

## **Restoration of the Reflecting Pool between Lincoln Memorial and Washington Monument**

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### **Introduction**

In the following paragraphs, the history of the reflecting pool and the National Mall will be discussed. The Lincoln Memorial reflecting pool is found on the Washington National Mall located between the Lincoln Memorial and the Washington Monument. In 1791 Pierre L'Enfant drew the Plan of the City for Washington DC. A 10 mile square centered on the Capital, the permanent seat of the government in the United States. In Pierre L'Enfant's plan, the National Mall ended at the Washington Monument.

It was the turn of the century and with the Industrial Revolution at its peak, the United States of America was an economic and military power to be reckoned with. The leaders of the United States also wanted to show the world their emergence not only in the industrial arena but in culture and art as well. They wanted to provide their people with parks and open space that would rival Napoleon's palace of Versailles in Paris with its gardens and pools and the Taj Mahal of India with its ornate reflecting pool.

In 1904 Senator James McMillan of Michigan organized the Senate Park Commission. The McMillan Commission, as it would later be called, would draft a new plan. The new plan for the National Mall called for the extension of the National Mall past the Washington Monument, to where the Lincoln Memorial now stands, all the way to where the Jefferson Memorial now resides. To accomplish this new plan for the new extended National Mall, some minor issues needed to be resolved. The land that both the Lincoln and Jefferson Memorials sit on was part of the Potomac River and would have to be reclaimed from the river by filling the area.

The original reflecting pool was designed by the architect Henry Bacon. The reflecting pool dimensions would be two thousand twenty nine feet long—over one third of a mile—by one hundred and sixty seven feet wide. The pool's depth at the sides would be eighteen inches deep and at the center would be thirty inches. The pool would hold six million seven hundred fifty

thousand gallons of water. The original pool was constructed on soft marshy river clay and some dredged material atop bedrock.

Pools are usually designed on a stable foundation; the reflecting pool would have to deal with the variations in temperature, freezing conditions in the winter and heat extremes in summer. The bottom of the pool would have to be water proof; on the pool bottom, cinders would be placed, followed by alternate layers of asphalt and tar paper. The final layer would be slate which was black or nearly so, it was felt this would provide the best possible reflection.

At the edge of the pool there were three hundred sixty six piles driven with a pile cap on top on them. The pile cap would support a T beam that would not only support its weight but the weight of granite coping stones placed on it and half the weight of the attached apron. The T beam was attached to the pile cap with four steel dowels. The apron was finished with Mount Airy, North Carolina, granite.

The construction of the reflecting pool was done by the Office of Public Buildings and Grounds, overseen by the Corps of Engineers. The Corp's Major C.S. Ridley oversaw early construction; later construction was overseen by Col. C.O. Sherrill C.E. The construction of the new Mall began in 1921. Construction began with the removal of one hundred thirty five thousand yards of fill. The removal of fill was accomplished by the use of steam shovels. A narrow gauge industrial rail road was constructed from the reflecting pool to the Lincoln Memorial. This railroad would transfer the material to the memorial to be used as fill. The end of the railroad would be moved and extended as needed to bring the fill up to grade at different locations. The original drainage piping installed would allow drainage of water in a twenty four hour period not a small feat considering the reflecting pool would hold six million seven hundred and fifty thousand gallons of water.

In 1914, five hundred English elm shade trees were imported and planted on the future walkways at the sides of the reflecting pool. The completed reflecting pool was finished in 1922 for the dedication of the Lincoln Memorial and its visitors. It was on February 19, 1923, mid afternoon, that five hundred plus ice skaters enjoyed ice skating on the reflecting pool's frozen pool water. Engineers and officials played with the idea of adding pipes to the reflecting pool to allow skating all winter; however, the idea was quickly abandoned due to the projected cost (i.e. \$500,000).

The original design of the reflecting pool in the Mc Millan plan called for the pool to be shaped like a T; however, for several reasons this design never came to fruition. This is largely due in part to the fact there were navy buildings and ammunition plants located in the area where the Pool would have been constructed. Not to mention that the United States had just ended the First World War and was on the brink of a Second World War . During the Second World War there were wooden walkways constructed across the pool, but due to public outcry they were removed in 1947.

In the following years the reflecting pool played a significant role in American history. In 1939, African American singer Marion Anderson was denied permission to perform in Constitution Hall by the DAR. As a result, Eleanor Roosevelt resigned her membership in the DAR and arranged for Anderson to perform at an outdoor concert at the steps of the Lincoln Memorial and the reflecting pool attended by 75,000 people.

The reflecting pool and Lincoln Memorial again would once again be a part of history during the 1963 on the march on Washington for jobs and freedom. The civil rights march ended at the monument and reflecting pool with a quarter of a million people in attendance and Dr.

Martin Luther King delivering his famous *I have a dream* speech. In 2009, the reflecting pool and Washington Monument area was filled with people who were there to celebrate President Barrack Obama's Inauguration. In 2010, the mall was once again filled with hundreds of thousands of people there for Glen Beck's *Pride in America* concert.

The reflecting pool, Lincoln Memorial and the Washington Monument on the National Mall have over 25,000,000 visitors annually from all over the world. The Mall also plays host to over 3,000 events. Last year, the reflecting pool turned 89 yrs old, and with that said, there are a number of structural issues that needed to be addressed. With its 6,750,000 gallons of water and a combined weight of 56,000,000 lbs, the weight on the reflecting pool's bottom has added to the sinking of the pool on the soft marshy river clay base and needs to be addressed. Additionally, there is also the need to eliminate the accumulation of stagnant water in the pool.

### **The American Recovery and Reinvestment Act of 2009**

The National Park Service was allocated money for the reflecting pool upgrades by the American Recovery and Reinvestment Act of 2009. The park service put out a bid for the restoration contract, which would outline the required upgrades. The park service awarded the contract in late 2010 to the lowest bidder. The contract was for \$30.7 million dollars and detailed the restoration of the reflecting pool. This included upgrading the drainage system, removing the existing pool and its substructure, and removing the existing coping stones and storing them .In the restoration of the pool, a new modern water supply system would be installed for the circulation of the pool's water supply from the tidal basin 600 feet away and an alternate hook-up to DC water. To accomplish this task, 5000 feet of drainage pipe would be installed to a depth of up to 16 feet.

### **Construction of the Reflecting Pool**

**Phase One.** The 670 granite coping stones, which each weighed in excess of two thousand pounds apiece, had to be removed and stored. Once the coping stones were removed, the initial demolishing and removal of the base of the pool began. It was an abatement operation because of the aliphatic asbestos board below the existing slate bottom. Monitoring of potential asbestos releases was ongoing during this operation, though it never had occurred. The removal of the slate base and board took ten weeks with 30 to 45 dumpsters 40 feet long going to a regulated landfill every day. To prepare for this operation as safety director, I completed an asbestos worker training class. I used the knowledge obtained in the training class during the removal operation to oversee the subcontractors' operation and make sure the operation was completed in compliance with the law.

**Phase Two.** To support the new reflecting pool base on the marshy river clay bottom, twenty five hundred piles 40 to 50 feet long would be driven into the ground. The piling would be delivered early in the morning prior to the Washington traffic jams developing. Once delivered, the piling would be taken by workers using a chainsaw (tapered) for the added installation of a pile cap. A coating was applied to the head of the pile to retard insect infiltration. The covering was copper coated. This liquid's MSDS sheet stated if you get this on your skin it could be fatal; if you inhale it, it could be fatal; and if you ingest it, it could be fatal. Haz com and the right to know were relayed to all the workers about this product. After the pile preparation was completed, they would then be delivered to the pile driving rigs by excavators. The pile rigs crew would at this point hook a chain from the pile rig onto a pile raise it by winch vertically and place it in the pile hammer driving head.

The pile rig would start the driving process hydraulically. During the driving stage of construction, a high of 118 piles were driven by two pile rigs in one day. It would take ten weeks for the two pile rigs would take to complete driving the twenty five hundred piles. The piles would support the construction of the grade beams, a reinforced rectangle block approximately 80 feet long, a concrete slab and 6,750,000 gallons of water placed on top of them. The grade beams were placed on top of the driven pile. The grade beams are placed across the width of the reflecting pool in two pieces to complete the pool's 167 feet width. The grade beam is a reinforced concrete beam (rebar in side) which once poured will allow the transfer of the load of the water, to the slab, to the beam, to the support piles. The grade beams run the length of the reflecting pool spaced every twenty feet.

Once enough grade beams were completed, the deck forming process began. When that was completed, the rebar mat placement and the placement of concrete would be next. The start of concrete placement began in November 2011. The concrete would be placed in 24 pours of 375 cubic yards per pour in a checkerboard pattern. The work being generated in the reflecting pool reconstruction process would require and support a workforce high of approximately one hundred workers. Mobile equipment required for the restoration would include two pile driving rigs, front end loaders, excavators, trucks, and a concrete pump truck, RT crane, and crawler crane.

On February 2<sup>nd</sup>, 2012, twenty pours were completed, and concrete placement in the pool area was done by the first week of March. One side of the reflecting pool's coping stones had been returned to their proper places and the end was in sight. The reflecting pool, while not a ten-story building or a bridge over water was indeed a challenging, multifaceted job that required safety preparation and planning to not only protect the workers but the ever present public who were a stone's throw away.

## **The Reflecting Pool's Neighbors**

The Washington Monument is an obelisk, 4 sided pillar that tapers as it rises with a nearly flat top. This obelisk has a 100 ounce aluminum tip/lighting rod. Construction began in 1848 and was completed in 1884. Located at the west end of the Mall, it is constructed of granite, marble, bluestone, and gneiss. At the time, the Washington Monument was the world's tallest structure and the tallest obelisk: 555 feet 5 ½ inches tall. The Washington Monument is comprised of stones from all over the world. Stones were sent by foreign countries and individual people, including the Pope. The stones varied in size from 2 feet by 2 feet to 6 by 8 feet. A variety of stones were used on the interior: granite, marble, limestone, sand stone, soapstone, and jade. The monument has 897 steps; its first elevator was a steam elevator and only men could ride it because it was deemed to dangerous and took twenty minutes to get to the top. Today's elevator takes 70 seconds. The monument is the tallest structure in Washington DC.

Thirty years after the architect Robert Mill's death, the monument was finally completed. In 1889 the monument was passed in height by France's Eiffel Tower. However, the Washington Monument is still the tallest structure in Washington DC and will remain so .The building act of 1910 stated that no building could rise more than 20 feet above the width of the adjacent street.

The Lincoln Memorial is a memorial to the 16<sup>th</sup> President of the United States, Abraham Lincoln, who was assassinated on April 14<sup>th</sup>, 1865. The structure is built on reclaimed land from the Potomac River basin. The memorial is built in the style of a Greek Doric temple, designed by Clark Mills, architect Henry Bacon, and sculptor David Chester. It was carved by the Piccirilli brothers, and the murals were painted by Jules Guerin.

The original design had the memorial with a width of 201 feet 10 inches, depth of 132 feet, and total height from bedrock depending on bedrock surface, 169 to 192 feet. The Lincoln Memorial would be 79 feet 10 inches above ground level. The building would be located on 109.63 acres. The exterior colonnade would have a width of 189 feet 10 inches by depth of 118 feet 6 inches. Column height would be 44 feet. The base diameter is 7 feet 5 inches. The number of drums in column the column is 11, the total number of columns is 36, one for each state at the time of Lincoln's death and two at the entrance. The number of flutes in each column is 20.

The interior is divided into three chambers by two rows of ionic columns with a height of 50 feet. The base of each column has a width of 5.5 feet. The interior height is 60 feet floor to ceiling. There are two inscriptions in the interior of the monument, one from the Gettysburg Address and one from Lincoln's second inaugural address. Above the inscriptions are two 60 feet by 12 feet murals painted by the painter Jules Guerin. The statue of Lincoln was constructed in 25 pieces with a total weight of 120 tons at a cost of \$88,000. Total cost of the Lincoln Memorial is \$2,957,000 dollars. The structure would sit on a pile and concrete foundation placed on bedrock. Construction of the Lincoln Memorial began on Feb. 12, 1914 and was completed in 1922. The dedication ceremony was conducted by President Warren Harding and attended by Robert Todd Lincoln, Abraham Lincoln's only surviving son, who was then 79 years old.

## Conclusion

The reflecting pool when completed will again provide the center piece that connects the Washington Monument and Lincoln Memorial. The twenty five million annual visitors to the mall will once again see the reflections of the Lincoln Memorial and Washington Monument for many years to come.

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