



InCom WG 137

Navigation Structures Resilience to Overloading

Terms of Reference

Background

Care of the waterways, as well as the protection of harbours and the environment is a historic concern of PIANC. However, the emerging trend within PIANC is to consider more than inland navigation, but to develop an Integrated Water Basin perspective which also includes flood protection whether performed by the navigation authority or other organizations.

EnviCom Working Group 12, *Sustainable Waterways Within the Context of Navigation and Flood Management* was formed to investigate and quantify possible relationships between waterway development and maintenance measures for navigation and flood management. Also InCom WG26, *Design of movable weirs and storm surge barriers* addresses recent designs for these structures; however the concept of *resilience to overloading* was not included.

In many instances, navigation structures also serve as flood defence structures or become inundated during major floods. A significant issue associated with these systems is how they will behave when they have been loaded beyond their designed capacity.

The requirement for resilience is to ensure the system does not fail catastrophically if the flood is higher than the design flood. A small amount of cosmetic damage is acceptable, but the system should still be capable of withstanding the design loads after the flood event passes and is capable of being returned to navigational duty as soon as reasonably possible.

Design guidance for the incorporation of features to ensure resilience to overloading for flooding is limited. Comprehensive “lessons learnt” and the incorporation of features to ensure resilience will help facilitate preparation of design guidance and the design of new construction or rehabilitation of existing structures.

Objective of the Working Group

Establish a flood resilience Working Group to assemble lessons learned, determine the resilience of navigational structures, and to provide guidelines for the updating of existing structures and the design of new ones when used on inland waterways.

Final Product

The intent will be to provide a comprehensive summary of “lessons learnt” and best practices that can be incorporated into future navigational system designs. The intent of this Working Group is to provide advice for the structural, mechanical ,electrical and operational design for navigational structures to assure performance during and after a flood event. One important issue is to incorporate the concept of *resilience to overloading* which happens to a navigation system if it is overtopped.

This WG would identify methods for ensuring resilience to the system by requiring it to survive this overload without catastrophic failure, endure only cosmetic damage, be capable of withstanding the design loads after the flood event passes and returning to normal service.

The report will include a summary of relevant guidance documents from various countries. The Working Group will provide guidance on the choice of features and/or systems to use in future designs to ensure system resilience and consider the cost/benefit implications of the adoption of these guidelines.

Matters to be Investigated

The report will use Case Studies to identify and compile “lessons learnt” on the performance of navigation systems and whether or not they behaved in a resilient fashion. Resilience means gradual failure modes rather than sudden failure modes, not increased capacity. Some of the issues to be investigated include:

- a. Performance of storm surge barriers.
- b. Performance of banks, lock and flood walls
- c. Performance of gate closures and risks from overtopping.
- d. Performance of pumping stations and outlet works.
- e. Features added to the navigation system to minimize risk of catastrophic failure and consequential liabilities if system capacity is exceeded.

Desirable Background or Experience of Working Group Members

The background and experience may include the following:

- a. Civil, Mechanical, Geotechnical, Hydraulic, Hydrologic and Structural Design engineers.
- b. Personnel responsible for daily maintenance and emergency operation of flood protection systems.
- c. Academic personnel familiar with flood protection systems
- d. Representative from RecCom

RELEVANCE TO COUNTRIES IN TRANSITION

This working group can be useful for all countries where river navigations are subject to flooding and inundation and where navigation authorities wish to improve their navigational structures and increase their resilience in extreme conditions.