



NYC Office of
Management and Budget
NYC Department of
Parks and Recreation

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

Final Presentation – Community Board

22 February 2017

Study Team:

Perkins Eastman Architects DPC

Leslie E. Robertson Associates RLLP

GB Geotechnics USA, Inc.

Vertical Access

Highbridge Materials Consulting

Pullman SST, Inc.

Louis Berger

United Spinal Association

RGR Landscape

PACO Group, Inc.

Study Components

Research: Construction and Historic Significance

Conditions Assessment: Findings and Recommendations

ADA Assessment & Recommendations

Cost Estimates



Soldiers' & Sailors' Today



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)

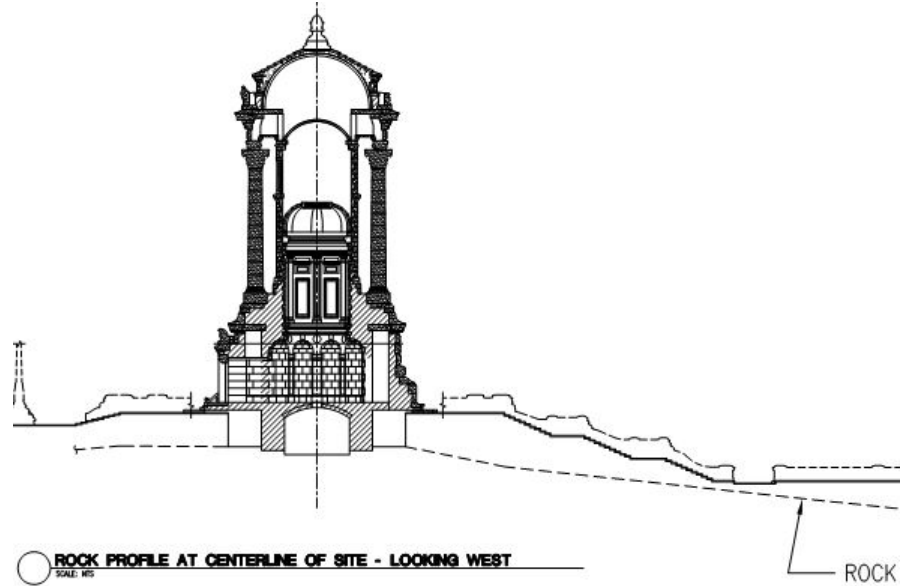
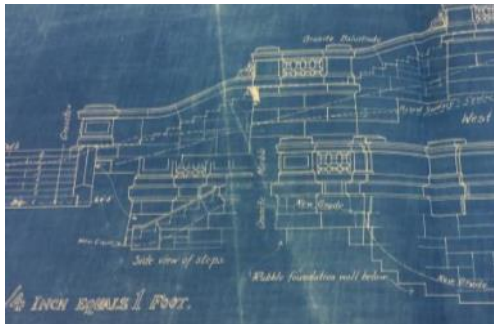
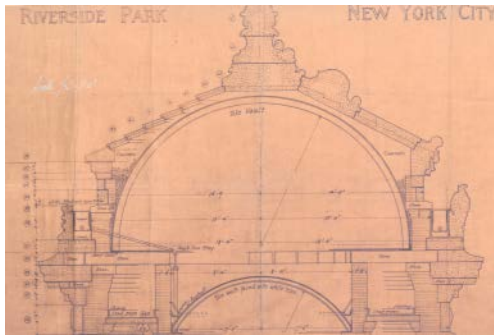


Site Significance and Prominence

1940 to 1975 (DPR/MCNY)

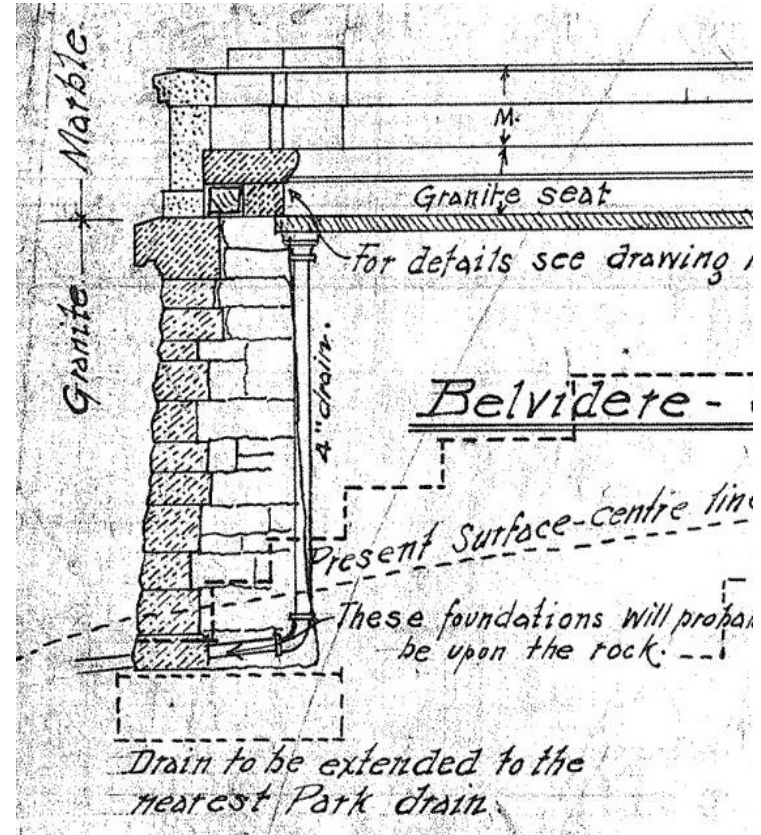
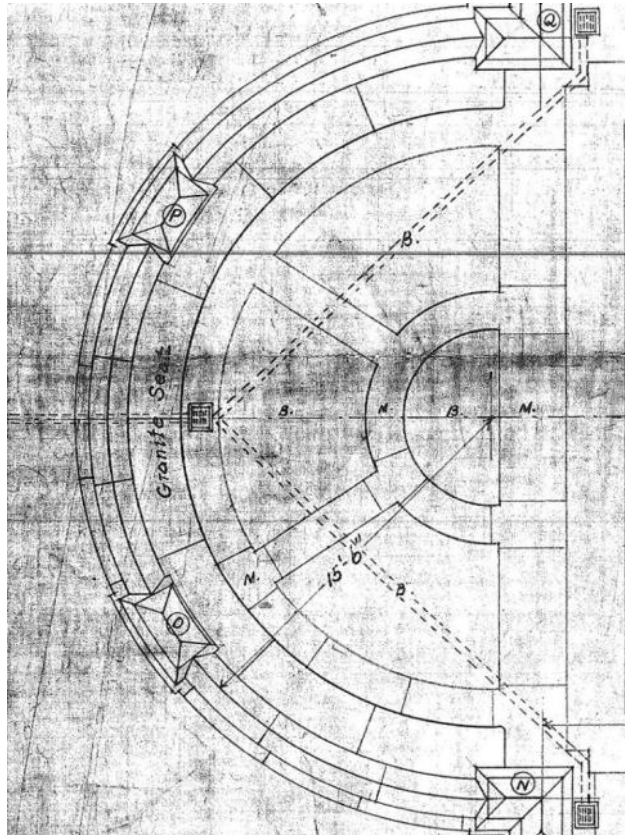
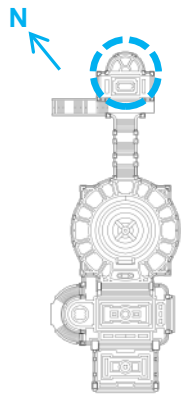


Background Research Findings



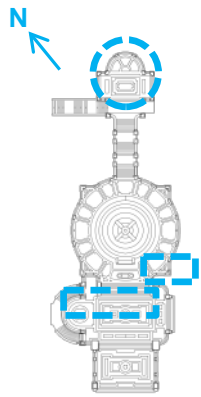
Historical Background

1899 Plan and Section Details of Plaza Drainage

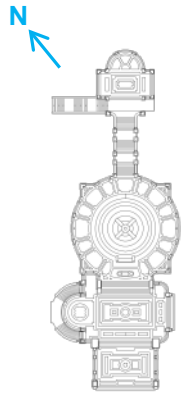


Historical Background/Previous Repairs

1920s and 1935 Plaza Images

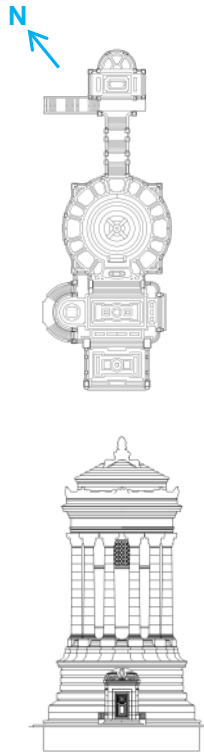


1960 – Pre-Restoration Conditions



Historical Background

1960-62: Last Comprehensive Restoration Campaign



Findings and Recommendations: Conditions Assessment



Conditions Assessment

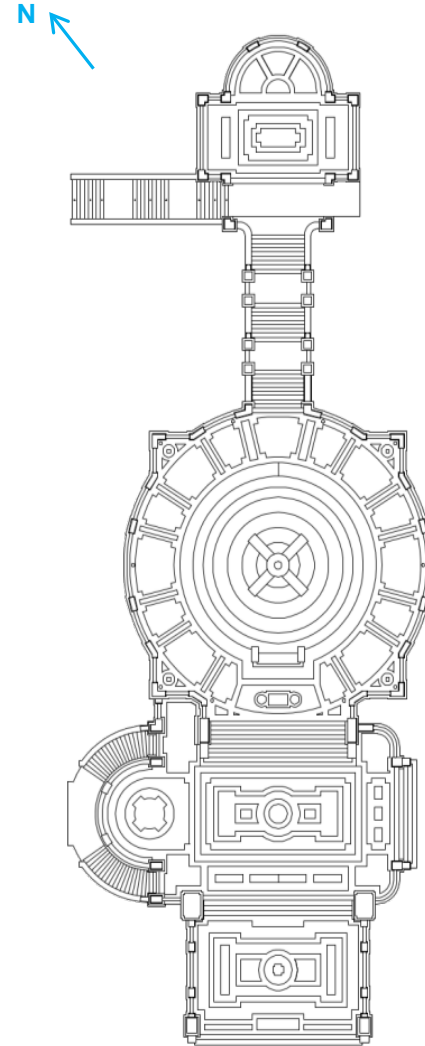
Monument and Plazas:

- ~ 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

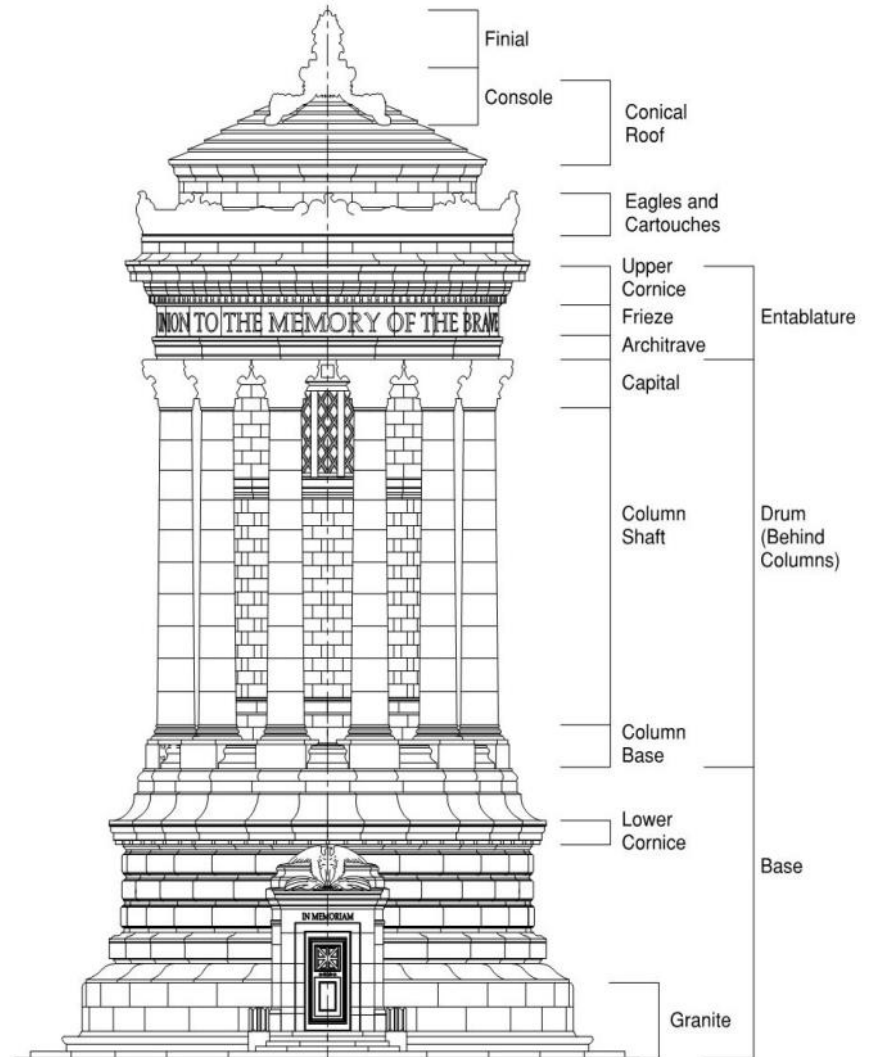


Visual Survey 2016



Visual Survey

Monument Exterior



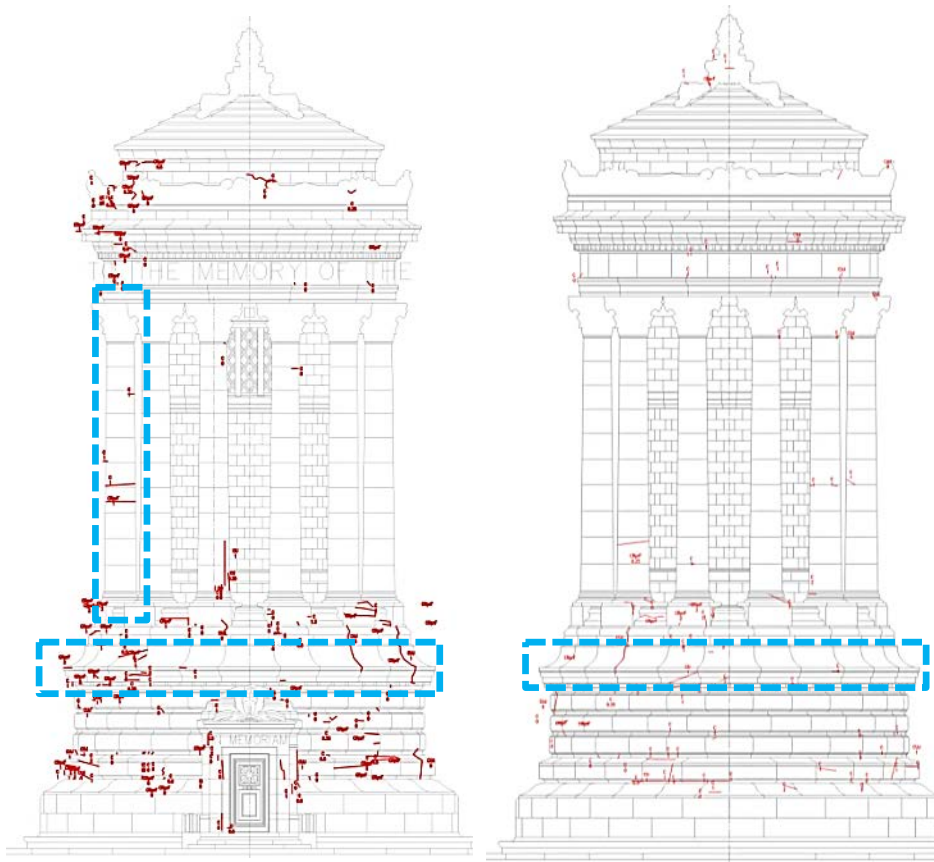


Findings and Recommendations

Monument Exterior:

~ Findings: Cracks

~ Recommendations: Crack filler, pinning, Dutchman repairs



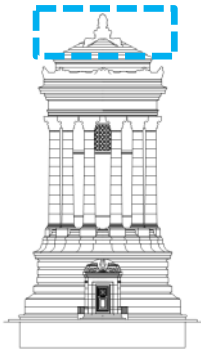
Findings and Recommendations

Monument Exterior:

Finial and Consoles

~ Finding: Spalls, failed patches, and fissures

~ Recommendation: Dutchman, patch and crack filler



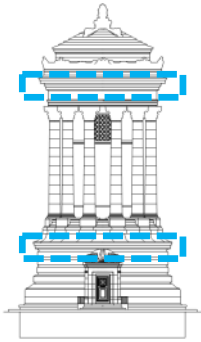
Findings and Recommendations

Monument Exterior:

Upper and Lower Modillions

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

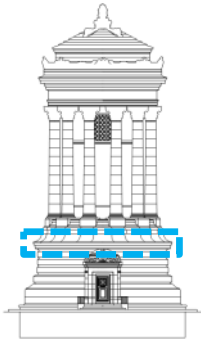
~ Recommendations: New Dutchman, consolidation, sealant abatement



Findings and Recommendations

Monument Exterior

- ~ Findings: Deteriorated mortar, biological growth and open joints
- ~ Recommendations: 100% Repointing



Findings and Recommendations

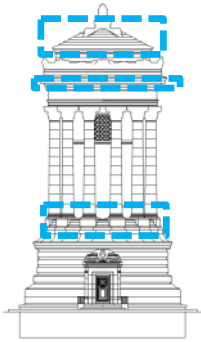
Monument Exterior – Sheet Metal Roofing

~ Findings: Main Roof, Gutter Infill, Cornice – repairable

Base of Drum – excessive tears and holes

~ Recommendations: Repair Main Roof, Gutter Infill, Cornice;

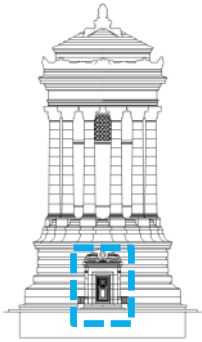
Replace lower drum roof with liquid-applied membrane



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

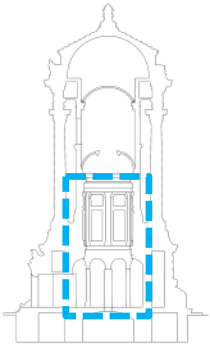
- ~ Findings: Cracked marble, missing and eroded tesserae
- ~ Recommendations: Crack repair and replace missing tesserae; repair concrete slab at manhole cover; clean and repatinated bronze



Findings and Recommendations:

Monument Interior via Drone Survey

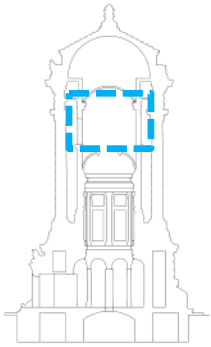
- ~ Findings: Open Joints and efflorescence, typ., selected spalls
- ~ Recommendations: 100% repointing, Dutchman repairs



Findings and Recommendations

Monument Interior: Brickwork between Oculus and Guastavino Vault

- ~ Findings: Open joints and vertical cracks
- ~ Recommendations: 100% repointing and selective brick stitching

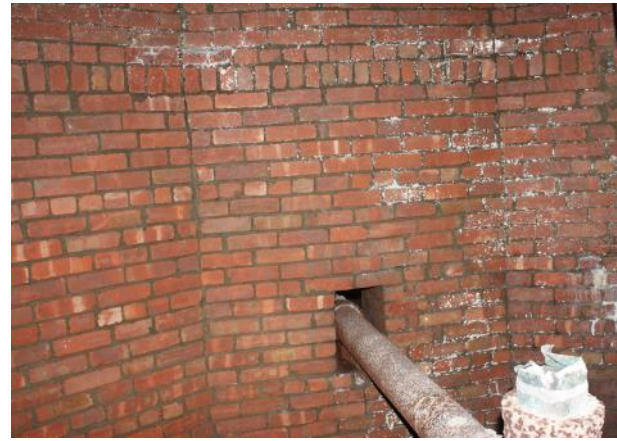
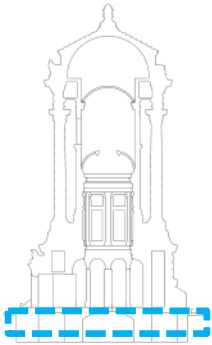


Findings and Recommendations

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

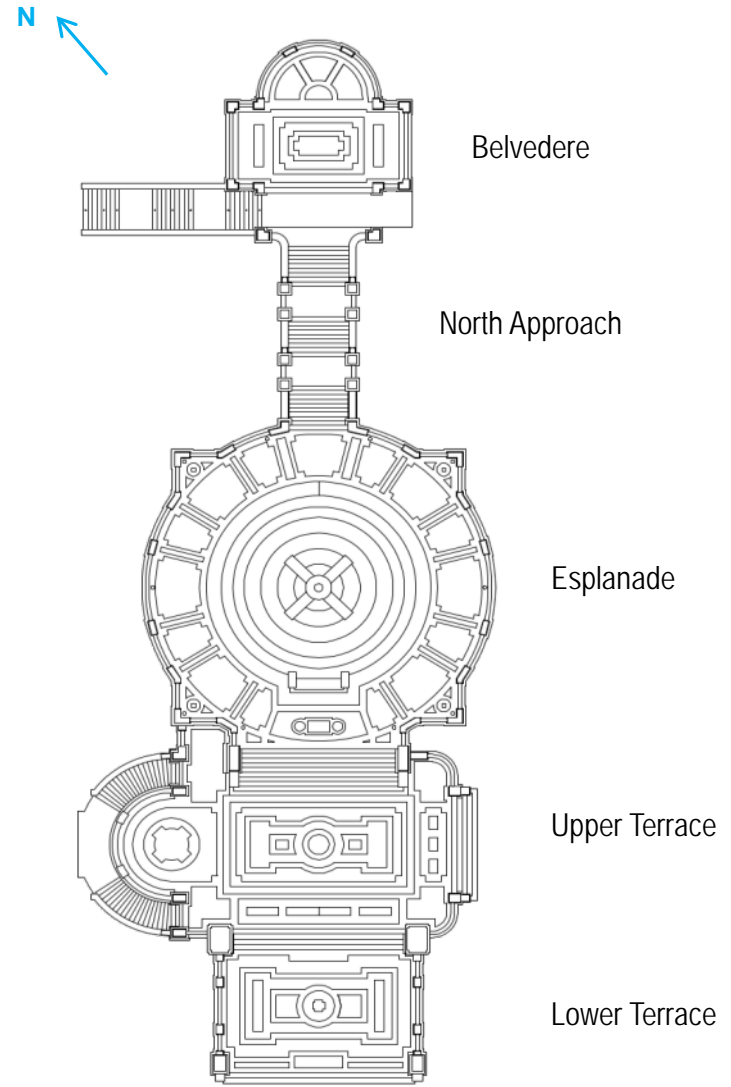
Mobilization

~ Recommendations: Enclosed scaffold system



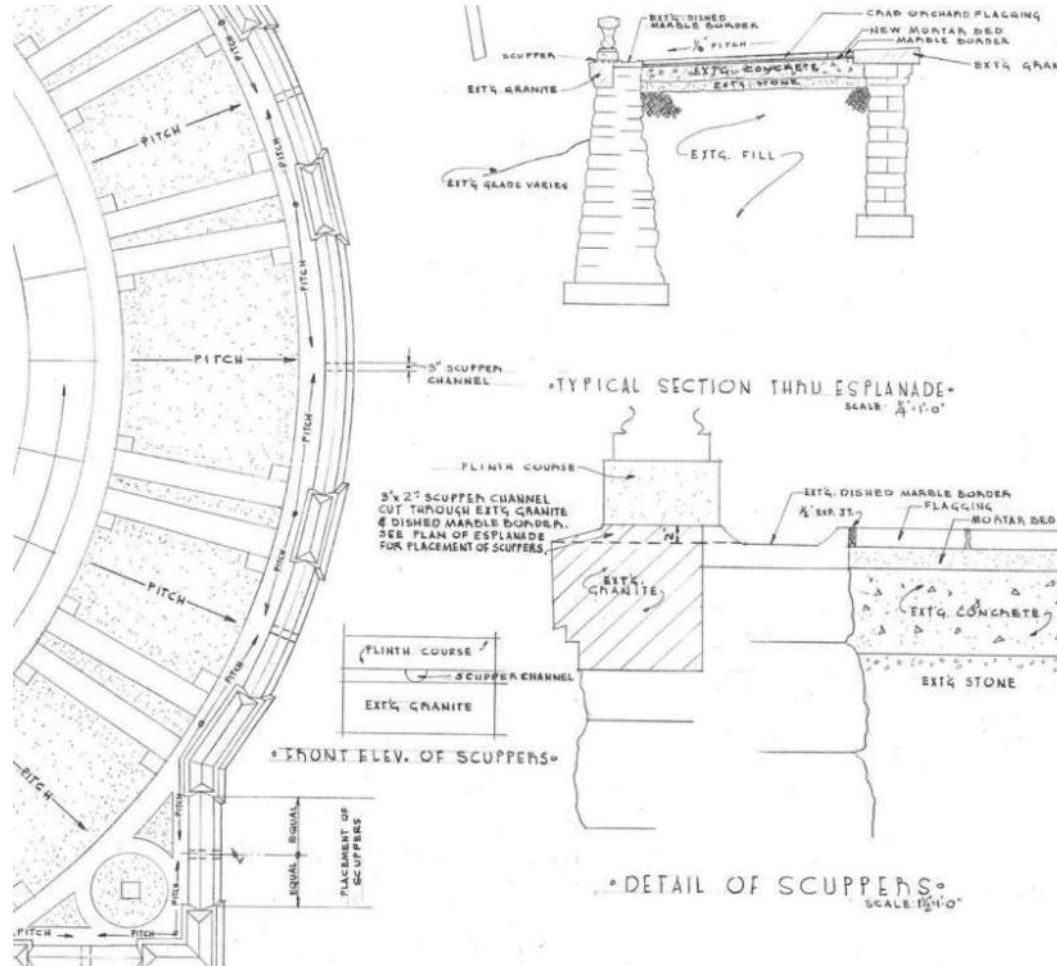
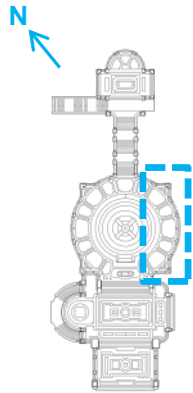
Visual Survey

Monument Plazas



Findings and Recommendations

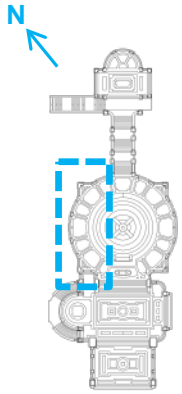
1959 Plan and Section Details of New Drainage Scuppers



Findings and Recommendations

Site Drainage

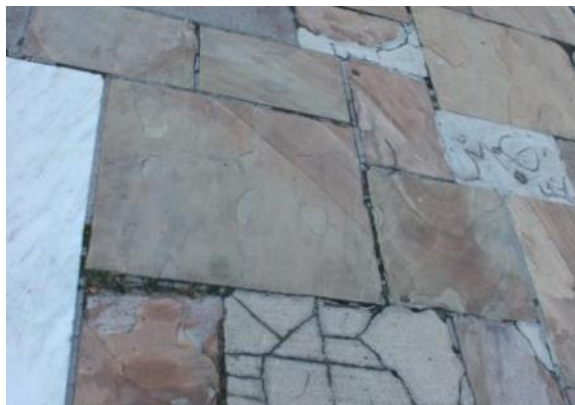
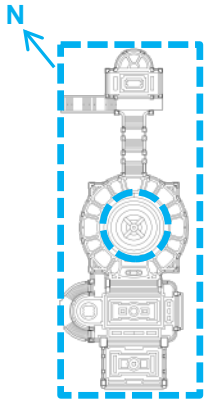
- ~ Findings: Failed drainage system causing collateral deterioration
- ~ Recommendations: Replace complete paving and drainage system



Findings and Recommendations

Marble and Sandstone Paving

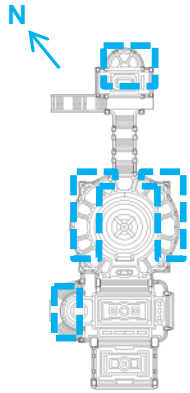
- ~ Findings: Heaving and displacement, severe sandstone deterioration
- ~ Recommendations: Remove and reset marble; replace sandstone with granite or marble pavers; replace substrate and introduce new drainage



Findings and Recommendations

Granite Veneer Foundation Stones

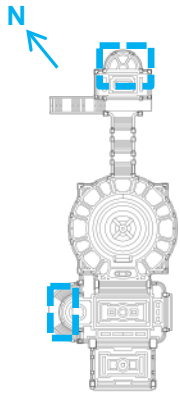
- ~ Findings: 100% deteriorated mortar joints, plant growth, displacement, and selective failure
- ~ Recommendations: Remove plants, grout injection, 100% repointing, selective rebuild of missing and severely displaced units; cordon off areas of loose stone at northern retaining wall



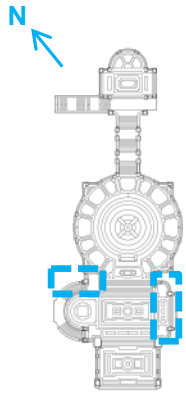
Findings and Recommendations

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

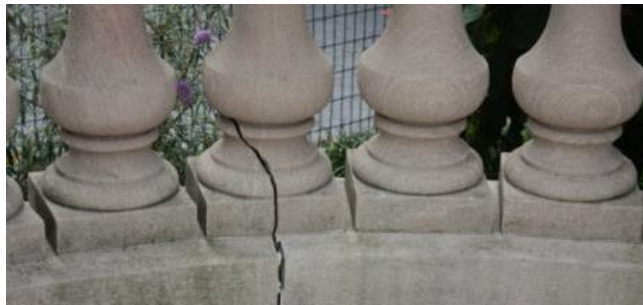


Findings and Recommendations



Limestone Balustrades

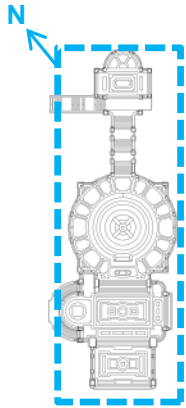
- ~ Findings: Plaza settlement cracks at plinth and full-depth baluster cracks
- ~ Recommendations: Remove, repair, reset



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)

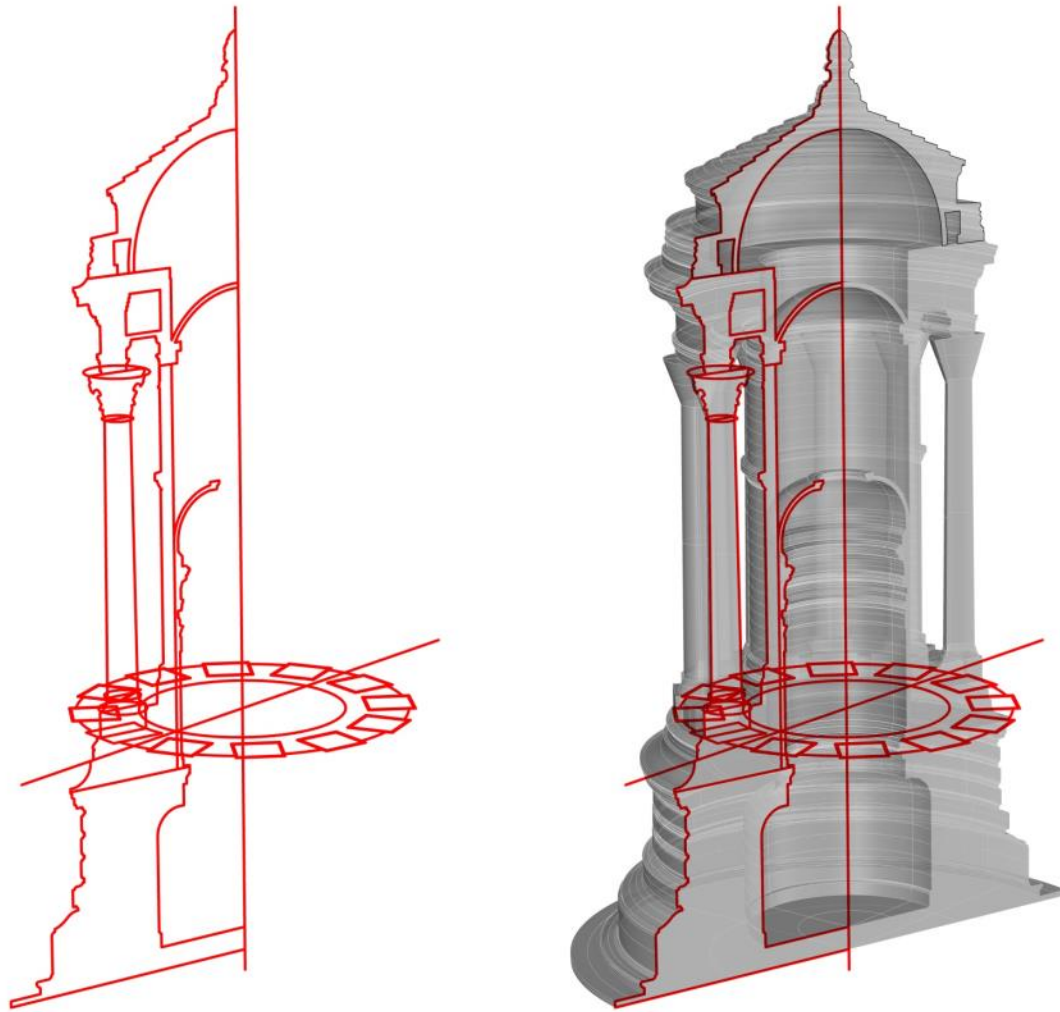
- ~ Findings: Graffiti and soiling
- ~ Recommendations: Peel Away 7 and Rotec Vortex Micro-abrasion



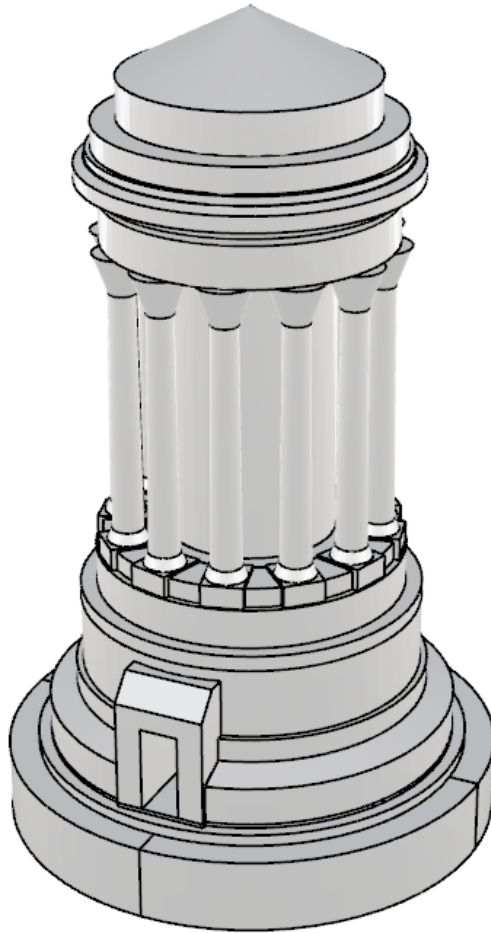
Findings and Recommendations: Structural Assessment



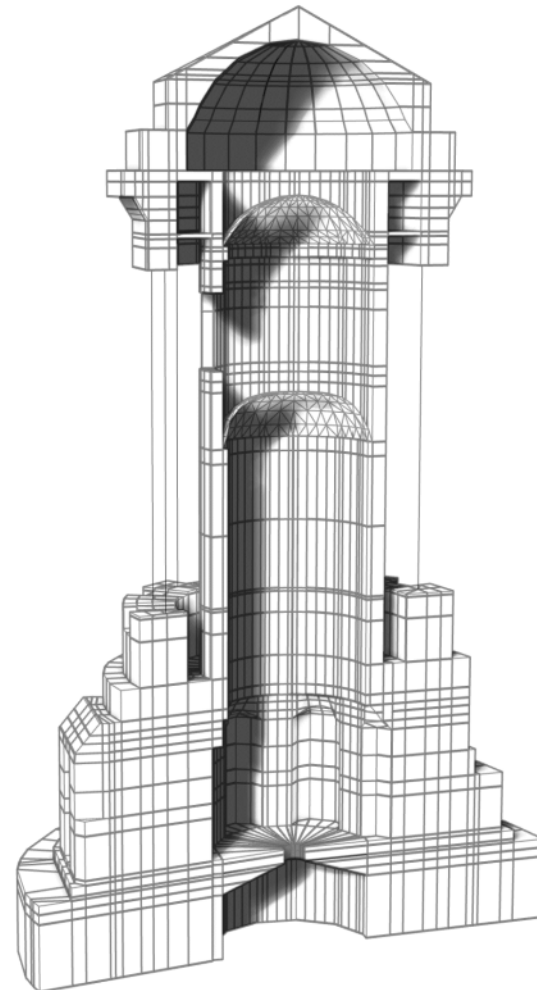
Structural Assessment



Structural Assessment

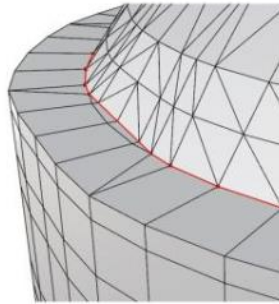
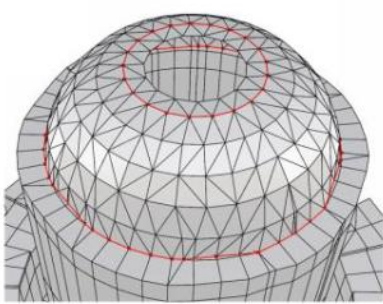


Rhino model

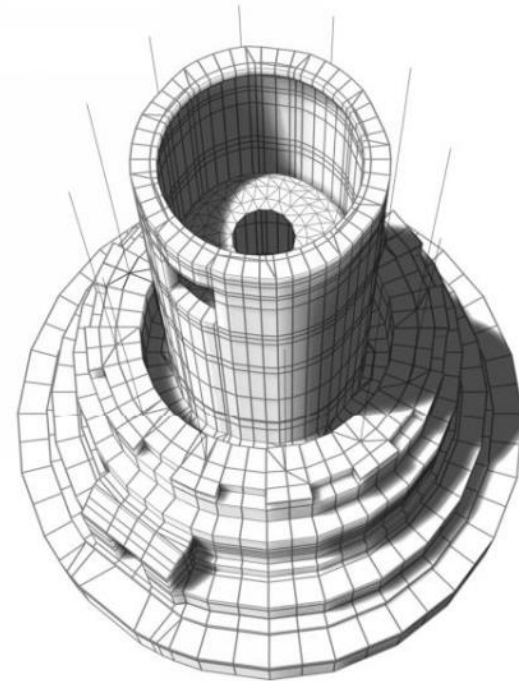
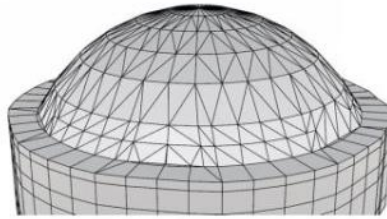
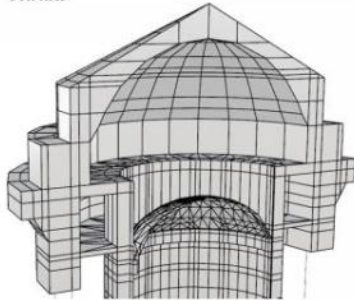


Sectional view of the model
ready for SAP

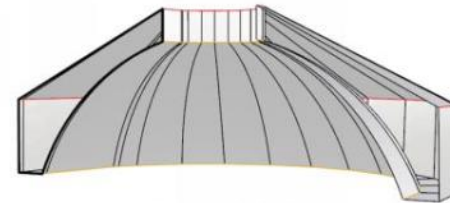
Structural Assessment



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.

9

Structural Assessment

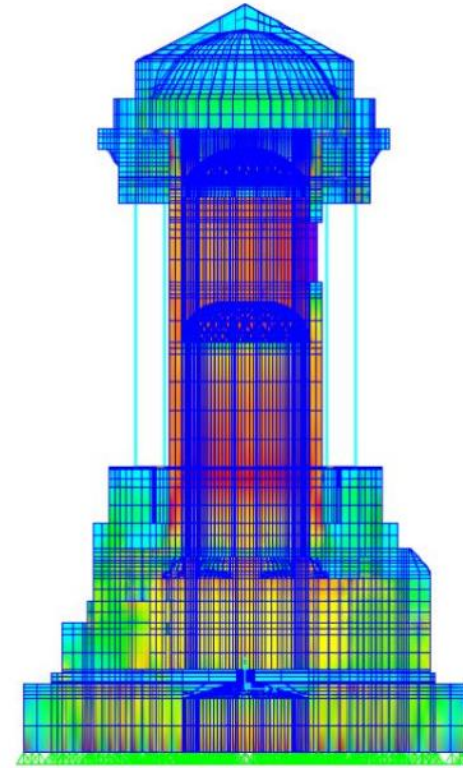
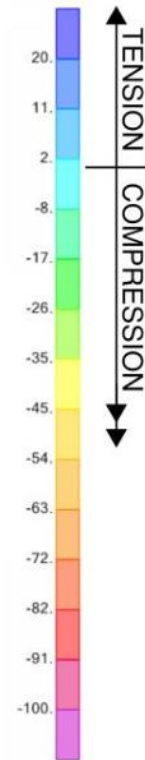
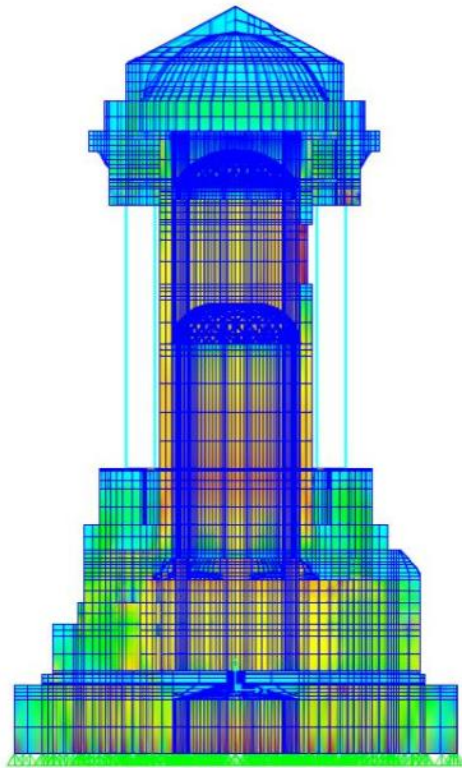
GRAVITY ENVELOPE:

D+L

D+0.75L+0.75S

$f'_m = 1000$ psi
Knowledge Factor = 0.75

$f'_m = 4000$ psi
Knowledge Factor = 0.75

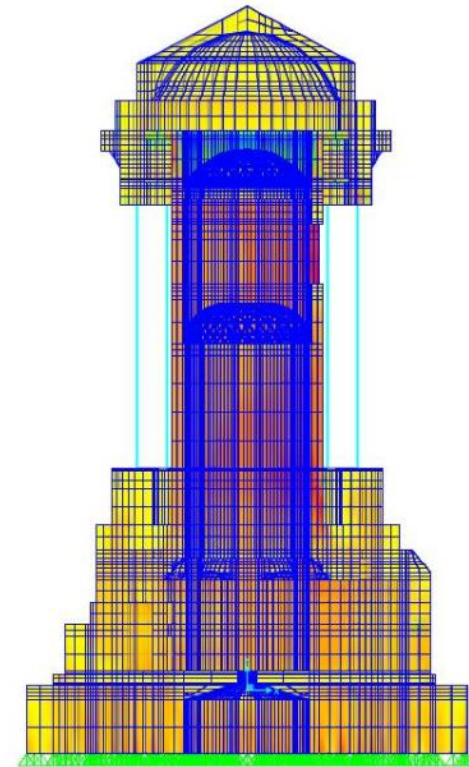
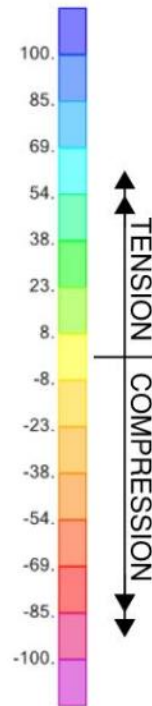
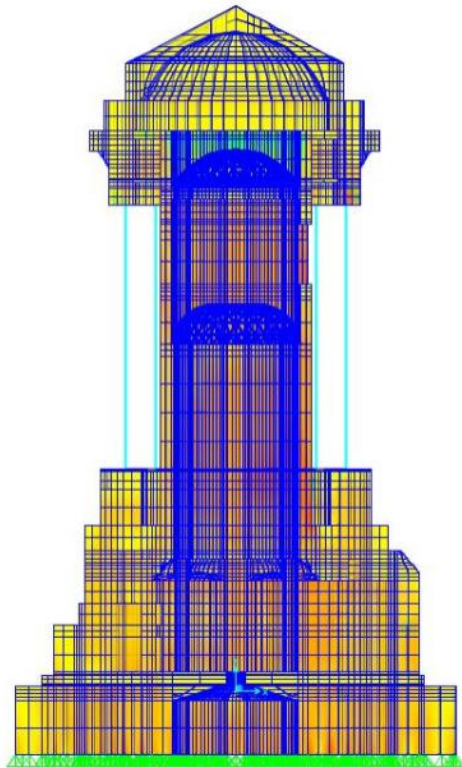


Structural Assessment

$f'_m = 1000$ psi
Knowledge Factor = 0.75

WIND ENVELOPE:
D+W
0.6D+W

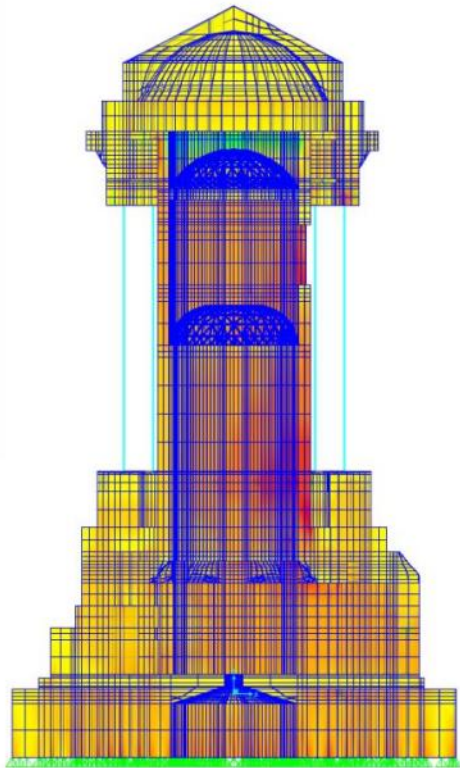
$f'_m = 4000$ psi
Knowledge Factor = 0.75



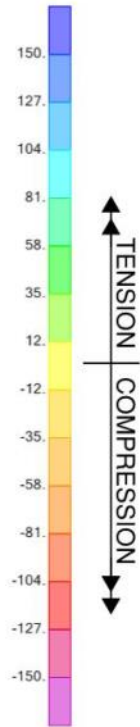
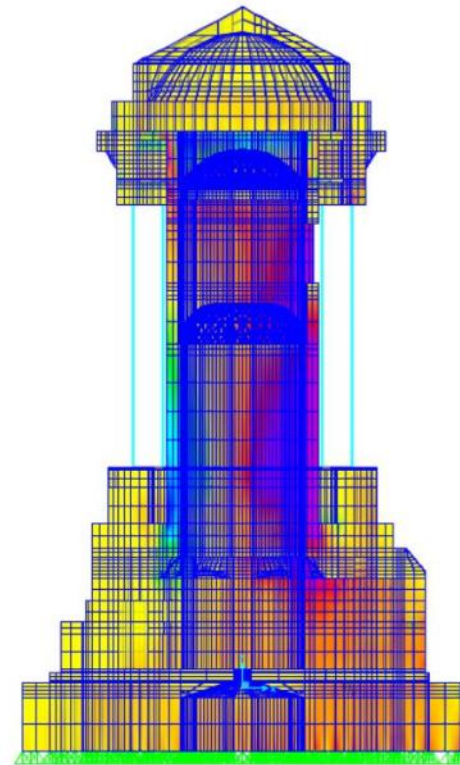
Structural Assessment

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

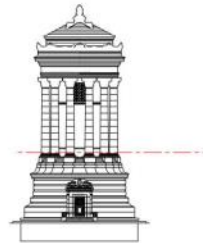


Structural Assessment

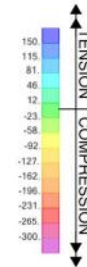
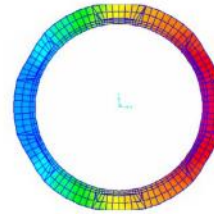
EARTHQUAKE: $D+0.75L+0.75(0.7E)+0.75S$

$f'_m = 4000$ psi

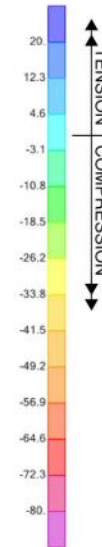
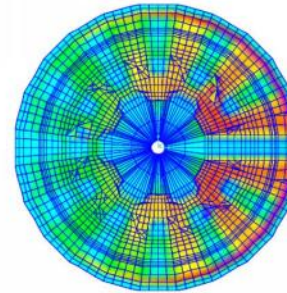
Knowledge Factor = 1.3



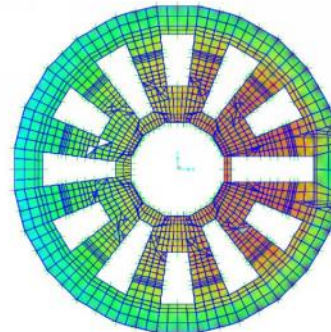
AT BASE
OF DRUM



LEVEL WITH
ENTRANCE



AT
FOUNDATIONS



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

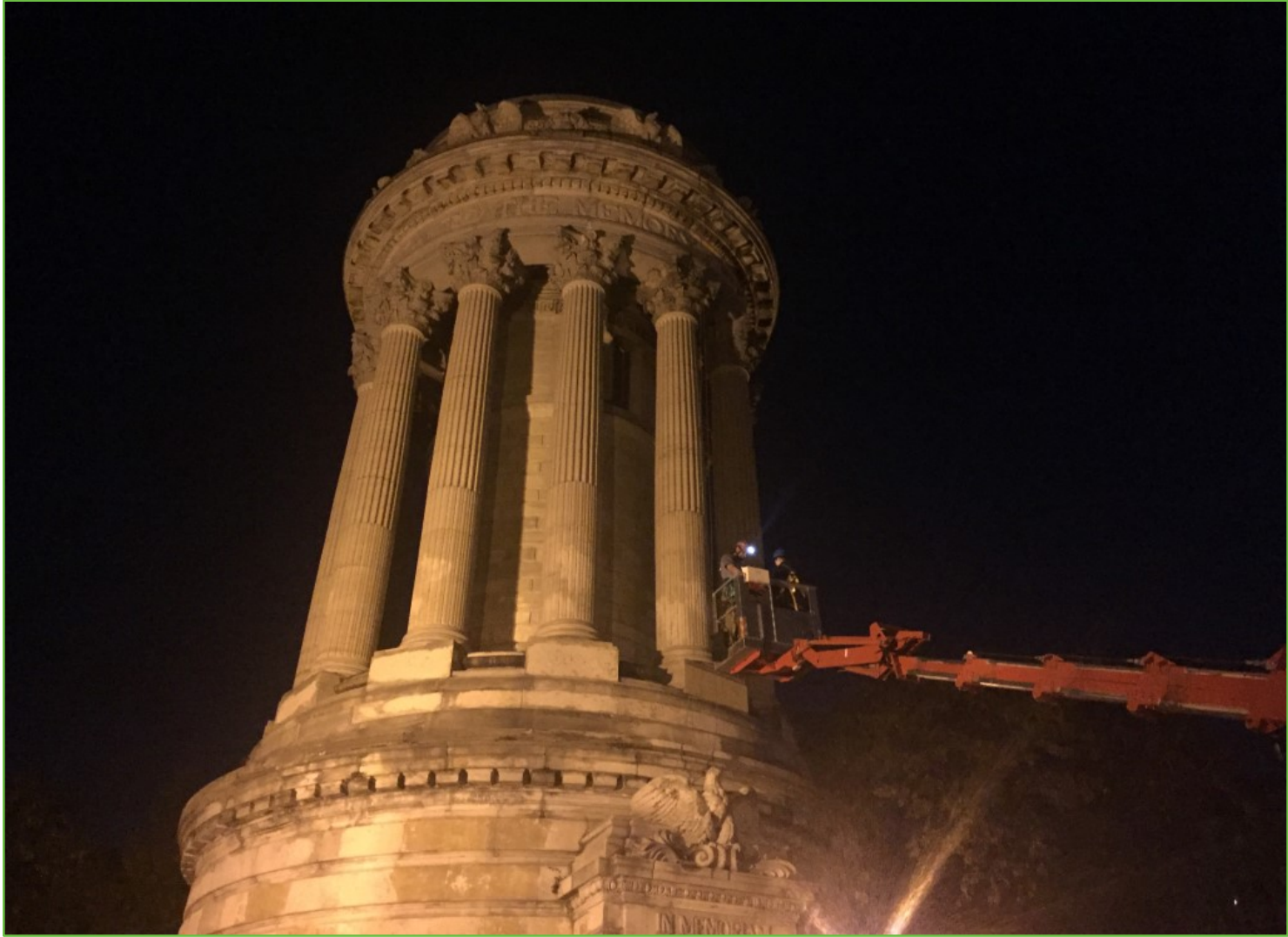
Subsurface Investigation/Scanning/Testing



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

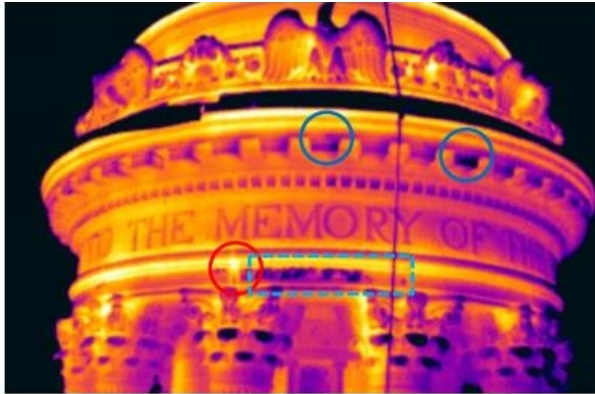


Figure 22: Infrared Image of the architrave at the front elevation

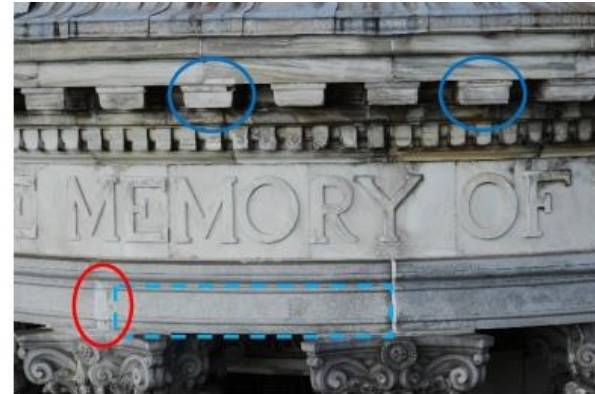


Figure 23: Image showing the condition around the stone with cooler thermal response

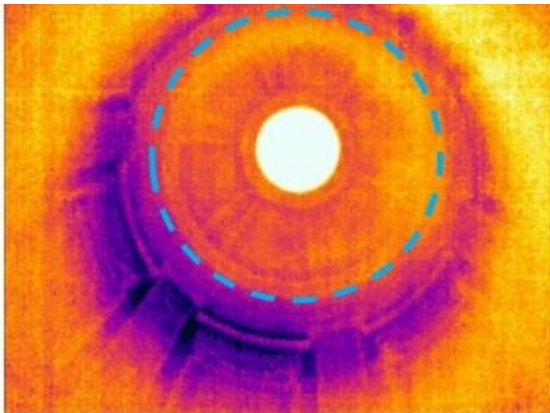


Figure 27: Infrared Image of the lower dome before rain event

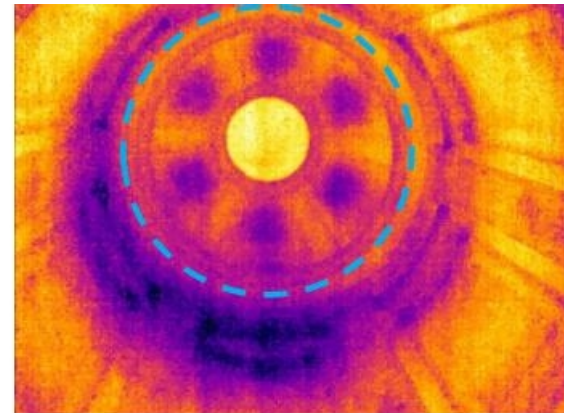


Figure 28: Infrared Image of the lower dome after rain event

Findings and Recommendations

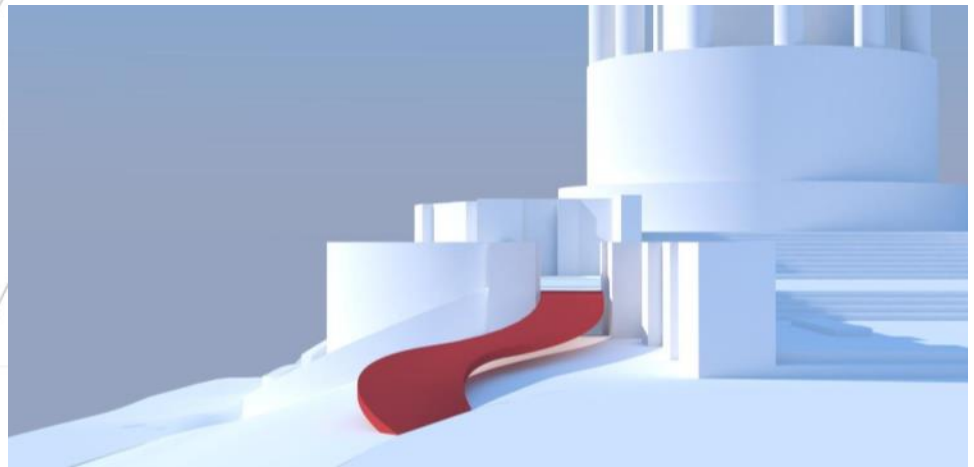
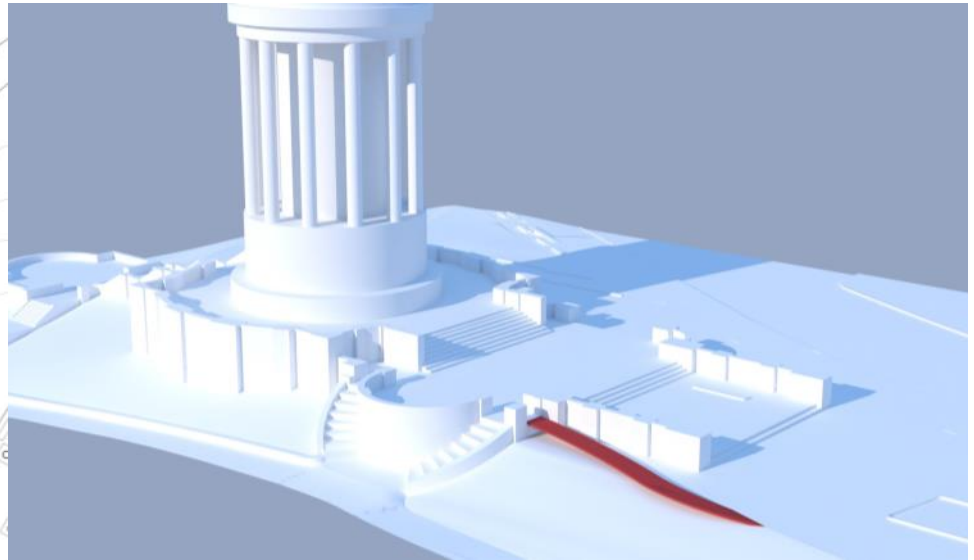
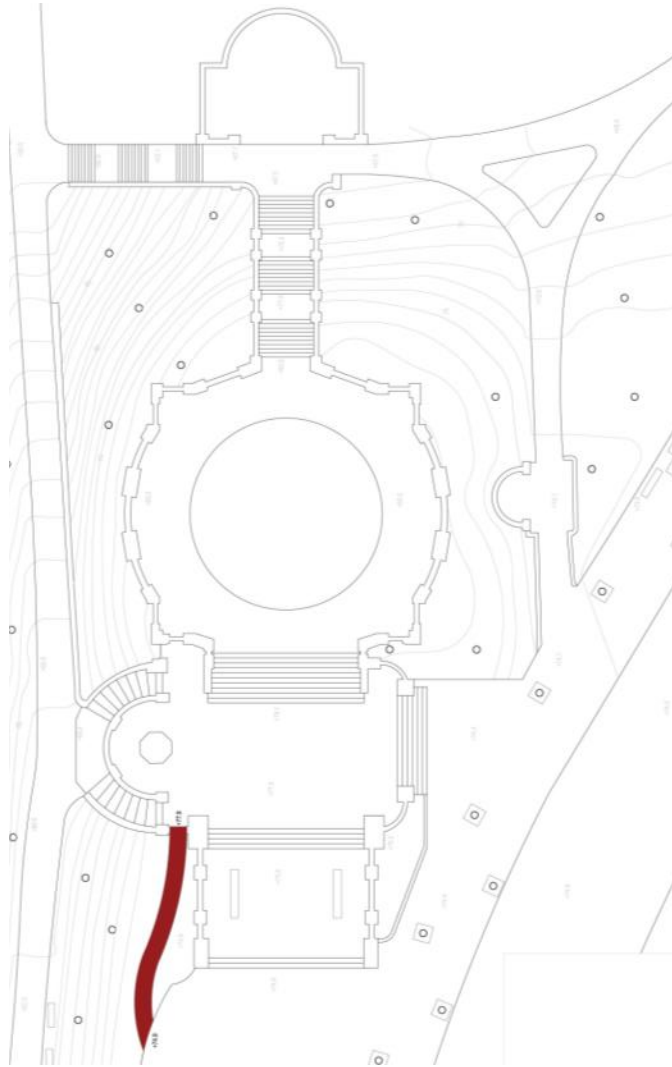
Hazardous Materials

- 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

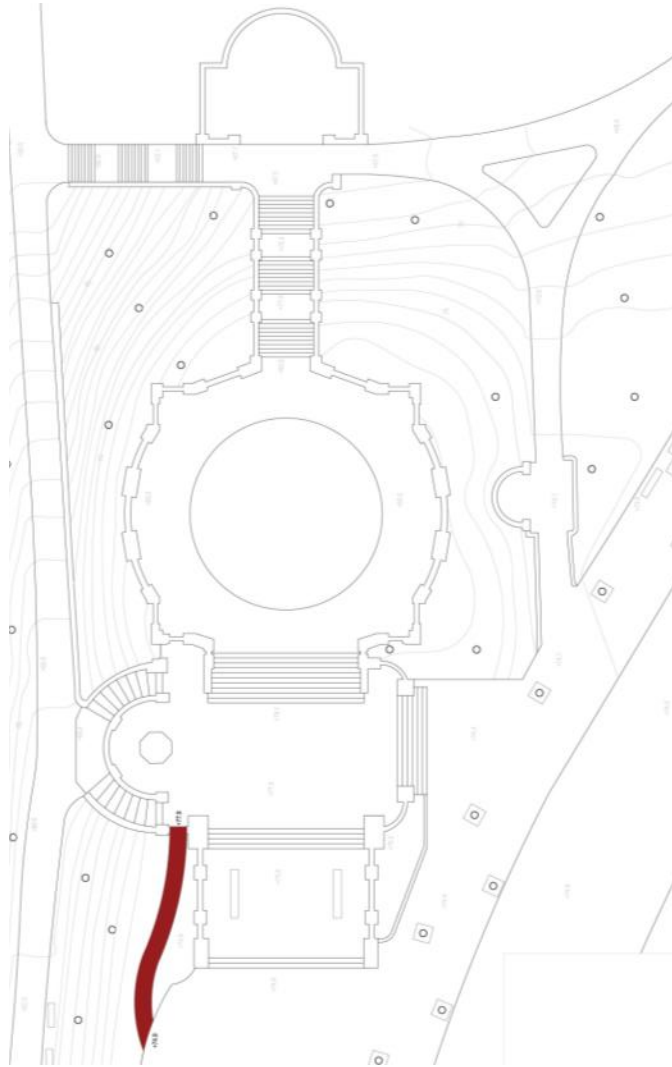
Findings and Recommendations: ADA Compliance/Landscape Study



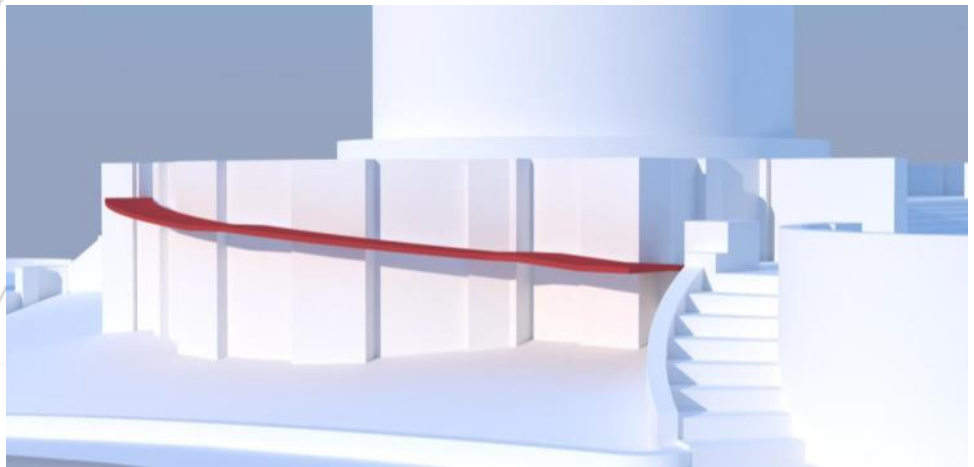
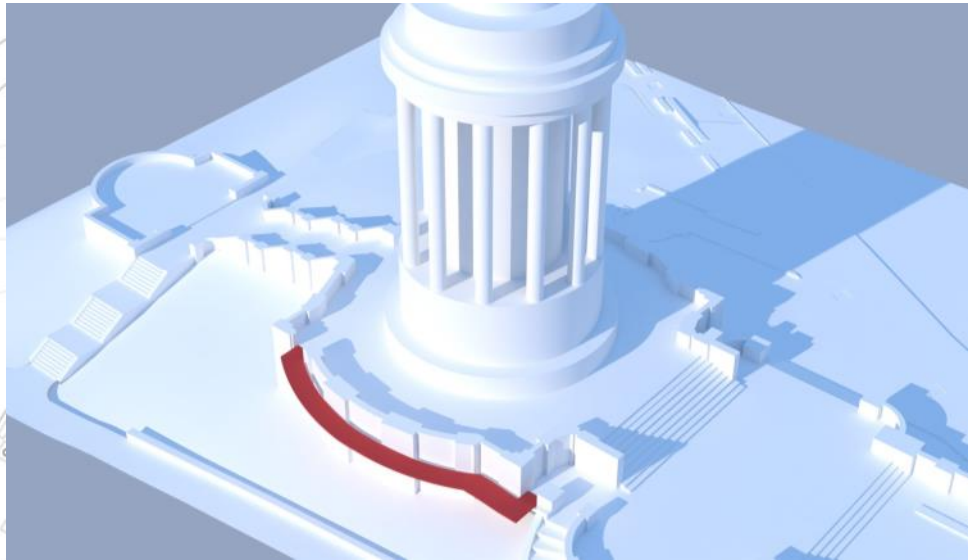
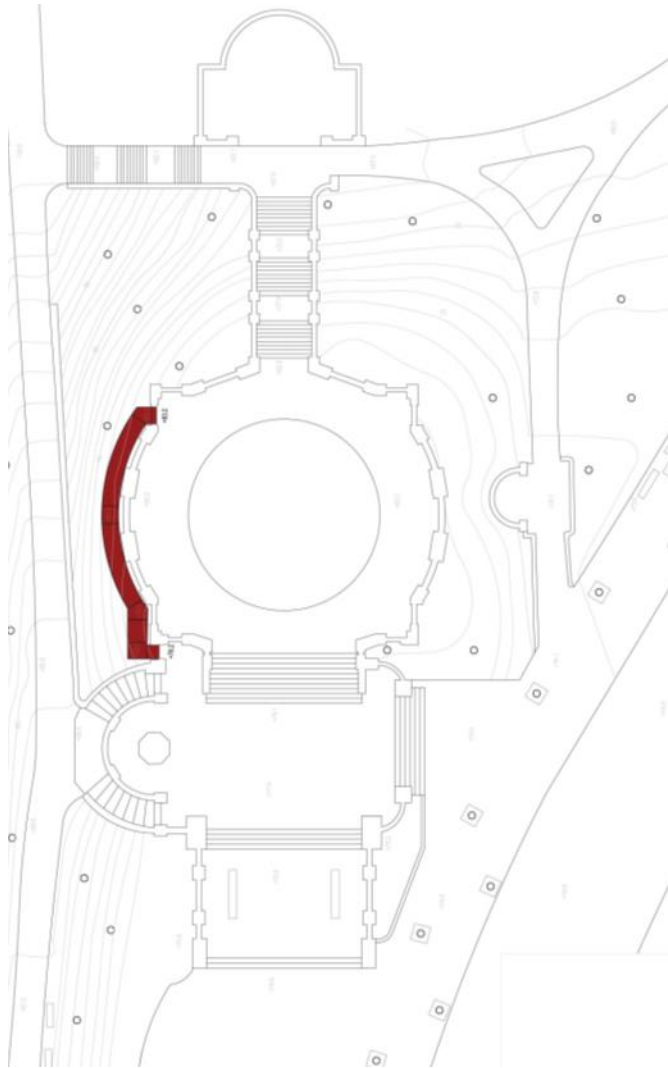
Walkway To Upper Terrace - Model



Walkway To Upper Terrace - Rendering



Walkway To Esplanade - Model



Potential Bio-swale / Rain Garden



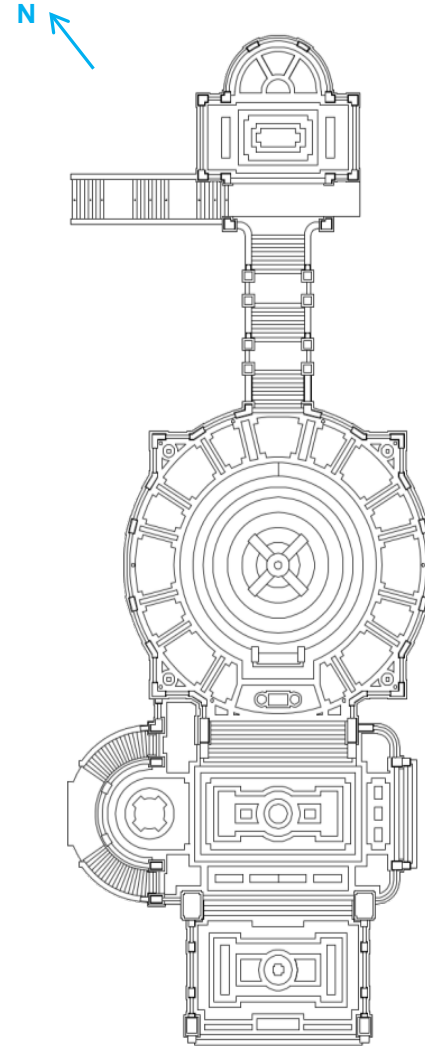
Cost Estimate



Cost Estimate

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

approx. \$29- \$30 Mil.

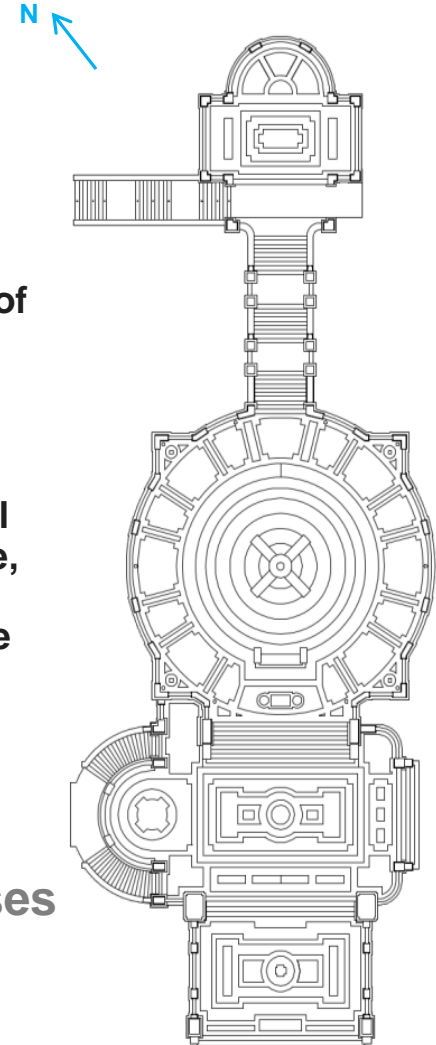


Cost Estimate

Cost Breakdown*

Monument	\$10,500,000
<ul style="list-style-type: none">• Scaffolding, interior and exterior repairs and repointing, roof repair, door restoration, interior floor restoration	
Plazas, retaining walls, and stairs	\$17,000,000
<ul style="list-style-type: none">• 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.







Parks