

# Historic Preservation Work following Hurricanes and Lessons Applicable to All Disaster Recovery

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# Introduction

- Disaster damage to historic buildings
- Three stages of disaster recovery:
  - Pre-disaster planning
  - Immediate post-disaster response
  - Long term recovery and lessons learned
- Examples

# Disaster damage to historic buildings

- Fire, earthquake, tornado, flood, hurricane
  - Lessons applicable to all but we will focus on hurricane damage

# Fire





# Earthquake





# Tornado





# Flood



# Hurricane





# Disaster damage to historic buildings

- Focus on hurricane damage in Charleston
  - Wind damage
  - Water intrusion
  - Damage to the spirit of the residents



# Three stages of disaster recovery

- Pre-disaster planning
- Immediate post-disaster response
- Long term recovery and lessons learned

# Pre-disaster planning

- Documentation
  - Digital camera
- Protection
  - Window protection
  - Supplies for post-disaster recovery

# Immediate post-disaster response

- Stabilization of the structure
- Prevention of further water intrusion
- Prevention of further damage by owners, public officials and volunteers
- Taking care of the needs of the people

# Finances

- Insurance settlements
- Fund raising

# Insurance Settlements

1. Avoid fast settlements.
2. Produce Contract Documents for work needed to return structure to its pre-disaster condition.
3. Select qualified contractors to bid the work.



# Insurance Settlements

4. Take the low bid as a starting point for negotiation with the insurance company.
5. Get the insurance company to buy in every step of the way.
6. Keep good legal counsel.

# Insurance Settlements

7. Use the insurance settlement as a starting point for the recovery work, but realize that only rarely will an insurance settlement cover the cost of the work.

# Fund raising

- Almost all disaster recovery will require that funds, beyond cash-on-hand and insurance settlements, be raised.

# Codes and government entities

- Maintain focus on preservation standards
  - Historic preservation is not new construction
  - IEBC
  - Don't let the immediate overshadow the long term... the rules of historic preservation don't change just because of a hurricane



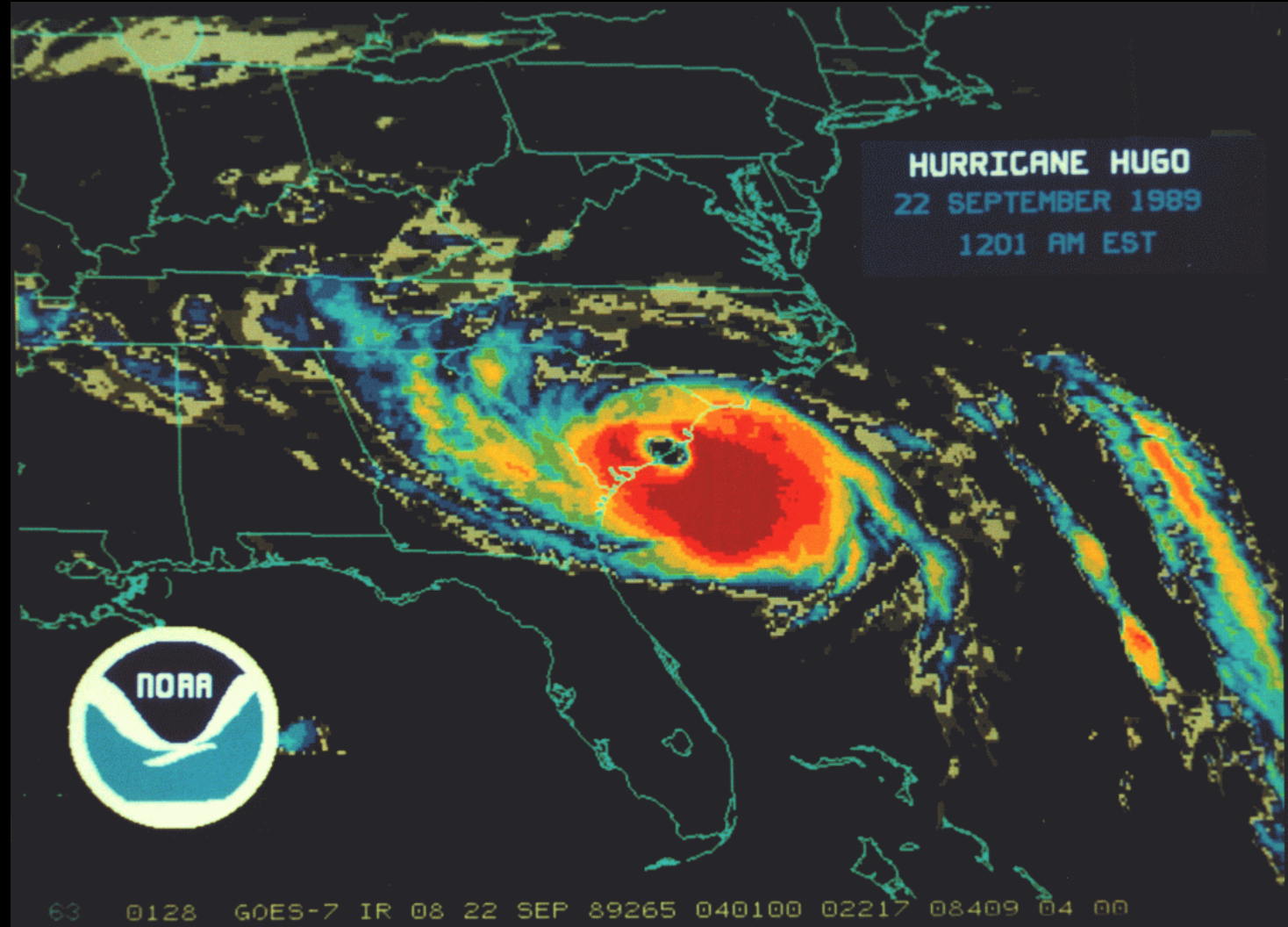


# Examples

Hurricane Hugo – Charleston, 1989

# Hurricane Hugo

- Winds
  - 135 MPH
  - Cat 4



# Hurricane Hugo

- Immediately obvious damage from water and wind
  - Roofs damaged or destroyed on the majority of buildings, particularly historic structures
  - Structural damage to some historic structures
  - Water damage throughout almost all interiors

# Hurricane Hugo

- Marine damage



# Hurricane Hugo

- Damage on the beaches





# Hurricane Hugo

- Damage on the barrier islands



# Hurricane Hugo

- Damage in the small towns north of the city





# Hurricane Hugo

- Damage in the City of Charleston



Charleston residents paddle through a street turned to a stream by Hurricane Hugo



# Hurricane Hugo

- Damage in the City of Charleston

## Hugo's wrath



S.C. residents and business people returned to King Street on Friday to pick through the rubble left by Hugo. Staff photo

rm leaves 14 dead, \$1 billion dama

# Hurricane Hugo

- Damage in the City of Charleston



# Hurricane Hugo

- Damage which becomes apparent later
  - Long term water damage to finishes, particularly plaster and paint
  - Mold
  - Vibration – Stucco failures, structural damage

# Hurricane Hugo

- Damage which becomes apparent later
  - Vibration – Stucco failures, structural damage





# Hurricane Hugo

- Damage which becomes apparent later
  - 3 years after Hugo





# Hurricane Hugo

- Damage which becomes apparent later
  - 3 years later
  - Netting to catch stucco



# Hurricane Hugo

- Damage which becomes apparent later

Vibration –  
Stucco  
failures,  
structural  
damage





# Hurricane Hugo

- Damage which becomes apparent later

Damage  
becoming  
apparent  
10 years  
after Hugo





# Hurricane Hugo

- Damage which becomes apparent later

Vibration –  
Stucco  
failure



# Hurricane Hugo

- Damage which becomes apparent later

Vibration –  
Stucco  
failure





# Hurricane Hugo

- Damage which becomes apparent later

Major stucco  
loss 20  
years later



# Hurricane Hugo

- Effect on people
  - Living is a struggle
  - Inability to deal with finances
  - Depression

# Hurricane Hugo

- Effect on people
  - No electricity, no heat, no air conditioning, no refrigeration
  - No water, no sanitary sewer
  - No transportation





# Hurricane Hugo

- Effect on people
  - Life as you know it comes to a halt



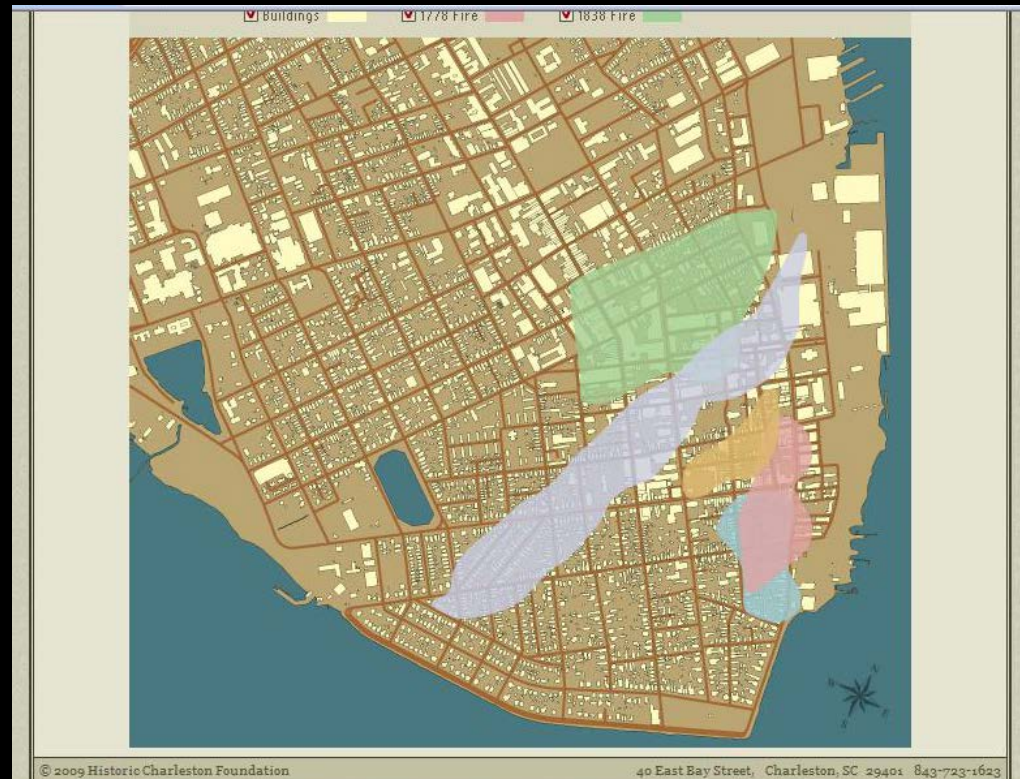
# Hurricane Hugo

- But this wasn't Charleston's first disaster, and it won't be its last
  - Nine recorded hurricanes, including 1751, 1890s, 1911, 1959, 1989
  - We can expect a major hurricane every 30 to 50 years



# Hurricane Hugo

- But this wasn't Charleston's first disaster, and it won't be its last
  - Five great city fires, including 1778, 1836, 1839, 1861



# Hurricane Hugo

- But this wasn't Charleston's first disaster, and it won't be its last
  - Tornado of 1937



# Hurricane Hugo

- But this wasn't Charleston's first disaster, and it won't be its last
  - Earthquake of 1886

## Map of shaking intensity caused by the 1886 Charleston earthquake.

USGS map taken from abridged from *Seismicity of the United States, 1568-1989 (Revised)*, by Carl W. Stover and Jerry L. Coffman, U.S. Geological Survey Professional Paper 1527, United States Government Printing Office, Washington: 1993.



# Hurricane Hugo

- But this wasn't Charleston's first disaster, and it won't be its last
  - Earthquake of 1886





# Hurricane Hugo

- But this wasn't Charleston's first disaster, and it won't be its last
  - The Civil War  
1861-1865



# What lessons have we learned?

- Other disasters have hit the city, and more will hit in the future.
- Next, we'll look at:
  - Pre-disaster planning
  - Immediate response
  - Extended recovery and restoration

# What lessons have we learned?

- Pre-disaster planning
  - You need good documentation of structures and of their condition
    - Historic Structures Reports
    - Photographs
    - Videos

# What lessons have we learned?

- Immediate response
  - Take care of the people.
    - They won't repair historic structures when they don't have a roof or meal.



# What lessons have we learned?

- Immediate response
  - Arrest damage with temporary, relatively inexpensive work.
    - Shore to prevent collapse
    - Rapid draining, slow drying
    - A roof of cheap 90 lb rolled roofing is a much better roof than having no roof. It's even a better roof than a poorly installed expensive roof. The slate and standing seam copper can come in 3 to 5 years.

# What lessons have we learned?

- Immediate response
  - Get the finances right.
    - People won't recover from a disaster when they can't pay for anything.
    - Avoid the temptation to accept an early insurance settlements.

# What lessons have we learned?

- Immediate response
  - Don't forget historic preservation.
    - Avoid the temptation to throw the rules of good historic preservation out of the window in the interest of expediency.

# What lessons have we learned?

- Extended recovery and restoration
  - Get the finances right, particularly with insurance settlements.
  - Get on with permanent repairs.



# What lessons have we learned?

- Extended recovery and restoration
  - Insurance settlements: *a fair procedure*
    - Have a lawyer advise on insurance settlements.
    - Have all design work done by architects, conservators and engineers skilled in historic preservation.
    - Have the design team prepare *biddable contract documents* for only the repair and restoration work needed as a result of the disaster.

# What lessons have we learned?

- Extended recovery and restoration
  - Insurance settlements: *a fair procedure*
    - Have the insurance company agree that the repair documents cover only disaster repair.
    - Get bids from pre-qualified contractors on biddable contract documents to determine the costs of the repairs. Don't allow anyone other than a craftsman skilled in his trade to do permanent work.

# What lessons have we learned?

- Extended recovery and restoration
  - Insurance settlements: *a fair procedure*
    - With the low bid in hand, settle or, if need be, litigate the insurance claim.
  - Only then, should you proceed with permanent recovery and restoration work.

# What lessons have we learned?

- Successful approach
  - St. Michael's Church
  - 1751, National Historic Landmark
  - Spire knocked out of position
  - Slate roof damaged
  - Significant interior plaster damage





# What lessons have we learned?

- Successful approach
  - St. Philip's Church
  - 1835, National Historic Landmark
  - Spire knocked out of position
  - Standing seam metal roof damaged
  - Significant interior plaster damage



# Recent example on applying the lessons learned

- Damage to a National Historic Landmark church
  - Installation of a trenchbox using a trackhoe – severe vibration
  - Settlement of portions of building
  - Cracking of masonry, stucco and plaster

# Recent example on applying the lessons learned

- Damage to a National Historic Landmark church
  - Pre-disaster planning
  - Immediate response
  - Extended recovery and restoration

# Recent example on applying the lessons learned

- Pre-disaster planning
  - Construction across the street had caused the owners of the building under construction to prepare for problems.
  - A structural engineer had made videos and a report on condition of the surrounding buildings, including this church, before construction began.



# Recent example on applying the lessons learned

- Potential problem:
  - Heavy construction machinery in a historic setting



# Recent example on applying the lessons learned

- Damage:
  - Installation of a trenchbox using a trackhoe
  - Severe vibration



# Recent example on applying the lessons learned

- Damage
  - Settlement of portions of building
  - Cracking of masonry, stucco and plaster





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# Recent example on applying the lessons learned

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  - Settlement of portions of building
  - Cracking of masonry, stucco and plaster



# Recent example on applying the lessons learned

- Immediate response: stop further damage
  - Keep the water out of the building
    - Temporarily cover the cracks in the building skin



# Recent example on applying the lessons learned

- Immediate response: stop further damage
  - Don't let the trenchbox damage the foundation further
    - Don't extract the trenchbox!
    - Grout the loose soils around the box
    - Install grouted piles under the box
    - Fill the box, including the hollow side walls
    - Abandon the box in place

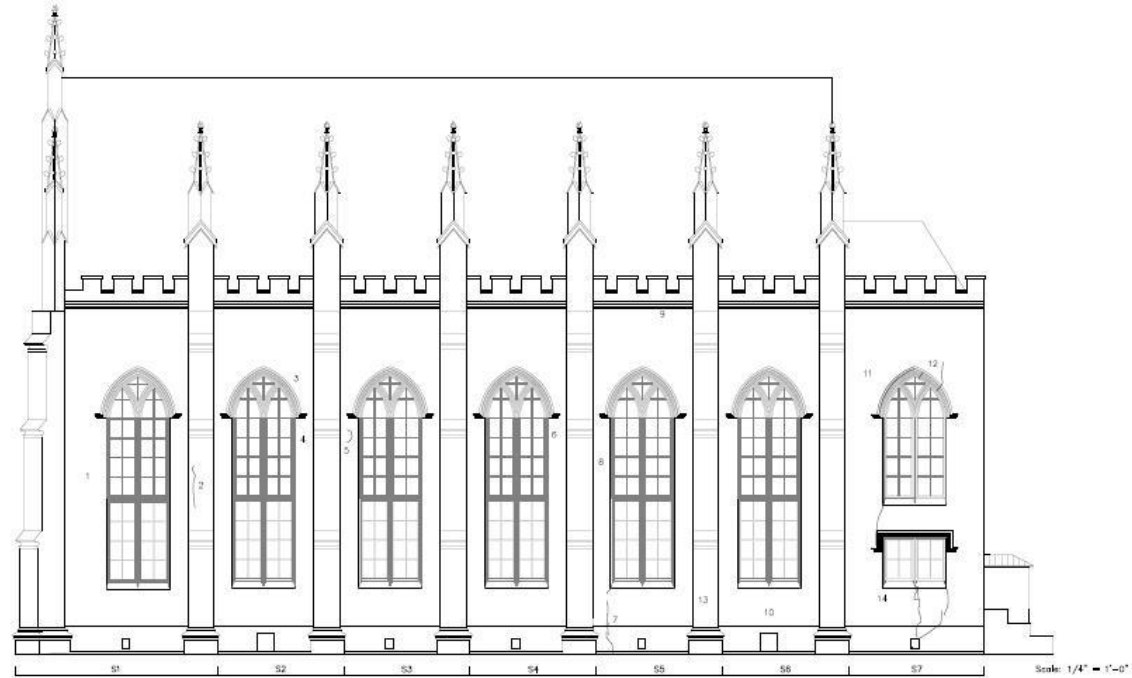
# Recent example on applying the lessons learned

- Report on damage to the building
  - Documentation of pre-existing cracks
  - Documentation of post-damage cracks
  - Damage caused by installation of the trenchbox is the difference between the two

# Recent example on applying the lessons learned

- Report:
  - Documentation of pre-existing cracks





Notes and Commentary from Russell Rowley's Preconstruction Survey:  
 1, S1: Cemetery - looking at south wall. Some minor paint defects in the stucco at the south wall.  
 2, S2: First buttress has crack in stucco.  
 3, S3: Peeling paint over exposed window set on surface and adjacent wood.  
 4, S4: Significant deterioration between stucco and wood.  
 5, S5: Third window set - peeling paint from stucco surface behind paint.  
 6, S6: Fourth window set - peeling paint both on stucco and wood. Separation is occurring between the materials.  
 7, S7: Fifth window set - There are visible cracks in the Preconstruction Survey recording, located below the window.  
 8, S8: Paint failure on wall adjacent to window.  
 9, S9: Piece of reinforcing steel at cornice work is rusted and spalling.

10, S10: Sixth window set was skipped during Preconstruction Survey.  
 11, S11: Southwest corner - Surfaces have some light staining and small paint failure.  
 12, S12: There is cracking here that continues down through top edge of window (not visible inside).  
 13, S13: Paint failure on adjacent buttress.  
 14, S14: Cracking all through this area.

OK

OK

OK

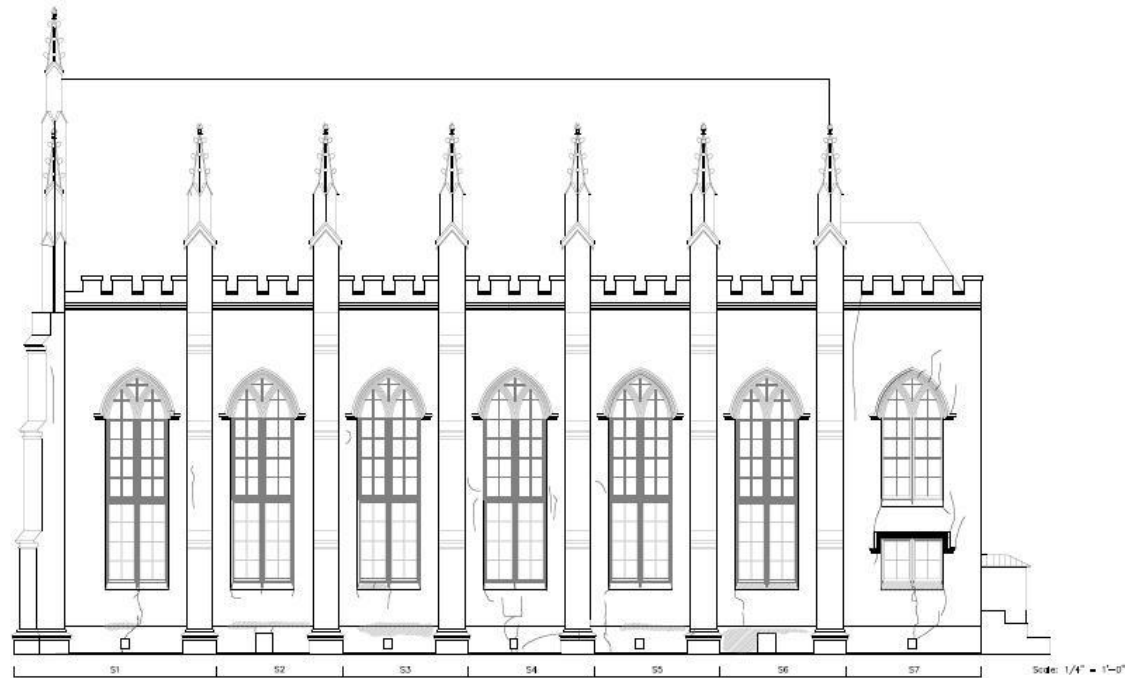

**South Elevation  
Preconstruction  
Conditions**

BY:	CMS, J
CHK:	FLM, TFA, HOK
DESIGN:	CMS, J
DATE:	FEB. 6, 2009
PROJECT:	08-009

**S5**  
 5 / 12

# Recent example on applying the lessons learned

- Report:
  - Documentation of post-damage cracks



**Notes:**  
 S1: The crack in the buttress to the west of S1 was documented in the Preconstruction Survey, but has probably worsened since that time. A new crack is present in the buttress to the west of S1. Several new cracks are evident below the window, as well as on the pilasters on the buttress to the east.  
 S2: Cracks were found below the window and on the southeastern face of the pilaster were not noted in the Preconstruction Survey.  
 S3: Stucco loss and missing paint located along the molding detail above the window were documented in the Preconstruction Survey. Newly observed conditions include cracking below the window, spalling below the window, and network cracking along the top of the water table.  
 S4: Missing paint and stucco loss along the molding detail above the window are consistent with the observations of the Preconstruction Survey. New cracks are seen to the right of the window.

S5: Cracks extending from the bottom of the window through the water table were recorded by the Preconstruction Survey, but the network cracking in that area and the crack to the west of the window were not observed until January of 2009.  
 S6: The top window sill was damaged during the Preconstruction Survey. There is currently a crack below the window and network cracking around the water table.  
 S7: This area is in worse condition than the other bays of this elevation. During the Preconstruction Survey, the surfaces along the lighting rail were exhibiting spalling. The current conditions are consistent with those observations, but there is now a crack running along the side of the lighting rail that extends up through the cornice to the top of the parapet. Cracking in the molding above the pointed arch window, between the two windows, and below the bottom window and deformation of the head of the bottom window have all worsened since the Preconstruction Survey.

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**Client Name:**  
 Cracks:   
 Network Cracking:

**South Elevation Existing Conditions**

DATE	DESCRIPTION
02/06/09	FLY, TRK, HNT
02/06/09	CRK, I
FEB. 6, 2009	
08-009	

**S6**  
 8 TOTAL 12

# Recent example on applying the lessons learned

- Report:
  - Damage caused by installation of the trenchbox is the difference between the two





# Recent example on applying the lessons learned

- Drawings and specs for repair of damage



# Recent example on applying the lessons learned

- Next:
  - Settlement with insurers
  - Possible additional fund raising
- The *last* step: Permanent repair

# Lessons learned...

- Disasters are common, and will recur
- Our job is to ensure:
  - Pre-disaster preparedness
  - Immediate response and
  - Extended recovery and restoration

# Lessons learned...

- Our historic structures might not profit from adversity, but we can keep them from being severely degraded.



**Historic Preservation Work following Hurricanes**  
and  
**Lessons Applicable to All Disaster Recovery**

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