UJNR Panel on Wind and Seismic Effects

Panel Update

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HIGHLIGHTS OF THE 38th JOINT MEETING OF THE PANEL ON WIND AND SEISMIC EFFECTS

The 38th Joint Meeting of the U.S.-Japan Panel on Wind and Seismic Effects was held at the National Institute of Standards and Technology, Gaithersburg, Maryland during 15-17 May 2006 followed by three-day technical site visits to New Orleans. The Meeting centered on eight Sessions: 1) Geotechnical Engineering and Ground Motion; 2) Next-Generation Building and Infrastructure Systems; 3) Wind Engineering; 4) Storm Surge and Tsunamis; 5) Recent Natural Disasters and Natural Disaster Management Plan; 6) Dams; 7) Transportation Systems; and 8) Fire Performance of Structures. Twenty-nine papers were presented during this meeting (15 from Japan and 14 from the US).

During the next 12 months, the Panel is planning six Task Committee Workshops:

a. Task Committee B, Next-Generation Building and Infrastructure Systems, Workshop on Multi-Hazard Risk Reduction for Building Systems, January or February 2007, Hawaii
b. Task Committee C, Dams, 4th US – Japan Workshop on Advanced Research for Dams, fall 2006, Tsukuba, Japan
c. Task Committee D, Wind Engineering, 4th Workshop, New Challenges for Reduction of High-Wind Disasters, 20-22 July 2006, Tsukuba
d. Task Committee G, Transportation Systems, 22nd US-Japan Bridge Engineering Workshop, fall 2006, USA
e. Task Committee H, Storm Surge and Tsunamis, 3rd Tsunami Workshop, July 2006, USA
f. Task Committee I, Fire Performance of Structures, Workshop on Fire Performance of Structures, November 2006, Japan.

Delegation members, 38th US-Japan Joint Panel Meeting in front of NIST

The Panel adopted its 2nd Five-Year Strategic Plan that addresses the Panel's mission and vision during 2006-2010 including a), evaluation of Panel's Task Committees, b) encourage partnering opportunities beyond the Task Committee member organizations and perform joint research, and c) more broadly disseminate Panel's activities. The manuscripts, Panel Resolutions, Task Committee Reports, and 2nd Five-year Strategic Plan will be available in the Panel's Proceedings, *Wind and Seismic Effects* with an

expected publication date of fall 2006. Information about the Panel is available at http://www.pwri.go.jp/eng/ujnr/ujnr.htm.

During 18-20 May the delegation visited New Orleans meeting with officials from the Louisiana Department of Transportation and Development, The Army Corps of Engineers, the New Orleans Planning Commission and the Louisiana State University's Hurricane Research Center. Discussions centered on the extent of flooding and damages to infrastructure from Hurricanes Katrina and Rita. The Hurricanes resulted in a large number of deaths and hundreds of thousands of displaced persons and tremendous impact on the local economies. Approximately eighty percent of the city was flooded. At the time of our visit we were told that approximately 50 percent of the population had returned. New Orleans' French Quarter and Garden Districts, on higher ground, were not flooded, but other neighborhoods such as the 9th Ward were seriously flooded.

Flood destroyed residences in New Orleans' Lower 9th Ward

The delegation visited several New Orleans neighborhoods including the Lower 9th Ward, originally a cypress swamp, adjacent to the Industrial Canal and also neighborhoods adjacent to the 17th Street Canal. Detailed information about these sites, performance of structures, key findings, and recommendations are available from NIST's report, *Performance of Physical Structures in Hurricane Katrina and Hurricane Rita: A Reconnaissance Report*, NIST Technical Note 1476, June 2006. The report is available online at: http://www.nist.gov/public_affairs/releases/hurricane_report060906.htm.

Highlights of each visit follow.

1. LOUSIANA DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT (LADOTD) http://www.dotd.state.la.us.

Officials from the Louisiana Department of Transportation and Development (LADOTD) provided the delegation with an overview of their response and recovery following the two disastrous Hurricanes. LADOTD staff presented examples of infrastructure damage such as the Lake Pontchartrain 1-10 Twin Span; flooding of many Parishes in New Orleans near the Inner Harbor Navigation Channel; scour that undermined bridge approach slabs and bridge piers; wind damages to structures such as electrical gear systems on vertical lift bridges and paint blasted from bridge structures such as the Huey P. Long Bridge; 52 movable bridges were damaged; some swing span bridges experienced flood debris lodged in their gear and motor systems. Some highlights from LADOTD discussions follow.

Lake Pontchartrain I-10 Twin Span Bridge Repair. This 8.6 km (5.4 mi) monolithic twin-span prestressed girder bridge experienced multiple span displacements on the north end of the east and west bound roadways. LADOTD representatives described and showed photographs of spans that had

been uplifted and displaced into the water, and others where the alignment of spans was shifted. Repairs were performed using a LADOTD design-build bid contract working with many organizations. One repair method involved the use of a self propelled jacking system on a barge to repair and reposition tens of bridge spans and hundreds of 300 ton concrete panels. The panels were transported to site using the barges that were floated under the deck sections and lifted by hydraulic jacks. The realignment and repair of damaged spans on the east bound roadway were completed in 34 days, 11 days quicker than the original estimation and at a cost of $1.1 million. About 1.6 km (1 mi) of the westbound roadway was replaced with Acrow 700[1] Series bridging (modular spans replacing the former military Bailey Bridge System) that were prefabricated and assembled at the site. Repairs of the eastbound lanes were completed in October 2005 and the westbound lanes in January 2006. The Acrow bridge spans will be maintained for 3 years. During this time period plans will be developed for a six lane bridge at a higher elevation (currently the bridges are about 4.3 m (14 ft) above mean sea level) with enhanced vessel collision resistance, and a planned service-life of 100-years. The new bridge is planned to be 17 797 m (58 388 ft) long with a total roadway length of 1.9 km (1.2 mi).

Huey P. Long Bridge
The delegation was briefed about and visited LADOTD's bridge truss widening project of the 70-year old Huey P. Long Bridge to improve traffic flow. Work includes widening the existing 2.9 m (9 ft) travel lanes to three 3.4 m (11 ft) lanes travel lanes in each direction, adding a 2.4 m (8 ft) outside shoulder and 0.6 m (2 ft) offset inside shoulders. The project is estimated to cost $600 to $800 million.

John James Audubon Bridge, http://www.timedla.com/bridge/audubon.
The delegation was briefed on the John James Audubon[2] Bridge, a design-build project that will be the longest cable-stayed bridge in North America. Its center span will be 482 m (1 583 ft) long with end spans of 197 m (647 ft). Its design life is 100-years. The bridge will cross the Mississippi river between Natchez, Mississippi and Baton Rouge, Louisiana. It is constructed by Audubon Bridge Constructors a joint venture of Flatiron Constructors, Granite Construction, and Parsons Transportation Group. The $334 million project will include a 3.9 km (2.4 mi) long, four 3.7 m (12 ft) lanes, 3 m (10 ft) shoulder, and approximately 19.2 km (12 mi) of approaches. The bridge is scheduled to be complete by summer 2010. The cable stays are semi-fan arranged parallel strand system with corrosion protection. Wind tunnel testing included wind induced flutter and rain induced vibrations.

2. US ARMY CORPS OF ENGINEERS (CORPS).

Officials from the CORPS 'Task-Force Hope', New Orleans hosted the delegation to the 17th Street Canal site and the 9th Ward Inner Harbor Navigation Canal and discussed the report, *Interagency Performance Evaluation Task Force (IPET)*. 'Task Force Hope' was created by the CORPS just after Hurricane Katrina to manage the work to repair damages to levees and floodwalls and flood protection systems, debris removal, and perform emergency response efforts. The actual work was performed by the Corps and its contractors under Task Force Hope. IPET was created to determine why specific infrastructure failed and to recommend remediation methods. The American Society of Civil Engineers' External Review Panel (ERP) conducted a review of the IPET Report on 17th Street Canal Levee Breach that is available at http://www.asce.org/static/hurricane/erp.cfm. New Orleans is surrounded by 560 km (350 mi) of levees and floodwalls, 71 pumping stations, and 4 gated outlets.

17th Street Canal.
According to the CORPS the 17th Street Canal was constructed of concrete I-wall and sheet steel pilings on an earthen levee. In locations of the failed floodwalls the CORPS is installing an inverted "T Wall" by driving piling down to 15.8 m (52 ft); where previous piling were driven down to 5.2 m (17 ft). The existing I-Walls are being strengthened. When repairs are completed at the 17th Street levees an additional 58 km (36 mi) of levees will be strengthened.

[1] Reference Acrow Corporation of America http://www.acrowusa.com
[2] Named after the famous artist of American birds.

17th Street Canal levee under new construction

Inner Harbor Navigation Canal (IHNC). The delegation visited the Inner Harbor Navigation Canal and Pumping Station. New Orleans has tens of pumping stations to remove rainwater from the city. Levee breaches occurred along the IHNC. The CORPS is replacing 1 250 m (4 100 ft) of wall where two breaches occurred. The CORPS is constructing a new Pumping Station at the IHNC to prevent storm surge from entering the canal and permit existing pump stations to continue operations. Piles are driven 32 m to 36.6 m (106 ft to 120 ft) below sea level. Eleven gates are installed. Capacity of the canal lock is 82 m^3s (1.3 M gpm) that will be tripled to 246 m^3s (3.9 M gpm).

Panorama of IHNC Flood Gates and Pumping Station

These levees were constructed with concrete I-Wall and sheet steel pilings. The CORPS is replacing failed I-Walls with inverted T-Walls. They are designed for heights of 4.9 m (16 ft) up from the previous 3.4 m (11 ft). Sheet piling is drilled to 7 m (23 ft) below sea level to prevent water from entering. A concrete pad base is constructed where H-Piles are welded to the sheet piles for each of the steel reinforced monolith sections. Additionally, some levees will be raised and their backsides armored with stone and concrete.

3. NEW ORLEANS REGIONAL PLANNING COMMISSION (RPC)

http://www.norpc.org**.**

The Planning Commission serves metro New Orleans including its five Parishes and 1.3 million residents. The Commission is managed by an elected 26 member Board of Governors from such industries as trucking, transit, airports, railroads, highways and from citizen members. The Commission addresses economic development planning, coordinates highway and transport projects such as air quality, traffic counting and monitoring, and urban area planning. The RPC performs forecasts of business growth 25-years out to promote the competitiveness of the region by working with Federal, State, parish, and municipal governments. Discussions centered on recovery following Hurricanes Katrina and Rita to bring citizens back to New Orleans. RPC's emphasis is on closely working with the Federal Government for repairing and restoring New Orleans and on providing incentives for citizens to return to New Orleans, improving communications with the community, working to restore medical technologies at closed hospitals and reopening Tulane University's Engineering Program. RPC provides planning assistance to the community and demonstrating

competencies they feel may not have been appreciated by the Federal Emergency Management Agency after the fall of the two Hurricanes. The Commission is:

a. obtaining high resolutions images of the greater New Orleans region for performing detailed analysis of land and transportation use in planning future growth, infrastructure maintenance, and economic development,
b. working to clean-up and develop Brownfield sites into useful land for living and agriculture,
c. encouraging the restoration of the wetlands that play an important role is protecting New Orleans from flooding,
d. organizing commercial neighborhood revitalization programs,
e. partnering with public and private organizations to become a green city by greater conservation of energy and enhanced air quality, and
f. developing inventories of traffic patterns and signals to facilitate traffic flow and identifying equipment needs for remote site monitoring.

4. LOUSIANA STATE UNIVERSITY HURRICANE RESEARCH CENTER (LSU/HRC) http://www.hurricane.lsu.edu**.**

The delegation was welcomed at the Hurricane Research Center where they discussed a series of presentations and visited HRC's aerodynamic and boundary layer wind tunnel with capabilities for flow visualization, flow measurement, and force and pressure measurement. Presentations included:

a. *Overview of Hurricane Research and Katrina-Specific Research and Operations* by Marc Levitan, Director, LSU Hurricane Research Center. Discussions included HRC's activities in hurricane frequency and intensity, modeling, hurricane impacts, preparedness, use of GIS for planning and response activities, response (real-time data analysis for land fall hurricanes), mitigation, education in disaster science and management. Hong Kong has used the New Orleans Hurricane strikes as case studies in wind, flood, and evacuation modeling.
b. *Katrina Storm Surge Modeling, Levee Failure Analysis and the Way Forward* by Ivor van Heerden, Director, Hurricane Public Health Center and Deputy Director LSU HRC. van Heerden recently published, *The Storm: What Went Wrong and Why During Hurricane Katrina--the Inside Story from One Louisiana Scientist.* Dr. van Heerden noted that many of the earth levees consisted of wood and organic matter from past Cyprus forests and peat and clays that can swell when saturated.
c. *Development and Application of a Method for Hurricane Shelter Assessment/Operations Planning for a New Orleans Hospital* by James P. Gregg, Structural Engineer, HNTB Corporation. Gregg described a project in which they developed a shelter assessment and mitigation method by incorporating the Saffir-Simpson Hurricane Scale; ASCE-7; and a flood, wind, structural, and cladding analyses to assess a 60-year old hospital.
d. *Flood Fatality Modeling and Hurricane Katrina* by Ezra Boyd, Graduate Research Assistant. Boyd discussed research to estimate the number of expected facilities for different flood scenarios using three models 1) disaster mitigation (optimal configuration of levees to reduce loss of life); 2) disaster planning (2004 hurricane Pam simulation), and 3) disaster response (real time support for search and rescue).
e. *Storm Surge Damage to Bridges* by Ayman Okeil, Assistant Professor of Civil and Engineering. Okeil assessed short- and medium-span bridges in the New Orleans area and concluded there is great need to identify improved methods to absorb energy from storm surge and wave actions.
f. *Hurricane Effects on Long-span Bridges* by Xianzhi Liu, Graduate Research Assistant, LSU. Reviewed advanced bridge aerodynamics analysis that incorporates the results from past research evaluation of the performance of bridges under similar conditions experienced from Hurricanes Katrina and Rita.
g. *Information Management for Hurricane Katrina Recovery* by John Pine, Chair, Geography and Anthropology and Director, LSU Disaster Science and Management Academic Programs. Pine reviewed work in creating a substantial management information system of data, photographs including satellite, reports, reference information for use by researchers, community planners, and others.

h. *Hurricane Katrina Environmental Impacts and Contamination* by John Pardue, Director, Louisiana Water Resources Research Institute. Pardue reviewed his analysis on levels of contaminates from chemicals and bacteria in floodwaters following Katrina. He noted that no agency has the responsibility for regulatory control of indoor contamination including mold, a major problem in restoring damaged buildings. Landfills created to accommodate debris from damaged and destroyed residences and other buildings and structures may present environmental problems. These landfills are not lined and are being filled with a wide range of hazardous materials including aerosols, paints, oils, and other chemicals that can leach into the ground.
i. *Hurricane Evacuations and Contraflow* by Brian Wolshon, Associate Professor of Civil and Environmental Engineering. Prior to Hurricane George in 1998, New Orleans did not have coordinated evacuation plans. Studies were performed following Hurricanes Katrina and Rita to maximize traffic flows by improved scheduling and reducing traffic congestion at contraflow nodes (loading points).

Note: Certain commercial entities, equipment, or materials are identified in this report in order to describe an experimental procedure or concept properly. Such identification is not intended to imply recommendation or endorsement no is it intended to imply that the entities, materials, or equipment are necessarily the best available for the purpose.