Marina Design to Incorporate Superyachts: A Case Study

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Abstract
There are increasing numbers of large private vessels worldwide and the trend is extending into Australian waters. To cope with demands, the Southport Yacht Club (SYC) is presently expanding the existing marina by an additional 37 berths, all over 16m and including 5 berths for "superyachts" and 1 for a "megayacht". These larger vessels have widely differing physical characteristics and their requirements vary from smaller recreational craft. Issues such as berth widths, wave climate, flood flows, maneuverability, electrical power requirements, firefighting and security were key design considerations.

1 Introduction

The existing Southport Yacht Club (SYC) is located in the Broadwater on the Gold Coast, Australia. The SYC marina was designed for a range of mid-size [10 – 18m] recreational craft, with 2 x 40m "superyacht" berths, one that is permanently occupied. SYC has played host to a range of visiting superyachts on an ad-hoc basis along the perimeter T heads. This has required mooring blocks to take the additional loads, particularly wind generated, on the marina piles.

There are a number of marinas within the Broadwater that are capable of catering to superyachts. As superyachts will pay very large fees to moor at suitable facilities in attractive and safe locations, competition for the superyacht dollars on the Gold Coast is fierce. However, at times, demand for superyacht berths has outstripped available berths in the area.

Figure 1 Aerial photo of the Southport Yacht Club marina prior to the extension.

2 SYC Extension

ICM was commissioned by the SYC to help determine the options for the layout for the marina extension and then project manage the contracts, approvals and construction. The marina tender was awarded to Bellingham Marine Australia, who undertook the final design with specialist marina consultants, IMC.

Approval to extend the previously existing seabed lease has been obtained and construction has started on an additional 37 berths, all over 16m. These berths include 6 berths for local and visiting "superyachts" (generally accepted as >24m) or 5 superyachts plus 1 "megayacht" (generally accepted as > 150 feet or 500 tons). [Figure 2].

During the initial design stages, the demand for larger berths experienced in the past by the SYC was evaluated. Expressions of interest were generally for mono hull and catamarans vessels of about 16m. Single berths are much more in demand than the cheaper double berths.

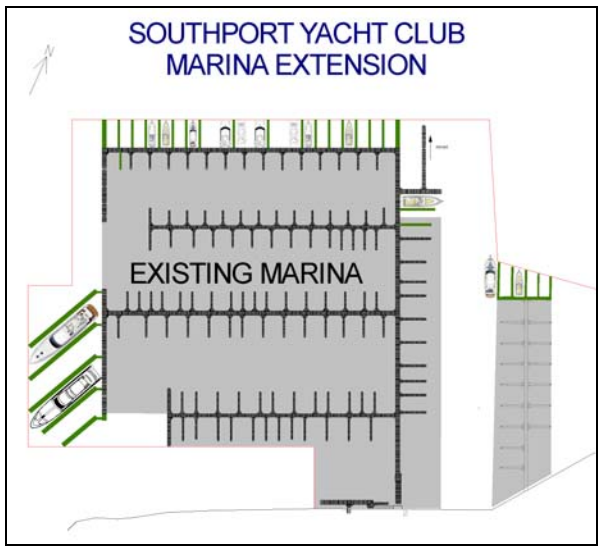

Figure 2 Proposed SYC marina extension

While the Australian standard (AS3962-2001: Guidelines for design of marinas) provides guidelines for vessels up to 50m in length, the varying requirements of larger vessels needed to be considered in detail in the design process. As the project progressed, the design of the extension had to take into consideration the differing requirements and expectations of the clientele in order to provide berths that were both functional and desirable. Design considerations included:

- Expected demand for superyacht berths
- Special characteristics of superyachts, including basic overall dimensions and handling.
- Waves and currents.
- Requirements in terms of provision of services such as water, power, sullage, fire fighting and security.

3 Demand

The Gold Coast is an attractive destination for superyachts. Additionally, the superyacht industry is experiencing high growth – reflected in increased manufacture and sale of superyachts. As a result, demand for superyacht berths in desirable locations is increasing.

In response to this, the Queensland state government has recently undertaken investigations into the "Gold Coast Marine Development Project". As well as construction of the much publicized cruise ship terminal [which is no longer being pursued], the proposal included a marine precinct with at least 30 berths for superyachts. [Qld Govt, 2007]

There is some flexibility in the layout and actual demand will be comprehensively reviewed.

4 Superyacht Characteristics

In Australia, presently, superyachts tend to be mainly motor or motor sailers. Regardless of type, these vessels are large and luxurious. Some have large vessels for tenders, helicopter platforms and swimming pools.

There is some debate regarding what minimum length is actually classified as a "superyacht". Government studies have classified these vessels as being over 24m, however there is no well accepted figure.

Figure 3 Photo of the Lady Moura [105m in length]

Figure 4 Photo of Project Platinum [160m in length]

The larger vessel sizes allowed berths to be constructed in areas where the wave and current climate precluded smaller vessels. The five dedicated superyacht berths included three 50m berths as well as a 30m & 35m berth. This was dictated in part by the location of extended lease boundaries and preferable orientation of the vessels for tidal currents.

4.1 Beam and Berth Width

Super sailing yachts typically have smaller beam dimensions in comparison to super motor yachts. The Vessel beam and berth dimensions given in the Australian code [Figure 5] are "based on the widest beams of monohull boats currently [at the time] being manufactured" [regardless of vessel type].

TABLE 3.2

MINIMUM BERTH DIMENSIONS FOR MONO-HULL BOATS

Boat length (L), m	Boat beam (B), m	Width of berth (b), m	
		Single berth	Double berth
25	6.5	8.0	14.5
27.5	7.0	8.5	15.5
30	7.5	9.0	16.5
35	8.7	10.2	19.0
40	10.0	11.5	21.5
45	10.0	11.5	21.5
50	10.0	11.5	21.5

Figure 5 Minimum Berth Dimensions. (Source: AS3962-2001: Guidelines for design of marinas).

A review of current superyacht vessel beams up to 50m showed that very few vessels of this size were over the 10m stipulated in the code. This was confirmed by a similar documented review undertaken by van Goolen et al (2005), although full analysis of a range of vessel sizes resulted in a slightly higher 95% beam of 10.6m for a 50m vessel.

For the SYC marina, the berth widths were set to dimensions dictated by the code.

4.2 Draught

As with smaller recreational vessels, super sailing yachts typically have larger draughts than the super motor yachts. Vessel draughts given in the Australian code [Figure 6] are "prepared on the basis that 95% of boats do not exceed the draughts [below]".

TABLE 3.1

TYPICAL VESSEL DRAUGHTS

Boat length (L), m	Vessel draught, m		
	Power boats	Yachts	Multihulls and house-boats
8	0.9	1.5	1.2
10	1.0	1.8	1.2
12	1.0	2.0	1.2
15	1.2	2.5	1.2
20	1.5	2.9	1.2
25	1.8	3.0	
30	1.9	3.4	
35	2.1	3.8	
40	2.3	4.2	
45	2.6	4.2	
50	2.9	4.2	

Figure 6 Typical Vessel Draughts. (Source: AS3962-2001: Guidelines for design of marinas).

Skippers of superyachts are often very conservative in terms of ensuring adequate depth at the berth, although

often time arrivals and departures around suitable tides.

At the SYC marina, the proposed superyacht precinct has depths over 4m at LAT. Experience with superyachts at SYC suggested that these existing depths were adequate for the majority of superyachts of this size. The Australian Standards indicated that it was suitable for most super motor yachts in this size range. As dredging was not planned, however, berths were limited to the water depths available and a comprehensive evaluation was not undertaken.

A documented review has been undertaken by van Goolen et al (2005). It showed a higher level of variability of draughts and analysis (Figure 7) showed that the 95% indicator was significantly higher for larger vessels than the requirements given in the code (which were closer to average draughts).

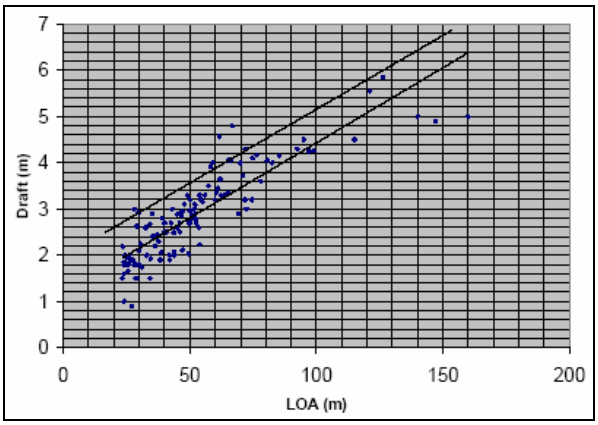

Figure 7 Typical Vessel Draughts for Super Motor Yachts. (Source: van Goolen et al, 2005).

5 Berth Layout

When considering layout, it should be noted that superyachts typically berth stern-in [Figure 8]. This provides improved vessel access for embarking/disembarking as well as for deliveries and loading of goods.

Figure 8 Superyachts at Antibe.

These types of vessels are usually very maneuverable [with bow and stern thrusters] and generally have very competent skippers. As such, these vessels are typically capable of turning in less space than the fairway width of 1.5 – 1.75L recommended by the code.

As access to the superyacht berths was not overly restrictive, the layout of the SYC extension was determined in part by:

- environmental conditions [superyachts were oriented parallel to the current]
- demand for berths [berth sizes were the maximum possible]
- geometric constraints of the new lease boundary

Additionally, due to high flood flows and the potential for a substantial debris mat in flood conditions, it is a requirement of the design that superyachts are not on the marina during these events.

6 Services

Appropriate services can make a marina both functional and more desirable for superyachts.

6.1 Electrical Power Supply

Given the facilities on board, it is no surprise that superyachts often have significant electrical power requirements. The difficulty is that not only do the requirements of vessels differ [both in terms of total demand and outlet type], but these demands are changing over time and it is not uncommon for marinas to gradually become under-powered. This is particularly true for the superyacht industry.

After consultation with electrical consultants and contractors, the SYC has provided 200A 3 phase power for each of the 50m berths and 163A 3 phase power for each of the 30m & 35m berths.

6.2 Firefighting

Original design undertaken by the contractors for firefighting was in accordance with local regulations. The approval process highlighted the local authority's concern over the adequacy of these requirements for superyachts, particularly given their location at some distance from the gangway.

Marina fires have a fire load of fibreglass, motor fuel and gas bottles. Marina fires burn very hot, producing a thick black smoke that reduces visibility to less than one metre (SFS, 2006).

Control and extinguishment of marina fires is extremely difficult except in the case of rapid intervention. It also presents additional problems in terms of fire fighter safety. A full risk assessment was undertaken by Scientific Fire Services (2006) to evaluate actual risk and effectiveness of various options in combating marine fires.

This report highlighted that superyachts are ocean-going vessels. As such, they must comply with International Marina Organisation [IMO] conventions, including SOLAS [safety of life at sea] and the FSS [fire safety systems code]. Because the ship is the

only refuge at sea, firefighting is a matter of life protection rather than property protection and they must have comprehensive systems for the prevention, containment and extinguishment of on board fires.

Typically, fire fighting systems include extinguishers, sprinkler systems, fire alarms, fire pumps, fixed gas and inert gas systems and foam systems as well as prevention measures and comprehensive staff training. Additionally, as superyachts are typically manned around the clock, there is an improved chance of early detection.

The report concluded that "Super yachts are the least hazardous of boats at a marina."

A number of options for combating fires were investigated, from prevention measures to multiple fixed water monitors [Figure 9] and fire boats [Figure 10]. Many of these options were prohibitively expensive with questionable effectiveness in different situations.

Figure 9 Water Monitor

Figure 10 Fire Boat

Prevention measures were generally viewed as effective. While the SYC had a comprehensive prevention plan, including regular maintenance and staff training, this was fully reviewed. Once a fire had started, deberthing of adjacent vessels [Figure 11] to provide a fire break was strongly recommended as the most effective way to prevent the spread of the fire to the rest of the marina.

It was decided, in conjunction with QFRS [Queesnland Fire and Rescue Service], to provide additional protection in the form of high-expansion foam and delivery system at the superyacht precinct. This type of foam is generally effective in dealing with fibreglass-based fires.

While damage to a superyacht is invariably newsworthy and this can result in criticism of the fire brigade, an appropriate response to this risk is important.

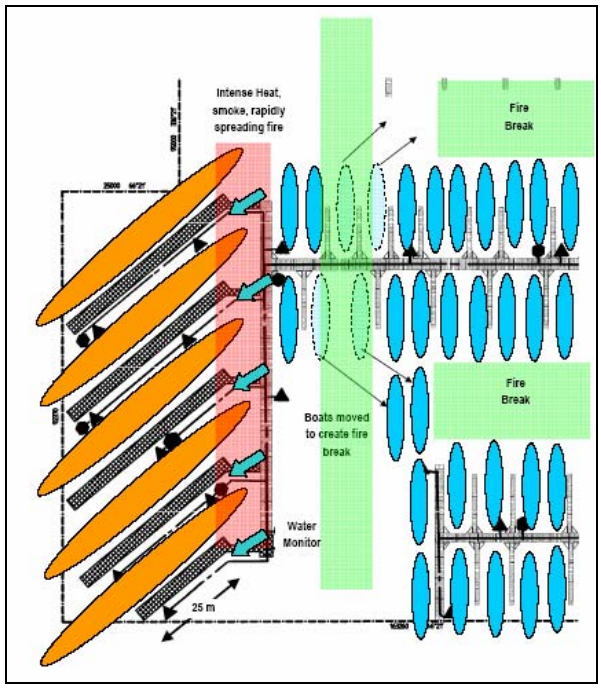

Figure 11 Deberthing strategy (Source: SFS, 2006)

6.3 Phone

While provision of phone lines was considered, we were reluctant to install them for the superyacht berths and they have not been included. This is predominantly because the level of technology on board is typically very high and it is likely that they have satellite phone (and email)facilities on board as well as individual mobile phones.

6.4 Sullage Pumpout facilities

Provision of dedicated sullage pumpout facilities was considered for the larger berths. Given the cost involved, it was decided to run the pipework for this system, but install the pump at a later date [if at all]. There are alternate locations to pumpout sullage locally that can be utilised.

6.5 Refueling facilities

While there is a fuel dock at the SYC marina, it is generally not accessible by the larger vessels. A new refueling jetty was not given serious consideration as there are a number of alternate locations locally where fuel can be purchased.

Often, given the volume of fuel purchased for such large vessels, it is significantly cheaper for them to order a fuel truck and pump direct from the shore independently of the club.

7 Summary

The Southport Yacht Club (SYC) is presently expanding the existing marina by an additional 37 berths. Due to past demand for berthing superyachts on an ad hoc basis and the growth of the superyacht industry, this extension included 6 superyacht berths between 30m and 60m.

During the development of a preliminary layout and berth requirements, it was obvious that superyachts differed from smaller vessels in a number of ways.

Review of typical vessel dimensions in the Australian Standards showed that beam dimensions given were generally appropriate, although a later comprehensive review showed vessel draught typically represented an average vessel rather than the conservative 95% of vessels indicated.

While it is obvious that higher power levels are needed to run these vessels, it was also noted that these power requirements are constantly increasing. While provision of other services is generally more typical, the approval process identified fire fighting as a potential issue.

After comprehensive review, prevention methods and prompt deberthing of vessels was recommended. It was recognized that superyachts were already well protected by onboard systems and were relatively low-risk. The addition of high-expansion foam was included during negotiations with authorities.

8 Acknowledgements

The input of the following people was critical in the project:

Sharon Morrish, Jan Mulqueen & Steve Fisher [SYC]
Gary Charlwood [Bellingham Marine Australia]
John Leman [IMC, International Marina Consultants]
Paul Clancy [Scientific Fire Services]

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