



REPLY TO
ATTENTION OF

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS, NEW ORLEANS DISTRICT
P.O. BOX 60267
NEW ORLEANS LA 70160-0267

CEMVN-ED-F

5 JUN 2015

MEMORANDUM FOR Commander, Mississippi Valley Division (CEMVD-PD-N/Mr. Rayford Wilbanks)

SUBJECT: Independent External Peer Review for the Greater New Orleans Hurricane and Storm Damage Risk Reduction System – Design Guidelines (June 2008)

1. This memo provides the Corps of Engineers' summary response to the Final Independent External Peer Review Report for the Independent External Peer Review of Greater New Orleans Hurricane and Storm Damage Risk Reduction System Design Guidelines produced by the Battelle Memorial Institute, 14 June 2010. The disposition of the IEPR to the New Orleans District (MVN) was by Baltimore District (NAB) subject memo dated 16 June 2010, transferring through the Mississippi Valley Technical Office, CEMVD-RB.

2. **Background.** This Independent External Peer Review (IEPR) was conducted in accordance with all applicable laws and regulations. Section 2035 of the Water Resources Development Act (WRDA) of 2007 directed the design and construction activities for hurricane and storm flood damage reduction projects to be reviewed by independent experts to assure public health, safety and welfare on any project that meets specified criteria. On 22 October 2008 Headquarters provided a revised approval for the Peer Review Plan for the Greater New Orleans (GNO) Hurricane and Storm Damage Risk Reduction System (HSDRRS). This plan outlined the purpose, authority and arrangement for the IEPRs and specified what reviews would be undertaken.

The U.S. Army Corps of Engineers National Planning Center of Expertise for Coastal Storm Damage Reduction (PCX) directed by North Atlantic Division (NAD) has responsibility for managing the review of coastal storm damage reduction "Planning" products in New Orleans; that responsibility was extended to include all IEPRs. The PCX, through NAB, worked with Task Force Hope (TFH) and the execution offices to develop the "charge" (scope) for the reviews. The U. S. Army Research Office (ARO) served as the contracting arm and contracted with Battelle Memorial Institute to perform the peer review. This ensured a third-party relationship was maintained between the project's execution office and Battelle. WRDA 2007 further directed use of the National Academy of Science's (NAS) policy for the selection of reviewers and the review for the IEPR which is consistent with Office of Management and Budget (OMB) requirements.

SUBJECT: Independent External Peer Review for the Greater New Orleans Hurricane and Storm Damage Risk Reduction System – Design Guidelines (June 2008)

In conjunction with these guidelines, the Corps defined the IEPR as a review in which the responsibility for coordinating the review is granted to an organization independent of Corps; that entity must be in charge of selecting the reviewers, all of whom should be independent of the Corps and free of conflicts of interest. All IEPRs for the HSDRRS are conducted in accordance with these policies.

The subject IEPR of the Hurricane and Storm Damage Risk Reduction System (HSDRRS) Design Guidelines (June 2008) was conducted from August 2008 through August 2010. The independent team of peer reviewers consisted of ten (10) Panel Members from four (4) major engineering disciplines: geotechnical, structural, hydraulic and civil. The IEPR effort included an Orientation Briefing (September 16, 2008), IEPR Conference (November 6-7, 2008) and Teleconference (January 19 and 21, 2010). The Final Independent External Peer Review Report is dated 14 June 2010.

3. Intent of HSDRRS Design Guidelines. On October 10, 2005, the Corps of Engineers established the Interagency Performance Evaluation Taskforce (IPET) to provide scientific and engineering answers to questions about the performance of the New Orleans and Southeast Louisiana Hurricane Protection System (HPS) during Hurricane Katrina. Critical lessons learned and recommendations from the taskforce follow:

- Planning and design need to be based on system-wide performance. All components must be examined and treated as integral parts of the system.
- The HPS was designed using a traditional standards-based approach that focused on the performance of individual components. This approach should be replaced by risk analysis, which provides greater capability for assessing system-wide performance and results in better-informed decisions.
- The design/construction and research communities must collaborate to develop new knowledge and fresh approaches to solving problems.
- Guidelines adaptable to new knowledge are preferable to inflexible standards.

Moving forward based on the IPET report and the funding and authorities provided by the U.S. Congress the Corps of Engineers began the planning, design and construction of a resilient risk based system for a 100-year hurricane event (HSDRRS). Additionally, numerous meetings were held with Corps personnel, academia and engineering experts from around the nation and the world to develop engineering design guidance that would be applicable to the unique design issues in the Greater New Orleans area (soft soils,

SUBJECT: Independent External Peer Review for the Greater New Orleans Hurricane and Storm Damage Risk Reduction System – Design Guidelines (June 2008)

subsidence, sea level rise, etc.). Even now, engineers continue in this effort to make appropriate and effective changes and improvements in the design and construction of the hurricane risk reduction system.

Based on IPET recommendations, the Chief of Engineering Division, New Orleans District, directed the preparation of the HSDRRS Design Guidelines to provide a comprehensive collection of best practices and lessons learned since Hurricane Katrina. The intent of the design guidelines is to provide a consistent interpretation of Corps of Engineers guidance to all HSDRRS designers whether internal or external to the Corps of Engineers. While use of the HSDRRS Design Guidelines is required, this document is not intended to remove engineering judgment and experience. Engineers are expected to practice with due diligence in their decisions. The guidelines continue to be a “living document” and will be modified (with IEPR of modifications) to reflect new design methods and/or engineering “best practices” that would be more effective in reducing risk to the public.

4. **Goals of this IEPR.** As the foundation of all work in the HSDRRS, it is imperative that the HSDRRS Design Guidelines provide clear and effective direction to engineers so that the end result will be a consistently successful system of risk reduction. The IEPR was thus intended to affirm correct application of engineering principles and assure that these engineering principles are applied with appropriate rigor. This is as required by the WRDA law and USACE regulations.

The Corps of Engineers also charged the IEPR to offer recommendations to improve the clarity and consistency of the guidelines with the goal that the input of independent peer experts would strengthen the quality and credibility of USACE decision documents. The result is evident in the review: the vast majority of reviewer comments offer constructive recommendations to add more detailed explanations, more illustrations, and more references to support and explain the rationale underlying the engineering guidance. The Corps welcomed these recommendations and has already acted on implementing and incorporating most of the revisions.

5. **Summary of Findings.** A total of 538 comments were submitted by the peer reviewers. Peer reviewers categorized their own comments in one of four engineering disciplines: Geotechnical, Structural, Hydraulic or Civil. Corresponding USACE subject matter experts evaluated each comment and provided a response that included specific revisions to be made to the Design Guidelines, as appropriate. This allowed the peer reviewers to see how the Design Guidelines would be revised to incorporate their comments. Table 1 summarizes the comments and the USACE initial response.

SUBJECT: Independent External Peer Review for the Greater New Orleans Hurricane and Storm Damage Risk Reduction System – Design Guidelines (June 2008)

Table 1. Summary of comments from IEPR

Discipline	Total Comments	USACE Initial Evaluation		
		Concurred	Non-Concurred	For Information Only
Geotechnical	236	142	40	54
Structural	91	63	6	22
Hydraulic	103	72	3	28
Civil	108	64	6	38
Total	538	341	55	142

The review process was interactive, engaging and rigorous. Because the vast majority of comments were resolved and closed with little effort, the peer reviewers and USACE subject matter experts were able to focus their energies on a few key issues. The resulting spirited dialogue is evidence to the independent validation of engineering guidance and design practices which is the goal of the IEPR process.

Most of the comments tagged “concurrent” and “for information only” addressed items to improve the clarity, organization and completeness of the guidelines. More than 100 comments were requests from peer reviewers for additional information including references cited and previously published USACE guidance.

Many comments, initially “non-concurrent” by Corps engineers, were successfully resolved with mutual agreement to make changes and clarifications in the design guidelines document.

Of the 55 comments initially “non-concurrent” by USACE, Corps engineers and the peer reviewers were eventually able to come to mutual agreement and resolution of 40 comments. In the remaining cases, peer reviewers and Corps engineers agreed substantially in the imperative for proven, state-of-the-art design methods that will assure consistent design results. These remaining 15 comments are either addressed by other reports or USACE Engineer Manuals; designer preference; or reflect the USACE management policy which allows use of A-E designers with appropriate oversight.

Both the Corps and the peer reviewers invested considerable time and effort to explain their positions on the issues to their counterparts. In the end, it must be acknowledged

SUBJECT: Independent External Peer Review for the Greater New Orleans Hurricane and Storm Damage Risk Reduction System – Design Guidelines (June 2008)

that professional differences of opinion cannot always be resolved. It needs to be clearly stated that even with the few issues, the Final IEPR Report concludes “the Design Guidelines contain very important information that will be useful to designers,” with the only caveat being that “some aspects of the document need improvement.”

6. Revisions to the HSDRRS Design Guidelines. The Corps has made numerous changes to its design practices since Hurricane Katrina. These improvements and innovations were thoroughly reviewed by USACE subject matter experts as well as experts from industry and academia prior to implementation. Nonetheless, standards and design methods used in critical life safety systems such as the HSDRRS warrant a rigorous, independent review. This review was provided by the IEPR. The resulting value added to the credibility of and confidence in the efficacy of the HSDRRS Design Guidelines cannot be measured.

The HSDRRS Design Guidelines were improved and a revised document was posted to the Internet in March and June 2012 with most of the recommendations and agreed-upon changes fully incorporated in the new document. The revised HSDRRS Design Guidelines is a much improved document as a result of this IEPR. Peer reviewers challenged USACE subject matter experts to provide broader explanations and documented justification for a number of design methods and criteria. These changes make the document a more complete guide to the design of a risk reduction system and improve the likelihood of consistent interpretation of standards by engineers engaged in such work now and in the future.

7. IEPR Conclusions. The final report includes a recap of the review process and recommendations for future improvements to the Design Guidelines. Peer reviewers concluded their report with the comments below in *italics*, with the USACE response following each.

- a. *The document should incorporate a systems approach that considers all pertinent scales of conditions and behavior that can significantly affect the overall system performance.*

The USACE Project Delivery Team (PDT) agrees that the document should include a discussion of the systems approach. A section addressing overall goals, design philosophies and the system-wide approach to the project is being developed and will be included in a future revision of the HSDRRS Design Guidelines.

SUBJECT: Independent External Peer Review for the Greater New Orleans Hurricane and Storm Damage Risk Reduction System – Design Guidelines (June 2008)

- b. *Additional information should be provided that describes the systematic development of levee/floodwall soil-profile segments and cross sections used for geotechnical analysis and design (i.e., Geotechnical Site Characterization).*

Additional information will be provided in the document to clarify the Geotechnical Site Characterization requirements. The team appreciates the illustrative example provided by the IEPR team regarding geotechnical site characterization. Relevant aspects of the example will be added, as well as specific site characterization issues encountered by geotechnical engineers working on HSDRRS projects.

- c. *The document should be consistent and accurate across disciplines with terminology and design usage of water levels and their relationships to levee and wall elevations.*

The USACE PDT agrees the document should be consistent and accurate with terminology throughout. The document has been revised and will continue to be revised to assure consistent use of terminology by all disciplines. In addition, a glossary of terms will be added to provide consistency in use of terms by all designers.

- d. *The document should state explicitly how the future effects from continued loss of wetlands, subsidence, climate change, storm frequency, storm intensity and duration, and storm travel speed would be accommodated into the design life of the flood control works.*

These important issues are included in the document “Elevations for Design of Hurricane Protection Levees and Structures.” The current version of this report is posted on the HSDRRS Design Guidelines Internet page. The report is also undergoing a separate IEPR effort.

8. **Future Initiatives.** Even as this IEPR was being finalized, further improvements and modifications to the HSDRRS Design Guidelines were being developed. This is consistent with the Corps’ policy to continuously reassess and update design and construction standards and to review and refresh engineering standards at a greater frequency that keeps pace with the generation of new knowledge.

These on-going efforts include the study “Aberrant Barge Impact Loads on HSDRRS Floodwalls.” Experience from past hurricanes has shown that while barge and vessel owners will take necessary and required steps to move their floating stock out of harm’s

SUBJECT: Independent External Peer Review for the Greater New Orleans Hurricane and Storm Damage Risk Reduction System – Design Guidelines (June 2008)

way or secure them in place to ride out a storm, vessels will come loose and go adrift. The current design criteria document recognizes the possibility of barge impact and requires floodwalls to be designed to withstand specified impact forces. This ongoing study provides the most in-depth analysis to date to best quantify the magnitude of those impact forces. As the results of this study are intended for addition to the HSDRRS Design Guidelines, the recommendations have undergone an IEPR in accordance with applicable law and USACE regulations. Of course, many floodwalls are located in areas where barges and other vessels are not typically found during storm events, so changes in the required barge impact design loads will not apply to those structures.

9. **Conclusion.** The IEPR of the HSDRRS Design Guidelines was conducted as required, and in accordance with, all applicable laws and USACE regulations. Thus the IEPR finalizes the important HSDRRS criteria, the critical component in meeting the FEMA requirements for the 1% chance exceedence storm conditions.

This memo closes out the action on the Independent External Peer Review Process.


JOHN C. BIVONA, P.E.
Acting Chief, Engineering Division

CF:
CEMVN Commander, Colonel Richard L. Hansen
CEMVD-RB, John A. Meador
CEMVN-PM-B, Mark Wingate
CEMVN-PM-O, Thomas Podany
CEMVN-ED-H, Julie LeBlanc
CEMVN-ED-F, Richard Pinner
CEMVN-ED-L, David Beck
CEMVN-ED-S, Jake Terranova
CEMVN-ED-T, Chris Dunn