



BUILDING PRESERVATION
— MATERIAL TECHNOLOGIES —
RESTORING THE PAST, BUILDING THE FUTURE

***Structural and Architectural Restoration of the
Puerto Rico Capital Dome***

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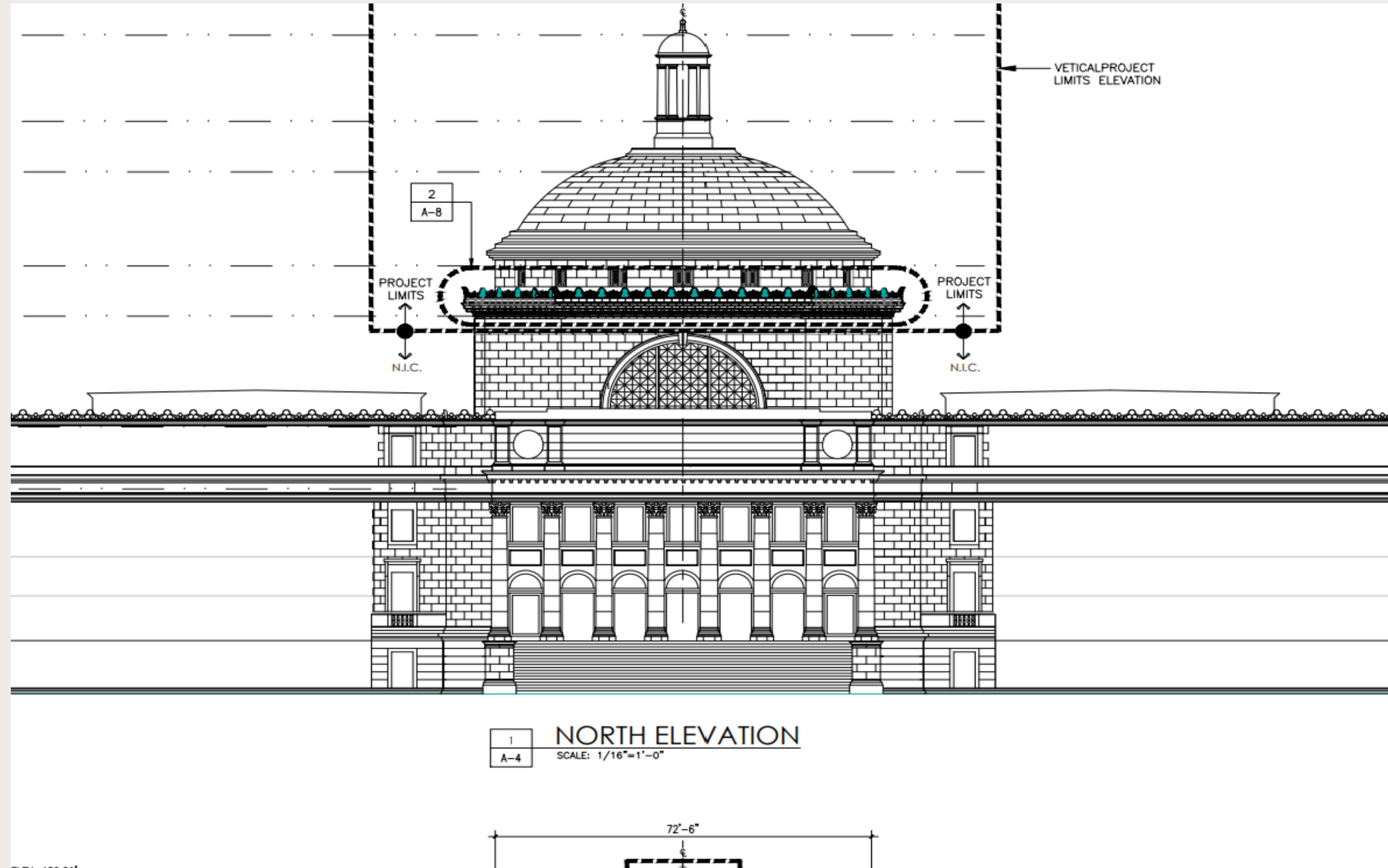


¿Why Rehabilitate?

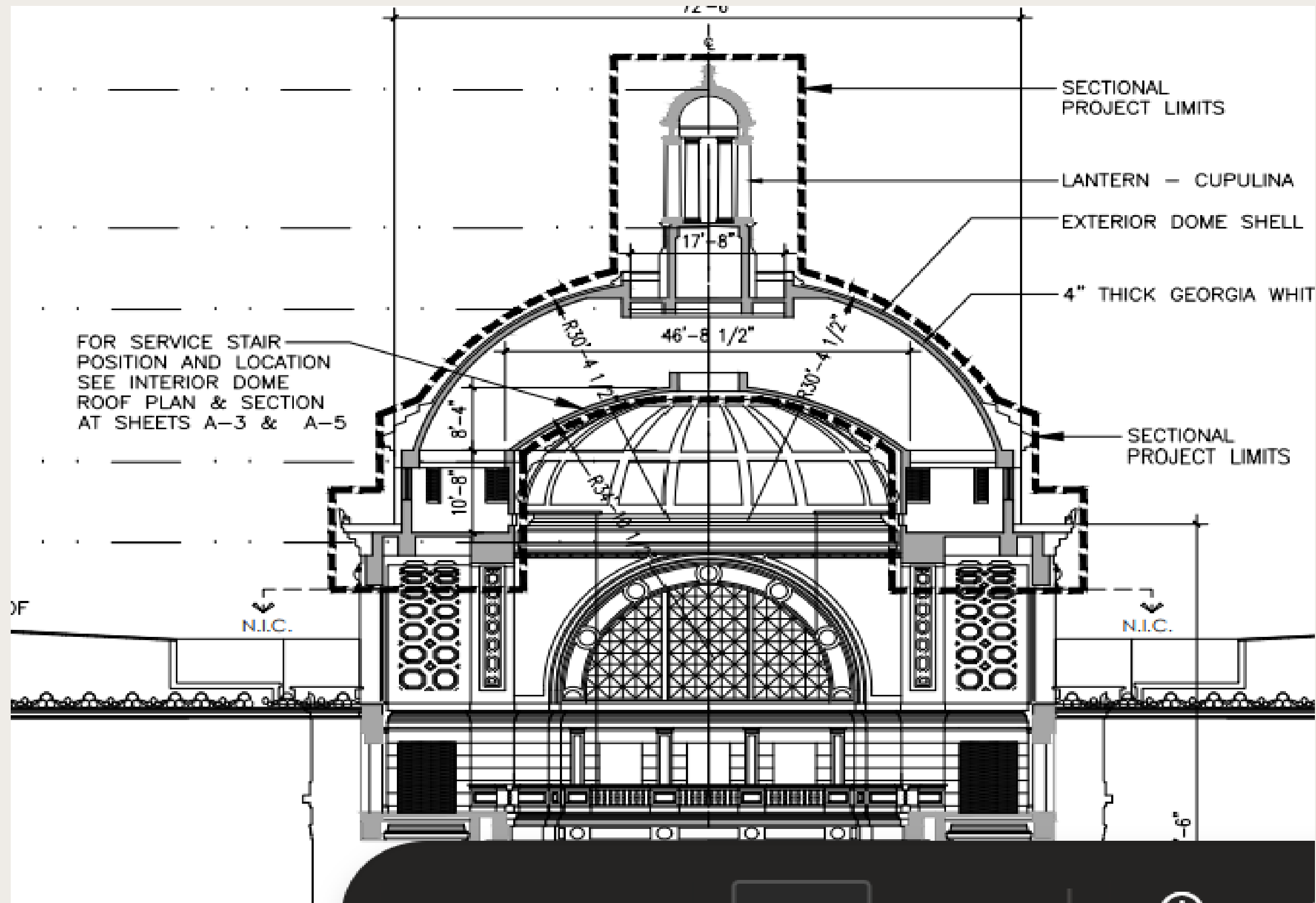
Key Elements:

- *Concrete
Segregation of
Exterior Dome*
- *Concrete
Delamination*
- *Terracotta
Façade Distress*

Dome Exterior



Dome Interior



Existing Conditions of Interior



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Existing Conditions of Interior



Existing Conditions of Interior



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Mar 10, 2023 12:24:57
52 Paseo Covadonga
San Juan Antiguo
San Juan

Existing Conditions of Interior

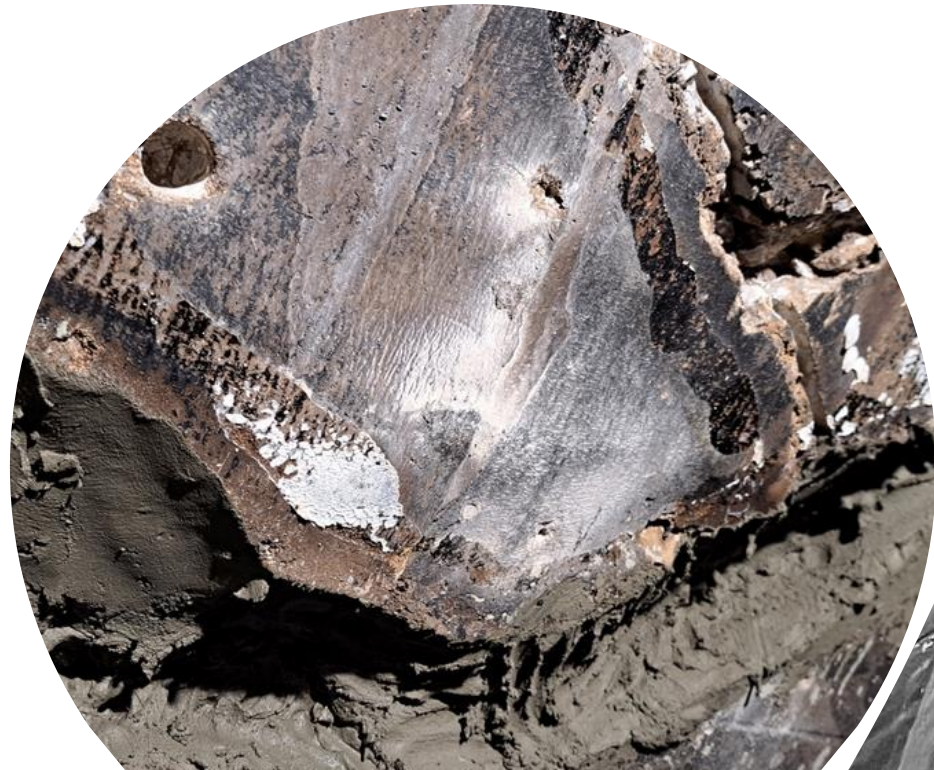


Existing Conditions of Interior



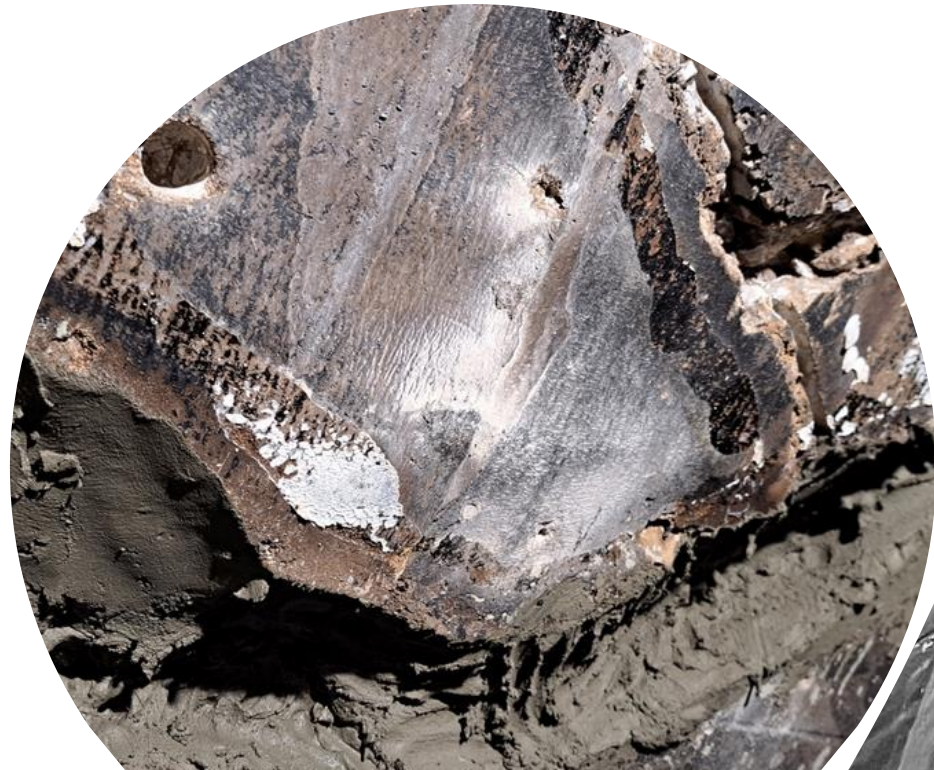
Interior Structural Repairs:

- Principal Challenges
 - Access
 - Concrete Segregation
 - Unforeseen
 - Repair Application:
 - Micro-Cement Injection



Interior Structural Repairs:

- Equipment:
 - Rotor Stator Pump
 - Low Pressure (30 psi max)
 - Performance: Filled 8% (approx.) of total volume
 - Materials: MasterRoc 900 SR

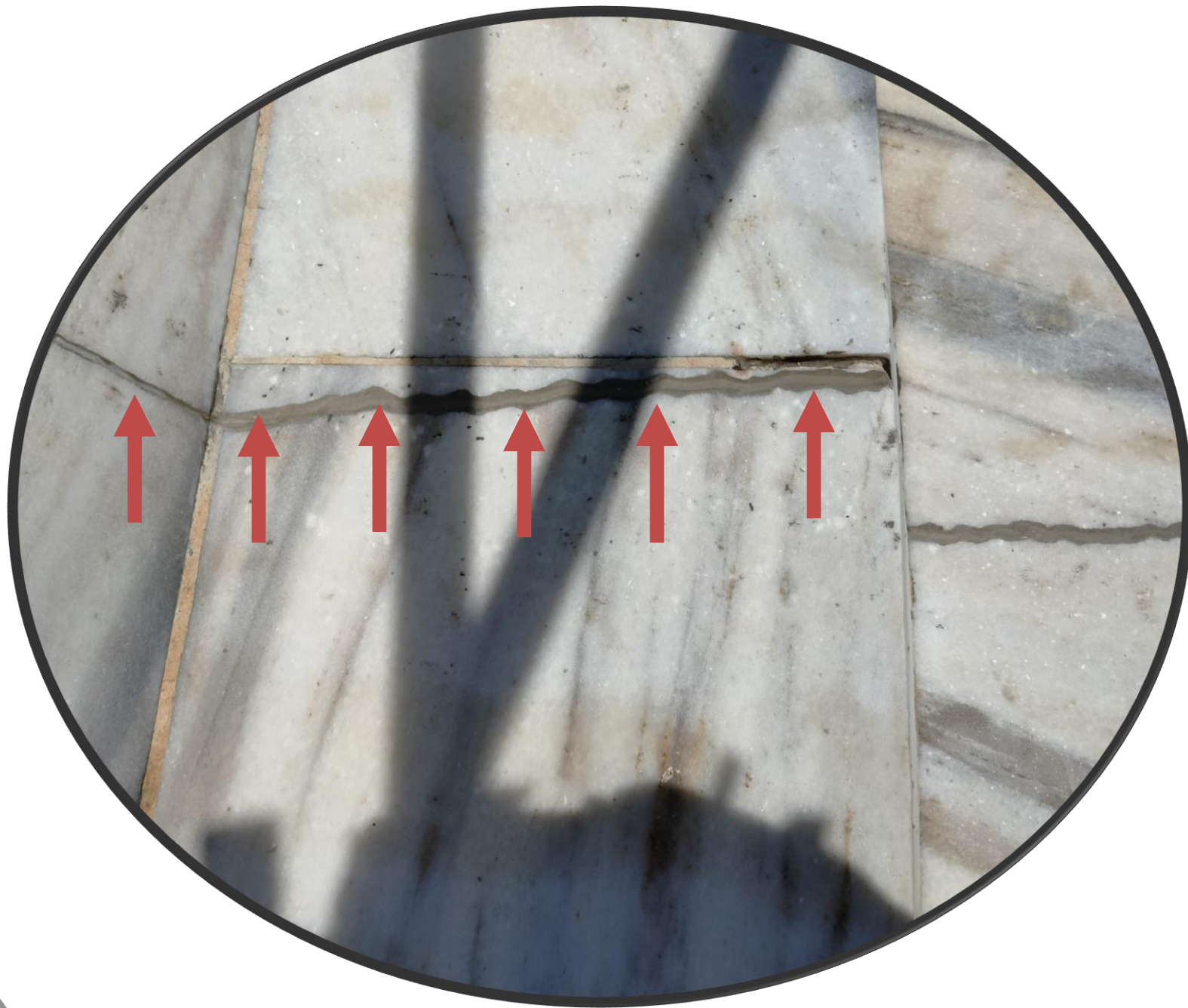


Interior Structural Repairs:



Interior Structural Repairs:

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Interior Works:

- **Main Girders**
 - Microcement Injection
 - Carbon Reinforced Polymers



TERRACOTA FACADE - CHALLENGES

- Coastal zone
- Tropical Environment
- High Winds
- Hurricane Zones
- Maintenance Issues



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Existing Conditions

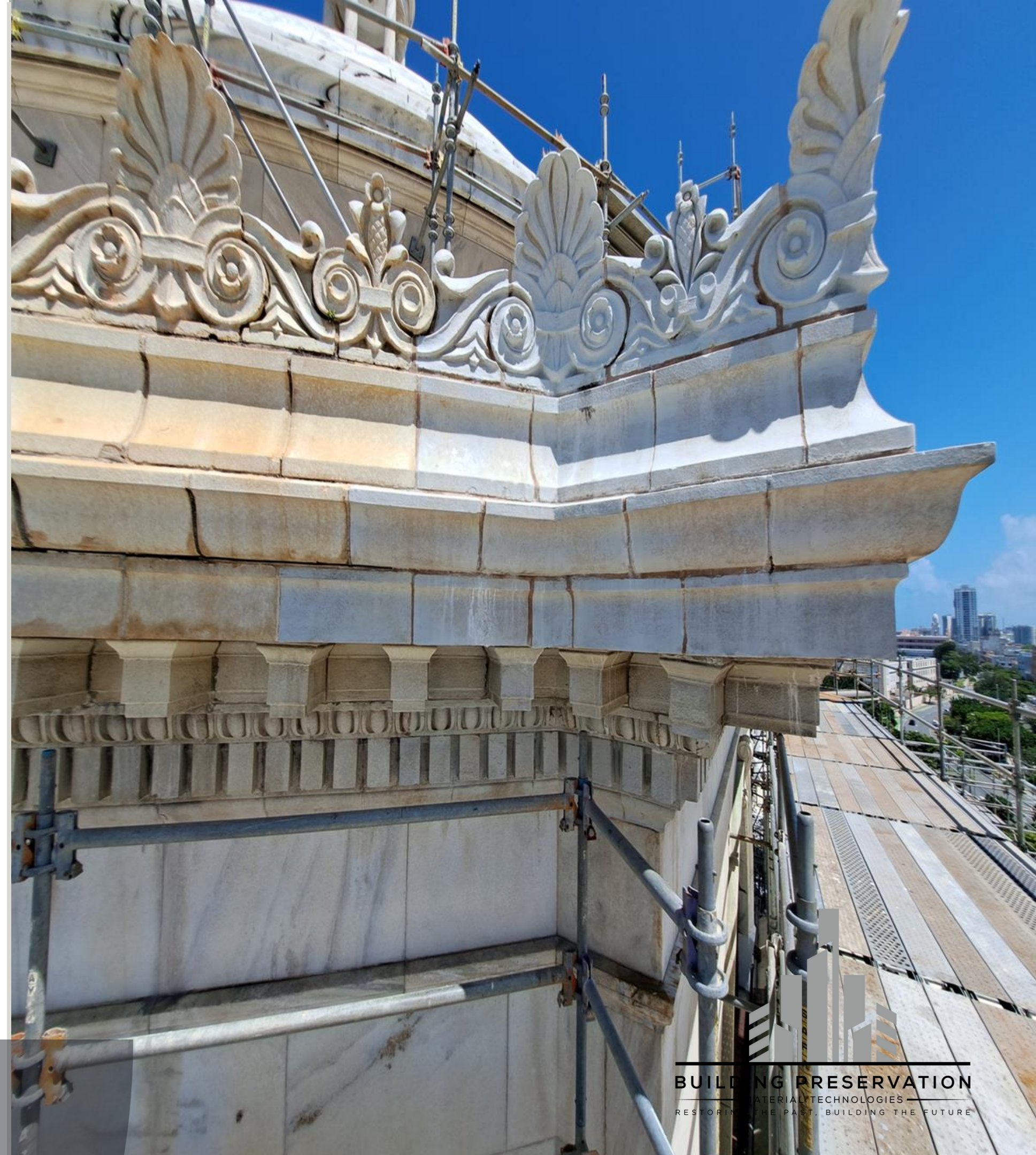
- Corroded Support System
- Collapsed Individual Pieces
- Grout Filled Terracotta individual Pieces
- Previous Repair Attempts



Existing Conditions



Existing Conditions



Existing Conditions-Corners

Cementitious Topping

Fill ("KLINKER")

Concrete Slab

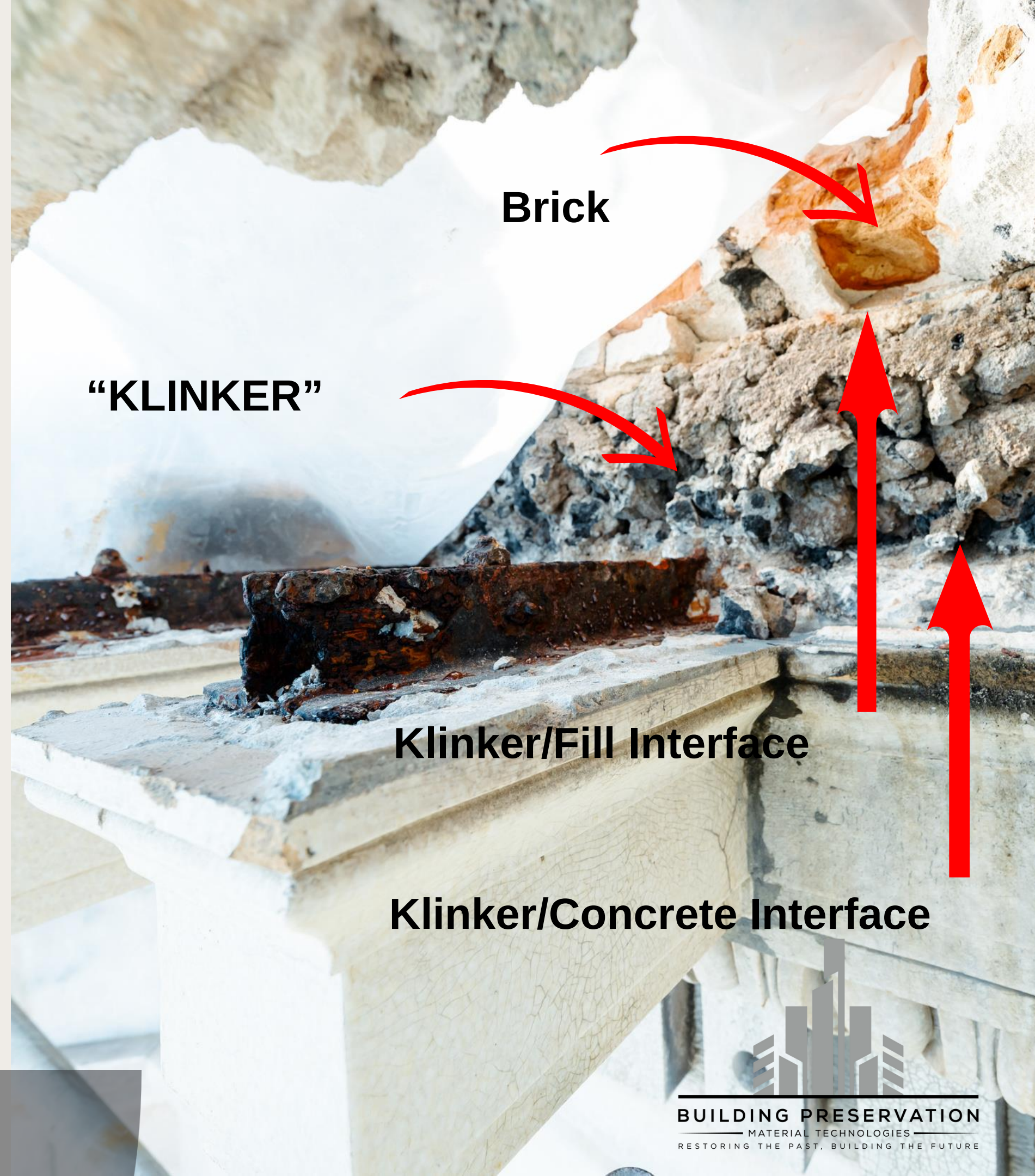
- Delaminated Reinforcement
- Highly Porous Fill

Iron Elements



Existing Conditions

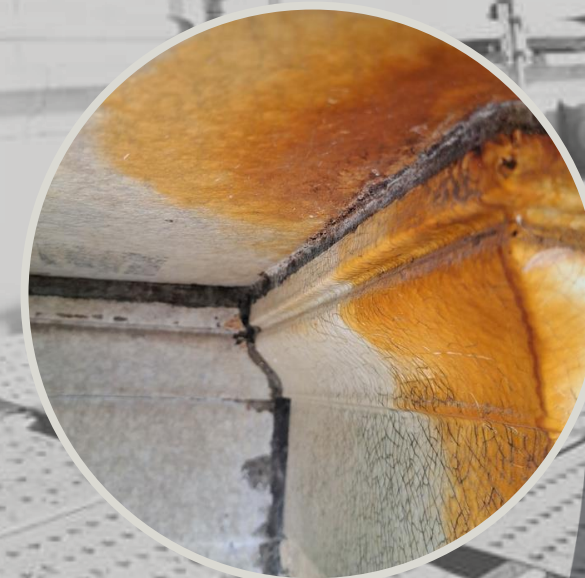
- Multiple Joints



Existing Conditions

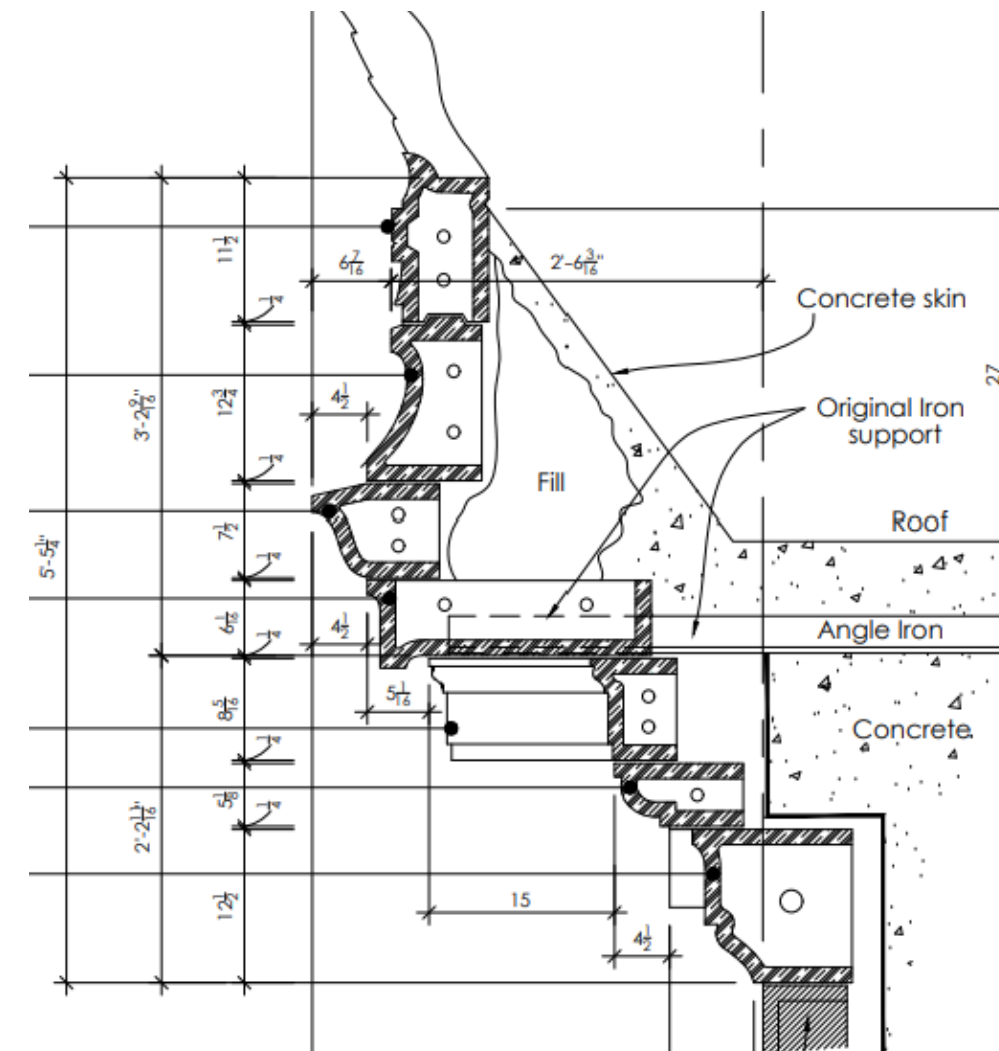


Existing Conditions



Structural System

- Façade supported by Iron Angles at 18" spacing
- Unfilled Terracotta Pieces
- “Klinker” serves as base



Retrofit Challenges

- Need for an Alternate Load Path
- Reinforcing the Façade without Removal
- Inclusion of Seismic Loading
- System Durability
- Interaction of multiple construction materials
- System Protection
- **Corrosion Mitigation**

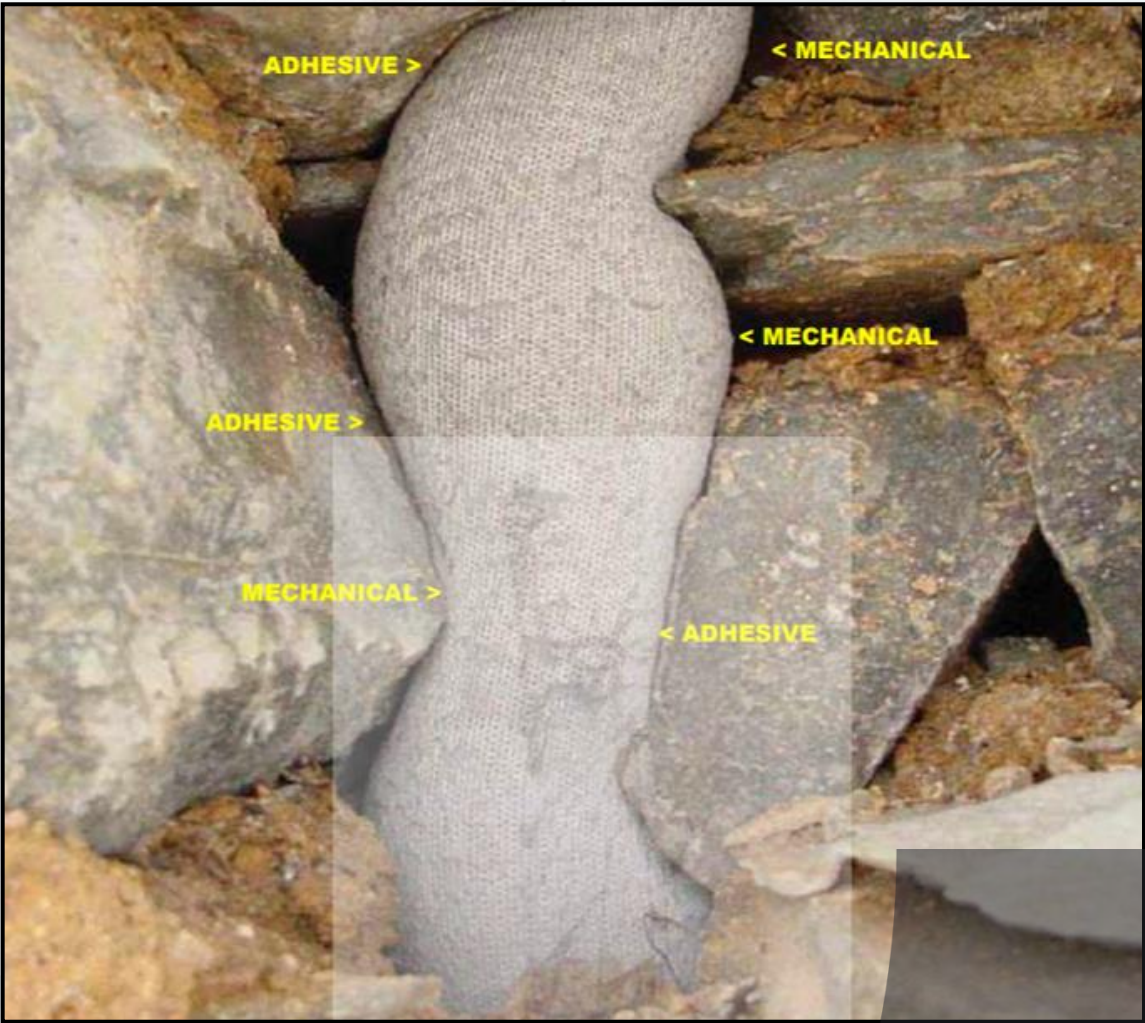
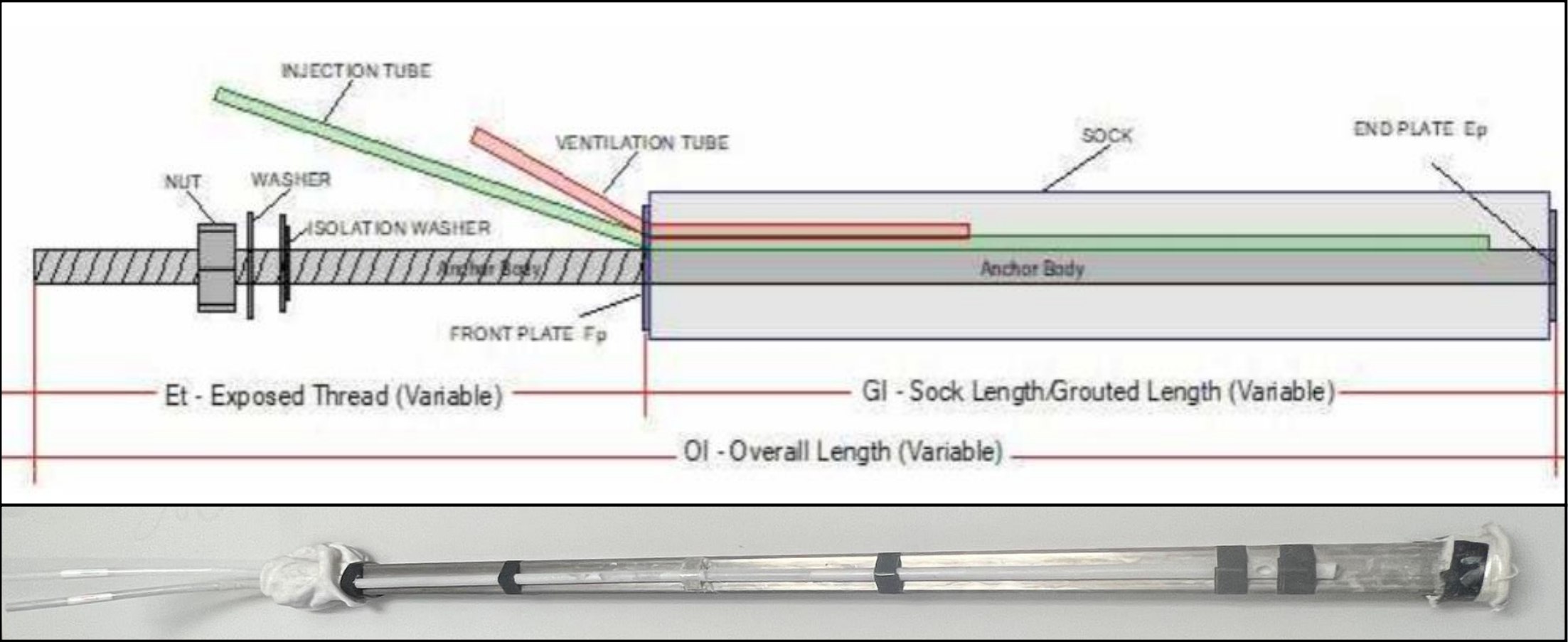


Alternate Reinforcement System

- Cintec Specialty Anchors
- Stainless Steel Angles at Corners
- No need to decompose and Rebuild the facade
- Anchors are Covered by a Specialty grout sock
- Designed for Weak Substrates



CINTEC



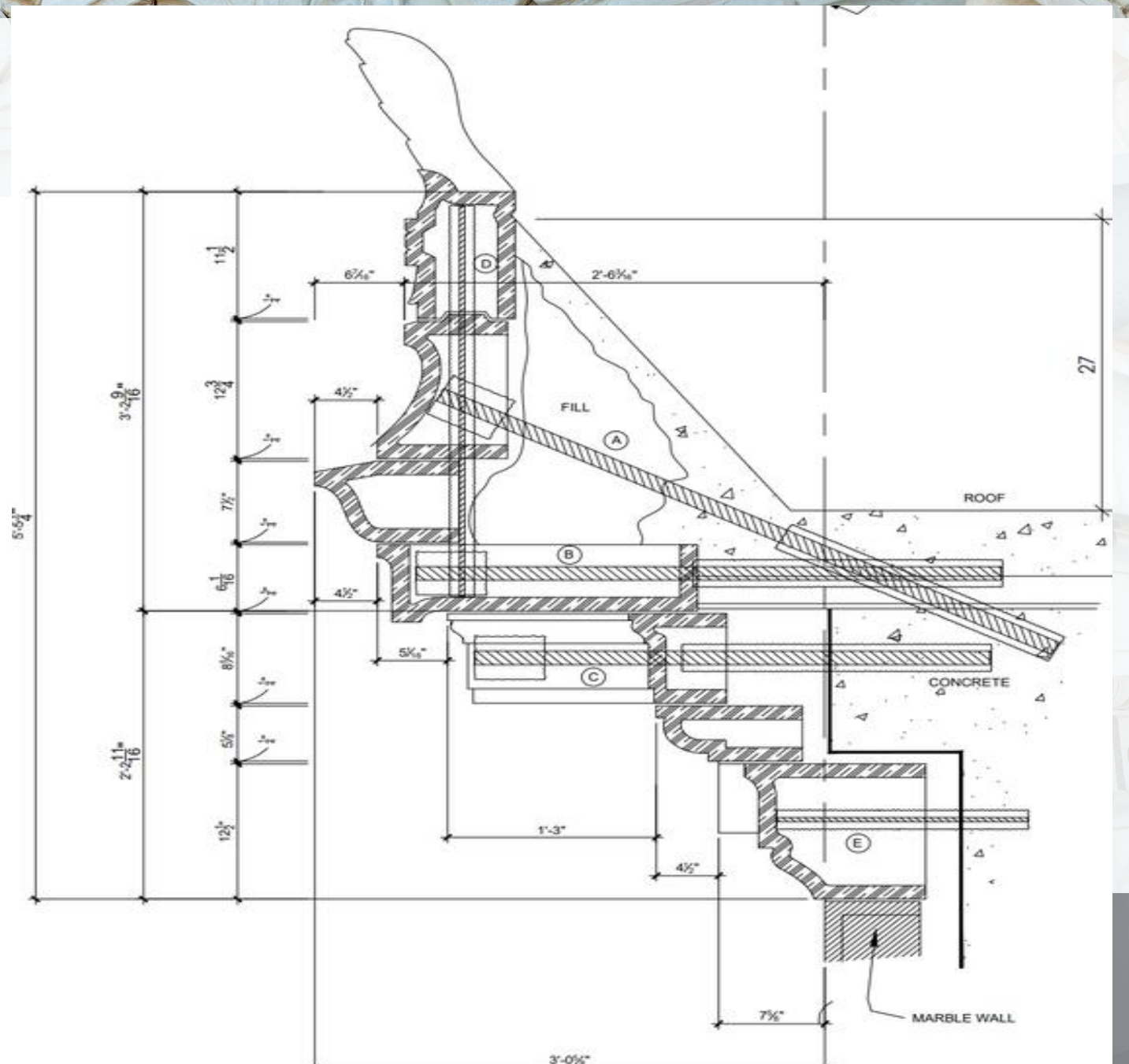
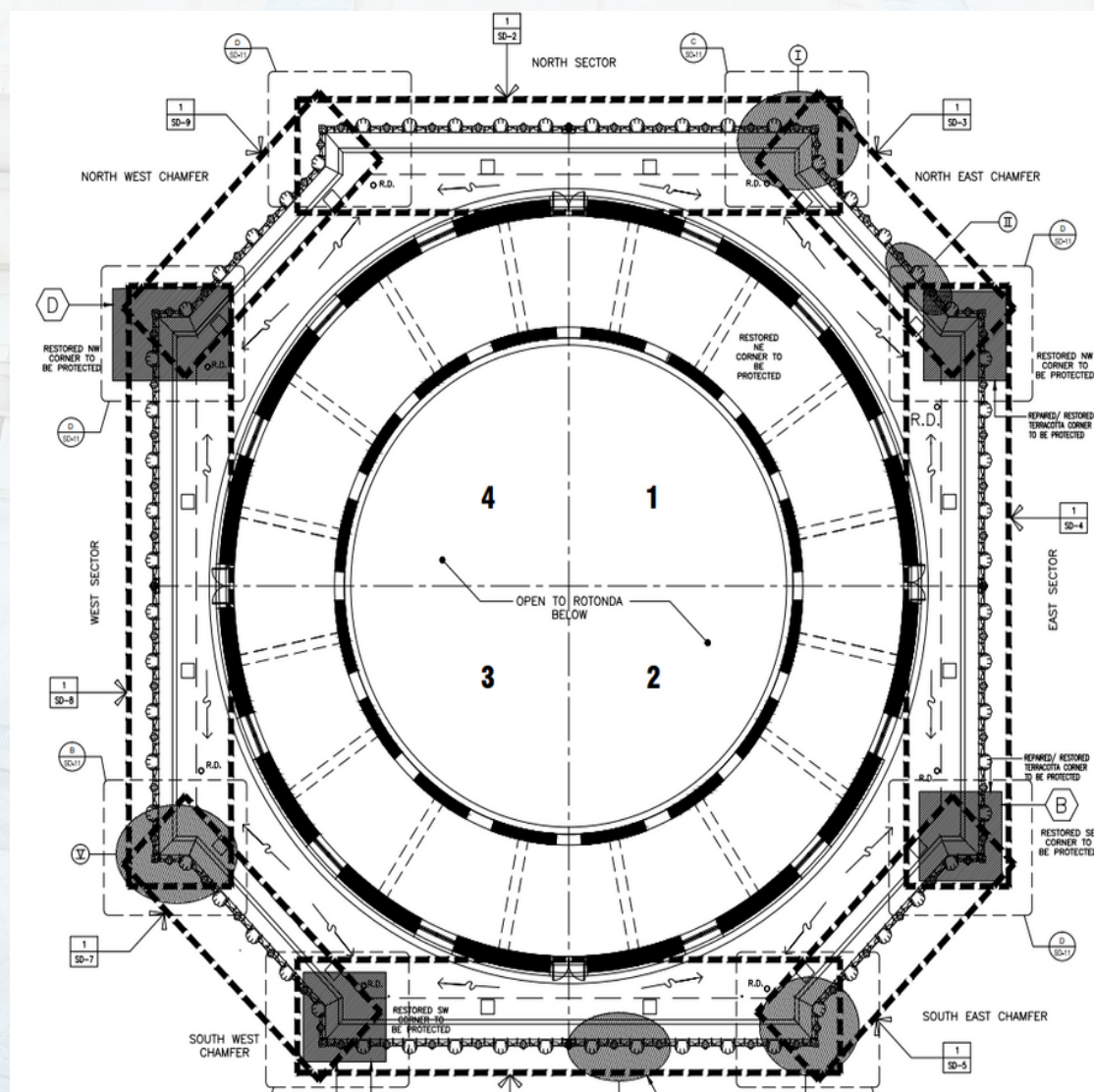
Final Design

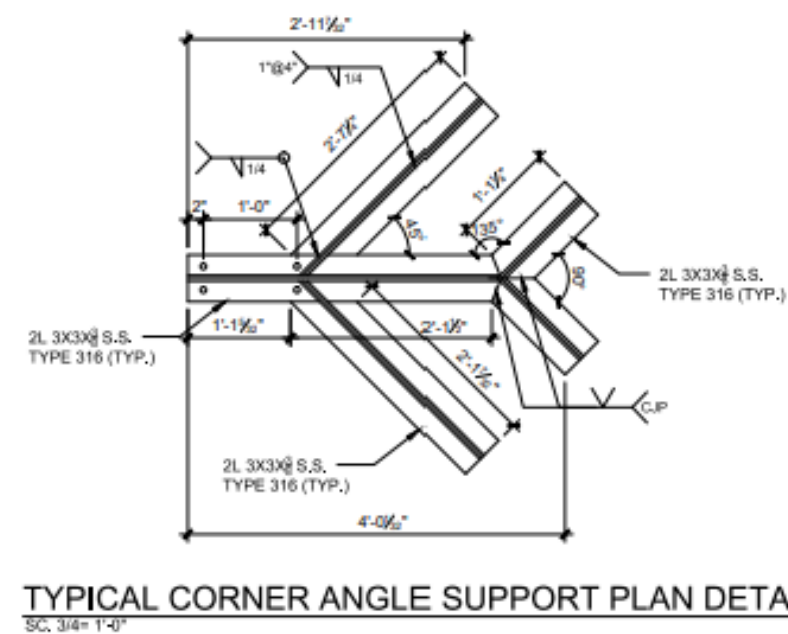
1. Final Design

a. Vertical Loads

b. Seismic

(IBC 2018)



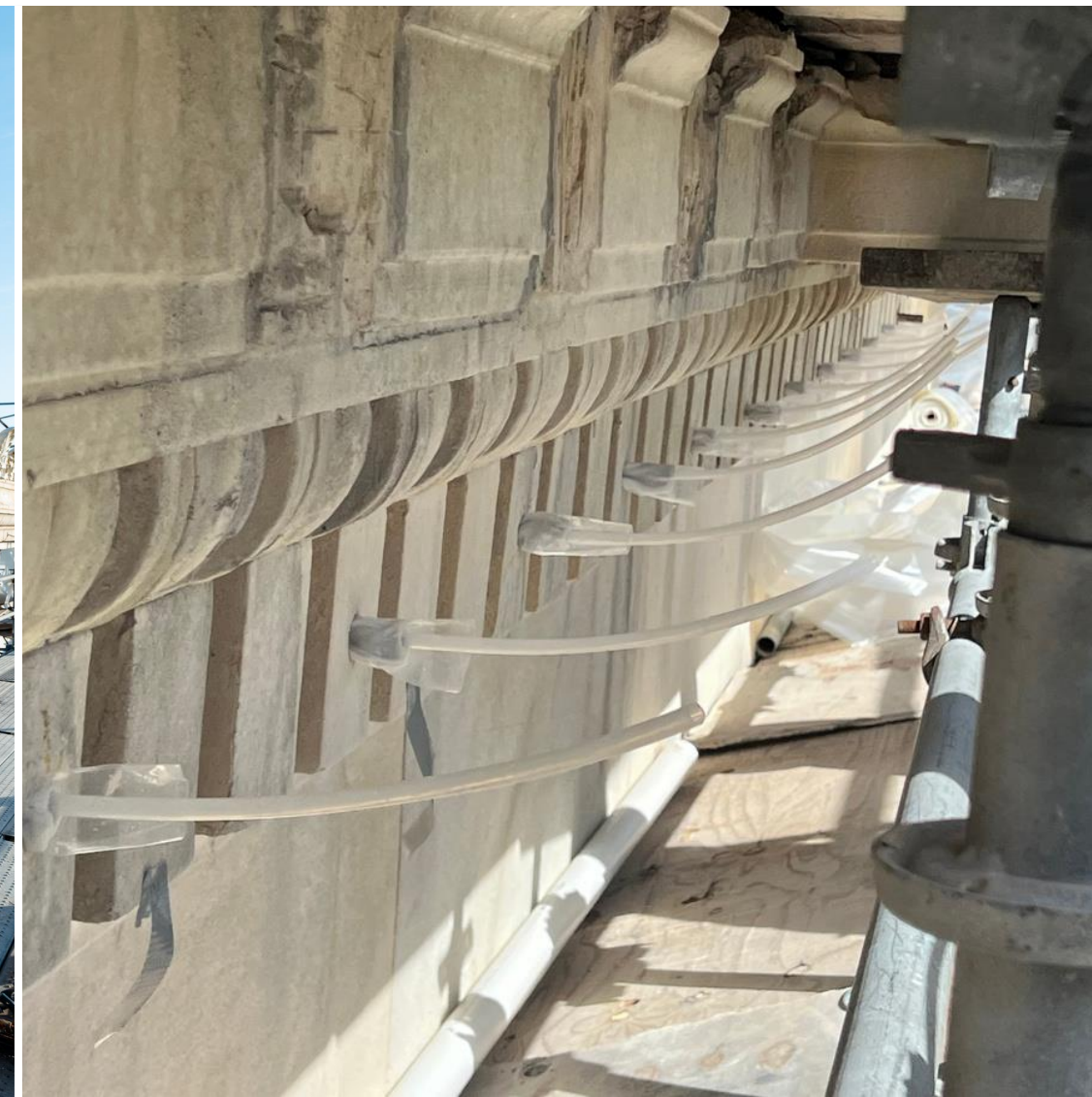


Execution

- Shore Elements
- Remove Modillions
- Remove Iron Angles
- Core Drill for insertion of anchors
- Install Cintec Anchors
- Reinstall Modillions
- Restore Terracotta Facade



Execution



Execution



Execution

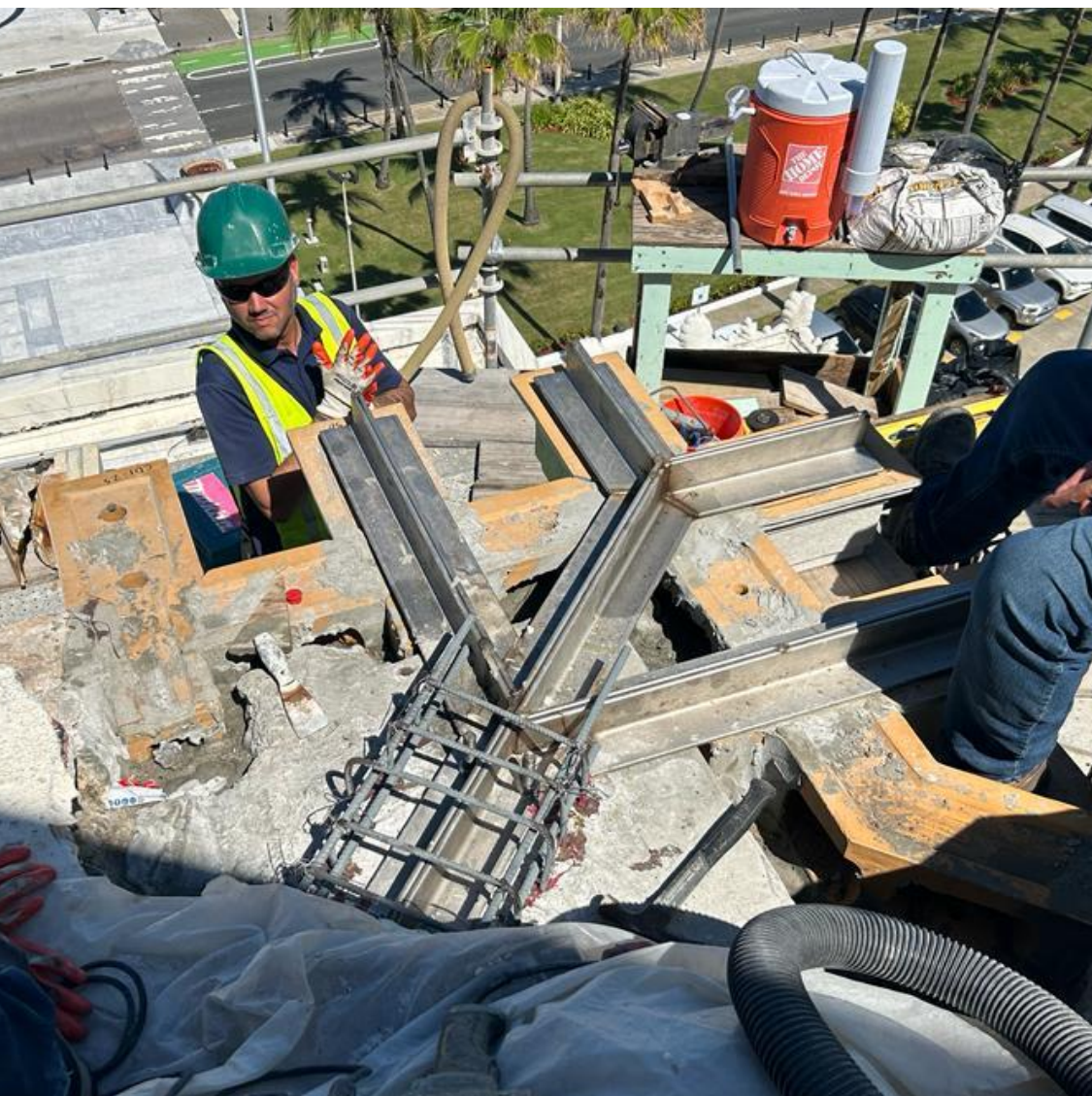
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Execution

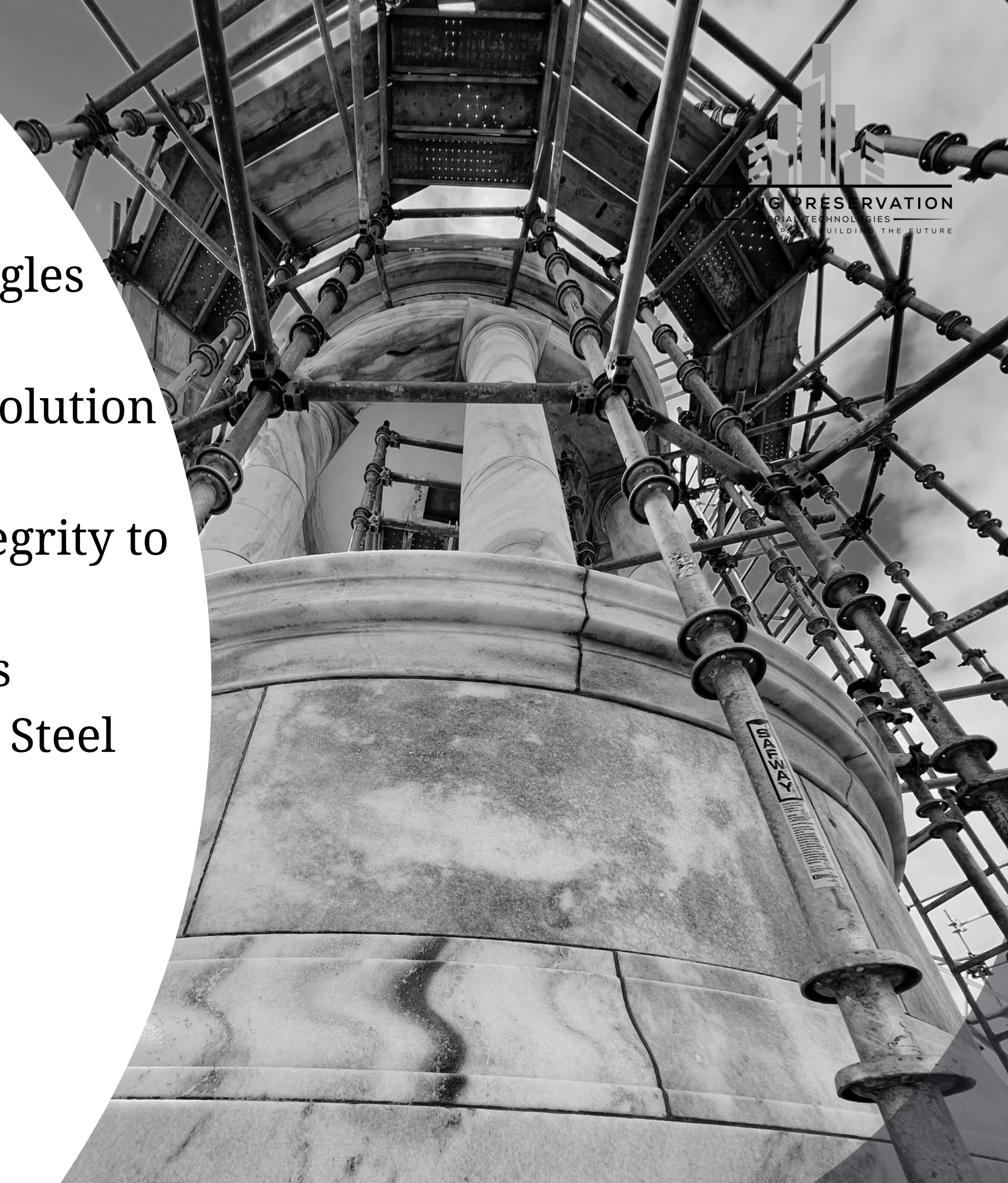


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CONCLUSIONS

- **Terracotta Facade:**
 - Major problem was the corroded angles
 - Lack of Competent Waterproofing
 - Cintec anchors provided a durable solution
- **Dome**
 - Micro-cement injection restored integrity to the domes shell
 - Protects against future water ingress
 - Carbon Fiber: Compensated for lost Steel Cross sectional Area at Beams





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¿Questions?

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