawlspace accessed through the manhole in the center of the memorial's floor. Based on original drawings and observed conditions, it appears as though the space beneath the foundation beams was originally filled. Removal of the fill material, however, does not affect the structural stability of the foundation, since the beams span to the outer concrete pile caps. The concrete beams appeared to be in good condition (Photo 18). In some locations, the reinforcing bars of the concrete slab were exposed, giving an appearance as if the framed slab was originally cast on earth but subsequently excavated for the vault construction (Photo 19).

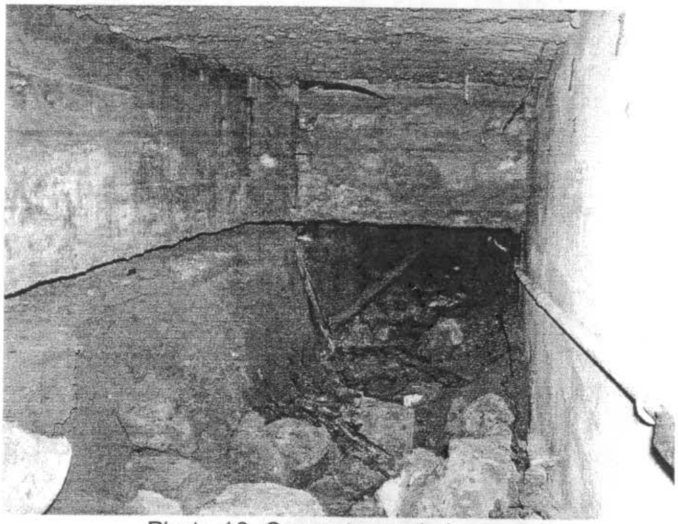


Photo 18. Concrete grade beams.

The outer concrete pile caps and piles were not accessible from the interior of the foundation.

Recommendation: Areas of exposed reinforcing should be repaired to minimize the possibility of further deterioration of the reinforcing steel. Exposed bars should be further exposed, coated with a corrosion inhibitor and bonding agent, then covered with an overhead repair mortar.

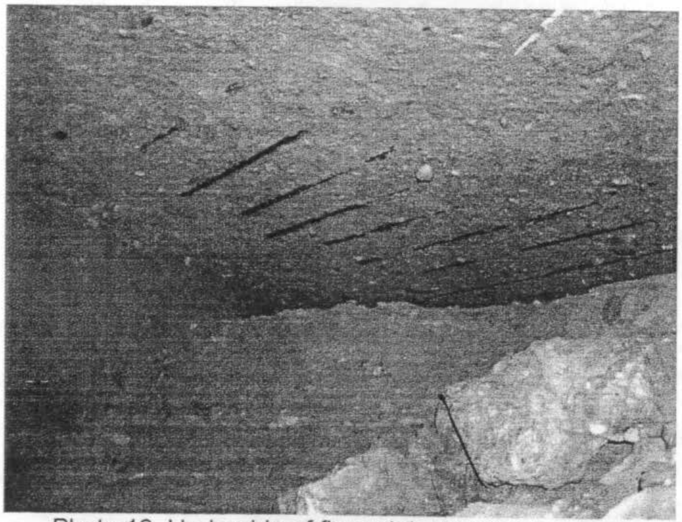
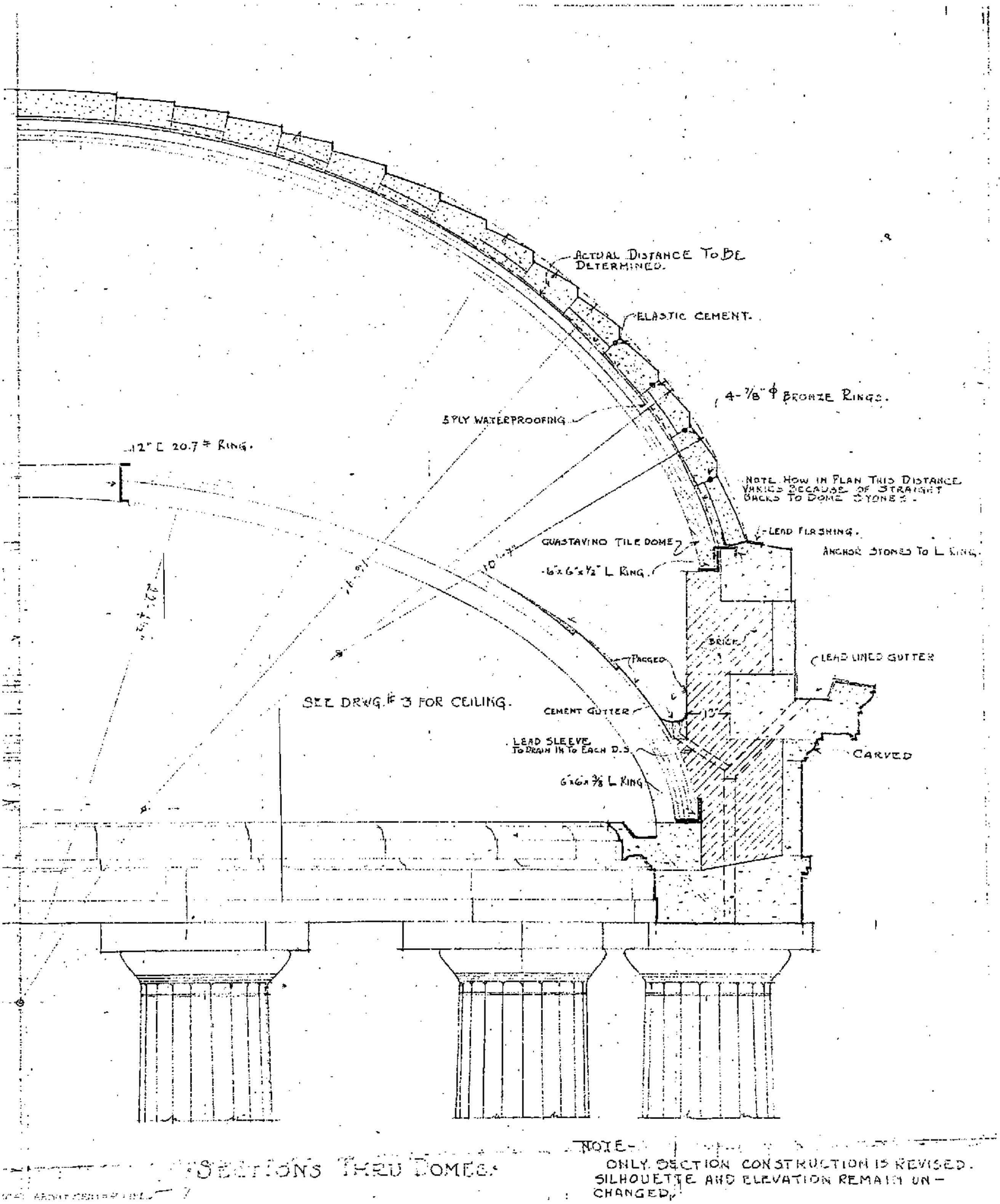
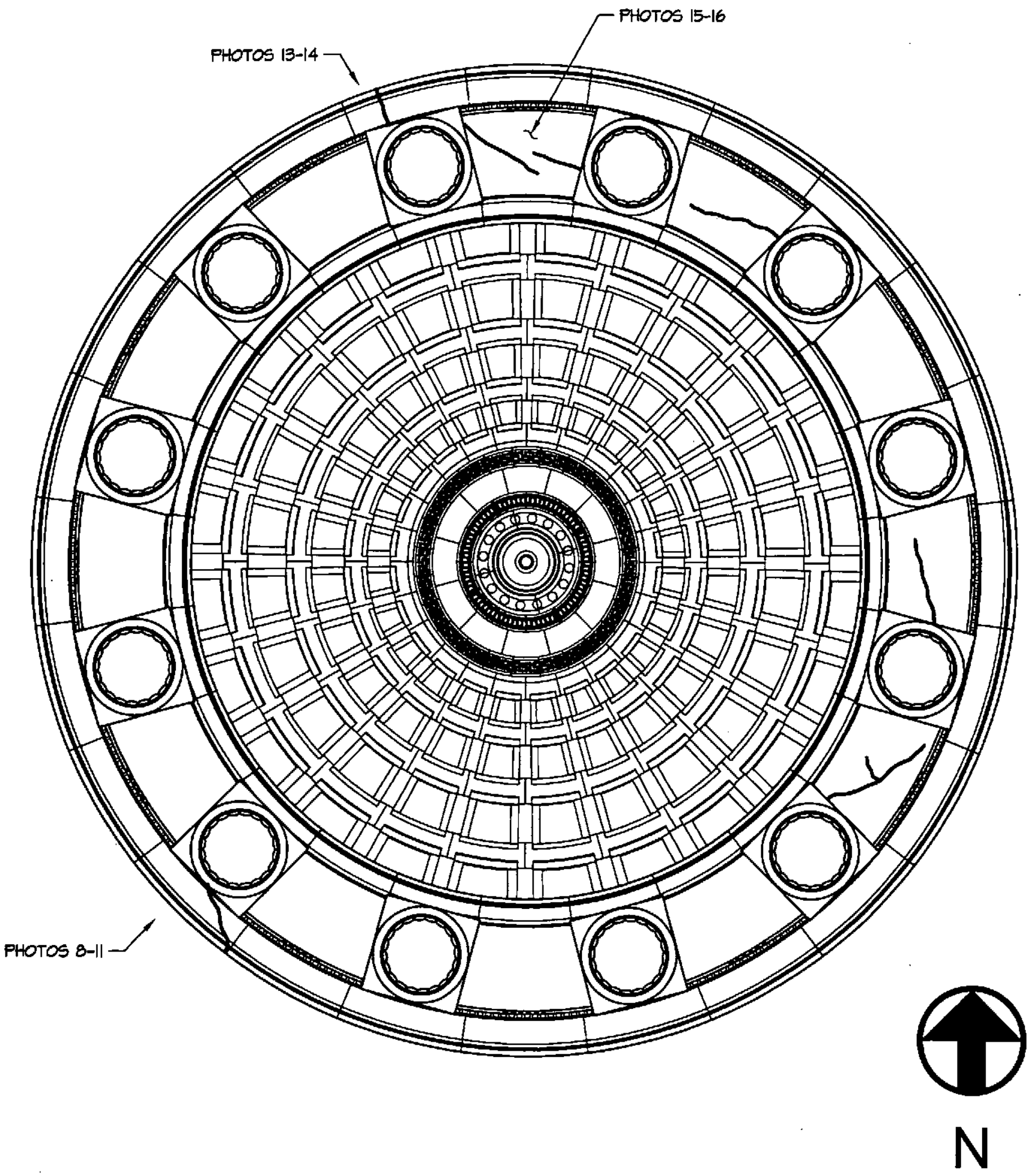


Photo 19. Underside of floor slab showing exposed reinforcing bars.



Dwg Title: SECTION THROUGH DOME	Issue Date: JULY 11, 2005
Job Number: W1543	Scale: N.T.S.
Job Title: DC WAR MEMORIAL	Dwg Number: SSK-1

ROBERT SILMAN ASSOCIATES, PLLC
STRUCTURAL ENGINEERS
1053 31st STREET NW, WASHINGTON DC 20007
TELEPHONE (202) 333-6230 FAX (202) 318-3015



Dwg Title: REFLECTED CEILING PLAN		Issue Date: JULY 11, 2005
Job Number: W1543		Scale: N.T.S.
Job Title: DC WAR MEMORIAL	Dwg Number: SSK-2	**ROBERT SILMAN ASSOCIATES, PLLC** STRUCTURAL ENGINEERS 1053 31st STREET NW, WASHINGTON DC 20007 TELEPHONE (202) 333-6230 FAX (202) 318-3015

APPENDIX H

INSPECTION OF CONDITIONS AND ON-SITE TESTING

MSSC
2005

MSSC
Masonry Stabilization Services Corporation
3741 Greenway Circle
Lawrence, KS 66046
Phone: 785/865-4200 Fax: 785/830-9176

DC War Memorial
Washington, DC

Inspection of Conditions and On-site Testing

Prepared for John G. Waite Associates, Architects

Frances Gale
September, 2005

Introduction

At the request of John G. Waite Associates, Architects PLLC, Masonry Stabilization Services Corporation participated in an assessment of conditions at the DC War Memorial in Washington, DC on July 14-15, 2005. JGWA provided background information that was reviewed prior to the site visit. The purpose of the site visit was to inspect biological growth and to conduct preliminary cleaning tests to remove the associated staining. During our site visit, we also reviewed other conditions affecting the marble of the Memorial.

This report includes a description of the existing conditions, a summary of the on-site testing, and our recommendations for further research and testing. Digital photographs illustrating conditions and cleaning tests are included. Information about the products tested is provided in an appendix to this report.

Construction of the DC War Memorial was completed in 1931. Records indicate that marble for the Memorial is Danby marble from Danby, Vermont, purchased from the Vermont Marble Company. In a 1925 trade publication, Danby marble is described as "a structural marble, close-grained, faintly cream tinted with inconspicuous mottling or streaks of greenish gray." The primary mineral is calcite (calcium carbonate). In addition to Vermont marble, Tennessee Pink limestone was used in the horizontal flooring.

Clay Palazzo and Nancy Rankin of JGWA and Tony Donald of the National Park Service were present during the inspection of conditions. The inspection was made from the ground level with binoculars and a field microscope. A JLG lift operated by NPS personnel allowed for close-up inspection of marble of the dome and column capitals.

Biological Growth

Dark-colored biological growth is present on marble in sheltered areas, particularly on the northwest side of the Memorial, where marble is shaded by nearby plants and trees and drying is slow. Certainly, the damp conditions have encouraged the growth of micro-organisms on marble in these locations.

In addition to the dark-colored biological growth, bright orange staining is present in several locations on the dome exterior. Close-up inspection with a field microscope suggests that the stains are actually below the marble surface. This staining was not present in other locations of the Memorial. Unlike the dark-colored biological growth present on the DC War Memorial, this organism appears to be phototropic. Because the orange colored staining is somewhat unusual, we reviewed reports and recent articles about similar staining.

In 1990 Dr. Erhard Winkler of Notre Dame University investigated similar biological staining on marble of Arlington National Cemetery. His report to David Kemnitzer of Einhorn Yaffee Prescott[1] states that the staining is caused by an "orange algae, Hematococcus pluvialis, and a bacteria of unknown species forming a dense black crust." The biologist who identified the organisms recommended washing the stone with a commercial Clorox® (sodium hypochlorite) twice each year. It is not known whether this was carried out and, if so, whether the Clorox® was effective.

Hematococcus pluvialis is a unicellular green alga that occurs worldwide where environmental conditions (e.g., dampness, warm temperatures and light) are conducive to its growth. Its orange (or red) color is due to astaxanthin, a carotenoid pigment. In locations where Hematococcus pluvialis is present on marble substrates, there has been associated decay as well as aesthetic issues. In an article published in the newsletter *Culture*[2], May discusses problems associated with Hematococcus pluvialis and other algae, including aesthetic changes, biogeochemical damage and biogeophysical damage to calcareous substrates.

More recent reports indicate that the organism associated with orange/red staining on marble at Arlington National Cemetery is Micrococcus roseus. This organism is a gram positive aerobic bacterium that produces reddish colonies. Again, carotenoid pigments are responsible for color.

In an article published in the CSIC newsletter *Coalition*[3], Tiano and Tomaselli provide a report of their investigation of similar reddish "patches" on a marble substrate. They found a "complex biocoenosis composed by bacteria, fungi and green algae" and identified a Micrococcus bacteria as the prevailing organism. The article further states that the color is due to carotenoid pigments which appear to have a strong bond to calcareous minerals present. In the testing they conducted, the pigments were not soluble in organic solvents.

Information related to recent renovation work proposed for the Arlington National Cemetery Memorial Reception Building included a report of testing conducted to remove dark red staining from Micrococcus roseus. An addendum to the Request for Proposals issued by the Department of the Army[4] includes a "Stain Removal Sheet" which lists a variety of cleaning materials that were evaluated in removing dark red staining thought to be caused by Micrococcus roseus. Household bleach, calcium hypochlorite, hydrogen peroxide, ammonium citrate, benzalkonium chloride, and several commercial products were tested. None of the materials was effective.

Cleaning Tests

We conducted on-site cleaning tests on July 14-15, 2005 without prior knowledge of the materials that had been evaluated at Arlington National Cemetery. Weather conditions were cloudy with some rain on both days and temperatures ranging from 75-90 degrees with very high relative humidity.

Several commercially available cleaning products were evaluated for removing biological growth. Rinsing was accomplished with pressure rinsing equipment or with fresh water and agitation with a natural bristle brush.

Whenever possible, evaluation of cleaning effectiveness was made following drying. Below is a summary of the testing with descriptions of the products used and test locations. Product literature is included as an appendix to this report. The results of these tests were used to determine research and further testing that are required.

Product description:

Concentrated liquid cleaner that contains quaternary ammonium compounds. The concentrate is diluted with water prior to use. The cleaner is designed to remove light to moderate biological growth from stone and other masonry materials.

Test location: Dome exterior, northeast side above columns #4 and #5.

Application: The cleaner was diluted 1:10 with water. The diluted cleaner was spray applied to dry marble and allowed to dwell for 3-5 minutes. The test area was agitated with a brush during the dwell period, and then rinsed with clean water.

Observation: Cleaning effectiveness was less than 10%. However, in our experience, the appearance of treated areas sometimes improves over time as biological growth diminishes. For this reason, we recommended monitoring the test area over a period of several weeks.

Product description:

Ready-to-use liquid cleaner that contains quaternary ammonium compounds. The cleaner is designed to remove light to moderate biological growth from stone and other masonry materials.

Test location: Dome exterior, northeast side above columns #4 and #5.

Application: The cleaner was spray applied to dry marble and allowed to dwell for 3-5 minutes. The test area was agitated with a brush during the dwell period, and then rinsed with clean water.

Observation: Cleaning effectiveness was less than 10%. As with the diluted quaternary ammonium compound cleaner, the appearance of treated areas sometimes improves over time as biological growth diminishes. For this reason, we recommended monitoring the test area over a period of several weeks.

Product description:

Alkaline cleaner that is mixed with a hydrogen peroxide activator for removing light to severe biological staining. Treated surfaces are neutralized with an acetic acid-based cleaning product.

Test location: Dome exterior, northeast side above columns #4 and #5.

Application: A cleaning solution of 1 part alkaline cleaner, 1 part hydrogen peroxide activator and 3 parts water was brush applied to the dry marble and allowed to dwell for approximately 20 minutes. The test area was agitated with a brush during the dwell period, and then rinsed with clean water. To ensure neutralization, the neutralizing solution (diluted acetic acid cleaner) was applied immediately following rinsing. After a 3-5 minute dwell period, the test area was rinsed again with water.

Observation: Cleaning effectiveness was approximately 30%.

Recommendations

Regarding the dark-colored biological growth that is present in shaded areas, a quarternary ammonium cleaner may be effective in reducing existing stains and preventing the recurrence of biological growth. Additional testing should be conducted on affected marble. We recommend monitoring the cleaned test areas over a period of several weeks. In our experience, the appearance of treated areas improves over time as biological growth diminishes.

In addition, trimming nearby trees and other planting that shade the Memorial and encourage biological growth may help reduce the recurrence of biological growth. Obviously, this should be considered in consultation with the National Park Service and a specialist in historic landscapes.

Removing the orange-colored biological growth may be more difficult. Considering the number of materials that were tested unsuccessfully in the Arlington National Cemetery, it is not surprising that the materials that we evaluated on the dome did not remove the staining.

Based on the reports and article that we reviewed, the orange-colored growth on the dome of the DC War Memorial may be Hematococcus pluvialis, Micrococcus roseus, or a combination of these and other micro-organisms. An important first step is identifying the organisms present. This should be done by a microbiologist with experience in algae and bacteria affecting marble and other masonry materials. Additional research might also include investigating alternative methods for removing the organisms and how best to prevent their recurrence. For example, if the organisms require light, it may be possible to cover the Memorial for a period of time to eliminate it.

Other Conditions

Our on-site inspection included a review of other conditions affecting marble of the DC War Memorial. Although the stonework is in generally good condition, there is slight surface erosion throughout. In addition, many of the blocks exhibit surface cracking. These vary in length from less than an inch to more than 12 inches. In the column shafts, most cracks are vertical. Occasionally, these cracks continue through a mortar joint. In marble of the base and stairs, most cracks are horizontal. Some cracks appear to be related to mineral inclusions in the marble.

The condition of mortar joints is variable. In many locations, mortar appears to be original and is in good condition. An exception is the entablature, where mortar is missing and deteriorated in many locations. Open head joints in this area are of particular concern. Head joints in the architrave are centered above each column; those of the frieze and cornice occur at both sides of the column capitals. Much of the dome exterior was recently repointed.

Soiling conditions affecting marble of the Memorial include vertical stains that vary in color, and dark colored soiling on horizontal flooring. Marble of the dome also exhibits dark mottling in many locations. These conditions are discussed below.

Vertical Stains
The vertical stains that are present on the entablature and columns are severe in many locations. On the exterior, the vertical stains are generally dark-colored. Most originate at the entablature, often extending through the column capital and the topmost blocks of the shaft. On the interior, the stains vary in color, from white to brown, reddish brown, and black. In several locations, there are deposits of staining material. Several stalactites were noted on the entablature, with the largest measuring two inches across at top and four inches long.

Similar staining and deposits are present on many of the column shafts. Here the staining material appears to emanate from horizontal joints or from cracks. The severity of these stains varies from column to column. Columns #1, #4, #7 and #10 (where roof leaders are located) and column #12 appear to be most severely affected by the vertical stains and deposits. On columns #1 and #12, the stains extend through three of the four blocks of the shafts. Column #4 has a severe dark-colored vertical stain that affects the bottom block of the shaft.

Dark-colored Soiling
Dark colored soiling is present on horizontal flooring, especially around the column bases. In some areas, there is pooling of water. This soiling affects the marble flooring that surrounds most of the columns as well as the lower 4-6 inches of the column shafts. Close-up inspection of the flooring in one area suggests that redeposited calcium carbonate is present.

Sources of Deterioration
Moisture is related to the soiling and deterioration conditions affecting marble of the DC War Memorial. This is not surprising because the presence of water exacerbates many types of soiling and deterioration.

Most of the vertical stains appear to be water-related. With these stains, acidic rainwater dissolves calcium carbonate that is present in the marble and in the lime mortar and the solubilized material travels with the rainwater. As the rainwater evaporates, a calcium carbonate "crust" is deposited on the stonework. The vertical stains on marble of the Memorial probably also contain gypsum, a mineral that is formed as a weathering crust on marble that is exposed to pollutants. The stains are dark-colored because soiling is trapped within the gypsum crust.

We expect that damp conditions have triggered the mottling on the marble dome and the dark-colored soiling that is present on the marble flooring. These conditions may be related to iron containing minerals present in the marble.

Historical documents reviewed by JGWA suggest that problems with proper shedding of rainwater were discovered soon after construction of the Memorial was completed. It appears that drainage issues have never been completely resolved. During our on-site inspection, some of the column capitals were wet with rainwater. Following an overnight rain, water pooled around the bases of several columns.

Additional Cleaning Tests

Although the focus of our project was the biological growth on marble of the DC War Memorial, our July site visit provided an opportunity to inspect other conditions and conduct preliminary cleaning tests.

Vertical Stains

Product description:
Mildly alkaline cleaning gel designed for removing moderate-to-severe atmospheric staining, metallic stains and gypsum. To lengthen the dwell period, the gel was applied in a poultice.

Test location: Interior entablature above columns #10 and #11.

Application: The gel was mixed with poultice clay to a paste consistency. The poultice was trowel applied to a thickness of approximately 1/8 inch and covered with a specially designed paper film. Following an overnight dwell period, the paper film and poultice clay were removed and the treated area was rinsed. This included initial rinsing with bucket and brush followed by pressure rinsing.

Observations: Cleaning effectiveness was approximately 10%.

Product description:
Ready-to-use mildly alkaline poultice cleaner that contains detergents and chelating agents. The poultice draws deep-seated stains out of masonry materials.

Location: Interior entablature above columns #10 and #11.

Application: The poultice was trowel applied to a thickness of approximately 1/8 inch and covered with a paper film. Following an overnight dwell period, paper film and poultice clay were removed and the treated area was rinsed. This included initial rinsing with bucket and brush followed by pressure rinsing.

Observations: Cleaning effectiveness was approximately 10%.

Dark-colored soiling – Paint Strippers

Paint strippers were evaluated because it was suspected that wax or coating residues might have been used on horizontal flooring.

Product description:

Alkaline paint stripper with organic solvents designed for extended contact with masonry surfaces. Treated surfaces require neutralization with an acetic acid-based cleaning solution

Location: Flooring around column #9 and bottom of shaft.

Application: The alkaline paint stripper was brush applied to a thickness of approximately 1/8 inch. Following an overnight dwell period, the stripper was removed and the surface was thoroughly rinsed with water. To ensure neutralization of the alkaline stripper, the diluted acetic acid cleaning solution was applied immediately following rinsing. After a 3-5 minute dwell period, the test area was rinsed again with water. Rinsing included initial rinsing with bucket and brush followed by pressure rinsing.

Observations: Cleaning effectiveness was less than 10%.

Product description:

Solvent paste paint stripper with a mild citrus odor that contains no methylene chloride or methanol. The paste stripper is a "slow-working" paint remover.

Test location: Flooring around column #9 and bottom of shaft.

Application: The paste stripper was brushed applied to a thickness of approximately 1/8 inch and covered with a protective paper film. Following an overnight dwell period, the paper and paste were removed and the surface was rinsed. This included initial rinsing with bucket and brush followed by pressure rinsing.

Observations: Cleaning effectiveness was less than 10%.

Product description:

Second solvent paste stripper with no methylene chloride or methanol. This paste stripper is also a 'slow-working' paint remover.

Test location: Flooring around column #9 and bottom of shaft.

Application: The paste stripper was brushed on to a thickness of approximately 1/8 inch and covered with a protective paper film. Following an overnight dwell period, the paper and paste stripper were removed and the surface was rinsed. This included initial rinsing with bucket and brush followed by pressure rinsing.

Observations: Cleaning effectiveness was less than 10%.

Product description:

Paint stripping gel designed for removing coatings and graffiti from masonry, wood and metal surfaces. The gel stripper contains methylene chloride and does not require a long dwell period.

Test location: Flooring around column #9.

Application: The gel stripper was brush applied to a thickness of approximately 1/8 inch. Following a 30 minute dwell period, the stripper was removed and the surface was thoroughly rinsed. This included initial rinsing with bucket and brush followed by pressure rinsing.

Observations: Cleaning effectiveness was less than 10%.

Dark-colored Soiling -- Other Cleaners

Product description:

Acidic gel cleaner that removes atmospheric soiling and subsurface staining. The gel cleaner contains wetting agents and inhibitors to reduce possible adverse effects with acid sensitive substrates.

Test location: Flooring around column #9.

Application: The gel cleaner was applied to prewet marble in concentrate. The cleaner was allowed a 20-minute dwell period. The test area was agitated with a brush during the dwell period, and then rinsed. This included initial rinsing with bucket and brush followed by pressure rinsing.

Observations: Cleaning effectiveness was less than 10%.

Product description:

Mildly alkaline gel cleaner for cleaning stone and other masonry. This cleaner is designed to loosen and dissolve surface dirt and atmospheric staining.

Test location: Flooring around column #9.

Application: The gel cleaner was brush applied to prewet marble and allowed to dwell for 20 minutes. The test area was agitated with a brush during the dwell period, and then rinsed. This included initial rinsing with bucket and brush followed by pressure rinsing.

Observations: Cleaning effectiveness was less than 10%.

Product description:

Mildly alkaline gel with detergents and chelating agents. This cleaner is designed to remove moderate to severe atmospheric soiling from stone and other masonry.

Test location: Flooring around column #9.

Application: The gel cleaner was brush applied to dry marble and allowed to dwell for approximately one hour. The test area was agitated with a brush during the dwell period, and then rinsed. This included initial rinsing with bucket and brush followed by pressure rinsing.

Observations: Cleaning effectiveness was less than 10%.

Product description:
Strongly alkaline cleaner for removing deep seated carbon and mildew from unpolished stone and other masonry. Treated surfaces require neutralization with an acetic-acid based cleaner.

Test location: Flooring around column #9.

Application: The strongly alkaline cleaner was brush applied to prewet marble and allowed to dwell for approximately one hour. The test area was agitated with a brush during the dwell period, and then rinsed with clean water. To ensure neutralization of the alkaline prewash, the diluted acetic acid cleaning solution was applied immediately following rinsing. After a 3-5 minute dwell period, the test area was rinsed. This included initial rinsing with bucket and brush followed by pressure rinsing.

Observations: Cleaning effectiveness was less than 10%.

Additional Recommendations

Limiting contact of rainwater with marble of the Memorial certainly will help prevent additional water-related deterioration and soiling. Improving the existing system for shedding rainwater (gutters and downspouts) is critical to preserving marble of the Memorial.

Removing deteriorated mortar and repointing all open joints is another important step. As is always the case with historic buildings, the mortar mix should be appropriate for the marble and, whenever possible, should match the original mortar in color, texture and strength.

Vertical Stains
The vertical stains likely contain calcium carbonate from the marble and mortar that has been solubilized by rainwater and redeposited on the marble surface. This staining, sometimes called “lime run” is often difficult to remove. On the entablature and columns of the Memorial, gypsum and atmospheric soiling appear to be present as well.

The purpose of our initial cleaning tests was to determine whether the stains could be softened by the poultice cleaners. Unfortunately, neither poultice was very effective in removing or even softening the heavy stains from the entablature. Based on the results of our testing, it appears that mechanical removal will be required to remove the vertical stains.

Although traditional abrasive cleaning methods are not appropriate for historic masonry, recent improvements have minimized the potential for damage. Because these new systems rely on soft blasting media and controlled cleaning, it is possible to remove stains such as those present on the Memorial without adversely affecting the masonry. Additional testing with microabrasive cleaning techniques is recommended.

The Rotex Vortex (JOS) cleaning process is a low-pressure micro-abrasive cleaning technology that is available through the Quintek Corporation in Virgil, Ontario. The system uses vortex equipment to deliver a low pressure swirl of air, water and an inert, micro-fine mineral powder. Air pressure, flow rate, water volume and nozzle distance are adjustable and the equipment has interchangeable nozzle tips and turbines. Although most often used as a wet process, the system can be used without water. Additional information is on the Quintek Corporation website http://www.quintek.net/quintek.html

Following mechanical removal of the vertical stains, additional cleaning may be required to remove brown and black colored stains. With less severe stains such as those of the column shafts, poultice cleaning may be effective.

Dark-colored Soiling

During our on-site testing on dark-colored soiling of the horizontal flooring, we evaluated several different cleaning products, including solvent and alkaline paint strippers, an alkaline prewash cleaner, mildly alkaline gel cleaners that contained detergents and chelating agents, and an acidic gel cleaner. Considering the wide range of cleaning products evaluated, it is surprising that none showed promise.

Additional research will help identify the composition of this soiling and determine cleaning materials and techniques for on-site testing. Because it seems unlikely that representative samples can be obtained from the Memorial, we will attempt to locate projects with similar stains. In addition to a literature search, information may be available from Vermont marble suppliers and from other conservators.

Footnotes

[1] Winkler, Erhard. Correspondence to David Kemnitzer, Einhorn Yaffee Prescott. August 18, 1990.

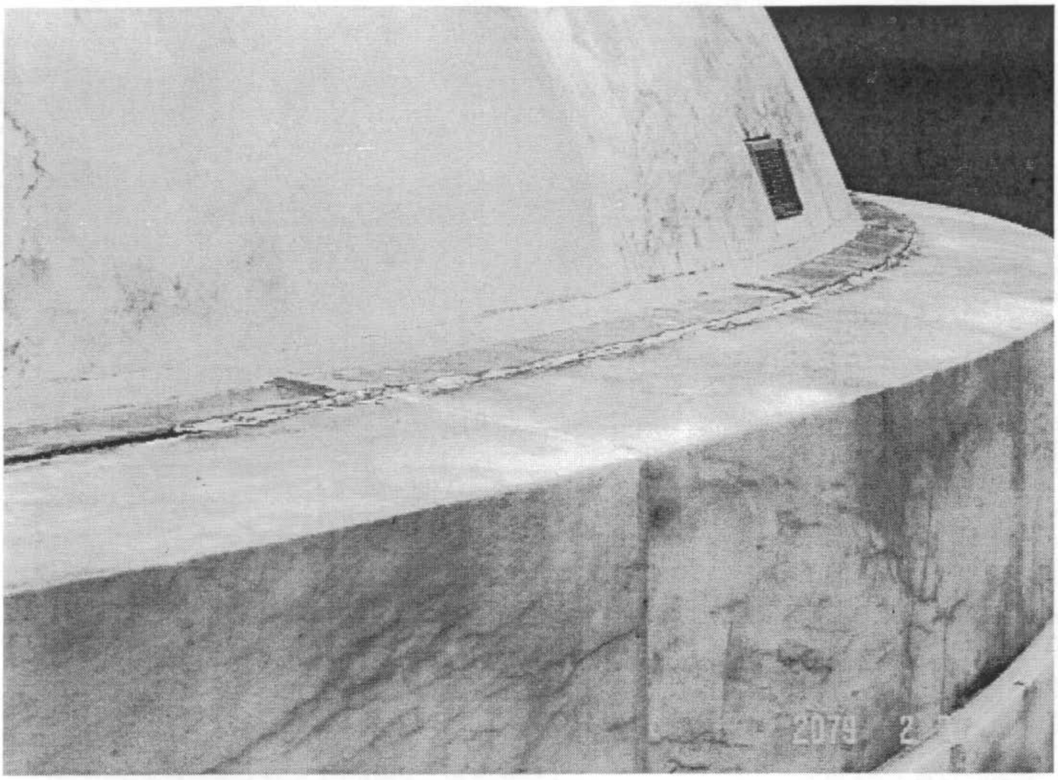
[2]May, Eric. "Microbes on building stone – for good or ill?" *Culture*, Vol 24, No. 2, September, 2003. pp 5-8.

[3]Tiano. P. and L. Tomaselli. "Red Staining and Heterotrophic Bacteria." *Coalition* No. 8, July 2004. pp 2-4.

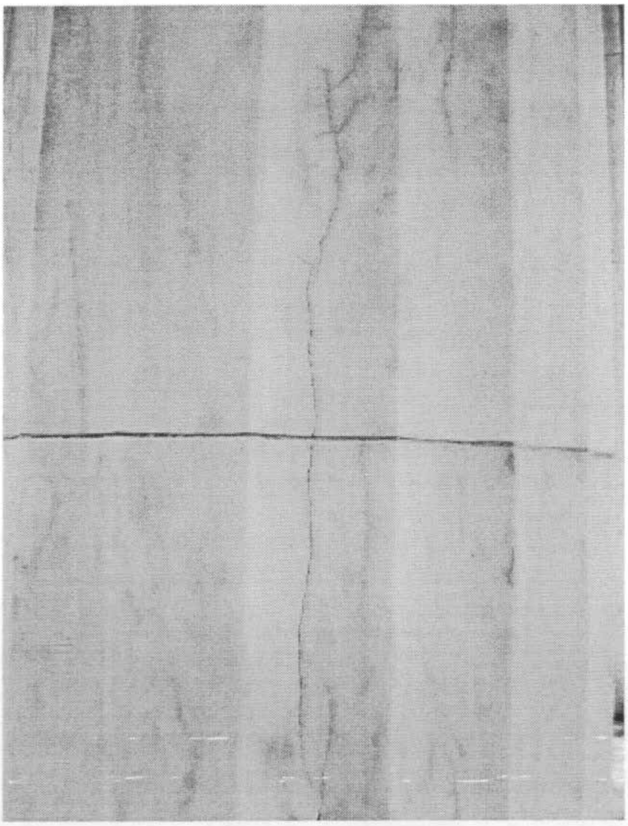
[4] Department of the Army Corps of Engineers. "Amendment of Solicitation/Modification of Contract, Design/Build Renovation of the Memorial Reception Building, Arlington National Cemetery, Virginia." March 9, 2004.

The District of Columbia War Memorial, July 14, 2005. [MSSC., 2005]

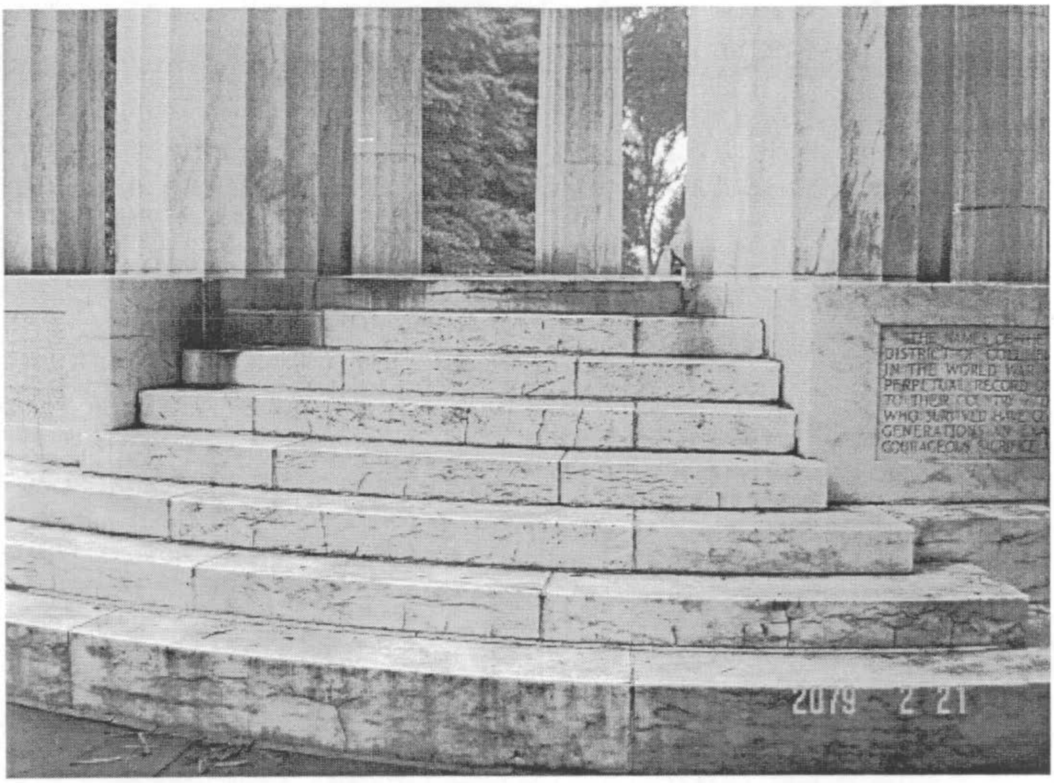
Dark-colored biological growth is present on marble in shaded areas. The blocks exhibit surface cracking. [MSSC, 2005]



The bright orange stains on several locations on the dome exterior are below the marble surface. [MSSC, 2005]

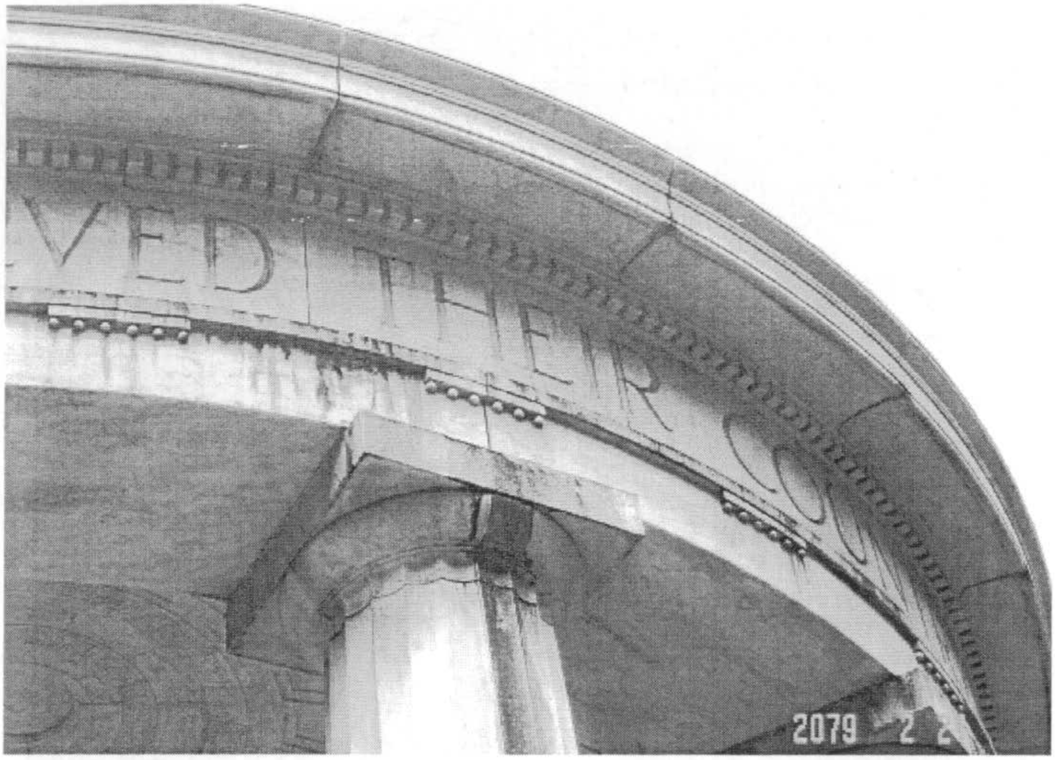


Occasionally, vertical cracks extend through mortar joints. [MSSC, 2005]

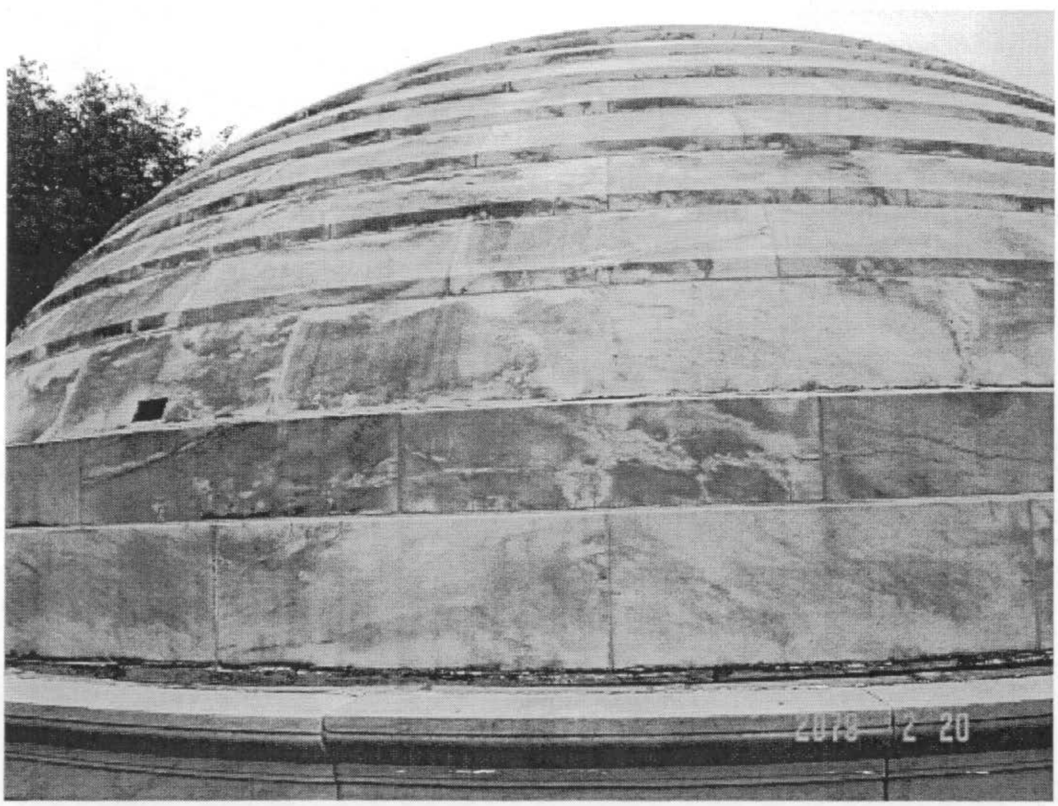


In the marble base and stairs, the cracks are predominantly horizontal. [MSSC, 2005]

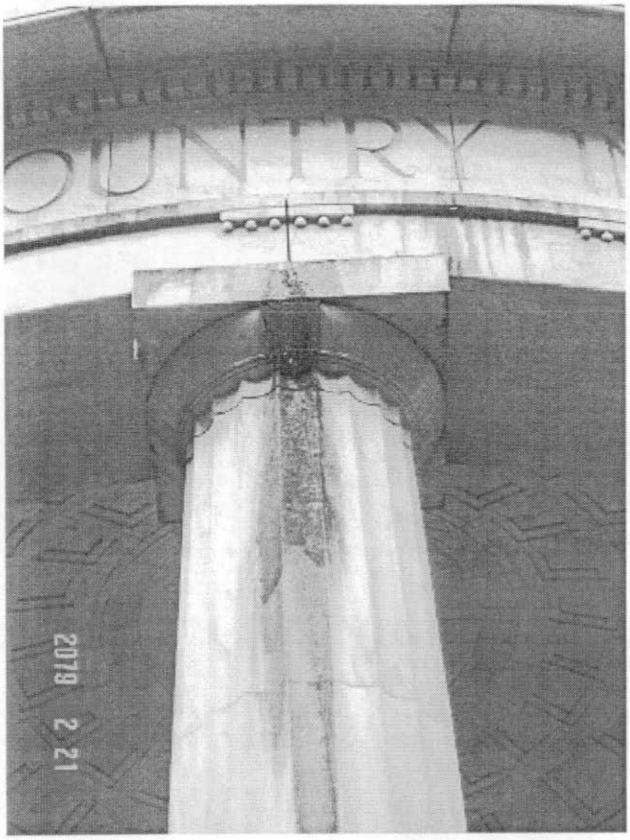
An open head joint above a column. [MSSC, 2005]



Mortar is missing and deteriorated in many locations on the entablature. [MSSC, 2005]

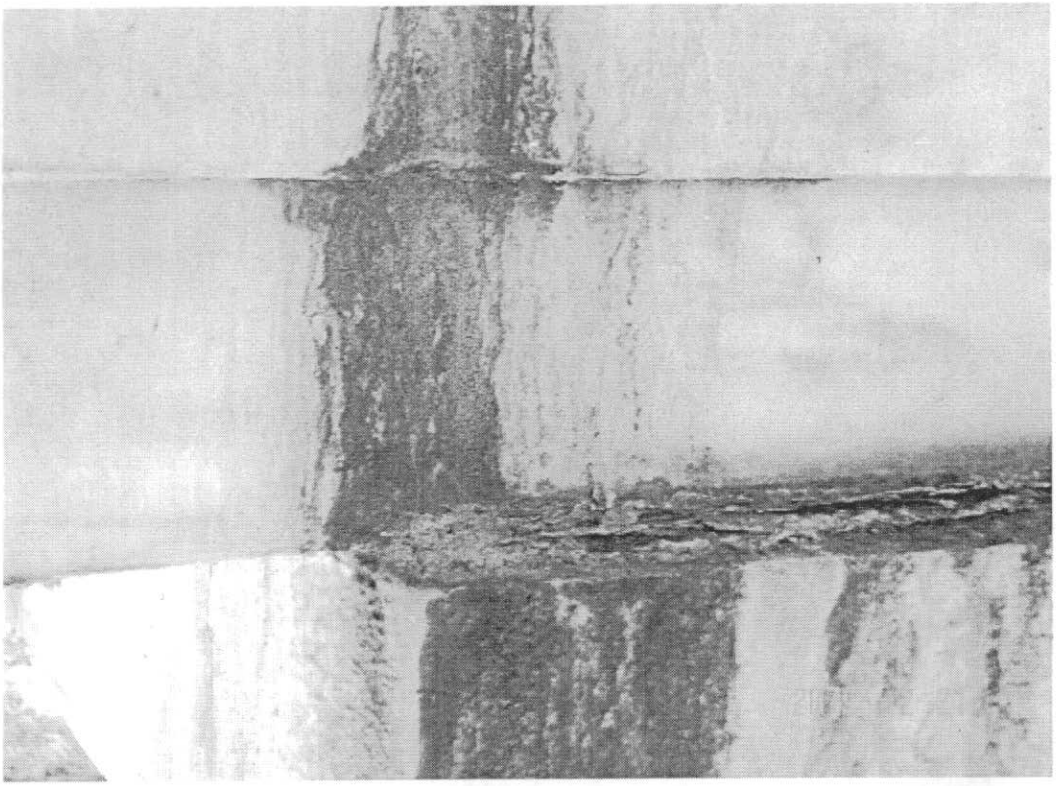


The marble of the dome exhibits dark mottling. [MSSC, 2005]



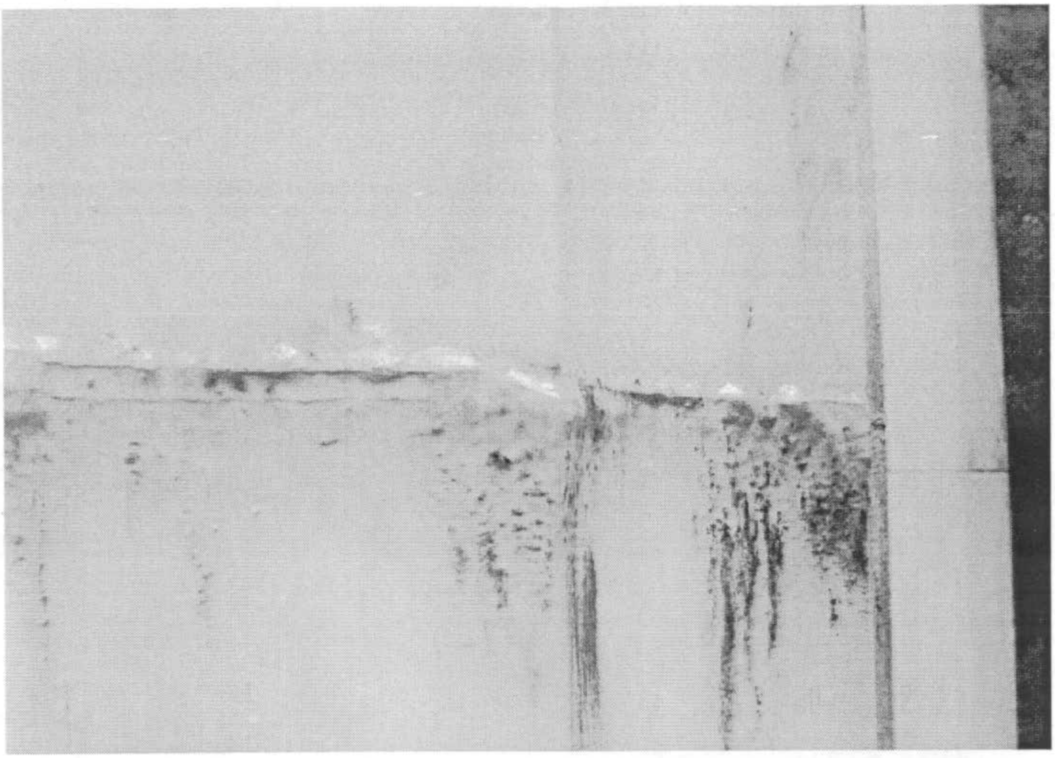
Vertical staining on exterior of entablature and column.[MSSC, 2005]

Vertical staining on interior of column. [MSSC, 2005]

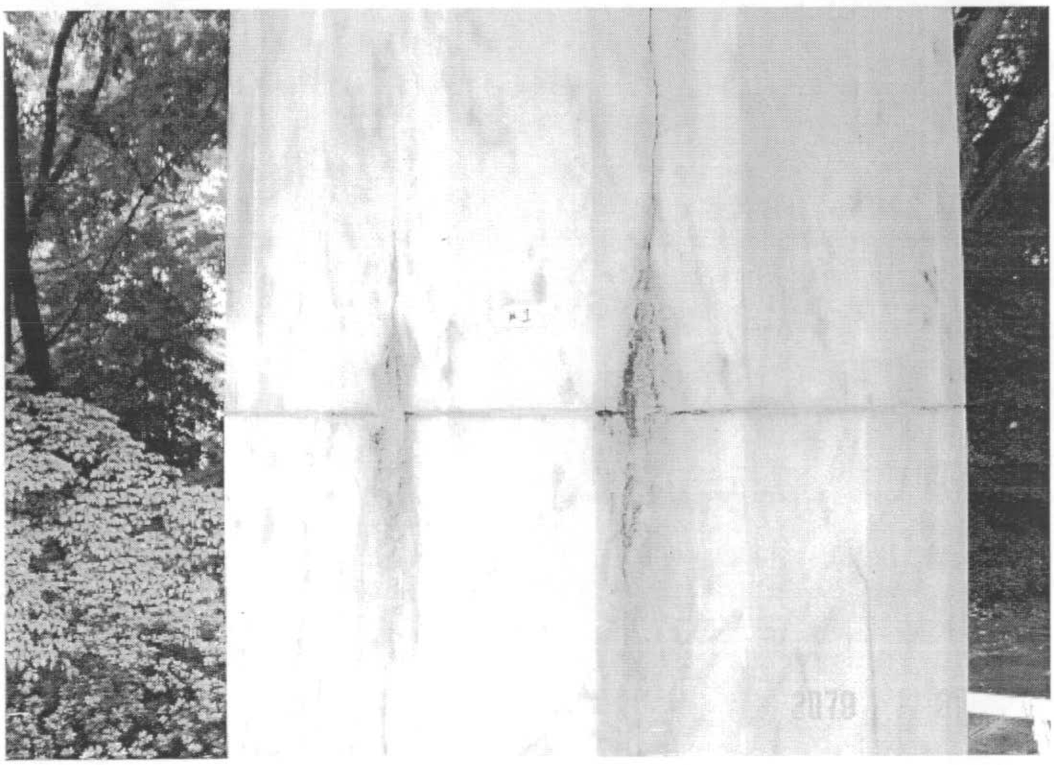


Deposit of staining material on interior of entablature and column capital. [MSSC, 2005]

Stalactite on base of entablature. [MSSC, 2005]

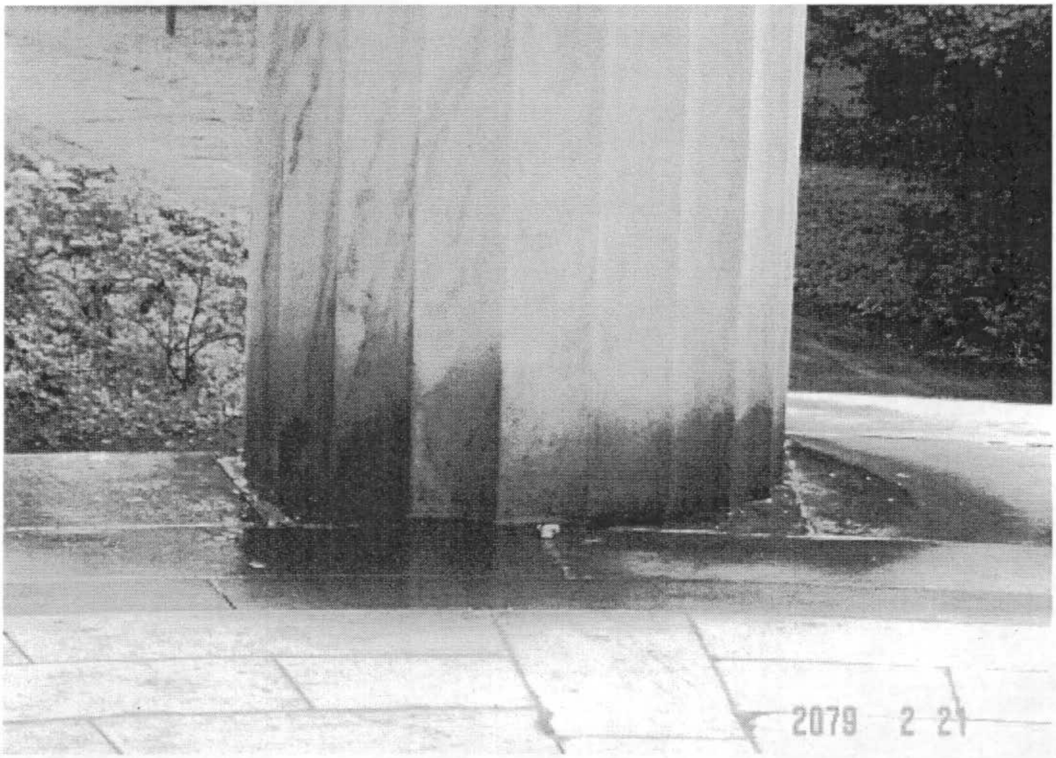


Staining material at column horizontal joint. [MSSC, 2005]



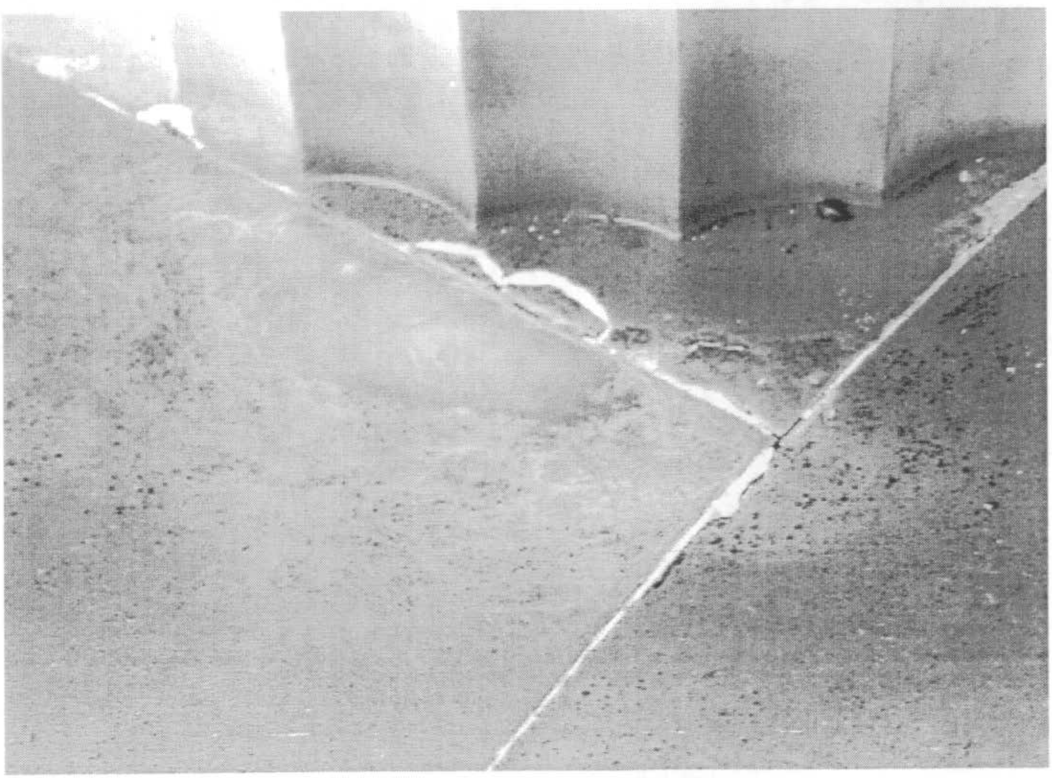
Staining material at vertical crack in column. [MSSC, 2005]

Severe dark-colored vertical stain at the base of column 4. [MSSC, 2005]



Dark-colored soiling at base of column. [MSSC, 2005]

Dark-colored soiling and water pooling on marble floor near base of column. [MSSC, 2005]



Re-deposited calcium carbonate on marble floor. [MSSC, 2005]

APPENDIX I

ARTICLES ON THE DISCOLORATION OF MARBLE

PROVIDED BY
MASONRY STABILIZATION SERVICES CORPORATION

"Report on Source of Patchy Discoloring and Interpretation of Ultrasound Data"
Edhard M. Winkler
August 1990

"Alteration of stone monuments: Phototrophic microbiodeteriogens"
G. Lamenti, L. Tomaselli, P. Tiano
Coalition, *Newsletter No. 8, July 2004*

'Red Staining and heterotrophic bacteria"
P. Tiano and L. Tomaselli
Coalition, *Newsletter No. 3, September 2001*

"Microbes on Building Stone - for good or ill?,"
Eric May, PhD
Culture, *Volume 24, No. 2*

"Arlington Amphitheater, Removal of dark red staining (Micrococcus Roseus)"
from Amendment No. 0006 to Advertised RFP W912DR-04-R-0018
August 26, 2003

Erhard M. Winkler, Ph.D.
Professional Geologist
Professor
17635 Juday Lake Dr.
South Bend, IN 46635

Mr.David Kemnitzer
Einhorn, Yaffee, Prescott
The Flour Mill, 1000 Potomac St.,NW,
Washington, DC 20007-3238

Dear Mr. Kemnitzer:

David Oberer asked me by telephone to analyze the discoloring on the white Vermont marble - and what to do about it. In the meantime the results of the microbiological investigation and the ultrasound data have arrived and the drill core from the "Cheekwall A" analyzed. The results of the data are submitted on a separate sheet. For a better full evaluation of the data I would need,

a) more drill cores, and

b) ultra-sound data of a quarry-fresh block of Vermont marble for comparison.performed with the same instrument, the same transducers and the same technicians, despite the availability of published data.

My expenses which I have submitted July 2, 1990 have not yet been honored. Settling this matter will be much appreciated.

Expecting to receive additional data as soon as possible, I am,

Sincerely.

Erhard M. Winkler, Ph.D.

ERHARD M. WINKLER
No. 396
GEORGIA REGISTERED PROFESSIONAL GEOLOGIST

REPORT ON SOURCE OF PATCHY DISCOLORING AND INTERPRETATION OF ULTRASOUND DATA:

Discoloring of Marble: A discolored piece of marble was analyzed by Dr. Kulpa of the Dept. of Biology. Two types of organisms were recognized, orange algae, **Hematococcus pluvialis,** and a bacteria of unknown species forming a dense black crust. SEM pictures are enclosed for each type of organism. The accurate identification of the bacteria would require the growing of a culture, a lengthy and expensive procedure. Neither organism binds nitrogen or sulfate from the environment, but produces organic acids which corrode the marble surface visibly. Dr.Kulpa, recommends washing the stone with commercial Chlorox. A 1:1 dilution with water prevents possible staining of the sensitive white marble. Painting such a mixture onto the stone surface should be repeated twice, and twice each year, one early in spring and the other one late in summer.

Soundness of the Vermont marble: Ultra-sound measurements of many stones was performed by Technicians of Law Engineering; a drill core fr- the "Cheekwall A" was sliced and the water absorption determined, also slices were tested for the modulus of rupture. The results are given on a separate sheet. Published figures for sound marble are near 5 km/sec. A curve is enclosed showing the relationship of the stone density with ultrasound velocity. The dispersion of data is large, but the minimum permissible density for exterior marble is 2.6 g/cm^3. Strength and water absorption is also plotted. The published relationship of the water absorption and the modulus of rupture is also enclosed. Sound marble should have a modulus of rupture near 12 MPa.and water a absorption of less than 0.25%. Dense Vermont or Carrara marble may have even less than 0.1%. The figures obtained on the drill core are unacceptable. Law Engineering's ultrasound figures appear to correlate with the lab tests performed on the drill core, assuming that the ultrasound tests were performed under identical conditions. Vermont marble is near 5 km/sec, all the stone on the Amphitheater is then deeply weathered with a life less than 50 years. More Drill cores and more ultrasound tests are needed to make a major decision on the future of the monument.

RESULTS OF TESTING THE DRILL CORE, "CHEEKWALL A":

No.of core Section:	Thickness of core section(mm):	Water Absorption in %:	Modulus of Rupture:
1 (surface)	17	0.39	
2	20	0.40	
3	14	0.52	
4	18	0.45	
5	20	0.46	
6	4.7	-	R=1.24 MPa
7	3.9	-	R=0.83 MPa
8	4.5	-	R=1.35 MPa
9	10	0.67	
10	15	0.57	
11	4.8	-	R=1.55 MPa
12	3.8	-	R=1.31 MPa
13	15	0.62	
14 uncut section	95		
15	19	0.65	
16	19	0.98	
total length:	260		

The stone of the Cheekwall A (north side entrance) appears to be dilated by weathering throughout. The ultrasound values 1.4, 1.8, 1.9 km/sec.appear to match the water absorption and the modulus of rupture of the core.

I am deeply concerned about the soundness of the other stone blocks. For a final evaluation many more ultrasound readings with actual drill cores will be needed.

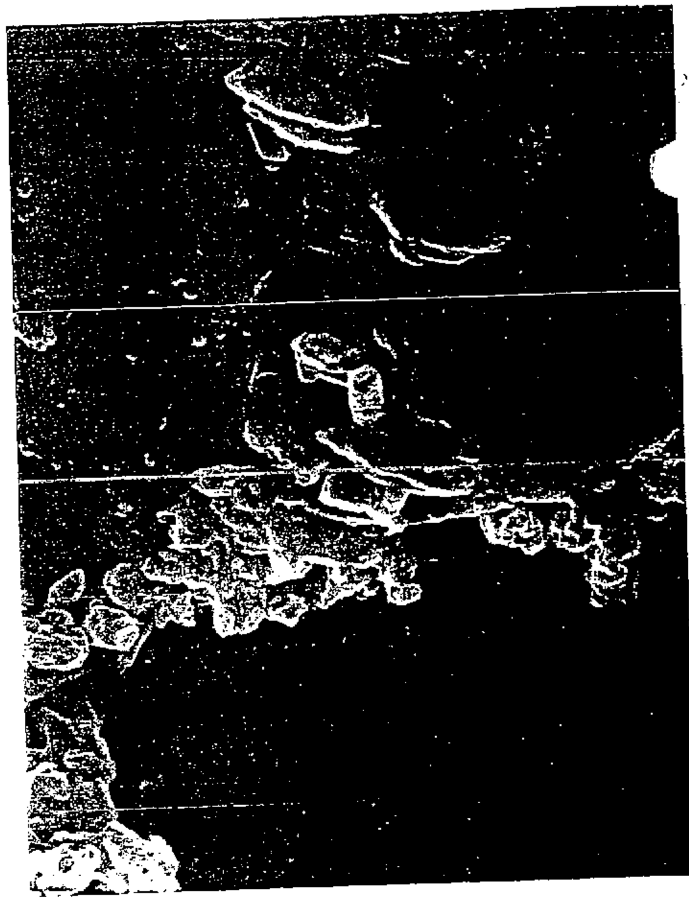
Respecfully submitted:

Erhard Winkler

Erhard M. Winkler, Ph.D.

ERHARD M. WINKLER
No. 396
GEORGIA REGISTERED PROFESSIONAL GEOLOGIST

8-18-1990.



8/6/90 5000X
MARBLE BLACK AREA

7/27/90 Marble Sample
5000X Dark Red area

8/6/90 7500X
MARBLE RED AREA

ISSN 1579-8410
Editor: C. Saiz-Jimenez
Assistant Editor: M.A. Rogerio

PATRIMONIO HISTÓRICO

COALITION

CSIC Thematic Network on Cultural Heritage. Electronic Newsletter

Newsletter No. 8
July 2004

Index

Edited by:

Red Temática del CSIC de Patrimonio Histórico y Cultural

Instituto de Recursos Naturales y Agrobiología de Sevilla, CSIC
Apartado de Correos 1052, 41080 Sevilla (Spain)

Correspondence to:

coalition@irnase.csic.es

RED STAINING AND HETEROTROPHIC BACTERIA

P. Tiano[1] and L. Tomaselli[2]

[1]*CNR-ICVBC, Firenze, Italy*
[2]*CNR-ISE, Sezione di Firenze, Italy*

Monumental stone surfaces are often covered with stained areas without any apparent biological presence. In the case studies illustrated here are shown some examples of red coloured patches whose origin may be attributed to a biological activity.

Exposed monuments support the dwelling of complex biocoenosis which can cover the surface with coloured patinas and black crusts (Figure 1) (Pietrini et al. 1985). Sometimes after the restoration and cleaning treatment the surface of the object appears stained with red colour patches (Figure 2). This effect is quite diffuse on different monuments mainly of calcareous composition (Figures 3-4). Diagnostic investigations to assess the nature and origin of these coloured patches have usually failed. The presence of lead, detected in a few cases, has been tentatively involved in the phenomenon (Realini and Sorlini, 1988).

Figure 1. Monumental Fountain placed in the Medici's Villa of Castello (Firenze, Italy) before its restoration

Figure 2. Detail of the Figure 1 after restoration. The breast of one of the satyr, holding the upper basin, shows a diffuse reddish staining

In the case of the Duomo of Siena (Figure 5), whose external walls were covered with diffuse red patches, it was possible to establish the biological nature of the staining of the white marble slabs (Tiano and Tomaselli, 1989).

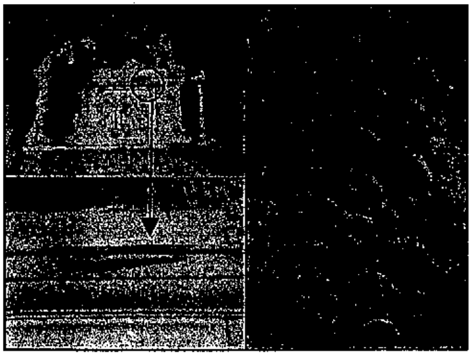


Figure 3 (left). Marble Cenotaph in the Monumental Cemetery of Pisa (Italy). Presence of red patches not removed by the restoration treatment. Figure 4 (right). Detail of a marble bas-relief on the facade of the Foligno Cathedral (Perugia, Italy) after restoration. Presence of undiscoloured red patinas after the restoration

To some of these red areas was also associated a green patina. This chasmolitic dwelling was found under a thin slice of white marble (Figure 6). The material collected from this sample, observed directly under optical microscope and after the development in organic and inorganic cultural media, showed the presence of a complex biocoenosis composed by bacteria, fungi and green algae (Figure 7).

The prevailing isolated bacteria were identified as coloured species of

Micrococcus. The colonies appear pink, yellow, orange and red owing to the production of different carotenoid pigments (Figure 8). These heterotrophic cocci (cell diameter 1-1.5 μm) probably derive organic nutrients from the association with the green micro-algae as observed *in situ.*

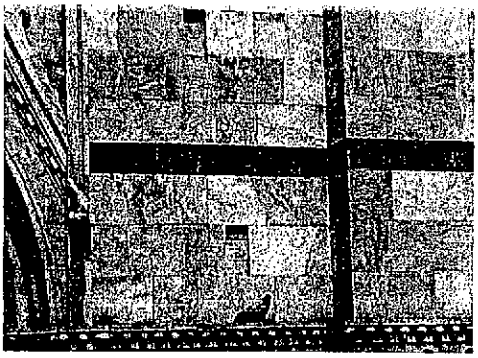


Figure 5. Siena Cathedral (Italy): various red areas on the marble slabs of the facade (south)

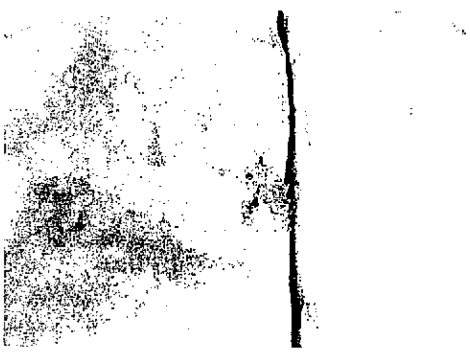


Figure 6. Detail of Fig 6, chasmolithic growth of green algae

Figure 7. Light micrograph of the complex biocoenosis (green algae, micro fungi and bacteria) occurring in the sample collected from the green area in Figure 6 (440x)

A liquid culture of one of the isolated red pigmented strains (Mr12) was inoculated in Petri dishes containing artificial media made with nutrient broth and powered $CaCO_3$ or $MgCO_3$ (Figure 9). The plates were incubated at 28°C and maintained wet with diluted nutrient broth.

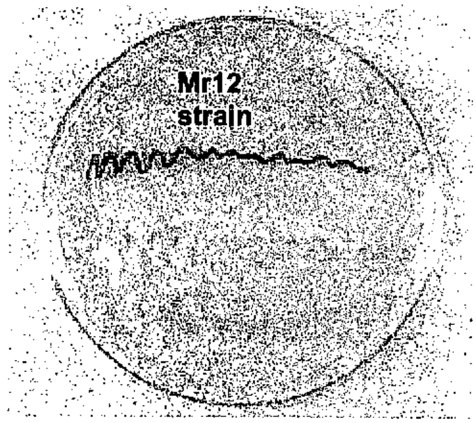


Figure 8. Three different isolated *Micrococcus* strains streaked on plate count agar

Figure 9. Mr12 strain developed on an artificial substrate made with powered $MgCO_3$. Note the formation of a red area very similar to those observed on the monument

After two weeks the Petri dishes were dried (120°C) and the red organic pigment produced by the cells was absorbed by the powered stone material inducing permanent red stained areas very similar to those on the monument.

In fact, the carotenoid pigments react with the calcareous matrix and constitute a very strong chemical bound.

They become practically insoluble to all solvents (organic and inorganic) used in the attempt to extract them.

This can explain the reasons for which is quite often impossible to assess the chemical nature of such red stained patches in samples taken from monuments.

References

Pietrini A.M., Ricci S., Bartolini M., Giuliani M.R. (1985). A reddish colour alteration caused by algae on stoneworks. Preliminary studies. *Proceedings Vth International*

Back to index

Congress on Deterioration and Conservation of Stone, Lausanne, pp. 653-662.
Realini M., Sorlini C. (1988). Le macchie rosse del marmo apuano. La Certosa di Pavia, passato e presente nella facciata della chiesa. Roma: CNR, pp. 263-282.
Tiano P., Tomaselli L. (1989). Un caso di biodeterioramento del marmo. *ARKOS* 6: 12-18.

LASER-INDUCED FLUORESCENCE

Marta Castillejo

Instituto de Química Física Rocasolano, CSIC, Madrid, Spain.

Abstract
Laser-induced fluorescence (LIF) is a versatile, non-destructive analytical technique that can be performed in situ and in remote sensing, and provides information directly related to the molecular structure of the materials on the illuminated substrate. LIF is capable of detecting both organic and inorganic species which exhibit fluorescence upon irradiation with UV or visible excitation. The instrumentation required includes a laser and a detection system. Two different cases in which LIF has successfully served to identify the materials on Cultural Heritage artefacts are presented.

Basic Principles
Every material has its own characteristic electromagnetic absorption and emission spectrum. By selective excitation using specific light wavelengths, it is possible to identify materials with high certainty. Using a laser as the excitation light source, it is possible to select a controlled excitation wavelength; this results in very high-resolution measurements that allow the detection of even small traces of substances or chemical compounds.

Laser-induced fluorescence (LIF) is the optical emission from molecules or impurity centres, doped in small concentrations into solids, that have been excited to higher energy levels by absorption of laser radiation. These emitters can be the own constituents of the material, i.e. the molecules in a molecular substrate, or be present as impurities or crystal defects into solids. LIF emission from painting materials provides information that can be directly related to the molecular structure of pigments or other painting materials, both inorganic and organic, as binders or varnishes. Biological layers also display their own characteristic LIF spectra. The possibility of employing different laser wavelengths for excitation adds versatility and selectivity to the technique.

In its application to Cultural Heritage, LIF is useful to identify the materials of an artifact, either original, as products of deterioration processes, or added in the course of restoration activities during the lifetime of the object. Analytical schemes have been proposed for performing LIF analyses of artworks and Cultural Heritage substrates. Excitation of the sample surface with a pulsed laser beam produces the emission of fluorescence, or more generally luminescence, that, for instance, can be characteristic of a pigment, provide information on the aging of a binder or varnish, identify the presence of a protective coating or biological grow on a stone surface, etc. Due to the versatility of the technique, LIF can be performed in situ (Miyoshi et al. 1982; Anglos et al. 1996; Borgia et al. 1998; Kautek et al. 1998; Athanassiou et al. 2000; Castillejo et al. 2001) and in a remote sensing system, using light detection and ranging (LIDAR) (Weibring et al. 2001).

Instrumentation
The excitation source for LIF is typically a pulsed laser operating in the UV, like an excimer laser, or the harmonics of a Q-switched Nd:YAG laser, or eventually a tunable dye laser in the visible spectral region. Studies in the near UV and near IR are becoming more common as near IR lasers and frequency-doubling methods improve. High-resolution studies require cooling of the substrate, using cryogenic methods or crystalline matrices, to remove spectral congestion and to reduce the Doppler width of the transitions.

A typical experimental arrangement used for LIF is schematically depicted in Figure 1. The main components of the set-up are a laser excitation source and a spectrum analyser.

The European Commission
Community Research
Energy, Environment
and Sustainable Development

COALITION

A concerted action from the European Commission (EVK4-CT-1999-2001) on molecular microbiology as an innovative conservation strategy for indoor and outdoor cultural assets

Editor in Chief: C. Saiz-Jimenez
Assistant Editor: M.A. Rogerio

CSIC

Genalysis®

UNIVERSITEIT GENT

ICBM

Newsletter No. 3
September 2001

Index

Coordinated by the Instituto de Recursos Naturales y Agrobiología de Sevilla, Consejo Superior de Investigaciones Científicas, Apartado de Correos 1052, 41080 Sevilla (Spain)
Address correspondence to: coalition@irnase.csic.es

http://www.geomic.uni-oldenburg.de/projekte/coalition

Short Communications

ALTERATION OF STONE MONUMENTS: PHOTOTROPHIC MICROBIODETERIOGENS

Gioia Lamenti[1], Luisa Tomaselli[1], Piero Tiano[2]
[1] CNR – C.S. Microrganismi Autotrofi
[2] CNR – C.S. Opere Arte, Firenze, Italy

Monuments located outdoors are affected not only by physical and chemical weathering but also by biological activities of stone-dwelling microorganisms, among which the phototrophs often prevail (Gómez-Alarcón et al. 1995; Urzì et al., 1994; Ortega-Calvo et al. 1993). One of the consequences of microbial development is the formation of thick patinas with intense pigmentation varying from green to dark-green or dark red, which considerably alter the aesthetic appearance of the monuments, like those covering the statues shown in Figures 1-2.

Fig 1. Sandstone statue, Boboli Gardens, Florence (Italy).

Microbial biofilms do not only produce aesthetic damage, but can cause stone surface weathering, enhancing the loss of stone particles from the crystalline structure (Krumbein, 1988).

Fig 2. Brick statue, Boboli Gardens, Florence (Italy).

In fact, the microorganisms can develop into the porosity and the first layers of stone material (Fig 3), and produce scaling and detachment

Fig. 3. Green phototrophic micro-organisms developed into the surficial layers of a Marble statue (x 40).

Phototrophic microorganisms are usually prevalent in microbial biofilms (Figs 3, 4). Many phototrophic microorganisms are able to produce dark coloured sunscreen pigments, as shown in Figure 4 (right).

These substances which protect the cells against UV radiation and high light intensities contribute to darken the biofilms of the stone surface.

Fig 4. Phototrophic biocoenoses (bar 10 μm).

The phototrophic microorganisms present in the biofilms collected from Italian stone monuments are prevailingly constituted by chlorophyta and cyanobacteria. These are usually identified following traditional techniques, but more recently molecular techniques have been introduced for a proper identification and with the objective to recognise these microorganisms directly on stone monuments. As example we report the procedure used for the identification of cyanobacteria by detecting the intergenic spacer (PC-IGS) between genes encoding for phycocyanin (a cyanobacterial specific protein) and using as references the cyanobacterial strains isolated from Italian monuments and PCC strains (Tomaselli *et al.* 2000).

The cyanobacterial strains were isolated from colonies developed on agarised cultural media ($BG\text{-}11_0$ and BG-11, Rippka *et al.*, 1979) in Petri dishes inoculated with samples collected from several Italian stone monuments. The isolated strains were identified according to the diagnostic keys reported in the 3rd volume of Bergey's Manual of Systematic Bacteriology (Castenholz & Waterbury, 1989). The cyanobacterial strains were purified by repeatedly cells washing followed by streaking in Petri dishes on the agarised cultural media. These strains purified and characterised constitute now a specific collection of phototrophic stone microbiodeteriogens.

The molecular analysis was performed both on some axenic strains of the collection (Table 1) and on the biofilms collected from stone monuments (Table 2).

Table 1. Cyanobacterial strains used and generic assignment.

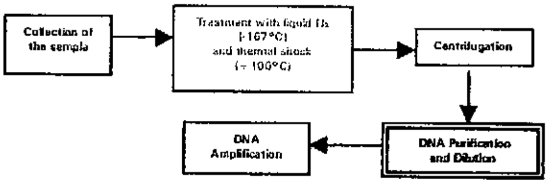
Strain	Origin	Assignment
C6	Leaning Tower (PI)	*Synechococcus* sp.
C8	Leaning Tower (PI)	*Leptolyngbya* sp.
C9	Leaning Tower (PI)	*Pleurocapsales*
C11	Leaning Tower (PI)	*Pleurocapsales*
LI-t	Medici Fortress (LI)	*Plectonema* sp.
LI-m	Medici Fortress (LI)	*Myxosarcina* sp.
Vol	Roman statue Volterra (SI)	*Phormidium* sp.
Peg	Boboli Garden statues (FI)	*Phormidium* sp.
Mu-2	Boboli Garden statues (FI)	*Pleurocapsales*
Mu-c	Boboli Garden statues (FI)	*Pleurocapsales*
Mu-sc	Boboli Garden statues (FI)	*Scytonema* sp.
Mu-pl	Boboli Garden statues (FI)	*Plectonema* sp.
Bg-c	Boboli Garden statues (FI)	*Pleurocapsales*
PCC 6307	Pasteur Culture Collection, Paris	*Synechococcus*
PCC 6308	Pasteur Culture Collection, Paris	*Synechocystis*
PCC 73106	Pasteur Culture Collection, Paris	*Gloeocapsa*
PCC 6306	Pasteur Culture Collection, Paris	*Leptolyngbya*

Table 2. Biofilms and their origin.

Biofilm	Origin
Dark patina	Marble substrate, Cascine Park (FI)
Dark patina	Sandstone substrate, Cascine Park Pyramid (FI)
Green patina	Sandstone substrate, Cascine Park Pyramid (FI)

The axenic cyanobacterial strains were aseptically grown in liquid media under controlled conditions. Cells of each strain were collected by centrifugation and the genomic DNAs were extracted to perform ARDRA (Amplified Ribosomal DNA Restriction Analysis) (Lamenti *et al.* 1999). The biofilms collected by scraping the stone surface were treated, in order to extract the DNA, with different methods: thermal shock; ultrasonic waves (Sonier); homogenisation in mortar with a buffer used for cell lysis or with liquid nitrogen. Among the tested methods we found that the most efficient procedures to extract the DNA was to pestle the patina in mortar with liquid nitrogen followed by the application of thermal shock to the suspension (Graph 1).

Graph 1. Scheme of treatment of biofilm samples for DNA extraction.



The extracted DNAs of axenic cyanobacterial strains were amplified for the 16S gene with the universal primers and for the intergenic region between the *cpc*A and *cpc*B genes encoding for the phycocyanin (PC-IGS), then the amplified products were digested with restriction endonucleases.

The restriction profile analysis of the amplified 16S genes for the strains reported in Table 1, permitted the construction of the dendrogram showing the similarities among the strains (Fig. 5).

This preliminary characterisation at genomic level (ARDRA) of phototrophic micro-organisms isolated from Italian monuments permitted us to have an indication of the biodiversity of culturable cyanobacterial strains present in the biofilms. A more extensive isolation and

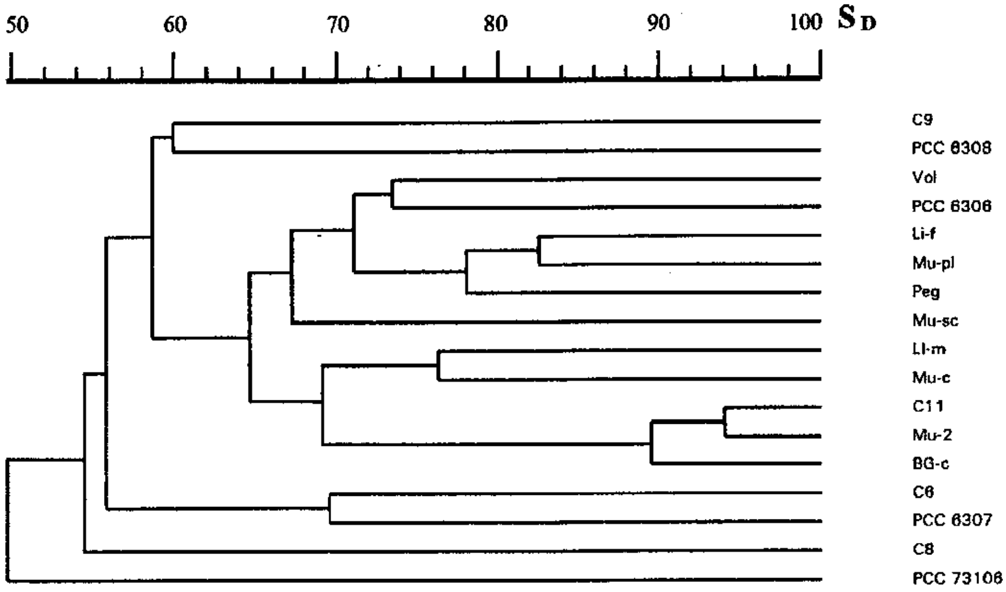


Fig. 5. UPGMA dendrogram of cyanobacterial 16S ARDRA on combined profiles from five endonucleases. So , Dice similarity coefficient (%).

purification work is ongoing in order to clarify the genetic structure of the sampled cyanobacterial biofilms.

The DNAs extracted from patinas with different methods were tested for the quality and amplified for PC-IGS. Although DNAs extracted from patinas treated with liquid nitrogen resulted to be of good quality and gave positive results for the amplification with universal primers, it failed to be amplified for PC-IGS. This fact could be explained by the presence of dead cyanobacterial cells in the biofilm or of cyanobacterial strains different from those used as reference, which could have mutations in the sequences where primers link.

On the other hand, the positive amplification for PC-IGS of the isolated strains suggests that such PCR target could be useful to detect the presence and to identify cyanobacterial strains directly in biofilms, provided that a specific data bank of cyanobacterial biodeteriogens is available.

Acknowledgements

This work was financed by the National Research Council of Italy, Special Project "Cultural Heritage".

References

Castenholz R.W., Waterbury J.B.(1989) Group 1. Cyanobacteria. In Bergey's Manual of Systematic Bacteriology, eds, J.T. Staley, M.P. Bryant, N. Pfennig, J.G. Holt, Vol. 3. Williams and Wilkins, Baltimore: 1710-1799.

Gómez-Alarcón G., Muñoz M., Ariño X., Ortega-Calvo J.J.(1995). Microbial communities in weathered sandstones: the case of Carrascosa del Campo church, Spain. Sci. Tot. Environ. 167: 249-254.

Krumbein W.E. (1988). Microbial interactions with mineral materials. In Houghton D.R., Smith R.N. and Eggins H.O.W. (eds), Biodeterioration, 7. Elsevier Applied Science, London: 78-100.

Lamenti G., Bosco M., Tiano P., Tomaselli L. (1999) Biodiversity and molecular analysis of cyanobacteria from biofilms degrading works of art in Tuscany. Abst. In: Proc. 1st International Conference on Microbiology and Conservation (ICMC'99), (Tiano P. and Feroci C., Eds.), CNR Opere d'Arte, Firenze, Florence, Italy, 16-19 June, pp. 35-40.

Ortega-Calvo J.J., Sanchez-Castillo P.M., Hernandez-Marine M., and Saiz-Jimenez C. (1993). Isolation and characterization of epilithic chlorophytes and cyanobacteria from two Spanish cathedrals (Salamanca and Toledo). Nova Hedwigia 57: 239-253.

Rippka R., Deruelles J., Waterbury J.B., Herdman M., Stanier R.Y. (1979) Generic assignment, strains history and properties of pure cultures of cyanobacteria. *J. Gen. Microbiol.* 111: 1-61.

Tomaselli L., Lamenti G., Bosco M., Tiano P. (2000). Biodiversity of photosynthetic micro-organisms dwelling on stone monuments. Int. Biodet. & Biodeg. 46: 251-258.

Urzì C., Krumbein W.E., (1994). Microbiological Impacts on the Cultural Heritage. In *Durability and Change: The Science, Responsibility, and Cost of Sustaining Cultural Heritage.* (W.E. Krumbein, P. Brimblecombe, D.E. Cosgrove and S. Staniforth, eds.), Wiley and Sons Ltd, Chichester, pp. 107-135.

MICROBIAL CONTAMINATION AND INSECT INFESTATION IN SPANISH MUSEUMS, ARCHIVES AND LIBRARIES

Nieves Valentín
Instituto del Patrimonio Histórico Español, Madrid, Spain

Over the last 10 years a survey has been carried out in Spanish museums, archives and libraries to detect the most common microorganisms and insects involved in the deterioration of historical objects. The results showed about 40 different strains of microorganisms identified from bioaerosols, in museums, and 75 from in archives and libraries. It was also found that biodeterioration of cellulose and proteinaceous materials was produced by 30 species of insects. However in general, insect infestation presented higher incidence than microbial contamination in the deterioration of objects located in cultural institutions.

Very often, collections are exhibited in historical buildings that maintain micro-environments appropriated for the development of fungi, bacteria and insects, on their objects including cultural properties made of cellulose; books, textiles, furniture, paintings, wood sculptures, altar pieces, and proteinaceous materials such as parchment, vellum, leather, mummy skin, and synthetic materials.

Many fungal and bacterial species start their development depending on the available moisture on the surface of an object. In this context, scantly research has been done on the effect of moisture content in a material and the appropriate water activity which determines the water available for the germination of microbial spores and indicates the risk of microbial contamination in a support. In addition, air ventilation should be taken into account. It contributes to inhibit microbial growth in both environment and objects.

In Spanish museums and archives the most common species of microorganisms isolated in recent searches belong to: *Alternaria solani, Alternaria tenuis, Aspergillus niger, Aspergillus luteus, Aspergillus flavus, Aspergillus fumigatus, Aureobasidium pullulans, Cladosporium herbarum, Cladosporium cladosporoides, Chaetomium globosum, Chaetomium sp., Fusarium roseum, Fusarium solani, Geothrichum sp. Gliocadium sp., Mucor racemosus, Penicillium glaucum, Rhizopus oryzae, Penicillium frequentans, Penicillium notatum, Penicillium griseofulvum, Penicillium chrysogenum, Rhizopus nigricans, Stachybotrys sp., Trichoderma viride, Trichothecium sp., Ulocladium, sp.*

These microorganisms produce deterioration of paper, adhesives and plastic materials. In this context, fungi with potential patological effects to people have been described including: *Alternaria solani, Aspergillus fumigatus, Aspergillus niger, Aspergillus versicolor, Aspergillus luteus, Chaetomium globosum, Cladosporium cladosporoides, Fusarium solani, Mucor racemmosus, Penicillium glaucum, Rhizopus oryzae, Trichoderma viride.*

In proteinaceous materials, it has been found that anaerobic bacteria are the most deleterious to parchment. Collagen can be hydrolysed by collagenase produced by bacteria such as *Clostridium*. Strains of *Bacillus, Pseudomonas, Sarcina* and *Bacteroides* induce collagen degradation in anaerobic conditions. Other proteins and lipids of parchment may also be altered by enzymes that are products of aerobic fungal and bacterial species. *Bacillus subtilis* exhibits very high activity in hydrolyzing native collagen which occurs above 95% RH.

In addition, several species corresponding to *Actinomyces* have been detected on organic and inorganic materials.

In the literature it has been reported microorganisms isolated from both environment and objects (cellulose and proteinaceous) located in museums and archives. They are as follows:

Fungi
Acremonium sp., Alternaria tenuis, Alternaria solani, Alternaria alternata, Aspergillus niger, Aspergillus flavus, Aspergillus tamari, Aspergillus versicolor, Cladosporium elatum, Cladosporium cladosporoides, Cladosporium herbarum, Cephalosporium sp., Curvularia lunata, Chaetomium globosum, Chaetomium succineum, Fusarium roseum, Fusarium solani, Fusarium oxysporum., Geothrichum sp., Gliocadium sp., Mixotrichum sp., Monilia macrospora, Mucor racemosus, Mycoderma sp., Myrothecium verrucaria, Ophistoma sp., Paecylomyces variabilis, Penicillium bevicompactum, Penicillium frequentans, Penicillium chrysogenum, Pestalotia oxyanthi, Phoma glomerata, Rhizopus nigricans, Trichothecium roseum, Trichothecium sp., Trichoderma viride, Trichoderma longibrachiatum, Trichoderma lignorum, Ulocladium botrytis, Verticillium chlamydosporium, Verticillium albo-atrum, Scopularioupsis brevicaule, Scopulariopsis acremonium, Stachybotrys atra, Spicaria sp.

Bacteria
Aeromonas caviae, Aeromonas sp., Bacillus subtilis, Bacillus cereus, Bacillus circulans, Cellulomonas sp., Cellulomonas cellasea, Cellulomonas cellulans, Cellvibrio mixtus, Chromobacterium sp., Cytophaga aurantiaca, Flavobacterium breve, Micrococcus luteus, Micrococus roseus, Micrococcus varians, Pseudomanas fluorescens, Pseudomonas elongata, Streptococcus sp., Streptomyces rimosus, Staphylococcus sp., Clostridium sp., Vibrio sp. Xanthomonas sp.

Different studies related to biodeterioration in European museums showed similar microbial species isolated from organic materials. However, more research is required to understand the biological activity of specific strains on museum objects exposed to particular microclimatic conditions. It is also necessary: determine levels of water activity in relation to the nature of the object, enzime production and metabolites excreted by microorganisms involved in biodeterioration, thresols for the development of specific organisms in both objects and environment and identification of species dangerous for people and for historic materials.

In the archives analysed it was recently detected a significant increase of professionals suffering physiological illnesses relating to indoor air pollution. In fact, it has been reported that spores and hifae fragments included in airborne biological particles play an important role in allergies, skin and systematic mycoses. Consequently, the pathology of the isolated species should be considered to establish regulations and guidelines in preventive conservation in museums, archives and libraries.

Insects
In Spain the most serious bio-deterioration problems produced by insects were found in Galicia and on the Mediterranean coast, basically in the Levant and southern Andalusia. This is due to the climatic factors of high relative humidity (RH) and moderate temperatures, the inappropriate maintenance and micro-environmental conditions of the museum or archive buildings themselves.

It has been found a progressive infestation of art collections by *Anobium punctatum, Lyctus bruneus, Hylotrupes bajulus, Anthrenus flavipes, Attagenus unicolor, Tineola biselliella,* and specially by the termite *Reticulitermes lucifugus*. The latter was detected on the Mediterranean coast and in the southern, north-western and central regions of Spain.

Species of the Anobiidae family are commonly found in works of art made from pine, oak, walnut, cedar, cherry, holm-oak, cork and chestnut. Cerambycidae insects were isolated from pine, cherry, oak, holm-oak, cork and walnut wood. Dermestidae species are mainly isolated from textiles made of silk and wool, and from wooden objects made with the help of organic adhesives.

At present, microbial and insect taxonomic studies in biodeteriorated objects are being carried out using conventional methods. However, very often these methods are time-consuming to develop and ineffective to determine some specific strains. For this reason, more accurate and rapid analyses including molecular techniques to optimize diagnostic studies on biodeterioration of Cultural Heritage.

Reports

SYMPOSIUM ON TECHNOLOGY AND THE PROTECTION OF CULTURAL HERITAGE MATERIALS

Ralph Mitchell
Laboratory of Applied Microbiology
Harvard University, Cambridge MA USA

Conservation of natural resources has been studied intensively in the United States during the past quarter century, with significant positive results for preservation of the natural environment. However, research into conservation of cultural heritage materials, and particularly biodeterioration processes, has not had a high priority. Funding for research is minimal, and there are few laboratories with active programs. A symposium was held at the annual conference of the American Association for Advancement of Science, held in San Francisco in February 2001. The symposium title was "Technology and the Protection of Cultural Heritage Materials". The objective was to make American scientists aware of the current challenges and innovations in the field of cultural heritage materials research.

The symposium was organized by Ralph Mitchell. In his introduction he described some of the recent major advances in microbiological research. These included the use of molecular biology and biotechnology methods of analysis, biochemical processes involved in deterioration, and novel approaches to control of biodeterioration. Participants described innovations in the fields of diagnosis and control of deterioration of works of art, historic documents, natural history and museum collections, and historic buildings and archeological sites.

Barbara Berrie of the National Gallery of Art in Washington described the application of chemical analytic techniques in the reversal of deterioration of works of art. One example showed how an understanding of corrosion processes could be utilized to control deterioration of metal objects. She also described the use of enzymes to clean works of art.

Norbert Baer from New York University discussed innovations being utilized to protect historic documents in the National Archives. He explained how the U.S. Declaration of Independence is being analyzed for deterioration, using modern non-invasive methods. His presentation also included a description of methods being used to preserve historic film and audio tapes being stored in the National Archives.

Carolyn Rose of the Smithsonian Institution Natural History Museum emphasized the need to move from remedial measures to preventative strategies to protect ethnographic and archeological objects. She described the use of computer tomography for early detection and the application of laser cleaning techniques.

The Getty Conservation Institute's extensive efforts to provide long-term preservation of Mayan archeological sites were described by the Institutes director, Tim Whalen. He demonstrated how a multidisciplinary approach could be used as a model for preservation of archeological sites.

The conservation of library, archival and museum collections was discussed by Jim Reilly of the Rochester Institute of Technology. He showed how the application of decay kinetics could be used to develop a predictive model for decay of organic objects in collections. The model is being tested on a wide range of objects in museums and archives.

It was clear from the positive response of the audience that these presentations provided our scientific colleagues with a new insight into conservation research. Further symposia at scientific conferences are planned as a means of increasing conservation research programs in the United States.

Participants
Norbert Baer. Conservation Center. New York University

Barbara Berrie. Conservation Department. National Gallery of Art. Washington, DC

Ralph Mitchell. Laboratory of Applied Microbiology. Harvard University. Cambridge, MA

James Reilly. Rochester Institute of Technology. Rochester, NY

Carolyn Rose. Department of Anthropology. National Museum of Natural History. Smithsonian Institution. Washington, DC

Timothy Whalen. Getty Institute of Conservation. Los Angeles, CA

Forthcoming Activities

Steering Commitee meeting S2. Seville, Spain, September 28-30, 2001.

COALITION Workshop 2: Novel molecular methodologies. Luckenwalde, Germany, March/April 2002.

Call for papers

This newsletter is open to external contributions. These include short communications and notes (maximum 2 pages), or critical comments (1 page) on the topics covered by COALITION.

Send your contributions by e-mail to: coalition@irnase.csic.es

Microbes on building stone – for good or ill?

Eric May BSc, PhD
School of Biological Sciences, University of Portsmouth, Portsmouth, Hampshire, UK

Introduction

Microorganisms play a crucial role in mineral transformation in the natural environment, notably in the formation of soils from rocks and the cycling of elements such as nitrogen and sulphur. It is therefore not surprising that a wide variety of micro-organisms, especially bacteria and fungi, have been isolated from rocks and the stonework of historic monuments and buildings such as Portchester Castle (**Figure 1**). The complex interaction of numerous microbial types at a microscopic level in intimate association with the mineral substrate is readily observed[1] often reaching deeper than 3cm into the stone. Microorganisms can be on or inside stone, as endolithic communities. In some circumstances their long-term surface growth establishes a coloured, varied *patina*, which can sometimes be protective to the underlying stone. Often, however, some types of patina growth leads to damage caused by erosion, biopitting and exfoliation (**Figure 2**). Research has highlighted a possible role for microbes in stone deterioration due to one or more mechanisms: their presence as undesirable *surface growths* (aesthetic), *mechanical damage* (biogeophysical change) by biofilms or penetrating hyphae and *corrosive effects* (biogeochemical change) due to metabolic activity (**Table 1**). Scientific investigation can present severe problems with objects of cultural value. Phototrophic organisms such as higher plants, lichens and mosses, together with algae and cyanobacteria, cause obvious surface effects. The impact of most bacteria and fungi is more difficult to appreciate and separate from purely physical and chemical phenomena that are acknowledged threats to the integrity of building stone.

Influence of air pollution

There is extensive evidence to suggest that historic buildings may suffer damage as a result of microorganisms using hydrocarbons in air as a carbon source and producing corrosive organic acids[2]. It is well known that atmospheric combustion pollutants such as nitrogen oxides and sulphur dioxide are a primary cause of accelerated deterioration of exposed stone-works, The gases are oxidized in the air to nitric and sulphuric acid, form acid rain which is deposited onto the surface of stone where carbonates are converted into sulphates (gypsum) and highly soluble nitrates. The presence of dust, residual hydrocarbons and other organic pollutants in urban air leads to stone alterations such as black crust formation, nitratation, and sulphatation, and damage. Black crusts on buildings are the result of atmospheric particles (spores, pollen, dust, and heavy hydrocarbons) being trapped in a mineral matrix of gypsum and re-crystallized calcite minerals. Atmospheric hydrocarbons on artistic stone-works will be supplemented by organic matter related to inadequate past restoration and lysis of microbial cells originating from primary surface colonisation. Nitrate and sulphate pollution processes, accompanied by crust formation and incrustations with organic patina on stonework, induce accelerated weakening and deterioration of the stone matrix. The substrates for microbial activity are certainly present but other factors play a role in the stone deterioration and it is difficult to assess the precise contribution that microorganisms might make to this process. Consequently, damage to stone by microbial mechanisms is the least well understood and was not widely recognised by conservators as a problem to be addressed[3].

Stone colonisation and biofilms

The stone ecosystem is subject to harsh environmental change, especially temperature and moisture, exerting extreme selective pressure on any developing microbial community. The complex consortium of micoorganisms that exists on weathered building stone at any given time is the result of ecological successions and interactions that directly relate to fluctuating substrate availability and environmental conditions. Initially, the mineralogy and structure of stone in relation to its capacity to collect water, organics and particles will control its predisposition to biodeterioration, or bioreceptivity[4].

The ability of the stone-colonizing microflora to cover and even penetrate material surface layers by the excretion of organic extracellular polymeric substances (EPS) leads to the formation of complex biofilms in which the microbial cells are embedded. Phototrophic organisms usually initiate colonisation by establishing a visible, nutrient rich biofilm on new stone from which they can penetrate the material below to

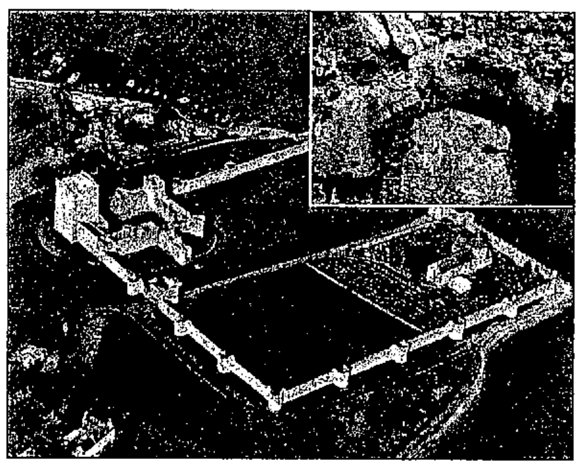


Figure 1. Portchester Castle: a historic monument suffering stone biodeterioration.
Figure 2 (inset). Stone decay and crusts on decorative arches at Portchester Castle.

Table 1. Microbial activities associated with stone biodeterioration	
Type of activity	Process
Aesthetic	Surface colour change Slime production
Biogeophysical	Biofilm formation Contraction and expansion of biofilms Blockage of pores Interaction with salts and water Growth/movement through stone
Biogeochemical	Excretion of inorganic acids Excretion of organic acids Enzyme attack of nutrients Chelation of minerals Mineral migration

seek protection from high light intensities or desiccation. Stone EPS trap aerosols, dust and nutrients, minerals, and organic compound complexes and take up water from air and release it under low RH conditions. Stone moisture and nutrients are thereby increased while porosity, water-uptake capacity and evaporation are reduced[5].

Notably rich and homogeneous biofilms, composed mostly of bacterial rods, are often observed on weathered stone substrates from sheltered areas (**Figure 3**). Microorganisms may degrade stone mechanically, chemically and aesthetically through metabolic activities and biomineralisation processes in these biofilms. The mechanical stress induced by shrinking and swelling of the colloidal biogenic slimes inside stone pores may damage stone and it may cause changes in the circulation of moisture to further enhance chemical dissolution and mineral loss from stone.

Interactions of microbes with stone salts

Salts acting on their own are very important decay agents and can attack stones, mainly mechanically in pore spaces during RH and temperature changes. Efflorescences present a niche for halotolerant and halophilic bacterial populations which are osmotically well-adapted to an extreme existence, such as members of Archaea. Media containing high concentrations of sodium chloride and magnesium sulphate (up to 25%) may be appropriate for studying efflorescences on stone monuments[6]. It has also been shown that microorganisms can enhance the physical or chemical processes by interacting with salts in stone[7]. When limestone has been subjected to both microbial and salt weathering, under different temperature/wet/dry cycling regimes, weight loss was higher with microbes alone (7.7%) than Na_2SO_4 alone (4.9%) but the two agents together more than doubled the additive effect and caused extensive exfoliation and fissure formation (**Figure 4**). Thus, by interacting with the effects of the salt, microbial biofilm growth can increase water content and enhance physical, mechanical pressures on stone during wet/dry cycling.

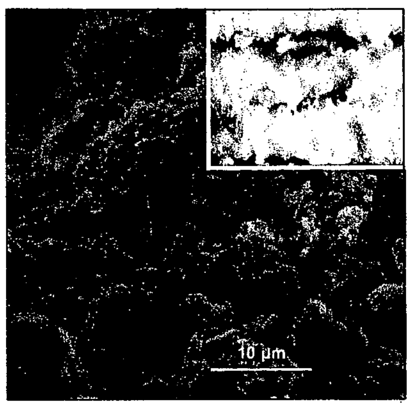


Figure 3. Biofilms on weathered stone.
Figure 4 (inset). Stone discs showing exfoliation after treatment with salts and mixed microbial populations.

Microorganisms associated with damage

Biodeterioration of stone is rarely associated with one group of microorganisms; weathering stone may support a balanced community whose members co-evolve with time to enable recycling of essential elements for activity and growth. Damage may thus be gradual through slow growth (biogenic *drift*) or be sudden and harmful stimulated by a dramatic change in environment, moisture or nutrients (biogenic *shift*). Microbial colonisation of building stones is characterised by a biological succession. Colonisation and conditioning of fresh stone by predominantly phototrophic types (*cyanobacteria, algae, lichens*) will enrich the stone so that chemorganotrophic *fungi, bacteria* and *actinomycetes* can grow on accumulated organic matter, from dead cells and trapped debris. Chemolithotrophs (*sulphur* and *nitrifying bacteria*) will become significant wherever inorganic nitrogen or sulphur compounds are available.

Algae are photosynthetic, developing on porous stone provided dampness, warmth and light are present. There are many instances where algae have caused fouling of stone surfaces or staining without surface changes (e.g. red discoloration of marble due to surface growth of *Haematococcus pluvialis*). Algal communities on stone are often embedded in surface slimy mats together with heterotrophic bacteria and these patinas undergo considerable volume changes through repeated wetting and drying and this has the effect of loosening the stone particles to promote decay. Although the main contributions to decay are to encourage water retention and facilitate succession by more aggressive microbes, corrosive acids have been shown to be produced on marble and limestone.

Cyanobacteria are oxygenic, phototrophic bacteria that can colonise rocks and stone in buildings and produce aesthetic changes due to stains, coloured biofilms and incrustations. They are considered to be pioneers in the colonisation process, along with other autotrophic types, but they may assist the damage process by supporting the growth of other more active decay types. Their tolerance to desiccation, water stress and varying light intensities help to explain their frequent occurrence on stone surfaces.

Lichens are 'microbial' in the sense that they have algal and fungal cells in close association, forming a visible thallus. They can tolerate extreme dehydration and nutrient limitation in the absence of algae or mosses although they are sensitive to air pollution. Growing slowly on (epilithic) and in (endolithic) stone, they are undoubtedly the cause of damage through mechanical and/or chemical means. Deterioration can be caused by the mechanical effect of substratum-penetrating fungal hyphae (bleaching, blistering or sloughing), excretion of oxalic acid and complexing and leaching of stone minerals by chelation.

Fungi are associated with the deterioration of stone and the mechanism of attack is thought to be both mechanical, due to hyphal growth, and chemical, as a result of acid secretion. Fungal mycelia are found penetrating many millimetres into porous stone. One group of fungi isolated from stone are the rock-inhabiting fungi consisting of black yeasts and meristematic fungi, a heterogeneous group of black-pigmented fungi that survive extreme conditions of humidity and sunlight. The latter group includes the Hyphomycetes and Coelomycetes that are more ubiquitous and widely distributed in soil and organic material.

Actinomycetes are filamentous bacteria that are often observed on stone surfaces during *in situ* studies and a large range of actinomycetes have been isolated from stone. Mechanical damage to stone by hyphal penetration of actinomycetes occurs and SEM analysis reveals an extended web of hyphae. These hyphae penetrate the stone material, producing patches of biofilm on stone particles and around the stone pores often interacting with salt crystals. The mycelial nature of actinomycetes (and fungi) gives them a greater capacity to penetrate the stone if it is friable. This may damage the stone directly as well as indirectly by increasing the surface area of biofilm production, which further enhances the stone damage. Laboratory investigations show that *Streptomyces* can greatly enhance the deterioration caused by salts to limestone[8]. *Nocardia restricta* has also been to be prevalent on decaying sandstone, detected by molecular probes[9].

Heterotrophic bacteria are readily isolated in large numbers from decaying stone (**Figure 5**) but their deteriogenic activity was discounted because stone was thought to contain little organic nutrient to support their growth. However all stonework probably possesses sufficient organic matter from soil, dust and dirt to sustain heterotrophic activity. Moreover, many stone bacteria have a preference for low concentrations of organic nutrients and may even be oligotrophic. Population activity has been related to seasonal and climatic changes and isolated bacteria can produce acids that cause morphological alteration of the stone surface and elution of minerals.

Sulphur-oxidising bacteria are chemolithotrophs which convert inorganic sulphur compounds to sulphuric acid that can cause severe damage to mineral material. Bacteria such as *Thiobacillus thiooxidans, T. thiosporus* and other thiobacilli have been isolated from decayed sandstone buildings and marble monuments in urban and rural areas. *Thiobacillus* species have been implicated with concrete corrosion in the Melbourne and Hamburg sewer systems due to sulphuric acid formation. However, a role in stone decay is less certain since sulphuric acid and calcium sulphate in stone can originate from the direct action of atmospheric pollution and acid rain.

Nitrifying bacteria are chemolithotrophs which oxidise inorganic nitrogen compounds for energy and generate acidic end-products either nitrous acid or nitric acid. Ammonia may be carried onto stone in dust as ammonium salts while nitrite can originate from the automobiles, soil or industry. Nitrifying bacteria can be isolated from stone material but a role in stone decay will be favoured in buildings with an obvious source of ammonia or nitrite. Nitrifiers often exist in a biofilm on the surface and within the pores of the stone and *Nitrosomonas, Nitrospira* with *Nitrosovibrio* are commonly isolated[10].

Investigating stone populations

Although microbial activity is not always correlated with the numbers of microorganisms on stone, traditional counts of microbial populations have tended to dominate the literature. The traditional approach using artificial growth media has severe limitations due to inappropriate nutrient balance or quantity and inevitably neglects the important interactions between different stone microorganisms[11]. It is clear that the distortion induced by the use of artificial media gives an unrepresentative estimate of the *in situ* population. Direct microscopic observation by SEM gives no indication of metabolically-active cells. Light microscopy, in combination with the use of fluorescent dyes or chemicals to detect dehydrogenase activity has been used to detect metabolically-active cells. This approach reveals far higher numbers of viable and active bacteria than plate counts and suggests substrate-accelerated death may be partially responsible for the apparent non-culturability of a high percentage of colony-forming units found on artificial media.

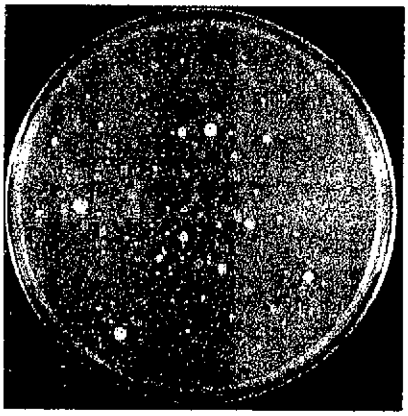


Figure 5. Heterotrophic bacteria recovered from stone on selective media.

Culture-independent techniques based on molecular biology have been used in the last ten years, initially for studying communities on biodegraded wall paintings[12] and extended to buildings and monuments by heritage microbiologists[13]. These methods of molecular ecology, based on extraction of DNA, amplification by PCR and identification by separation of marker sequences using DGGE, can characterise the entire microbial consortium on mineral materials, including the non-culturable majority and rare organisms. Recently Fluorescent *In Situ* Hybridisation (FISH) techniques have been used to detect bacteria and Archaea on stone monuments[14]. Thus target bacteria can be identified and it is possible to detect catabolic genes involved in biodeterioration such as those metabolic activities required for using aromatic hydrocarbon pollutants in air[15]. Molecular methods have been used successfully to assess biodiversity on stone and, as we suspected, our selective media are missing much microbial diversity. Heritage microbiologists are certainly interested in what is there but we especially want to know what they do. Much work is needed if molecular methods can quantify microbial activities that lead to damage. Until this can be done, a polyphasic approach, combining traditional isolation and culture practices with the discriminating power of molecular ecology, will provide the basis for investigating stone damage. Above all, perhaps, the need to understand what is there and how damage is caused must lead to a consideration of how to control the problem.

Controlling microbial growths

Ideally, control of stone biodeterioration should start with the environment (moisture, temperature and nutrients) that determines the growth of microbes. Direct intervention without such an understanding can sometimes lead to new problems[16]. Conservation techniques for stone include manual cleaning to remove biological growths, stains and soluble salts, chemical biocide washes and the application of water repellants and resins.

Microorganisms are most often associated with a visual disfigurement of buildings which can be physically removed by blasting with water or grit, or chemical cleaning. Unfortunately, it appears that such interventions remove only superficial layers and may only reduce microbial numbers for a short time so eradication of established growths requires toxic biocidal action.

Biocides have been widely used before and after conservation treatments, to remove existing microbes (possibly with hydrophobic compounds) and prevent re-growth of the restored surface. There have been concerns about safety in use, environmental effects and long-term effectiveness. Toxic chemical washes, such as quaternary ammonium compounds, are used to eradicate or remove unsightly biological growths from stone but they could be succeeded by other microbes or mosses and higher plants with greater damage potential. In Cambodia, treatment of Angkor Wat to remove a biopatina of algae and lichens led to extensive blackening of the treated stone due to growth of melanin-producing fungi in the absence of competition[16].

In recent years polymers and resins have been used in preservative treatments as waterproofing, consolidant or protective coating. The main types are silicone-based chemicals, inorganics, synthetic organic polymers and waxes/natural resins. Research has shown that some preservative treatments may actually act as a food source and unintentionally stimulate biodeterioration[17].

Bioremediation – microbes as restorers?

While microorganisms have usually been associated with detrimental effects on stone, affecting mineral integrity or exacerbating powerful physical processes of deterioration, there had been growing evidence that some types can be used to reverse the deterioration processes on historic buildings and objects of art. Bacteria, such as *Pseudomonas* and *Desulfovibrio*, have shown potential to remove harmful salts such as nitrate and sulphate by denitrification and sulphate reduction[18] and to mineralize organic residues or pollutants like carbohydrates, waxes or hydrocarbons which commonly occur in crusts on stonework[19].

Bacteria are also known to precipitate calcium carbonate in their immediate environment (**Figure 6**) and encrust cells in the process of carbonatogenesis (**Figure 7**). This process of biomineral formation by calcinogenic bacteria occurs in the natural environment but recently it has been used on calcareous stones and decorative reliefs (as in **Figure 8**). *Bacillus cereus* has been shown to protect exposed mineral surfaces by the formation of sacrificial layers of calcite, vaterite or aragonite crystals, which may be dissolved in a polluted environments but can be renewed when necessary[20]. Non-sporing bacteria such as *Micrococcus xanthus* may also produce calcite or vaterite crystals which strongly adhere to the original stone and production can, be controlled by changing the environmental conditions[21].

Figure 6. Calcinogenic bacteria in laboratory culture, showing calcite crystals developing within colonies.

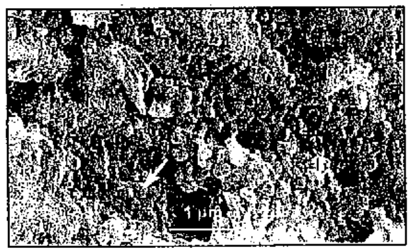


Figure 7. Encrustation of bacteria cells (arrowed) as a result of calcification during culture on stone.

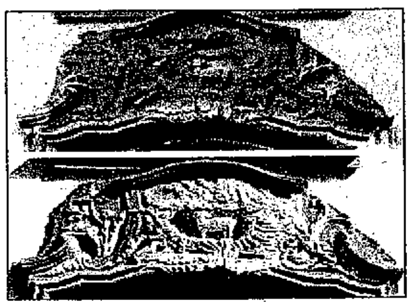


Figure 8. Effect of conservation treatments using calcinogenic bacteria. (Courtesy of Dr Franz Möll, ars restauro, Germany)

Recently, the EU has funded projects to develop bioremedation processes for conservation. One such project, BIOBRUSH (www.biobrush.org), aims to initially treat damaging salt crusts with different bacteria that can remove sulphate, nitrate and organics (as gases in sulphate reduction, denitrification and respiration) and then consolidate the stone with calcinogenic bacteria using biocalcification. Research will aim to establish how the bacteria can be delivered to the stone surface and to identify the conditions favouring biomineralising activity. Therefore our understanding of how microbes might damage stone provides us with a basis for putting some types to work for us to restore stoneworks and control the damage to cultural heritage in European cities.

Conclusions

Since microorganisms transform minerals in nature, it is no surprise to a microbiologist that many different groups of microbes exist on building stone and may be linked to stone deterioration. Alongside physical and chemical agents of decay, it is sometimes difficult to persuade conservators that biological mechanisms may be significant. Our understanding of the interaction between microorganisms and stone minerals has advanced greatly in the last 10 years, mainly because of dramatic improvements in methodology and research by multidisciplinary groups. Not surprisingly, metabolic diversity and versatility, combined with remarkable tolerance to extreme environmental conditions, characterise microbial communities on stone. However, through a combination of biomineralisation processes, we may be able to tap this versatility and put microbes to work to help us restore historic stonework.

Acknowledgements

Many thanks to my research collaborators Dr Alison Webster, Dr Franz Möll, Dr Sally Tayler and Sophia Papida for providing the photographs.

References

1. Krumbein WE. Microbial interactions with mineral materials. In: Biodeterioration 7. Houghton DR, Smith RN & Eggins HOW (eds), 1988; pp. 78–100. New York, US: Elsevier.
2. Mitchell R and Gu Ji-D. Changes in biofilm microflora of limestone caused by atmospheric pollutants. *International Biodeterioration & Biodegradation*, 2000; 46: 299–303.
3. Schnabel L. The treatment of biological growths on stone: a conservator's viewpoint. *International Biodeterioration*, 1991; 28: 125–131.
4. Guillette O. Bioreceptivity: a new concept for building ecology studies. *The Science of the Total Environment*, 1995; 167: 215–220.
5. Warscheid T, Becker TW, Braams J *et al.* Studies on the temporal development of microbial infection of different types of sedimentary rocks and its effect on the alteration of the physico-chemical properties in building materials. In: Thiel M-J, (Ed.), Conservation of Stone and Other Materials, 1993; RILEM, vol. 1, pp. 303–310.
6. Saiz-Jimenez C and Laiz L. Occurrence of halo-tolerant/halophilic bacterial communities in deteriorated monuments. *Int. Biodeterioration & Biodegradation*, 2000; 46: 319–326.
7. Papida S, Murphy W and May E. Enhancement of physical weathering of building stones by microbial populations. *Int. Biodeterioration & Biodegradation* 2000; 46(4): 305–317.
8. May E, Papida S and Abdulla H. Consequences of the microbe-biofilm-salt interaction for stone in monuments. In R Koestler (ed.), Art, Biology and Conservation: Biodeterioration of Works of Art, 2003, In Press, Metropolitan Museum of Art, New York.
9. Palla E, Anello L, Pecorella S, Russo R and Damiani. Characterisation of bacterial communities on stone monuments by molecular biology tools. In: C. Saiz-Jimenez (ed.), Molecular Biology and Cultural Heritage, 2003, pp 115–118.
10. Bock E, Sand W, Meincke M *et al.* Biologically induced corrosion of natural stones – strong contamination of monuments with nitrifying organisms. In: Biodeterioration 7. Houghton DR, Smith RN, Eggins HOW (eds), 1988; pp. 436–440. New York, US: Elsevier.
11. Warscheid T, Petersen K and Krumbein WE. Physiological characterization of chemoorganotrophic bacteria isolated from sandstones. In: VIth International Congress on Deterioration and Conservation of Stone: Supplement, 1988; pp. 26-32. Torun, Poland: Nicholas Copernicus University Press Department.
12. Röllecke S, Witte A, Wanner G and Lubitz W. Identification of bacteria in a biodegraded wall painting by denaturing gradient gel electrophoresis of PCR-amplified gene fragments coding for 16S rRNA. *Applied & Environmental Microbiology*, 1996; **62:** 2059–2065.
13. Laiz L, Piñar G, Lubitz W and Saiz-Jimenez C. The colonisation of building materials by microorganisms as revealed by culturing and molecular methods. In: C. Saiz-Jimenez (ed.), Molecular Biology and Cultural Heritage. 2003, pp 23–28.
14. Urzi C and Albertano P. Studying phototrophic and heterotrophic microbial communities on stone monuments. *Methods in Enzymology*, 2003; **336:** 340–355.
15. Daffonchio D, Borin S, Zanardini E *et al.* Molecular tools applied to the study of deteriorated artworks. In: Of Microbes and Art: The role of microbial communities in the degradation and protection of cultural heritage (ICMC 99, Florence), 2000; pp 21–38, Kluwer/Plenum.
16. Warscheid T. Integrated concepts for the protection of cultural artefacts against bio-deterioration. In: Of Microbes and Art: The role of microbial communities in the degradation and protection of cultural heritage (ICMC 99, Florence), 2000; pp 185–201, Kluwer/Plenum.
17. Koestler RJ and Santoro ED. Assessment of the susceptibility to biodeterioration of selected polymers and resins. GCI Scientific Program Report, 1988; pp. 56–66. New York, US: The Getty Conservation Institute.
18. Ranalli G, Chiavarini M, Guidetti V *et al.* The use of microorganisms for the removal of nitrate and organic substances on artistic stoneworks. Proceedings of the VIIth International Congress on Deterioration and Conservation of Stone, Berlin, 1996; pp1421–1427.
19. Saiz-Jimenez C. Biodeterioration vs Biodegradation: the Role of Microorganisms in the Removal of Pollutants Deposited on to Historic Buildings. *International Biodeterioration & Biodegradation*, 1997; **40:** 225–232.
20. Castanier S, Le Metayer-Levrel G, Orial G, Loubiere JF and Perthuisot JP. Bacterial carbonatogenesis and applications to preservation and restoration of historic property. In: Of Microbes and Art: The role of microbial communities in the degradation and protection of cultural heritage (ICMC 99, Florence), 2000; pp 246–252, Kluwer/Plenum.
21. Rodriquez-Navarro C, Rodriguez-Gallego M, Chekroun and Gonzalez-Munoz MT. Conservation of ornamental stone by Myxococcus xanthus-induced carbonate biomineralization. *Applied & Environmental Microbiology*, 2003; 69: 2182–2193.

Correspondence: Dr Eric May, Reader in Microbiology, School of Biological Sciences, University of Portsmouth, Portsmouth PO1 2DY, UK. Tel: +44 (0)23 9284, email: eric.may@port.ac.uk

AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT

1. CONTRACT ID CODE

PAGE OF PAGES 1 2

2. MODIFICATION NO.: 0006

3. EFFECTIVE DATE MAR 09, 2004

4. REQUISITION/PURCHASE REQ. NO. W81W3G-2035-7181

PROJECT NO. *(If applicable)*

6. ISSUED BY CODE CA31

Department of the Army
Baltimore District, Corps of Engineers
Contracting Division
P.O. Box 1715
Baltimore MD 21203-1715

7. ADMINISTERED BY: CODE E1P0100

Contracting Division, Contracts Branch
CENAB-CT-C
10 S. Howard ST. Room 7000
Baltimore, MD 21203-1715

8. NAME AND ADDRESS OF CONTRACTOR *(No., street, county, State and ZIP Code)*

(x) X 9A. AMENDMENT OF SOLICITATION NO. W912DR-04-R-0018

9B. DATED *(SEE ITEM 11)* JAN 29, 2004

10A. MODIFICATION OF CONTRACT/ ORDER NO.

10B. DATED *(SEE ITEM 13)*

CODE FACILITY CODE

11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offers **is not extended**

DATE OF RECEIPT OF PROPOSALS 4:00 PM, LOCAL TIME, MAR 16, 2004

Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended, by one of the following methods: (a) By completing Items 8 and 15, and returning 1 copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

12. ACCOUNTING AND APPROPRIATION DATA *(If required)*

13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS, IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.

	A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: *(Specify authority)* THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER No. ITEM 10A
	B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES *(such as changes in paying office, appropriation date, etc.)* SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR43.103(b)
	C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF: changes clause FAR 52.243.1
	D. OTHER *(Specify type of modification and authority)*

E. IMPORTANT: Contractor __ is not, __ is required to sign this document and return ____ copies to the issuing office.

14. DESCRIPTION OF AMENDMENT/MODIFICATION *(Organized by UCF section headings, including solicitation/contract subject matter where feasible.)*

DESIGN-BUILD RENOVATION OF HE MEMORIAL RECEPTION UILDING
ARLINGTON NATIONAL CEMETERY, VIRGINIA

SEE THE FOLLOWING PAGES

Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect

15A. NAME AND TITLE OF SIGNER *(Type or print)*

16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print)

15B. CONTRACTOR/OFFEROR

____
(signature of person authorized to sign)

15C. DATE SIGNED

16B. UNITED STATES OF AMERICA

BY ____________________
(Signature of Contracting Officer)

16C. DATE SIGNED

AMENDMENT NO.0006 TO ADVERTISED RFP W912DR-04-R-0018
EFFECTIVE MAR 09, 2004

SOLICITATION:

1) Questions/Responses to Requests for Information (RFI's): A copy of questions and responses from RFI's are attached, and are being provided for information only and do not represent a change to the RFP.

2) Site Visit Sign-In Sheet: The "1 March 2004 Pre Bid Site Visit Sign in Sheet" is attached for information only.

SPECIFICATIONS:

3) Page 01011-4, Paragraph 1.3.4: Add the following sentence to the end of this paragraph, "The required code analysis relates to building construction type, egress, and fire separations."

4) Page 01011-21, Paragraph 4.3.7.2.8: Change from: "second and third box" to "fourth and fifth box."

5) Page 01011-51, Paragraph 6.5.3.4: Delete paragraph text and substitute the following: "Minimum equipment efficiencies shall meet the requirements of ASHRAE Standard 90.1-2001. Overall equipment energy performance, and efficiency of system components, must meet or exceed the minimum requirements of 10 CFR 435 or ASHRAE Standard 90.1-2001, whichever is more stringent."

6) Page 01012-8,Paragraphs 1.10.1.3 (3rd Subparagraph), 1.10.2.2 (4th Subparagraph), and 1.10.3.3(4th Subparagraph): Delete all paragraphs referring to Spirit worksheets and Bronze Certification.

7) Stain Removal Sheet: Add the attached "Removal of dark red staining (Micrococcus Roseus)" to the RFP.

Attachments:

- Arlington Amphitheater, Removal of dark red staining (Micrococcus Roseus)
- 1 March 2004 Pre Bid Site Visit Sign in Sheet
- Questions/Responses to Requests for Information (RFI's)

KEY	LOCATION	PRODUCT	DILUTION	DWELL	RESULTS	COMMENTS
A	Box 1	AP Plus (Primary Ingredient- Benzalkonium Chloride)	Unknown	25 MIN	No Change	This should arrest growth but will not effect color change.
A-1	Box 1	AP Plus (Primary Ingredient- Benzalkonium Chloride)	Unknown	25 MIN	No Change	Test Repeated in same area.
B	Box 1	D/2 Architectural Antimicrobial	1	25 MIN	No Change	
B-1	Box 1	D/2 Architectural Antimicrobial	1	24 Hours	No Change	Test Repeated in same area.
C	Box 1	Prosoco EnviroKlean EIFS	1	25 MIN	No Change	
D	Box 1	H20 Scrub	1	NA	No Change	
E	Box 1	Prosoco SureKlean Marble Poultice	1	25 MIN	No Change	
F	Box 1	Ammonium Citrate Poultice (Proprietary Product mixed with Attapulguite & Kalonite)	NA	48 HOURS	No Change	
G-1	Box 1	Calcium Hypochlorite	1	25 MIN	No Change	Spot Test
G-2	Box 1	Bleach (Household)	1	25 MIN	No Change	Spot Test
G-3	Box 1	Benzalkonim Chloride	50% as packaged	25 MIN	No Change	Spot Test - This should arrest growth but will not effect color change.
G-4	Box 1	Benzalkonim Chloride Poultice (Attapulguite & Kalonite)	50% as packaged	48 HOURS	No Change	Spot Test - This should arrest growth but will not effect color change.
G-5	Box 1	Prosoco Stand Off All Surface Cleaner	1	25 MIN	No Change	Spot Test
G-6	Box 1	Prosoco 942 Limestone & Marble Cleaner	1	25 MIN	No Change	Spot Test

Questions/Responses to Requests for Information (RFI's)

Q1: Please clarify the extent of the box seating that is to be repaired under this contract.

A1: Drawing A102 clearly shows the limit of the Reception Building that includes the 8 box seats (4 on each side of the stage) that section 4.3.7 discusses.

Q2: Marble repairs are designated on the plans at specific locations. They are not noted on elevations. The following specification sections all indicate repair of all marble as required: Windows and Doors 4.3.11.3; Crypt Chapel 4.4.1.2.7 & 4.4.1.3.1; North and South Entry Vestibules 4.4.1.3.1; First Floor Renovations 4.4.2.1 & 4.4.2.14; Grand Stair Case 4.4.4.1 & 4.4.4.14. Are we to bid just the repairs shown on the drawing, particularly for the interior elevations, or are we required to repair all marble?

A2: All marble is to be repaired as described in the specification sections and as depicted on the drawings.

Q3: Does Arlington County have jurisdiction over this project? Are there other review agencies we need to be aware of or will the Corps be the review agency? If so does the 407 days include time for the permit process? Have any portions of this project been reviewed by any of the listed reviewing agencies for prior approval?

A3: *Agency coordination is defined in the RFP.*

Q4: Do we need to create documents that must be reviewed and stamped by Arlington County prior to construction and/or do we need to obtain a building permit beforehand? If we need a permit, has the period required for review and permit issuance been considered into the 407-calendar day contract term?

A4: Agency coordination is defined in the RFP.

Q5: Is there a video of the drainage system available for review? If so, please let us know what areas were surveyed and when this work was done?

A:5 A video survey of the building related storm water drainage system was completed in July/August 2003, to establish baseline conditions. This video includes all in-wall rain leaders starting at the roof inlets, all under-slab and under-stage lines, the yardlines from where it exits the building all the way down to the manhole, and all of the lines running under the amphitheater floor. The video is not available for review.

Q6: Are their detailed and accurate subsurface drawings showing utilities or other sensitive subsurface issues? If no, or if these are not updated, should we include subsurface testing?

A6: The drawings contained in the RFP represent the best known existing conditions.

Q7: Is the Cemetery Urban Forester available to provide technical information to the design team or should we include an arborist? Is there an accurate survey of tree conditions and other landscape conditions or will that need to be done by the design team prior to creating a work area?

A7: The Cemetery's Urban Forester is available to provide technical information to the design team. There is an accurate tree survey that can be obtained from the Cemetery.

Q8: Have quantity allowances and/or unit pricing of, e.g., marble repairs, cleaning and stain removal, HAZMAT removal and disposal been considered for inclusion on the bid form?

A8: There are no unit price line items in the price schedule.

Q9: Reference Section 6.5.6.2., regarding specified design conditions for indoor spaces. We are assuming that the Government's use of the term "All Occupied Spaces" is limited to: the Tomb Guard Quarters, the basement public and staff restrooms, the VIP Room, the Curator's Office and the Historical Records Room -- since these appear to be the only currently occupied and conditioned spaces and the current project mechanical spaces would not support the addition of mechanical systems for other definitions of the term "occupied space". Please advise if this is incorrect.

A9: Occupied space is considered to be all spaces not defined as mechanical and utility space.

Q10: For Bid Option 0006 - Cleaning of the Amphitheater should we include the entire Amphitheater or only the parts defined by the limits of construction?

A10: The limits of the Amphitheater cleaning are defined in the RFP.

Q11: Refer to: Plumbing Section 01011 – Page 56 – 7.2 Overview, 7.2.1 - Does the solicitation require replacing of the below grade storm piping or just the modifications to the below grade indicated on sheet P-103?

A11: As is stated and referred to here, the work is "the complete removal, redesign, reconfiguration and reconstruction of the existing sanitary drainage and stormwater drainage systems in the lower level of the structure." Now, above the slab, the work may be limited to at the design-builders discretion to modifications of the vent, hot and cold water piping to meet new fixture locations and new points of vent connections to the new sanitary drain lines. The design-builder is responsible for the performance of all piping serving the new fixtures, whether the he chooses to reuse some of the above slab piping or not.

IMPORTANT: Drawings P-101 and P-103 indicate a recommended method of separating the Amphitheater storm drainage from the building collection system as required by the solicitation, along with the requirement for the new Amphitheater trench drain. These drawings also indicate the size of the system below slab for reference. ALL sub-slab piping is required to be replaced. It may or may not be configured as the present system at the design-builders discretion. If the portion of the existing 12" line extending out to the Amphitheater collection is going to remain (simply because it is not located within the footprint of the Reception Building's footprint), it must be capped so as to not leave a void under the Amphitheater's floor that will draw water. However, since so much work is being done, this 12" may be removed (by default) and not exist at all by the end of the project. There is hands-on coordination needed with the building footings/wall.

Q12: The plumbing overview requires replacing the existing sanitary drain. Drawing P-104 indicates existing sanitary. Do we also replace sanitary to VIP Toilet?

A12: Yes. As stated in the previous response (A11), sanitary is to be replaced.

Q13: Section 01011- Page 56-44.1.5.4 VIP Room Suite does not indicate floor removal in the bathroom as indicated in the other toilet rooms.

A13: Removal of the entire floor in the VIP toilet room is at the design/builder's discretion, based upon the requirements defined in the RFP.

14: Is there other below grade plumbing to be replaced that is not indicated on P-104 existing plumbing?

A14: P-104 represents available information.

What is the elevation of the 5" sanitary sewer and the 12" storm sewer? What is the elevation of the large footings? What is the elevation of the floors?

A: We do not have this information available.

APPENDIX J

CLASS C COST ESTIMATE

RESTORATION OF THE DISTRICT OF COLUMBIA
WAR MEMORIAL AND SURROUNDING LANDSCAPE

JOHN G. WAITE ASSOCIATES, ARCHITECTS PLLC
APRIL 2006

National Park Service - Class C Cost Estimate

Project: **DC War Memorial**
Washington, DC
Restoration of the District of Columbia War Memorial and Surrounding Landscape

Park: National Capital Parks - Central

Estimate By: John G. Waite Associates, Architects

Date: April 21, 2006

Item No.	Description	Base Estimate	Alt. Estimate
1	Clean marble using chemical, water, and mildly abrasive treatments	$ 65,000.00	$ 65,000.00
2	Additional testing to determine effective treatment for bright orange and yellow discoloration of marble	$ 20,000.00	$ 20,000.00
3	Conduct additional probes to determine nature and condition of bronze tension ring reinfocement at base of outer dome	$ 10,000.00	$ 10,000.00
4	Remove and reset individual pieces of displaced marble	$ 120,000.00	$ 120,000.00
5	Pin broken stones	$ 80,000.00	$ 80,000.00
6	Repoint marble construction	$ 75,000.00	$ 75,000.00
7	Perform dutchman repairs where stone is missing or has been improperly repaired with mortar or flash patching	$ 60,000.00	$ 60,000.00
8A	Install new lead gutter and flashings to replicate the origninal sheet metal construction. Install new downspouts and drainage piping (this will involve disassembly of four marble columns and excavation beneath the bandstand).	$ 200,000.00	$ -
8B	Alternate: Install lead flashing and drip edge over the capstones at the base of the outer dome, and over blocking in the orginal gutter at the projecting cornice	$ -	$ 60,000.00
9	Replace electrical panel box within the vault beneath the bandstand, and replace all circuit wiring in the Memorial	$ 40,000.00	$ 40,000.00
10	Replace the cove lighting beneath the lower dome so that quality of light is more sympathetic with original design intent	$ 20,000.00	$ 20,000.00
11	Provide new underground telephone service to the vault beneath the bandstand	$ 6,000.00	$ 6,000.00
12	Properly cut and support an opening for an access panel in the north wall of the brick vault beneath the bandstand. Install a code compliant access door	$ 10,000.00	$ 10,000.00
13	Provide a new floor access panel in the center of the bandstand to replicate the original decorative access panel	$ 25,000.00	$ 25,000.00
14	Rebalance the counterweighted marble ceiling access panel in the lower dome	$ 2,000.00	$ 2,000.00
15	Clean out the valley and condensate drains in the attic space between the upper and lower domes	$ 2,000.00	$ 2,000.00
16	Dry brush and point the brick construction of the upper dome drum within the attic space	$ 20,000.00	$ 20,000.00
17	Fix the wire screens in place a the four air vents in the upper dome	$ 2,000.00	$ 2,000.00
18	Install a new reinforced concrete base with new stone paving to accommodate vehicular traffic between Independence Avenue and the Reflecting Pool. Match the new paving stone to the original flagstone paving in pattern, color, texture, and size (site grading will be required).	$ 100,000.00	$ 100,000.00
19	Restore the lawn areas surrounding the Memorial	$ 30,000.00	$ 30,000.00
20	Map and restore the site drainage	$ 40,000.00	$ 40,000.00
21	Remove the azaleas and dogwoods planted in formal alignment	$ 10,000.00	$ 10,000.00
22	Trim trees and planting that shade the Memorial and promote biological growth	$ 10,000.00	$ 10,000.00
23	Establish a new memorial marker system for the trees	$ 4,000.00	$ 4,000.00
24	Develop a maintenance manual for the long term care of the Memorial and site	$ 40,000.00	$ 40,000.00
		$ 991,000.00	**$ 851,000.00**

Basis of Estimate

Date of Estimate:	April 21, 2006
Estimated By:	John G. Waite Associates, Architects PLLC 384 Broadway Albany, NY 12207 (518) 449-5440 tel (518) 449-5828 fax
Supporting Material:	District of Columbia War Memorial Historic Structure Report & Cultural Landscape Assessment April 21, 2006
Cost Data:	Square Foot Cost Data and Lump Sum Allowances Unit Prices based on 2006 Cost Data

*Note: This cost estimate is based on the scope of work outlined in the recommendations of the District of Columbia War Memorial Historic Structure Report & Cultural Landscape Assessment prepared by John G. Waite Associates for the National Park Service. This scope of work exceeds that outlined in the PMIS statements referenced below; see statements below for approximate equivalencies.

Line items considered equivalent to scope of work outlined in **PMIS 27782**: **$ 430,000.00**
Correct Life Safety Issues at the District of Columbia War Memorial
(Reference cost estimate line items No. 1, 2, 3, 4, 5, 6, 7)

Line items considered equivalent to scope of work outlined in **PMIS 27804**: **$ 100,000.00**
Repair Slate Walkway at the District of Columbia War Memorial
(Reference cost estimate line item No. 18)