FIMA Briefing of the MAT Investigation of Hurricane Sandy

An Overview and Next Steps in NY and NJ

February 7, 2013

FEMA

Building Science Branch

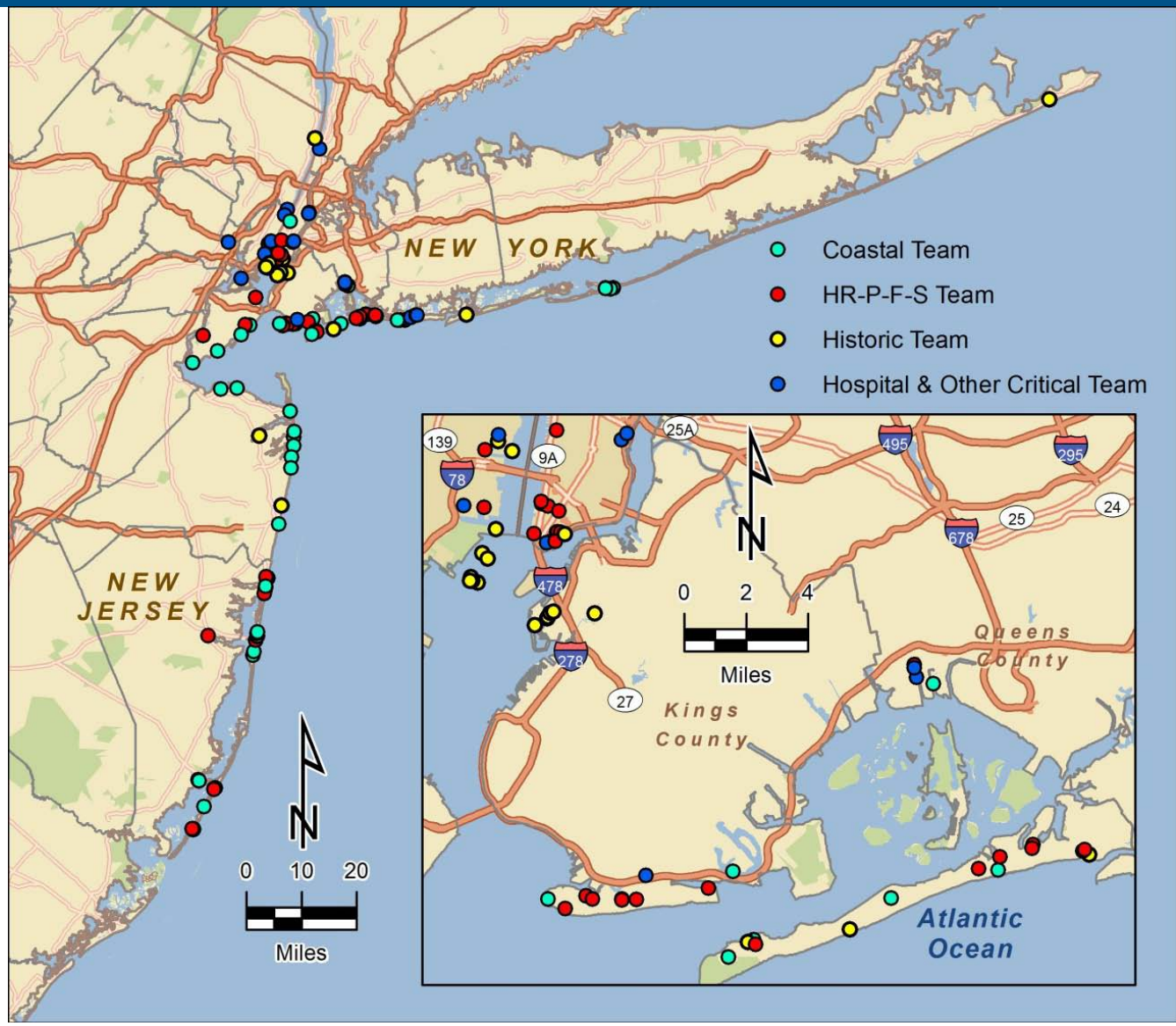
1. NY/NJ MAT Teams & Partners

Teams	Team Members	Partners
• Coastal • Hospitals and Other Critical Facilities • High-Rise, Police, Fire, Municipal and Schools • Historic	• FEMA • NIST • ICC • NAHB • HUD • Industry • Higher education • National subject matter experts	• NYC Mayors Office • Building Departments • Local • Sea Grant • HHS • DOE • EPA • NJ Builders Association

2. Summary of MAT Field Work

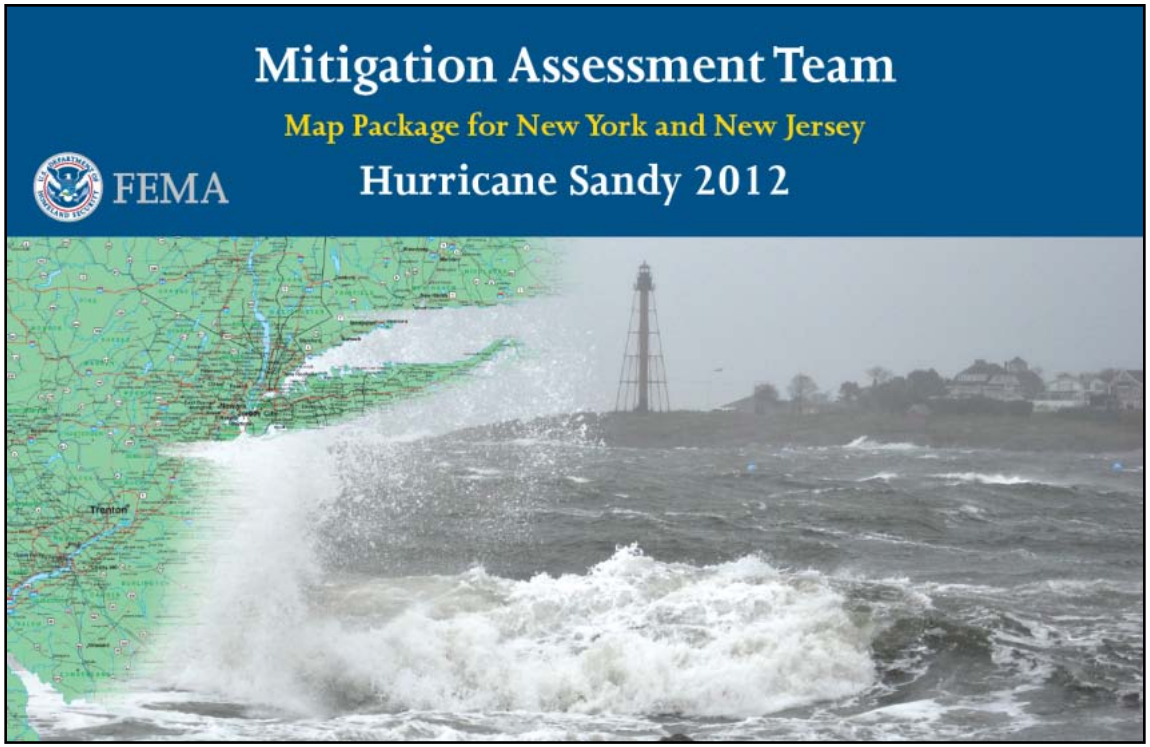
MAT deployed in 4 sub-teams:

- Coastal Team
- Hospitals and Other Critical Facilities Team
- High-Rise, Police, Fire, Municipal and Schools Team
- Historic Team

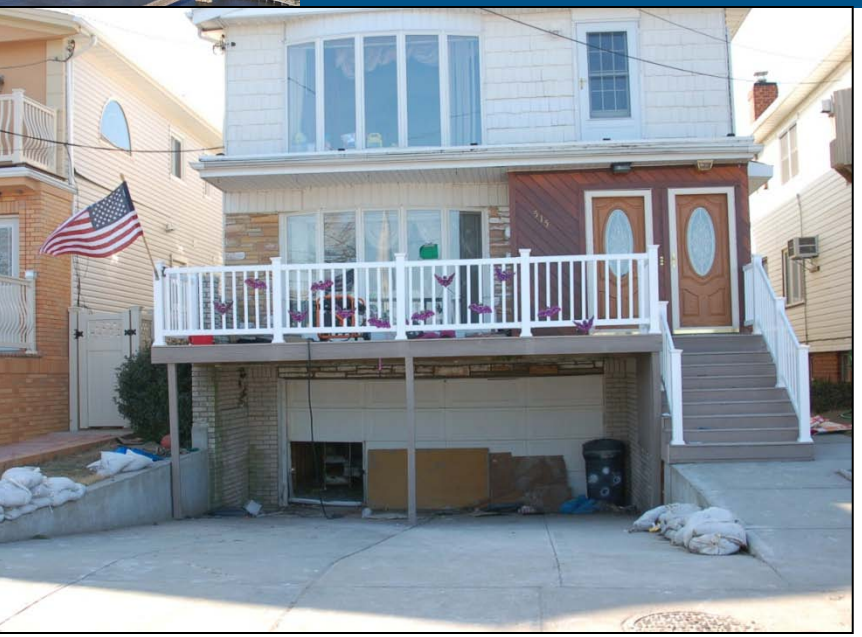


3. Data, GIS, ABFE, and Mapping

- The MAT is working to leverage available data
- FEMA Modeling Task Force (MOTF) produced high resolution Hurricane Sandy depth grids and flood extents using USGS HWM Points – used by teams in the field



2. Coastal



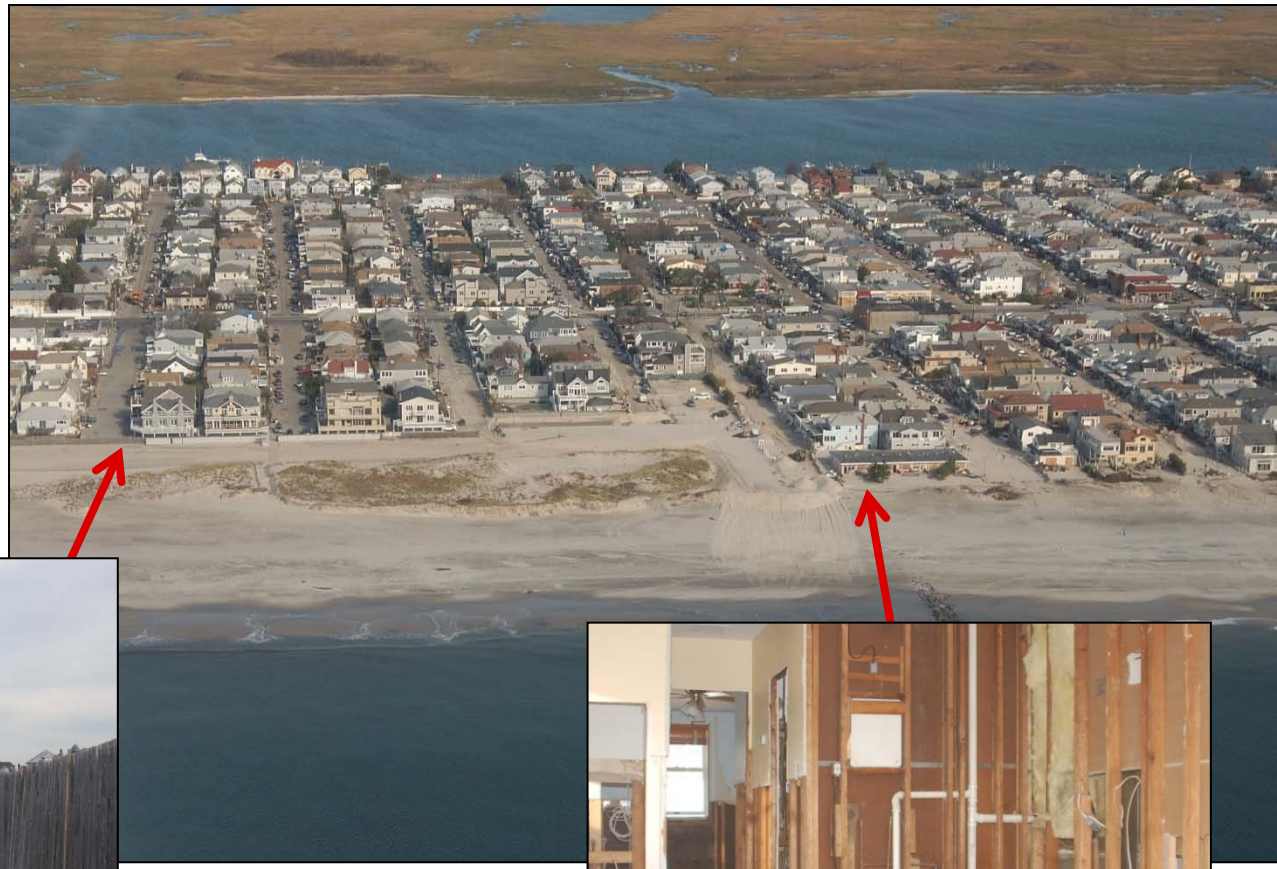
Key observations

- Widespread damage from inundation and shallow flooding
- Mechanical and utility equipment as well as living spaces in lower levels and basements were flooded.
- Downward sloping driveways contributed to damage?

2. Coastal

Key observations

- Building setbacks and wide dunes reduced damage



2. Coastal

Key observations

- Building damage in close proximity to low or damaged shore protection structures

2. Coastal

Key observations

- Load Path issues with old and new construction

2. Coastal

Key observations

- Inadequate foundations for coastal flood and erosion conditions

2. Coastal

Key observations

- New construction was placed atop old foundations

2. Coastal

Key Take-Aways/ Successes

- Ocean Beach (Fire Island) HMA elevation projects did not sustain flood damage to elevated floors; lower neighboring buildings flooded

- Homes elevated higher because of State freeboard requirement (BFE + 2) did not flood or sustained less flood damage than neighboring homes

2. Coastal

Analysis Focus Areas:

- Coastal Foundations
- Continuous Load Paths
- Elevation of Equipment and Utilities
- Proximity to Shore Protection and Debris Sources

2. Hospitals

Key Observations: Hospitals

- Loss of Emergency Power
  - Loss of fuel supply to generator (tank failure or inability to pump)
  - Inundation of emergency power equipment (generator set) or power distribution equipment (switchgear)
- Loss of Vertical Conveyance/Elevators
  - Controls lost (sensors in elevator pit)
  - Loss of power
  - Loss of Telecom/IT
- Loss of Equipment
  - Emergency room equipment
  - Radiology equipment
  - Other equipment

2. Other Critical Facilities

Key Observations: Other Critical Facilities

- Senior Care Centers – Same issues as hospitals
- Data Center – Elevation is key
- Yonkers Wastewater Plant
  - Experienced personnel, planned shutdown of facility helped reduce damages and functional downtime
- Gas Stations
  - All four stations visited lost power and all had supply restrictions/none ran out of fuel
  - Two stations visited in Queens flooded and had to replace pumps
  - Some stations need IT/telecom as well emergency generators to pump gas

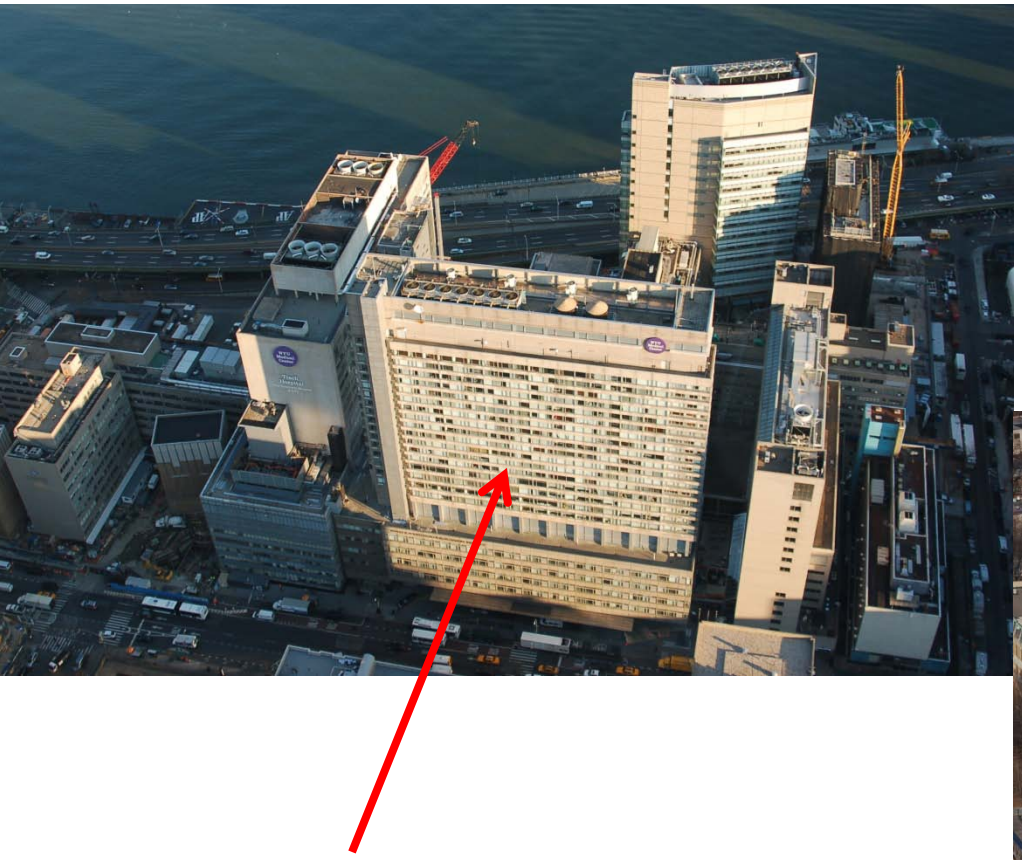
2. Other Critical Facilities

Analysis Focus Areas

- Flood damage nearly all due to inundation (i.e., hydrostatic, not hydrodynamic forces)
- Emergency power system design focus is to mitigate normal power loss, not flood or high wind event
- Flood protection planning typically in two dimensions instead of three (i.e., perimeter wall openings protected but not floor drains)
- Fuel tank location relative to emergency generator
- Some fuel tank failures from implosion (hydrostatic loads)

2. Hospitals

Success Story: Skirball Building at NYU Langone Medical Center Complex and New Tower at Coney Island Hospital (Manhattan, NY)



2. High-Rise

Key Observations: High-Rise

- Pre and Post Sandy: Immediate response and experience from building engineers, maintenance staff, and contractors
- Building interconnectivity/complexity in NYC
- Fuel tank regulations may need revisiting
- No damage observed to sustainable features (PV panels, green roofs)
- New construction with floodgates but no emergency power
- Basement/utilities
  - Location, location, location
  - Generally elevated utilities allowed buildings to remain fully functional and not rely on temporary power, heat, etc.
  - Fuel type may make a difference
  - Common steam and natural gas service typically restored sooner than oil

2. High-Rise

Successes: High-Rise

- Top photo - Facility with protected fuel pumps, fuel tanks (approximately 50,000 gallons), rooftop generators, and six sump pumps; sustained little to no damage

- Bottom photo - 700 Grove built in 2006 and located in Zone A. Utilities located on top floor. Adjacent residential building on left still not completely occupied due do damages to basement mechanical room.

2. Police and Fire

Analysis Focus Areas: Police and Fire

- Impact on emergency services
- Mechanical/Electrical Rooms
  - Emergency Power
- Floodproofing opportunities
- Fuel tanks and dispensing fuel

2. Historic

- Ellis Island Immigration Museum (Main Building)
  - Flooding approximately 3’ above grade.
  - Damage to utilities in basement.

2. Historic

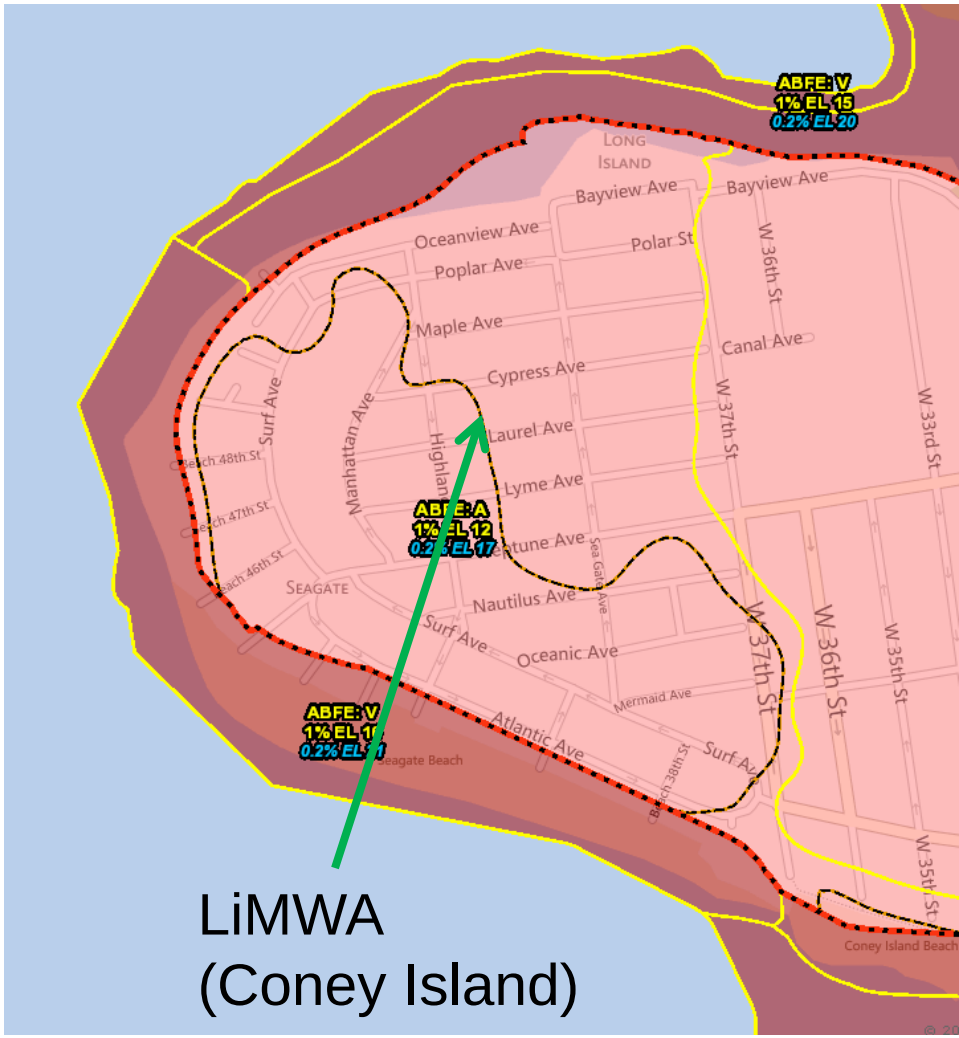
Analysis Focus Areas

- **Elevation needs:** Utilities and buildings (where feasible)
- **Opening Protection:** Flood-resistant window and door replacements - retain building character and protects aesthetics
- **Boardwalks:** Community interest to retain setting, location, and historic appearance, with more resilient reconstruction
- **Structural:** Retrofit methods for hardening unreinforced buildings that protects aesthetics
- **Secondary Mitigations:** Contingency preparations to protect historic features in the event that primary mitigations are inadequate

3. ABFEs

ABFE info now available for:

- **New York:**
  - Westchester County
  - New York and portions of NYC
- **New Jersey Counties:**
  - Atlantic
  - Bergen
  - Burlington
  - Cap May
  - Essex
  - Hudson
  - Middlesex
  - Monmouth
  - Ocean
  - Union



LiMWA
(Coney Island)

3. Recovery Advisories

Updated Guidance:

- Designing for Flood Levels Above the BFE
- Reducing Flood Effects in Critical Facilities
- Cleaning Flooded Buildings
- Improving Connections in Elevated Coastal Residential Buildings

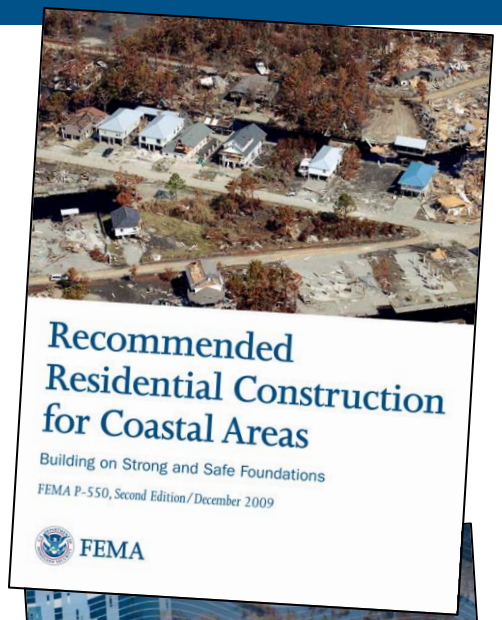
NEW:

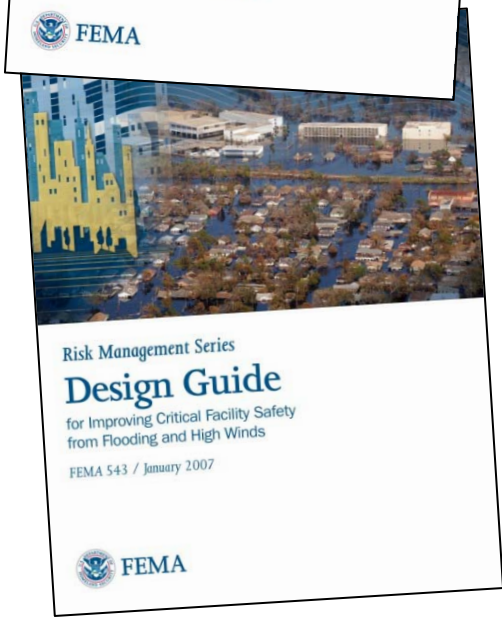
- Restoration of Mechanical, Electrical, and Plumbing Systems in Non-Substantially Damaged Residential Buildings
- Existing Buildings: Reducing Flood Risk and Flood Insurance Premiums *(title subject to change)*
- Providing Fuel for Emergency Power Systems *(title subject to change)*
- Mid- and High-Rise Mitigation

3. MAT/BS Support

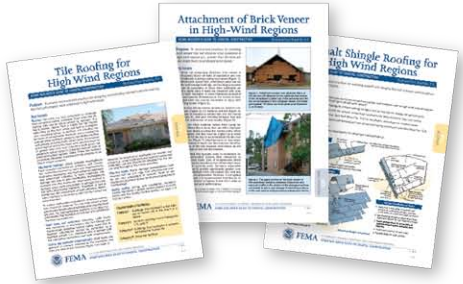
- Technical Assistance to JFO
- Building code technical assistance
- Briefings and outreach
  - Mayor's Offices, DOB, HHS, Open Houses, AIA Comittees, Design Charette, Resiliency Task Force
- Training courses
  - FEMA 543 1-day course providing 5 times – Jan 15-17, Feb 7-8 at NY JFO
  - Flood and Wind (for A/E/Bldg Officials/Contractors) 1-day course – date TBD at NJ JFO
  - FEMA 543 1-day course and other support for AIA – Feb 20
  - FEMA 499/E279 2-Day course to be provided 3 times – date TBD

Reservists FQS trainings E386 and E312





1. Hurricane Sandy MAT Schedule



INITIAL RECON TEAM TO JERSEY SHORE
November 6

HURRICANE SANDY LANDFALL
October 29

AERIAL RECONNAISSANCE NEW JERSEY AND NEW YORK
November 26

RECOVERY ADVISORIES COMPLETE
February

BRIEFINGS AND OUTREACH

MAT REPORT COMPLETE
September

FEMA MAT MITIGATION ASSESSMENT TEAM

2012: OCT NOV DEC | 2013: JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC

PRE-MAT DEPLOYMENT NEW JERSEY AND NEW YORK
November 15–18

FIELD INVESTIGATIONS NEW JERSEY AND NEW YORK
December 5–20

SME AND TECHNICAL ASSISTANCE TO JFO

CODE PROPOSALS