Designing a Marina for some of the Worlds Largest Yachts

PIANC Marina's and Mega Yachts Conference
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Halcrow

About Me

- Background in coastal engineering and design of much smaller marinas.
- Relocated to the UAE where I had the opportunity to project manage the design of a prestigious mega yacht marina development.
- Confidential project so not able to discuss project specifics.
- Share the general experience and knowledge I have gained, highlighting some of the lessons learnt and key considerations for future designs.
- Pictures from Yas Island Race Track Marina to help explain some key points.

Design Guidance for Mega Yacht Marinas

- Gap in current guidance for design of marinas to accommodate very large leisure vessels:
  - Australian standard for design of marinas for ‘small’ leisure craft <50m.
  - British standards for design of ports for large commercial vessels.

  (draft PIANC guidance for design of super yacht marinas, July 2009)
- Developed my knowledge to fill these gaps, working closely with a marina operator and through discussions with pontoon manufacturers, vessel captains and, most importantly, our client to better understand expectations of the current market.

MY Ellix Too, length 48m
(NOT a mega yacht !)

Overview

Background

- What is a Mega Yacht?
- Mega Yacht Dimensions
- Requirement for Mega Yacht Marinas

Design Considerations

- Manoeuvring a Mega Yacht
- Overview of Berth Layouts
- Finger Pier Structures
- Quayside Access Requirements
- Utilities Required at Berth
- Refuelling at Berth
- On-land Facilities
- Marina and Vessel Security

Summary

What is a Mega Yacht?

- No clear definition of size but generally regarded as vessels greater than 60m in length.
- Mega yachts are not typically managed by their captain but are usually managed externally. This operation has been compared to running of a small hotel and travel agent combined.
- Trend for increase in length means many vessels cannot fit into existing leisure marinas.

MY Silver, length 94m
(this is a small mega yacht !)

Mega Yacht Dimensions

- Largest mega yacht was the MY Dubai, length 162m (2005).

- Currently the largest is the MY Eclipse, length 164m (2009).

- Trend for increase in length seems set to continue with clients and the market already demanding berths for vessels up to 180m.

Mega Yacht Dimensions (cont.)

- Vessel beam can vary significantly as many new mega yachts are converted from existing vessels.
  - Converted ferries: proportionally wider
  - Converted naval frigates: proportionally narrower
- Mega yachts are typically bespoke ‘one-offs’ so designing for a standard design vessel may be difficult.
- Future mega yacht marinas may therefore need to be designed around specific vessels.
- Information on specific vessels is often very sensitive (hull design, security etc.) and tends to be difficult to obtain.

MY Dubawi, length 90m, beam 15m

MY Swift, length 141m, beam 15m

Requirement for Mega Yacht Marinas

- Mega yachts are often seen moored in commercial ports or anchored offshore.
- These locations are not suitable for the millionaire owners, royalty, VIPs and dignitaries.
- Increased market demand for prestigious ‘home port’ marinas for mega yachts.

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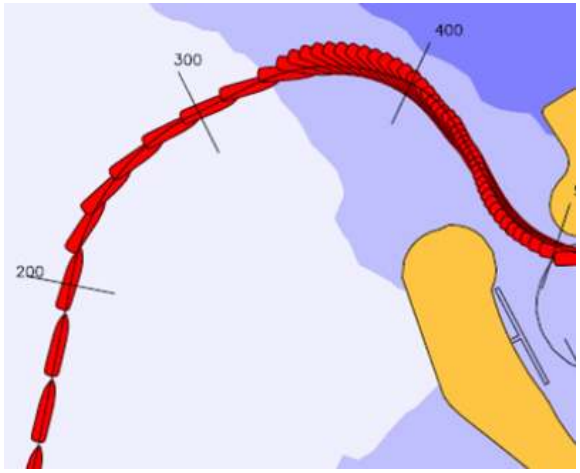
Manoeuvring a Mega Yacht

- Modern hi-tech equipment such as pod propulsion systems and bow thrusters as well as qualified captains and professional crew make mega yachts very manoeuvrable.
- Current guidance recommends turning circles of 1.5L to 1.75L but discussions with captains suggest as little as 1.1L may be acceptable.
- Use of fast time vessel navigation software (eg. SHIPMA) to verify manoeuvring behaviour for safe navigation.
- Vessels follow predefined course under the influence of wind, wave and currents where auto pilots correct and control behaviour.
- Difficult to model mega yachts as full vessel characteristics not easily available.



Overview of Berth Layouts

- Along side mooring
  - More typically seen in commercial ports, good access for unloading/ maintenance etc.
  - Not efficient use of quay wall.
- Stern-to-quay mooring
  - Popular in the Mediterranean (Monaco etc.)
  - Industry is moving away from this layout as it offers reduced access for maintenance/ cleaning, less privacy between vessels.
- Finger piers
  - More typically seen in small leisure vessel marinas.
  - Ease of mooring (no bow lines, divers etc.), provide improved privacy and access for cleaning/ maintenance. Increasing popularity for use in berthing of mega yachts.

Finger Pier Structures

- Solid fixed piers
  - Durable, easy to maintain, allow architectural finishes, stable platform for servicing/ events.
  - But, reduced water circulation/ flushing.
- Pontoons finger piers
  - Improved water circulation/ flushing, allows future flexibility of berth layouts.
  - But, no current examples of use for vessels >100m.
- Open fixed piers (preferred)
  - Reduced wave reflections, improved water circulation/ flushing, stable platform for servicing, events etc.
  - But, higher maintenance requirements for corrosion protection systems, increased security risk (blast attack from below).

Quayside Access Requirements

- Dock level. Small vessels berthed on pontoons typically <500mm freeboard. What does a 5 storey mega yacht require?
- Width of finger piers determined by requirement for services, bollards, vehicle access (lorries, 50t crane), parking & turning, equipment storage.
- Overall finger pier width of up to 18m may be required, compared to only 1-2m for small leisure vessels.

Utilities at Berth

- Water
  - Potable water usage for largest vessels can be as much as 20,000l/day. In comparison, a typical 3-bed house in UK uses only 400l/day, around x50 less.
  - Dedicated sewage pump-out at each berth requiring vacuum systems. Lift stations to feed into local sewer network.
- Power
  - Huge power demand. Fitted power of largest vessels typically 4,100 kW. Comparable to a small tower block.
  - Even at berth, vessels in ‘hotel mode’ continue to use between 40% - 70% of this fitted power.
  - A development including as many as 5-10 ‘tower blocks’ likely to require significant upgrading of local cable networks, provision of local feeder stations, dedicated sub-stations at each berth.
  - In addition, a requirement for shore based power converters (frequency, voltage) requiring a dedicated building or quay space for temporary lorry mounted units.

Refuelling at Berth

- Refuelling at berth typically preferred by marina operators.
- Vessel insurance may be invalidated if refuelling not directly from a certified supplier (eg. local petroleum companies) due to reduce risk of contamination and damage to the engines.
- Refuelling pipes/ pumps built into the dock are therefore not preferred. Would require onerous cleaning/ certification by operator prior to each refuelling operation.
- Solution: to allow for refuelling of mega yachts directly from road tanker. Capacity of largest vessels around 1 million litres could require as many as 25!! tanker loads.

On-Land Facilities

- The largest mega yachts typically have accommodation for 70+ guests and 100+ crew.
- Large reception buildings may be required for guests as well as provision of facilities for the crew.
- Offices for managing mega yacht logistics also required; trip bookings, re-supply and maintenance arrangements, owner/ crew travel arrangements etc.
- Separate land based helipad(s) could be required as use of helicopters is not allowed at berth.
- Power converters require building or quay space, typically around 40m^2.

Marina and Vessel Security

- Owners of mega yachts are typically millionaires, royalty, VIPs and dignitaries who require heightened security.
- Requirement to segregate mega yacht berths and on-land facilities from rest of marina.
- Maritime barriers used to control water access beneath open piled piers and around vessels.
- Preferred systems (pictured top to bottom) include:
  - Halo Maritime Defence System
  - Harbour Offshore Security Barrier
  - Dunlop Barrier
  - WhisprWave Vessel Exclusion Barrier (local examples at Umm al Nar oil refinery, Abu Dhabi)

Summary

- Interesting and challenging learning opportunity for me.
- Highlighted gaps in current design guidance for mega yacht marinas.
- Identified key design considerations specific to mega yachts and trends in the design of marinas to accommodate them.

- I hope this presentation has been interesting and informative and offered some useful knowledge that might benefit future mega yacht projects.
- Final thought: The market demands for mega yacht marinas looks to continue with a clear trend for increasingly larger vessels.

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