

1. USACE Response to Sandy – Ports

2. NAVFAC Response to Sandy - Base

3. USSOUTHCOM/NAVFAC Response in Haiti – Port Au Prince Port

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(With help from USACE NY District, NAVFAC
Mid-Atlantic, and others)**

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**US Army Corps of Engineers
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AGENDA

- USACE Response to Sandy
- NAVFAC Response to Sandy
- USSOUTHCOM/NAVFAC Response to Haiti Earthquake – Jan 2010
- Questions



USACE Response to Sandy - Ports (Oct 2012)

Reasons for Success

1. RELATIONSHIPS and EXTENSIVE COORDINATION:
 - US Coast Guard
 - Port Authorities of NY and NJ
 - NOAA Ocean Surveying
 - Port Industries

2. USACE, NY District is member of the following Committees:
 - NY and NJ Harbor Operations Committee
 - Marine Transportation System recovery Unit (MTS-RU)

3. Experience from previous disasters and emergency response plans
 - 1998 City of NY purchased Large Ferry Boats for Staten Island – started disaster planning.
 - September 9/11 – evacuation plans – planning and coordination between agencies.
 - Experience from Hurricane Irene in 2011

4. Many vessels were moved up the Hudson River to ride out storm and deep draft ships delayed their arrivals in NY until after storm passed

USACE Response to Sandy - Ports (Oct 2012) – (Cont.)

USACE NY Division Mission – Assist in re-opening Ports of NY & NJ:

1. Use its Drift Collection Vessels to:
 - Survey navigation channels for submerged obstructions
 - Clear floating storm debris
 - Pulling and collecting floating obstructions from deep draft navigation channel

2. Provide USCG with notice of channel being cleared, so they can update Notice to Mariners

Priority for Reopening NY & NJ Harbors:

1. Regional Petroleum Distribution double-hulled barges (25 foot draft)
2. Commuter Ferries (12 – 15 foot draft)
3. Deep draft vessels

USACE Response to Sandy - Ports (Oct 2012) – (Cont.)

Challenges for Getting Fuel to double-hulled barges for distribution:

1. Deep Draft Fuel Tankers were still several days away from Harbor
2. Tank Farm Terminals did not have electric power to pump product from their storage tanks into the barges.
3. Blown down overhead wires and flooded underground conduits caused grid power to fail
4. Higher than expected storm surge and flooding overwhelmed the terminal's back-up power systems.

Recommendation:

1. Ports should assure there are reliable emergency power systems for waterfront terminals (especially fuel terminals).

NAVFAC Response to Sandy - Ports (Oct 2012)



Where:

- Naval Weapons Station Earle, NJ

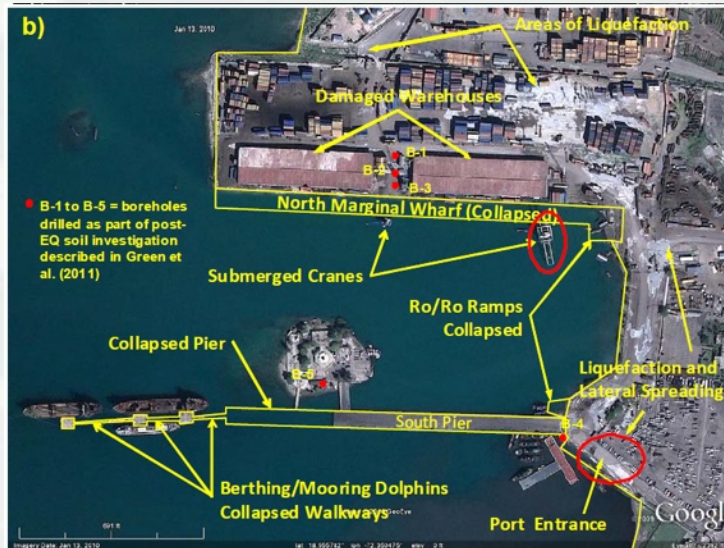
What:

- Hurricane Sandy damages to Pier and support facilities in base
- Damage to surface water and sewage pipes and 2 power cables on top of Pier
- Pier Structure had minimum damages
- Damage to warehouse buildings - 1 foot of water

How NAVFAC Repaired:

- Used its Global Contingency Support Contract (GCSC)
- Contracted out Emergency back-up generators

HAITI – Port Au Prince Port Damages

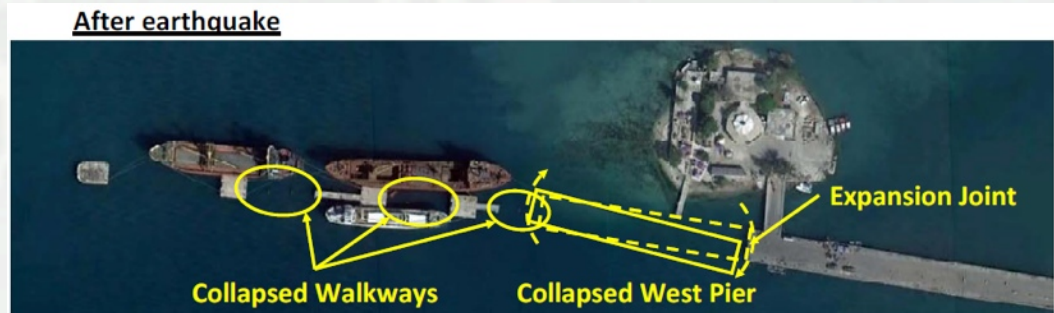
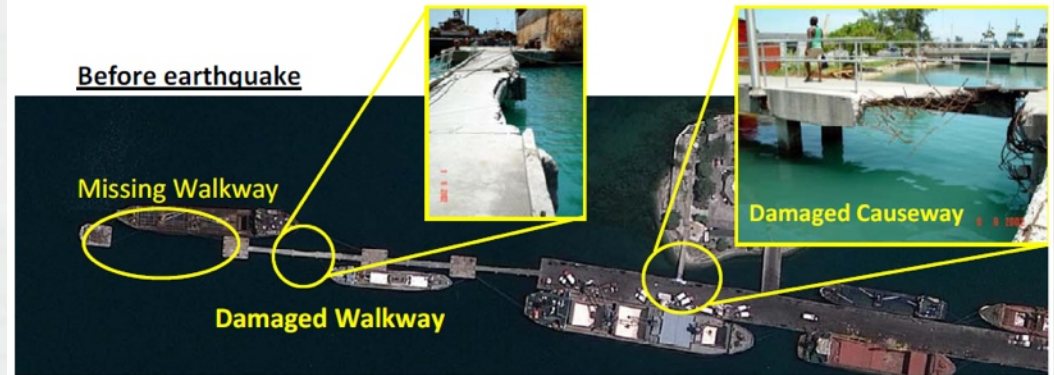


1. Port Au Prince – Port Description:

- A. North Wharf and South Pier constructed between 1976 and 1979
- B. **Before Jan 2010 earthquake** it handled 170,000 Twenty-Foot-Equivalent (TEU) cargo containers/year

2. Major Contributors to Damage due to earthquake:

- A. Widespread Soil Liquefaction
- B. Poor performance of batter piles
- C. Poor pre-earthquake condition of waterfront structures



HAITI – Port Au Prince Port Damages (Cont.)

1. **Technical Paper: Seismic Performance of Port de Port-Au-Prince during the Haiti Earthquake and Post-Earthquake Restoration of Cargo Throughput**
 - A. By: Stuart Werner, Nason McCullough, William Bruin, Alex Augustine, Glenn Rix, Brian Crowder, and Joshua Tomblin
 - B. Published by: Earthquake Spectra; Volume 27, Number S1; October 2011

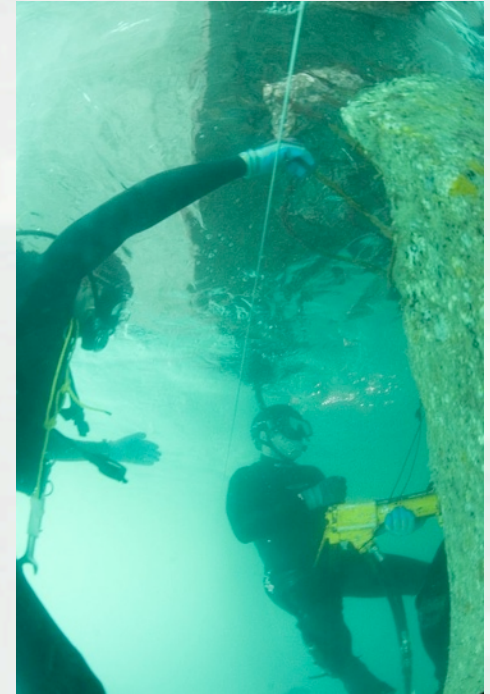
2. **U.S. Military Task Force (MTF):**
 - A. Underwater Construction Team One (UCT-1),
 - B. Mobile Diving and Salvage Unit Two (MDSU-2)
 - C. Naval Facilities Engineering Command (NAVFAC)
 - D. Army personnel from 544th Engineer Dive Team



PORT-AU-PRINCE, Haiti (Feb. 6, 2010) Builder 2nd Class Andrej Paskevic, assigned to Underwater Construction Team (UCT) 1, drills guide holes into a damaged section of a pier. UCT-1 and Army Divers are conducting repair operations in the main seaport of Port-au-Prince. (U.S. Navy photo by Mass Communication Specialist 2nd Class Chris Lussier/Released)

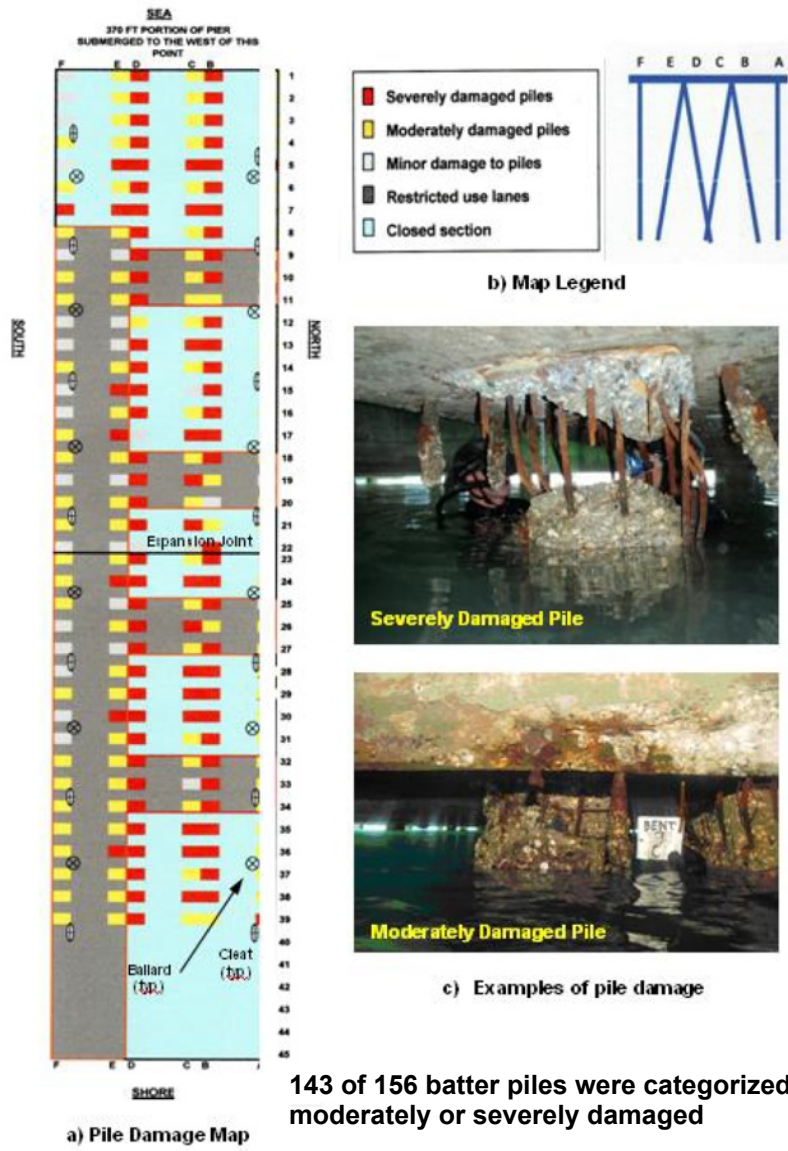


PORT-AU-PRINCE, Haiti (Feb. 6, 2010) Builder 2nd Class Andrej Paskevic, assigned to Underwater Construction Team (UCT) 1, drills guide holes into a damaged section of pier at the port in Port-au-Prince. (U.S. Navy photo by Mass Communication Specialist 2nd Class Chris Lussier/Released)

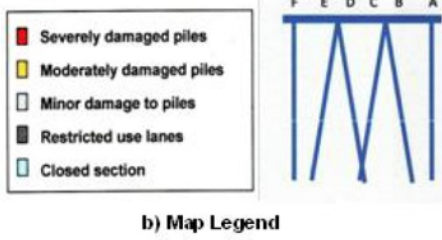


PORT-AU-PRINCE, Haiti (Feb. 6, 2010) Army Diver Staff Sgt. William D'Angelo, assigned to the 544th Engineer Dive Team, right, drills guide holes into a damaged section of a pier at the port in Port-au-Prince, Haiti. (U.S. Navy photo by Mass Communication Specialist 2nd Class Chris Lussier/Released)

HAITI – Port Au Prince Port Damages (Cont.)



143 of 156 batter piles were categorized as moderately or severely damaged



c) Examples of pile damage

1. **Repair:**
 - A. Repair of Port was completed in less than 3 months
 - B. As many as 7 piles per day were repaired w/ methods:
 - Epoxy mortar repair
 - Single and Double cast-in-place reinforced concrete caps
2. **Temporary Measures:**
 - A. Army Landing Craft Utility (LCU) – move goods ashore
 - B. Temporary Pier Capacity – floating causeway system
3. **Possible Contributors as to why movement of North Wharf continued to progress after Earthquake:**
 - A. Aftershocks may have triggered additional liquefaction
 - B. Pavement Structure may have provided seepage barrier, thus slowing dissipation of liquefaction
 - C. Presence of 2 moored ships temporarily restraining lateral movement, until ships disembarked.



Figure 13 - Completed Formed Repair

HAITI – Port Au Prince Port Damages (Cont.)

LESSONS LEARNED – SEISMIC PERFORMANCE ON PORTS:

- A. Need for engineering of the soils to reduce potential for future liquefaction
- B. Maintenance practices to minimize pre-earthquake structure deterioration
- C. Need for seismic retrofit for wharves outfitted with older batter piles



QUESTIONS ???

THANKS!

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