Soldiers’ & Sailors’ Memorial: Conditions Survey & Restoration Treatment Study

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Study Components

Research: Construction and Historic Significance

Conditions Assessment: Findings and Recommendations

ADA Assessment & Recommendations

Cost Estimates
ERECTED BY THE CITY OF NEW YORK TO COMMEMORATE THE VALOR OF THE SOLDIERS AND SAILORS WHO IN THE CIVIL WAR FOUGHT IN DEFENSE OF THE UNION.
Soldiers’ & Sailors’ Today
Soldiers’ & Sailors’ Today
Construction and Historic Significance

1902 Dedication
Construction and Historic Significance

1917 Decoration Day

1945 Viewing Navy War Ships from the Memorial
Site Significance and Prominence

1910 to 1935 (MCNY/DPR)
Site Significance and Prominence

1940 to 1975 (DPR/MCNY)
Background Research Findings
Historical Background

1899 Plan and Section Details of Plaza Drainage
Historical Background/Previous Repairs

1920s and 1935 Plaza Images
1960 – Pre-Restoration Conditions

THIS MONUMENT IS IN DANGEROUS CONDITION. A FENCE HAS THEREFORE BEEN PROVIDED BY THE DEPARTMENT OF PARKS TO PROTECT THE PUBLIC FROM FALLING STONES. THIS FENCE MUST REMAIN UNTIL FUNDS TO RESTORE THE MONUMENT ARE MADE AVAILABLE.
Historical Background

1960-62: Last Comprehensive Restoration Campaign
Findings and Recommendations:
Conditions Assessment
Conditions Assessment

Monument and Plazas:

~ Findings: Fair to Poor overall condition
  (Deterioration due to age and lack of drainage)

~ Recommendations: Comprehensive rehabilitation
  (Immediate hazards currently stabilized)
Conditions Assessment

Total Area:

approx. 20,000 SF or .5 acres
Visual Survey
2016
Visual Survey

Monument Exterior
Findings and Recommendations

Monument Exterior:
~ Findings: Cracks
~ Recommendations: Crack filler, pinning, Dutchman repairs
Findings and Recommendations

Monument Exterior:

Finial and Consoles

~ Finding: Spalls, failed patches, and fissures
~ Recommendation: Dutchman, patch and crack filler
Findings and Recommendations

Monument Exterior:

Upper and Lower Modillions

~ Findings: Failed Dutchman, crack repairs and ACM in sealant, typ., fissures, and spalls

~ Recommendations: New Dutchman, consolidation, sealant abatement
Findings and Recommendations

Monument Exterior

~ Findings: Deteriorated mortar, biological growth and open joints

~ Recommendations: 100% Repointing
Findings and Recommendations

Monument Exterior – Sheet Metal Roofing
~ Findings: Main Roof, Gutter Infill, Cornice – repairable
   Base of Drum – excessive tears and holes
~ Recommendations: Repair Main Roof, Gutter Infill, Cornice;
   Replace lower drum roof with liquid-applied membrane
Findings and Recommendations

Monument Bronze Door

~ Findings: Severe deterioration and inoperable condition
~ Recommendations: Refurbish in off-site facility and reinstall
Findings and Observations

Monument Interior: Marble and Mosaic Floor

~ Findings: Cracked marble, missing and eroded tesserae

~ Recommendations: Crack repair and replace missing tesserae; repair concrete slab at manhole cover; clean and repatinate bronze
Findings and Recommendations:
Monument Interior via Drone Survey
~ Findings: Open Joints and efflorescence, typ., selected spalls
~ Recommendations: 100% repointing, Dutchman repairs
Findings and Recommendations

Monument Interior: Brickwork between Oculus and Guastavino Vault
~ Findings: Open joints and vertical cracks
~ Recommendations: 100% repointing and selective brick stitching
Findings and Recommendations

Monument Interior – Brick Vault and Adjacent Brick Chamber

~ Findings: Overall good condition with excessive moisture

~ Recommendations: Repair concrete slab at manhole cover
Findings and Recommendations

Mobilization

~ Recommendations: Enclosed scaffold system
Visual Survey

Monument Plazas

Belvedere

North Approach

Esplanade

Upper Terrace

Lower Terrace
Findings and Recommendations

1959 Plan and Section Details of New Drainage Scuppers
Findings and Recommendations

Site Drainage

~ Findings: Failed drainage system causing collateral deterioration
~ Recommendations: Replace complete paving and drainage system
Findings and Recommendations

Marble and Sandstone Paving

~ Findings: Heaving and displacement, severe sandstone deterioration
~ Recommendations: Remove and reset marble; replace sandstone with granite or marble pavers; replace substrate and introduce new drainage
Findings and Recommendations

Granite Veneer Foundation Stones

~ Findings: 100% deteriorated mortar joints, plant growth, displacement, and selective failure

~ Recommendations: Remove plants, grout injection, 100% repointing, selective rebuild of missing and severely displaced units; cordon off areas of loose stone at northern retaining wall
Findings and Recommendations

Semi-Circular Marble Bench Backs at Belvedere and Flagpole Platform
~ Findings: Severe displacement and outward bowing of stonework
~ Recommendations: Remove and reset marble units above granite benches
Findings and Recommendations

Limestone Balustrades
~ Findings: Plaza settlement cracks at plinth and full-depth baluster cracks
~ Recommendations: Remove, repair, reset
Findings and Recommendations

Marble Piers

~ Findings: Missing and failed Dutchman repairs, erosion fissures and cracks

~ Recommendations: Install new marble Dutchman with surgical pins, fill with hydraulic lime patch filler, pin other cracks
Findings and Recommendations
Marble and Limestone Surfaces (Monument and Balustrades)
~ Findings: Graffiti and soiling
~ Recommendations: Peel Away 7 and Rotec Vortex Micro-abrasion
Findings and Recommendations:
Structural Assessment
Structural Assessment
Structural Assessment

Rhino model

Sectional view of the model ready for SAP
Drum Dome: The dome is modeled as a shell structure, by creating a mesh out of a sphere and adding to the mesh the points of discontinuity in the highlighted end.

The top of the structure is made by sweeping a profile curve (grey) along the two rail curves (yellow).

The sweep is done for all the sections, and then the step for the vault (page 9) are repeated.
Structural Assessment

GRAVITY ENVELOPE:
D+L
D+0.75L+0.75S

f'm = 1000 psi
Knowledge Factor = 0.75

f'm = 4000 psi
Knowledge Factor = 0.75
Structural Assessment

WIND ENVELOPE:
D+W
0.6D+W

f'm = 1000 psi
Knowledge Factor = 0.75

f'm = 4000 psi
Knowledge Factor = 0.75
Structural Assessment

EARTHQUAKE:
D + 0.75L + 0.75(0.7E) + 0.75S

f'm = 1000 psi
Knowledge Factor = 1.3

f'm = 4000 psi
Knowledge Factor = 1.3
Structural Assessment

EARTHQUAKE: D+0.75L+0.75(0.7E)+0.75S
f'm = 4000 psi
Knowledge Factor = 1.3
Structural Assessment

Monument

• Structurally stable under gravity and NYCBC wind loads

• Can resist NYCBC earthquake loads but will experience damage

• Masonry exterior and interior joints need to be restored to ensure full bearing contact
Subsurface Investigation/Scanning/Testing
Subsurface Investigation/Scanning/Testing

Monument Tower Exterior and Interior:

- Infrared Thermal Imaging
- Ground penetrating radar/Metal detectors
- Ultrasonic pulse velocity
- Video scoping/Fiber-optic borescope
Subsurface Investigation/Scanning/Testing
Monument Exterior and Interior – IR scanning performed by GBG

Figure 22: Infrared Image of the architrave at the front elevation

Figure 23: Image showing the condition around the stone with cooler thermal response

Figure 27: Infrared Image of the lower dome before rain event

Figure 28: Infrared Image of the lower dome after rain event
Findings and Recommendations

Hazardous Materials

• Confirmed ACM – Caulking at modillions
• Assumed ACM – Caulking at window frame and roofing
• Confirmed Lead-based Paint – Monument marble façade wall beige paint
• Confirmed PCB-containing Materials – Caulking at balustrade, caulking at terrace paving stones, and caulking at edges of stairways
• Remediation required as part of restoration
Findings and Recommendations:
ADA Compliance/Landscape Study
Walkway To Upper Terrace - Model
Walkway To Upper Terrace - Rendering
Walkway To Esplanade - Model
Potential Bio-swale / Rain Garden
Cost Estimate
Cost Estimate

Total Program Cost, contingent on being bid as a single project:

approx. $29- $30 Mil.
Cost Estimate

Cost Breakdown*

Monument $10,500,000
  • Scaffolding, interior and exterior repairs and repointing, roof repair, door restoration, interior floor restoration

Plazas, retaining walls, and stairs $17,000,000
  • Demolish and replace foundation slab, remove and reset all marble stonework, install new marble in place of sandstone, remove, repair and reset balusters, repair and repoint all walls, remove and reset stairs, benches, ornamental bronze

ADA compliant access ramps $1,200,000

Landscaping $700,000

*If project is phased, cost of each phase increases due to escalation and multiple mobilizations.