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## The Washington National Cathedral

- Cathedral Church of Saint Peter and Saint Paul
- Seat of the Bishop of the Episcopal Church
- Construction began in 1907 and was "completed" in 1990.
- 6<sup>th</sup> Largest Cathedral in the World
- 2<sup>nd</sup> Largest Cathedral in the US
- Highest Elevation in Washington DC



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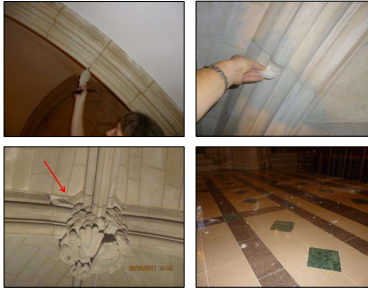
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## Seismic Damage Interior

- Isolated Locations of Unstable Mortar
- Limestone Spalls
- Cracks in Boss Stone, Ribs, and Ceiling Interface



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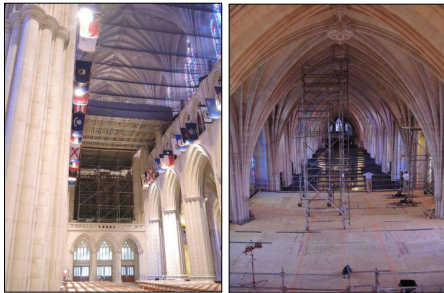
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## Interior Stone Restoration



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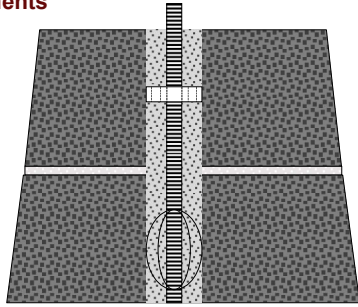
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### Center Coring Components

- Core
- Reinforcement
- Centralizers
- Grout
  - Polyester Resin, Sand
  - Cementitious



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### Strengthening Apse Buttress Lower Flyer



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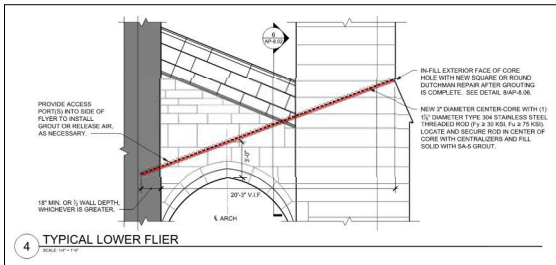
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### Strengthening Apse Buttress Lower Flyer



4 TYPICAL LOWER FLIER  
SCALE: 1/4" = 1'-0"

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**Strengthening**  
Apse Buttress Upper Flyer



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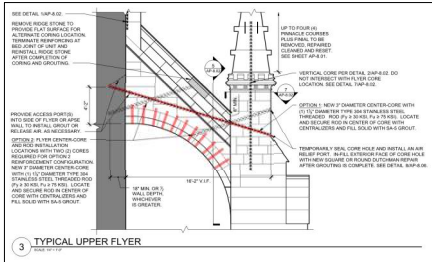
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**Strengthening**  
Apse Buttress Upper Flyer



3 TYPICAL UPPER FLYER

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**Strengthening**  
Apse Buttress Upper Flyer



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**Strengthening  
Pinnacles**



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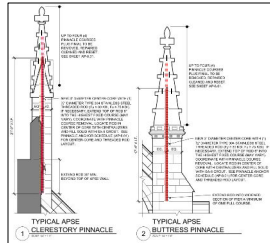
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**Strengthening  
Pinnacles**



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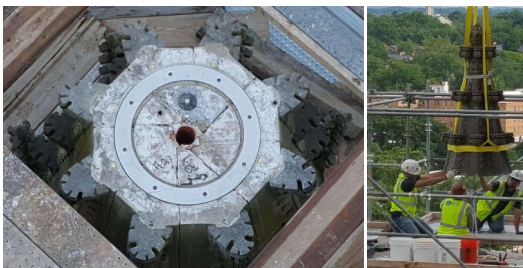
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**Strengthening  
North Transept Turrets**



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**Strengthening**  
South Transept Turret



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**Strengthening**  
South Transept Turret



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**Strengthening**  
South Transept Turret



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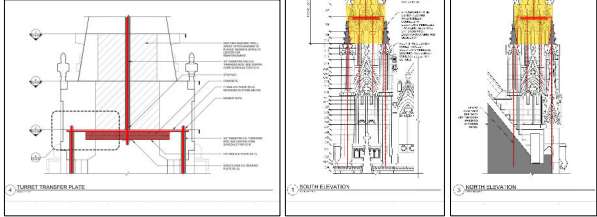
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**Strengthening**  
South Transept Turret



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**Strengthening**  
South Transept Turret



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**Strengthening**  
South Transept Turret



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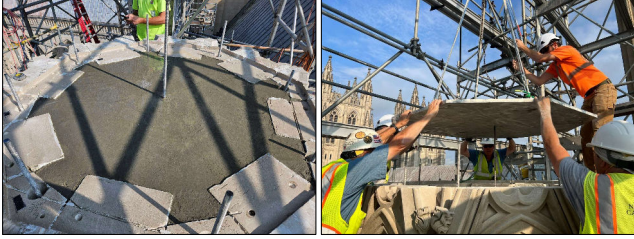
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**Strengthening**  
South Transept Turret



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**Strengthening**  
South Transept Turret



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**Strengthening**  
South Transept Turret



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**Strengthening**  
South Transept Turret



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**Strengthening**  
South Transept Turret



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**Stone Restoration**  
North Transept Turrets



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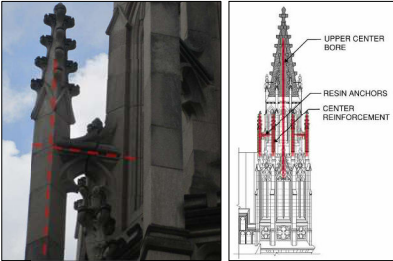
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**Stone Restoration**  
North Transept Turrets



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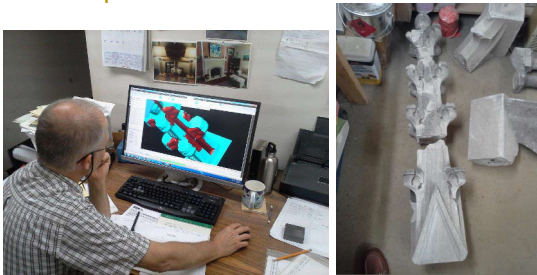
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**Stone Restoration**  
North Transept Turrets



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**Stone Restoration**  
North Transept Turrets



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**Stone Restoration**  
North Transept Turrets



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**Stone Restoration**  
North Transept Turrets



32

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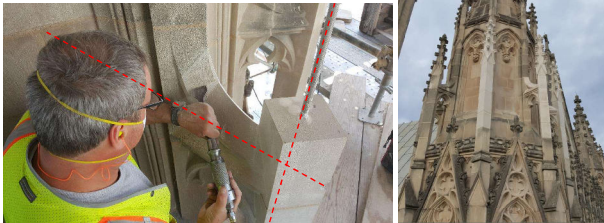
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**Stone Restoration**  
North Transept Turrets



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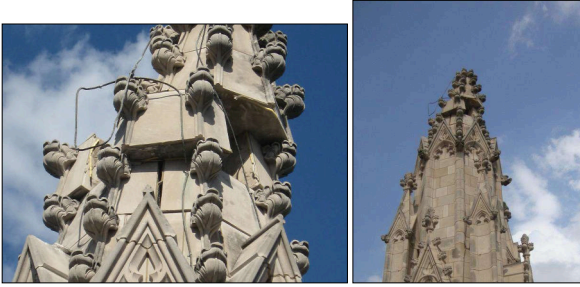
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**Stone Restoration**  
Central Tower Grand Pinnacles



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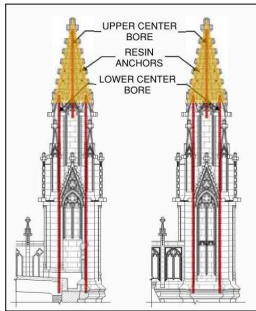
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**Stone Restoration**  
Central Tower Grand Pinnacles



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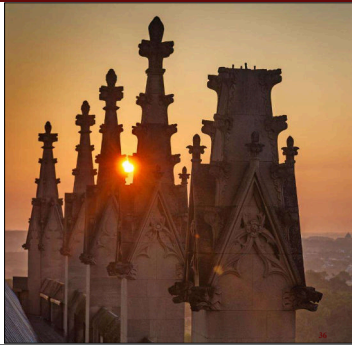
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**Questions?**

MATTHEW FARMER, PE | SENIOR PRINCIPAL  
WISS, JANNEY, ELSTNER ASSOCIATES, INC.



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