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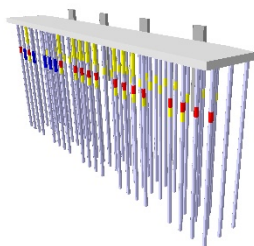
Part 6
Floating
Structures

Gareth
Evans
And
John
Berry

Gareth Evans

BSc PhD C.Eng FICE FStructE MBCS

Managing Director of Constructex Ltd (specialist maritime contractor)



CONSTRUCTEX

John Berry

BSc C.Eng MICE

Principal of John Berry Associates



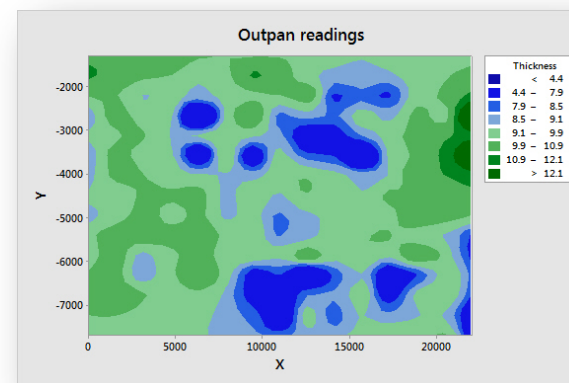
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8th February
2016*



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Gareth Evans – Will outline the proposed section on Inspection and Maintenance



John Berry – Briefly go over the principles of the new Part 6 and then discuss particular aspects dealing with marina pontoons



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Floating Structures

Definition

Stationary, buoyant and floating (or designed to float) restrained by a mooring system and generally in sheltered waters.

Design

Can be designed for a specific environment and wave climate. May be required to be moved/towed for repair or installation. Can cover a wide variety of uses, floating structures, berthing/ mooring pontoons, access ways

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The floating structures covered within this section of the code have different standards and requirements to vessels, and this will be reflected in both the design and maintenance requirements.

The design standards will be agreed with marine insurers in order to ensure that marine insurance cover can be obtained for towage and transport of the units for installation and maintenance

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Floating structures require a formal inspection and maintenance regime similar to that used for vessels. It is intended to provide specific guidance on:

- **Frequency of Inspections**
- **Level of inspection**
- **Qualifications of Inspectors**
- **NDT recommendations**
- **Integrity testing**

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Alternative Approaches

A risk based approach developed by the designer will be cited as an alternative to the proposed inspection regimes.

This is to cater for unusual situations where the more prescriptive approach is not considered relevant



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Frequency	Comments
Annual inspections by a suitably qualified person	It is anticipated this will be a walkover inspection, including critical elements and damage
3 Yearly inspections overseen by a Chartered Engineer	Detailed inspection including some NDT on critical parts
6 Yearly inspections to include an inspection of the underwater elements.	As 3 yearly but the external parts normally underwater to be included
12 Yearly out of water inspection and survey	Would normally be combined with any repair and refurbishment works
Special Inspections	These would be detailed in the health and safety file and would cover situations such as storm events; statutory inspections



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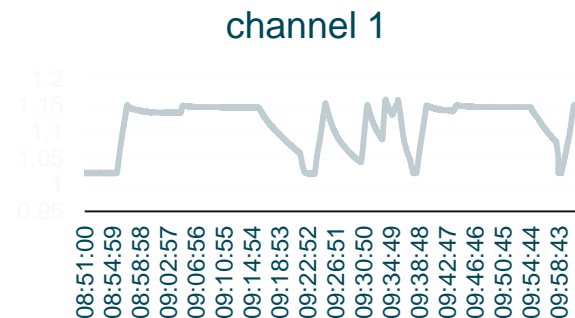
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Integrity testing

Where pontoons are compartmented it is important to verify the integrity of the original these compartments.

Air pressure test (+0.12 bar)



Levels of testing

The level of testing is dictated by the original design criteria as demonstrated below:

- Connections
- Design life and corrosion
- Pontoon use
- CP system
- Mooring system
- Exposure conditions
- Age





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Pontoons

The following are being considered for the new code:-

- Classification of pontoons
 - A Unrestricted Access
 - B Restricted Access
 - C Maintenance and Temporary works
 - **D Marina pontoons**
- This is not an exhaustive list and may well be added to during the development of the standard



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- a) Commercial Use
- b) Recreational Use
- c) Specific operations such as the RNLI



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The required Criteria for each installation is basically the same and can be considered to be:

- a) Vessel types using the facility
- b) Its location and exposure
- c) Safety of those using the facility
- d) Failure modes
- e) In addition depending on the type of pontoon being used free surface effects may need to be considered as well as ballasting.

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Design Criteria

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This will be further developed to cover :-

Serviceability

- Define acceptable motions for both in service and extreme conditions
- Operational tidal range and allowance for extreme conditions
- Operational wave climates
- Operational wind conditions on a berth

Installation / Maintenance

- Recommendations for maintenance inspection periods, detailing to ensure that bearings and joints can be easily accessed by the end user.

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- The proposal will be to add in a flow chart which will lead the user through the options for each section and cover the necessary points that are considered necessary.





Design Flow Chart

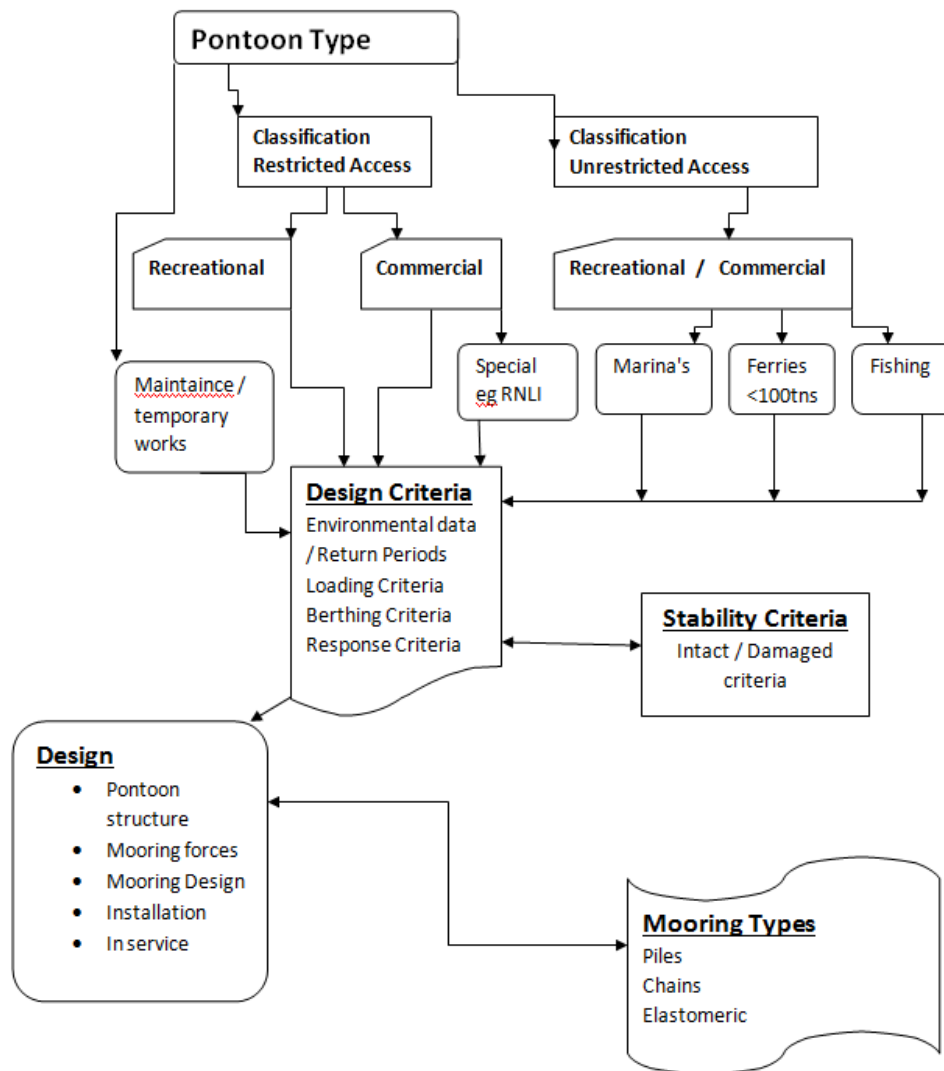
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Concept for Determining Pontoon Design Route





Marina pontoons - Design Approach

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The analysis of motion response and stability both intact and damaged stability requires detailed consideration and it is proposed to provide information on the ranges of analytical programmes available to the designer.

This may be simply hand analysis for a marina type installation to a very rigorous analysis for a landing pontoon for a commercial port.

In respect to Marinas there is also a case to consider individual elements during erecting and then an overall analysis of the system taking into account the design and capacity of the joints and fixings.

Each design is site specific and needs to consider those effects that will be imposed on the installation.

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Marina Installations need to be treated as a separate section due to the nature of the installation.

The sections for this element will consider:-

- ❖ Investigations
- ❖ Dimensional Criteria
- ❖ Loading and Stability
- ❖ Design considerations

Its considered that criteria for installation stability needs to be considered to ensure they are stable in the unloaded case separately from the complete system which needs to be considered with attention paid to the capacity and of the connections.

Design considerations will include suggestions / recommendations for design of access to the connections so that regular inspections can be carried out. The design also needs to consider servicing of units in the future so that elements can be disassembled without needing to carry out major dismantling of the system. This could include hospital piles for brow support / service connections that can be split etc, removing pontoons from piles without having to lift the pontoon up and off the piles!

The guidance will also cover aspects of the layouts for Marinas ie berth layouts and spacing's

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Various publications and standards exist already which provide guidance on criteria for the design of Marina installations ie the YHA Guidance and the Australian Code

It is proposed to include guidance for loadings and load combinations

For example :-

FLOTATION AND STABILITY LOADS FOR PONTOONS

Access (see Clause 4.3)	Flotation load (kPa)		Stability load (kPa)
	Walkways	Fingers	
Unrestricted	3.0	3.0	2.0
Restricted	2.0	2.0	1.5

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Load Combinations

For Strength Limit States, the designer should be satisfied of the appropriate load combinations and load factors for the particular circumstances. Where more accurate data is not available, the following load combinations are suggested:

- (a) *For pontoon piling:*
- (i) Wind load (See Note 1) + $1.5 \times$ current load + $1.5 \times$ wave load.
 - (ii) The piles are to be designed for water level at highest astronomical tide (HAT) (See Note 2).
 - (iii) *Where flooding or surges can occur:*
 $0.8 \times$ wind load (see Note 1) + $1.25 \times$ current load + $1.25 \times$ wave load taken at the maximum water level.
- (b) *For the marina itself* Wind load (see Note 1) + $1.5 \times$ current load + $1.5 \times$ wave load + $1.5 \times$ the vertical effect of wave action.
- (c) *For boat impact:*
- (i) $1.25 \times$ the loading created by boat impact.
 - (ii) Taken on its own without environmental loads.

NOTES:

- 1 Wind loading is based on the ultimate wind velocity.
- 2 Where the water depth in a particular section of the marina varies, the piles should be checked for a water level at lowest astronomical tide (LAT). In this situation the piles in the shallower water will tend to carry a greater proportion of the total loads applied to this section of the marina.



Mooring types

It is proposed to include a section on mooring types
ie

- Piles
 - Chain Moorings
 - Wall Guides
 - Elastomeric Bearings etc
-
- All of which will have an impact on the way the installation operates and needs to be considered in combination with the pontoon units themselves.



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The development of this reworked code is still in its infancy and we would be please to have suggestions / input from anyone with an interest in the development of the final work. Please feel free to contact Gareth.

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