National Archives and Record Administration

Installation of Self-Closing Flood Barriers and Loading Dock Turntable Removal and Structural Slab Repairs

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2010 Baltimore Washington Chapter

Outstanding Repair Project Award

Part II

1. Project Name: National Archives and Record Administration Installation of Self-Closing Flood Barriers and Loading Dock Turntable Removal and Structural Slab Repairs.

2. Location: Washington, DC

3. Contract Amount: $931,480.00

4. Project Duration: May 15, 2008 – March, 2009

Abstract

Recognizing a tremendous opportunity to participate in a project focused ultimately on the preservation of some of the nations most cherished and priceless archived documents, the project inspired both feelings of pride and anxiety due to the importance of the assignment. The installation of self-closing flood barriers would need to proceed flawlessly and would require strict adherence to schedule, budget and the client's expectations.

By way of background, the National Archives and Records Administration – NARA – was established in 1934 by President Franklin Roosevelt, for the purpose of preserving records deemed important to all citizens. Designed by renowned architect John Russell Pope, the building was planned to emulate the architecture of other Washington landmarks such as The White House, The Lincoln Memorial and The Treasury Building. Among the many documents archived in the NARA building on Pennsylvania Avenue, in Washington, DC, few are more important than the Declaration of Independence, The Constitution and The Bill of Rights.

Background

Having experienced severe flooding to the buildings lower levels during severe storms in recent years, resulting in the loss of some important documents, computer equipment, furniture and a lower level theater, a plan was devised to install self-closing flood barriers at both the east and west vehicular entrances to the Archives building. The building is sited between 7th and 9th Streets, NW, with the south facade fronting Constitution Ave., and the north fronting Pennsylvania Ave., NW, in Washington, DC. (Fig. 1)

The repair contractor was contacted by the construction management firm to visit the site and understand the scope of the project, the time frame to completion and the logistical challenges associated with the work site. The project delivery method was design-build, and considering there were no as-built plans available to review from previous construction, certain assumptions along with a heavy dose of caution were integral to the design-build process. Additionally, given the building location in the nation's capital, with pedestrian and vehicular traffic at very high volumes (Fig.2), the safety and security issues related to the project were paramount in the mind of the owner, client and contractor. All construction personnel associated with the project had to go through extensive back ground checks. Additionally, each day prior to entering the site and accessing the building, all construction crew members had to register with the security office and were subject to a full body inspection.

Project Execution and Challenges

Prior to the installation of the flood gates, it was determined that the loading dock turntable (Fig.3), would need to be removed. The Turntable inside the loading dock was used to maneuver trucks delivering materials and supplies to the building, and was utilized to assist in positioning van pool vehicles and limousines for VIP's in loading dock parking spaces. It had been determined that the turntable was obsolete, needed to be removed, and the removal and associated structural repairs would need to be performed with the planned loading dock closure for the flood gates. Closing the loading dock required arranging for a different delivery site at the building and this necessitated the relocation of a security detail and their x-ray equipment. As this proved to be an untenable arrangement, the NARA project officials requested the work schedule be modified to complete the work in a two week period rather than the planned two month time frame.

The thirty foot diameter steel turntable was removed by cutting it into manageable sections for disposal. Next, the interior area of the turntable, which was four feet deep, was formed and prepared to receive the structural concrete joist slab; the 4000 psi mix was placed and finished to match adjacent surfaces. All work associated with the removal and infill of the turntable was completed in a two week schedule which included weekend shifts.

The installation of the first self-closing flood barrier was slated for the east loading dock entrance, and the west side vehicle entrance would follow in a similar manner. Preceding the actual excavation of the site, it was imperative to have a pedestrian and vehicle control plan devised at the east gate entrance area.

Recognizing there was no area adjacent to the excavation site where excavated material could be stored, a well coordinated plan of soils removal and immediate placement into dump trucks positioned along 7th street was necessary. Upon excavation to the required depth, it became clear that a number of unforeseen circumstances were at hand. Among the conditions encountered:

- At a depth of about six feet, the soil being removed was found to be contaminated with oil and old debris, and required disposal in a special landfill.

- An electrical duct bank was unearthed, and this required inspection and capping (Fig.4).

- Pipes and other conduit running through unearthed concrete bunkers were discovered in the excavation site. For obvious site safety concerns, this condition required inspection of the bunker prior to continuing the excavation. It was not known if live electrical conduits were present or if natural gas transmission lines were involved, but through inspection by the project engineer and NARA officials, and evaluation by GPR, it was determined that the lines were already capped.

- The original plumbing design and plan to evacuate the water from the flood barrier basin required redesign due to conditions discovered during site excavation. A drain pipe originally considered as a connection for evacuating the water from the barrier tank was five feet higher than expected. Rather than evacuating the water into the sewer system as originally planned, a new pipe was installed in the barrier basin and the water from the basin would now be piped to a drainage area adjacent to the 7th Street entrance where it would serve to irrigate the grass and the trees.

- Next, the pier cap supporting the very large Federalist style pilasters would need to be enlarged in order to properly install the flood barrier (Fig.5).Associated with this condition would be the need to design and install additional underpinning of the pilasters on each end of the barrier structure. This required an engineering redesign of the large pier cap beams at each end of the barrier so the barrier structure would be perfectly level and allow the flood gate to work properly. With the structural enhancements to the pier caps and underpinning completed, the construction of the footings and the watertight basin foundation walls proceeded (Fig.6).

- The process of receiving and placing the concrete was another challenge. In light of the steady pedestrian traffic on the sidewalk at the site entrance, the sidewalk could not be blocked and the concrete had to be placed on site from a pump truck located on the street, utilizing many feet of piping to the area (Fig.7). The concrete placement was performed during hot summer days, requiring the use of ice to assure smooth and efficient placement and finishing of the concrete. On a few occasions, due to extreme weather conditions, the concrete hardened in the pipes while pumping, and it was necessary to return the truck for a new load of concrete

The lateral reinforced cap beams were formed atop the basin foundation walls to exacting dimensions (Fig.8), in order to receive the self-closing flood barrier hardware provided by PS Doors (Fig.9). With the use of a track excavator, the flood barrier concrete cap beam forms were placed atop the foundation walls (Fig. 10). Upon placement of the cap beam forms provided by PS Doors, which arrived from the manufacturer with installed steel reinforcing, it was discovered that some of the rebar atop the basin

foundation wall required position alteration in order to receive the cap beam form (Fig. 11). Prior to placing concrete in the cap beam forms, the manufacturers rep from PS Doors inspected the newly placed beam forms to verify the distance between the cap beams was to exact measurements in order to eventually receive the flood barrier gate hardware. Concrete was placed in the cap beams (Fig. 12), and following adequate curing time the flood barrier doors and associated hardware were installed. A flood test was successful and the self-closing flood barriers functioned as designed (Fig. 13).

As part of the project it was necessary to replace the driveway entrance ramp and sidewalk due to the impact of heavy equipment on these areas. It proved a challenge to match the existing and very aged exposed aggregate surfaces adjacent to these areas but a satisfactory appearance was attained (Fig.14). Additionally, as a final touch to enhance the look of both the east and west entrances, the large steel and bronze gates on the ramps were disassembled and professionally cleaned, polished, lubricated and reinstalled.

Conclusion

The west side self-closing flood barrier installation benefited from the lessons learned on the east side installation, and the west side operation was performed on schedule and to the satisfaction of the client and owner, NARA. Although the project presented many tactical, logistical and technical challenges, it offered numerous opportunities to display the commitment and benefit of team members all working together to successfully overcome project impediments, delivering the owner's desired outcome – protecting the nation's most precious historical documents utilizing a self-closing flood barrier (Fig. 15).


Fig 2