Mitre Gate Design and Operation

Terms of Reference

Objective of the Working Group

The main objective of the WG is identifying "Best Practices" for the design, fabrication, and operation of lock mitre gates.

Background

Mitre gates are critical components of locks for system reliability. The system reliability is strongly dependent on the successful long term operation of mitre gates. Experience has shown that mitre gates have performed well but there have been a number of problems. There have been several examples of gates failing and as a consequence the need to improve on past designs has been recognized.

Final Product

The intent is for this working group to create a compilation of mitre gate designs that discusses the benefits and disadvantages and makes recommendations for typical sized low, medium and high head mitre gates. This group will build upon the information provided by *WG 29 Innovative Lock Design, WG 129 Asset Management, WG151 Impacts of Seismic Loads and Ship Impact on Lock Gates and WG 138 M&E Lessons Learnt*.

Matters to be Investigated

The report needs to address mitre gates on a number of topics to include: design criteria, quoin blocks, pintles (movable vs. fixed), horizontally framed vs. vertically framed, seals, diagonals, fenders, heat straightening repair techniques, use of composites, need for vehicle access over the gate, corrosion protection systems (cathodic protection), condition monitoring, improved strength, long term service, fabrication and erection techniques, ease of repair, user friendly maintenance, ease of access, ease of cleaning, machinery, machinery connections, double skinned floating gates, need for redundant gates, spare gates (parts), placement of fill/empty valves within mitre gates, ice and debris, removal and replacement, standardized gate designs (feasibility, components to standardize, etc), and quick change out programs. For this review there is an important need to ensure that proven design concepts move forward and make recommendations for "Best Practices".

Also the types of failures associated with mitre gates need to be identified, such as: anchorage, strut arms, machinery, quoin blocks, etc. possibly in the form of case studies so as to reinforce "Best Practice". Another concept is to have the gate pintle located at the top of the gate instead of the bottom. This does not alleviate the wear problem in the pintle but allows easier access for maintenance. The concept of replacing directly connected cylinders by "gate machines" connected to a large strut on the wall side of the mitre gate should also be investigated due to the advantage of the cylinder not being over water and being sheltered from impact damage and the weather.

While mitre gates are the main focus, the report needs to consider and discuss other alternative types of lock service gates and innovations, such as sliding gates, sector gates, vertical-lift gates, rotary segment gates, swing gates, reverse mitre gates, suspension gate, etc. provided the Working Group considers whether it has the capacity to examine these other forms of construction within the permitted life span of the Working Group. The main focus of the Working Group must be to consider the issues associated with mitre gates.

Desirable Background or Experience of Working Group Members

The background and experience should include Structural Design Engineers and Lock Operators from various organizations, such as VNF/CETMEF with Seine Nord Europe, ACP for Panama, BAW, Rijkswaterstaat, British Waterways, Port and Navigation Authorities, UK Ministry of Defence, and the US Corps of Engineers.

Relevance to Countries in Transition

This working group can be useful for all countries developing hydraulic structure infrastructure by providing a relevant design experience for mitre gates.

Climate Change

During the preparation of the report, the possible impacts of Climate Change should be considered and any findings and/or recommendations should be made accordingly.