Lessons from 9/11 and Hurricane Katrina

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Military Engineering       Civil Works

[Images of military engineering and civil works projects]
ASCE Building Performance Study

THE PENTAGON BUILDING PERFORMANCE REPORT
NOTE: FLOOR IS 5½" CONCRETE SLAB
Reinforcement of Floor Slabs

#4 STRAIGHT @ 18" o.c.
#4 TRUSS BARS @ 18"o.c.
#4 STRAIGHT @ 18" o.c.
#3 @ 12"o.c.
Spirally Reinforced Columns

- Vertical bars lapped at bottom of story
- Spiral reinf does not extend through joint
- Spiral reinf (1½" clear cover)
- Vert bars
- Electrical conduit is placed at many corners
Aircraft Impact
Impact Damage to Columns

LEGEND

- ❌ MISSING COLUMN
- ○ STRIPPED AND BOWED COLUMN
- ⬍ SPALLED BUT STRAIGHT

US Army Corps of Engineers
Limit of Collapse
Performance Evaluation of the New Orleans and Southeast Louisiana Hurricane Protection System


Volume I - Executive Summary and Overview

1 June 2006
New Orleans East Water Levels

Lake Pontchartrain

D: Design Water Level (ft)
C: ADCIRC Water Level (ft)
M: High Water Mark (ft)

All water levels relative to NAVD 88 (2004.65)

D: 11.8
C: 9.9
M: 11.7

D: 12.4
D: 13.0
C: 15.8

GIWW

D: 13.1
C: 13.5
M: 12.7

D: 13.2
C: 16.7
M: 16.3

D: 13.2
C: 17.0
M: 18.4

Lake Borgne
Overtopping
Post Katrina Condition
Multi-Hazard Engineering - Design FOR Failure

- Circuit Breaker
- Bush Hog
Multi-Hazard Framework

- ASCE 7-02: “…sustain local damage with the structural system as a whole remaining stable…”
  - Energy-absorption
  - Redundancy
  - Continuity