Product Analysis and Design of a Superyacht
Analysis of a semi-custom fiberglass range of Benetti Yachts, from 93' to 145'
Redesign of a "Classic" 121' Yacht

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ABSTRACT

The present work consists of two major parts. First is a “Product Analysis” of a complete Benetti semi-custom fiberglass range (10 models – each with 500 items compared), and second part is Redesign of a Benetti “Classic” 121’– the most successful yacht of “Benetti” with 60 boats build in past 10 years. This work provides a 360° overview of a product of superyacht.

In the first part, research is concentrated on technical specification analysis of all the models. Each technical section is shown with relevant areas and examples of comparison done during the internship. Some of the fundamental systems that allows the operation of the yacht have been closely described, depending on availability of data and privacy terms of a company. Apart of textual description and examples of specimens compared, there is also a graphical comparison and onboard pictures during the inspections of different stages in the production, for a different technical areas shown.

Because of highly competitive market, it was necessary to take a closer look at how industry works. By studying the trends in sales, design, technology, future building trends and distribution of the fleet in Superyacht industry determines a direction of future developments. Strategic positioning of a new project is then possible with closer look on direct competitors of a previous model “Classic” 121’. Cross analysis with, “in house” and external competitors, provides initial inputs for concept design. By improving the drawbacks of a previous model, and implementing the advantages of it, proposal is well balanced between building trends, market demands and Shipyard’s characteristic style.

Furthermore, in the second part, according to previous analysis of different technological systems inside the superyacht, together with conclusions drawn from the Market analysis, it is decided to make a proposal for a new model of a semicustom GRP yacht. Results of detailed studies are implemented in the proposal.
It is necessary to keep recognizable Benetti lines together with contemporary trends of the industry. Evolving the design imprinted on Benetti yachts with 140 years of history, is an ambitious task, but it was part of innovative Benetti DNA.
For the sake of simplicity of the project, dictated by the limited time, all possible similarities with previous model are implemented in construction and design of a new model.
The study includes a description of a proposal for a new model, together with conceptual research sketches, brief Technical specification and all the necessary technical drawings.

1. INTRODUCTION

1.1. A Quick Historical Overview

Even if the term `yacht' was coined specifically for the sailing world, this word has been associated with the concept of going to sea for pleasure purposes, and extended to include `motor boats' as well.

The term `motor boat' generally refers to a vessel whose main propulsion is provided by a mechanic propulsion system represented, in most cases, by internal combustion engines but can include steam engines or more modern gas turbines. The first motor boats were very simple, small and wooden, and were mostly work boats. The ease of handling and the higher performance of these motor boats with respect to sailing, yachts immediately attracted the attention of the boating public and pleasure motor boats powered by combustion engines soon became very popular. The high demand for bigger, faster and more comfortable vessels made motor boats ever larger and more technologically advanced, culminating in the huge range of pleasure vessels of today, from very simple and small motor boats to highly sophisticated and extremely large motor yachts.

Private motoryachts, which today account for about 80% of the superyacht fleet, came into existence a little later in 1872 when three 15m (50’) steam yachts were built by the Camper & Nicholsons (C&N) shipyard in England. The first diesel-powered yacht was the 45m (150’) Pioneer, built for Paris E Singer and launched by the C&N shipyard in 1913.

Throughout the 20th century it becames, an international industry where a few major players gradually emerged from the USA, Italy, the Netherlands and Germany, to name the most prominent.

Today there are yacht builders on every continent, and more than 100 shipyards worldwide currently build superyachts over 24m (80’). Although some countries, or shipyards, are still considered more specialised than others, with a stronger market share in, for example, sailing yachts rather than motor yachts, or custom yachts rather than production yachts, there is less clear delineation than there used to be.

1.2 The Evolution of Yacht Building

For a long time motor yachts were designed using an `experience-based' approach by shipyard owners and craftsmen rather than naval architects and designers, and they were considered, in a certain sense, a `second class' category with respect to ships. Nowadays a medium size motor yacht brings with it a huge series of problems to be solved, slightly different from those associated with ships, and these vessels contain a great deal of structural and high tech equipment packed into very concentrated spaces, all aimed at raising passenger comfort and safety to a high level. Whilst, up to very recently, most designers followed tried and tested paths in order to avoid possible mistakes, at present many use advanced design techniques and `high-tech' to make their product stand out from those of the competition. Both attitudes are motivated by the high intrinsic value of the product and a large effort is spent in research and testing.

Thanks to these recent changes, the progress in yacht design and construction has increased significantly, leading to levels of technology equivalent to or exceeding those already existing for ships. Structures in particular have been an important subject of such a development, being heavily influenced by the introduction of new construction materials (such as composites), the increase in performance and size, the need to reduce noise and vibrations, and the continuous search for new shapes and lay outs to acquire new markets. In particular, the length of the yacht represents the main discriminating factor with regard to the technical and commercial typologies of the vessels, which have given rise to the categories `superyachts', `mega yachts', `giga yachts' and `dream yachts'. However, the exact definition of these categories in terms of length are to a certain degree subjective and not clearly defined, and the only objective classification is that which divides the fleet into vessels below 24m in length (`small yachts') or over 24m (`superyachts'). The worldwide pleasure yacht fleet in 2011 consisted of approximately 23;350;000 units in total, of which 5;980 are `superyachts'. The worldwide yearly production (2011) is approximately 550;000 small yachts units and 800 superyachts (values from The Superyacht Intelligence, 2012).

1.3 The Superyacht:

1.3.1 A Quick Historical Review

Superyachts represent the development of cruisers in terms of increasing length, resulting from the requirements of very exigent owners looking for an absolutely exclusive and unrepeatable product. This was once attainable only by royal families and very important industrial or business men. Even if actually closer to ships than to yachts, some excellent historical examples should be mentioned as the first `mega yacht': the Savoia Royal Ship, 133m, built in 1883 in Castellamare di Stabia (Italy), the German imperial yacht Hoenzollern II, 120m, built in 1893 in Stettin and the Victoria and Albert III Royal Yacht, 116m long, built in 1901 by Pembroke Doc shipyards in Scotland. In the USA Herreshov shipyards built more than 200 motor boats between 1878 and 1945, the most famous of which are the steam commuter 81 ft Mirage (1910) built for C. Vanderbilt, and the 114 ft Navette (1917) built for Jack Morgan. In Europe, the Ailsa Shipyard in Scotland built the first steel superyacht Triton in 1902. At 55:4m long, this vessel operated in the British Royal Navy as a Royal Patrol Yacht during World War II.

The size of superyachts changed over the years, with a continuous enlargement until the Second World War, peaking with the construction of Savarona, a 136m yacht built by Blohm & Voss in 1936 and destined to be the biggest yacht boat for nearly 50 years. After the end of World War II there was a sensible reduction in average yacht dimensions, with the only exception being the 125m Royal Yacht Britannia, launched in 1953 by John Brown's Shipyard in Clydebank. Only in the eighties the size of the largest yachts start to increase once more; in 1980 Benetti Shipyards launched Nabila, 86m in length and, few years later, in 1984 the 144m yacht Abdul Aziz built by Helsingor Vaerft in Denmark, became the largest yacht in the world.

1.3.2 The 24m (80') Benchmark

Thirty years ago, the superyacht industry considered that a yacht above 20m (70') was to be classed as a superyacht. There were far fewer harbours in those days and berthing was a real problem even without the yacht building explosion that was to follow.
The first million dollar used superyacht was sold by C&N in the 1960's, but it was a rarity.
The increased port building and yachting infrastructure in general must be considered a catalyst in the post 1970's yachting boom.
Given the evolution in the number of yacht orders as well as the growth in wealth in the 80s to 90s, a new benchmark gradually emerged. Following the example of such builders as the

Rodriguez Group, where a minimum length of 24m (80') was deemed necessary to join the superyacht league, other yards followed suit.
This benchmark is still in use today by MCA (small ships rules apply below 24 meters), the yachting media, yacht brokers and shipyards alike. The benchmark also serves as an indicator separating companies dealing with yachts under 24m (80'), and those concerned with vessels above that length. Within this category the industry's range of activities can further separate players: from those that rent yachts to those that charter superyachts, and from builders of production-only yachts to builders of semi-custom yachts. Only superyachts above the 24m (80') mark may require external yacht management services, whereas those under are usually managed by the captain or skipper.

However, with increases in yacht size – the average yacht is now 30m (100') – should the superyacht benchmark be shifted to new heights, or, rather, a new LOA? Some of the yachting media, and indeed yachting companies, tend to think so as they become increasingly focussed on yachts of 30m (100') and above.

Nowadays a huge number of superyachts and a relatively high number of vessels of over 50m are built every year and the demand for these vessels and for ever increasing dimensions and opulence seems not to slow down, although the current global economic climate has cooled this previously rampant industry in recent years. An emblematic characteristic of superyachts is the large number of decks, giving the superstructures an imposing appearance, and very large internal spaces. The length of a superyacht is the defining characteristic, so the vessel's typology can be any of those previously described; hence, there are very large ying bridge, open and expedition yachts. At present the largest yacht in the world is M/Y Azam, at 180m in length, delivered in 2013 by Lurssen Shipyards in Germany.

1.3.3 Motor yachts / Superyachts today

The majority of motor superyachts are monohulls. They are usually categorised along two sets of technical and manufacturing criteria: the general type of hull, and their level of customisation. Light displacement (Planing), displacement and semi-displacement hulls.

Without going into too much detail, a planing hull is characterised by light displacement and low draft. It is normally used on smaller-sized superyachts, for fast boats that require low

resistance from the water at sea, reaching speeds of up to and above 30 knots, depending on their engine size. A comparison in the motor industry would be a small, low sports car. The downside of a planing hull is that it is generally less stable at anchor and, quite logically, not easy to handle when the sea is rough.

Displacement hulls, meanwhile, move a lot of water when cruising. The displacement is measured in tons and depends as much on the shape of the hull as on the length of the yacht and her draught. Displacement hulls are usually found on larger yachts, for stable, all-weather, long-distance cruising. The yacht's speed is therefore limited, and is usually between 10 to 17 knots, and is very dependent on waterline length.

In between comes the range of semi-displacement hulls. A compromise between speed, stability and comfort at sea, they have become increasingly popular as they provide speeds between 17 to 25 knots, again depending on waterline length and power, and are able to face tougher sea conditions than yachts with a planing hull. They are normally found on superyachts in the medium-size range, that is between 25-45m (83-120').

The above sizes are approximate and only indicative of general trends. There have been many technological developments in recent years that have modified such categoriations, affecting the hulls as well as the devices designed to improve performance at sea, or at anchor.

1.3.4 Production, Custom and Semi-custom yachts

At first glance it seems straightforward. Production yachts are manufactured in larger series, based on standard designs for both the exterior styling and interior fittings. As when ordering a car, one may opt for certain colours and optional equipment; yet the basic components and arrangement are a given. This of course reduces production costs, and therefore the final price of the yacht.It is, to a certain extent, an economical approach to yacht ownership.

Custom yachts are designed and manufactured specifically to the requirements of a future owner, by the designer and naval architect, inside and out. As such, they take much longer to develop, engineer and manufacture; therefore, custom yachts are likely to be the larger ones, usually above 45m (140'), where the impact of the 'made-to-measure' cost is supposedly less

visible. However, as there is no real limit to what can be executed on board, the final price of a custom yacht may vary greatly and, for the same size vessel, can easily be anywhere on a 1:2 scale.

Semi-custom yachts, like semi-displacement hulls, are a compromise. While the hull is based on a set design, the rest of the yacht is adapted to the requirements of the owner, from the type of engines to the number of cabins, to the materials used in the interior styling. There are great variations in the options that shipyards offer when it comes to semi-customisation, which in turn induces great variations in the final price. However, sometimes it is the other way around: the price is set and includes a range of options that will not affect the end figure; in such cases, the line between 'production' and 'semi-custom' is less obvious.
While semi-custom yachts tend to belong to the medium-range of superyachts, from 30m (100') to 40m (120'), there is no fixed rule here either. Over the past three years, a wide range of shipyards have come up with semi-custom designs that have shifted the line to 50m (165'), and even up to 60m (195').

In summary of these categorization: Custom superyachts are designed as a one-off yachts, whilst semi-custom yachts and production vessels are designed and built on the same platform. There is a fine line between a custom project, and a semi-custom project.

In short, depending on the type of hull and level of customisation, a superyacht can be defined by one of the six possible combinations listed above. However, such categorisations far from define the price tag. From the type and quality of materials used inside and out, to the large choice of engines (that can easily cost over a million dollars each), to the craftsmanship and reputation of the shipyard, to the popularity of its builds or the designer, to market behaviour, there are too many components to determine even an approximate price of a superyacht.

1.4 A Quick Historical Review

Today, Benetti is one of the most famous and well-regarded builders of luxury motor yachts in the world, but clearly it did not start out in this way. Lorenzo Benetti opened the first Benetti shipyard in Viareggio, Italy in 1873. At the time, Benetti built large wooden sailing ships, the

famous "barcobestia," used for local and international shipping. After Lorenzo's death, his sons Gino and Emilio took over. They changed the shipyard's name to Fratelli Benetti and consolidated the fame of their shipyard in building commercial sailing ships. But the twentieth century was a time of turbulence, upheaval and technological revolution. After the Second World War, commercial sailing vessels built from wood were simply obsolete. The Fratelli Benetti shipyard could have become an industrial oddity or have disappeared. Instead, they adapted to the times, changed direction radically and began producing pleasure crafts from steel.

In the early 1960s Benetti, once again, anticipated the direction of the future and produced its first luxury megayacht, quickly establishing its name as a leader in the 30 to 60 meter range market segment and beyond.

Their success in this area did not mean that the time for change was over. In 1985, the shipyard was acquired by the Turin-based builder Azimut Yachts. New management transformed Benetti into the modern, technologically advanced reality we know today: a forward-looking and innovative boatyard that proudly builds on and adapts its traditional values of experience, skill and passion for fine craftsmanship, not just to keep up with the times, but to always stay ahead of them.

With 140 years of history, close to 300 boats built, production facilities that cover over 300,000 square meters in six boatyards located in Italy and 34 yachts under construction at the present time, including a 90-meter megayacht.

1.4.1 Benetti Today

Luxury brand that stands for excellence in yachting, the first shipyard which introduced the quintessence of Italian ingenuity and creative to the international yachting industry.

A record-breaking shipyard, it holds the record for longevity, with 138 years of uninterrupted production and over 350 yachts sailing. The Benetti shipyard is one of the world's oldest still operating and was one of the first to build yachts. It is also in the technological lead with environmentally friendly solutions such as diesel-electric propulsion, the future prospect for making yachts environmentally friendly.

Now for the sixth consecutive year the Azimut-Benetti Group is the world's biggest shipyard in terms of production of mega-yachts. Over the past twenty-five years more mega-yachts have been launched than in the yard's whole previous history.
Beside these production numbers and of course its financial success, Benetti also has a technological edge that places the brand at the top of the world shipbuilding industry for the pleasure craft sector.
It is sure to continue to amaze the world not only with its numbers but also its increasingly sophisticated technology.

The international yacht market has changed radically in recent years. The Azimut Benetti Group has been conducting a due diligence investigation aimed at optimizing productivity to maintain its leadership in the field.
"*The Group's Chairman Paolo Vitelli says:* "*The yacht is an object of desire, a dream, a myth, and we want to sell this dream, this myth, made in Italy; but to do this, we must make our factories competitive and efficient to counteract the growth of production in emerging nations...To achieve our goal and increase productivity we need to reduce our structural costs, shorten the chain of command...*".

The choice has led to changes in the company's organization with the aim of maximizing the efficiency of production while preserving a focus on human capital in order to compete on an increasingly global market. This means defending the product's Italian identity and maximizing efficiency. Having looked at amount of job Benetti is conducting currently it's enough to realize that this kind of business strategy makes them leader on the world market.

Below is the semi-custom fiberglass displacement and fast displacement range of Benetti :

Benetti DELFINO 93' SEMI-CUSTOM FIBERGLASS CURRENTLY IN PRODUCTION:

BD009 July 2014
BD008 February 2014
BD007 April 2014
BD010 September 2014

TRADITION SUPREME 108' SEMI-CUSTOM FIBERGLASS CURRENTLY IN PRODUCTION:

BK001 March 2014
BK002 May 2014
BK003 November 2014

Benetti CLASSIC 121' SEMI-CUSTOM FIBERGLASS CURRENTLY IN PRODUCTION:

BC130 October 2013
BC131 May 2014
BC132 February 2015

Benetti CLASSIC SUPREME 121' SEMI-CUSTOM FIBERGLASS CURRENTLY IN PRODUCTION:

BS005 August 2014
BS003 March 2014
BS004 June 2014
BS006 February 2015

Benetti CRYSTAL 140' SEMI-CUSTOM FIBERGLASS CURRENTLY IN PRODUCTION:

BY003 March 2014
BY004 February 2015
BY005 June 2015
BY006 December 2015

Benetti VISION 145' SEMI-CUSTOM FIBERGLASS CURRENTLY IN PRODUCTION:

BV019 June 2014

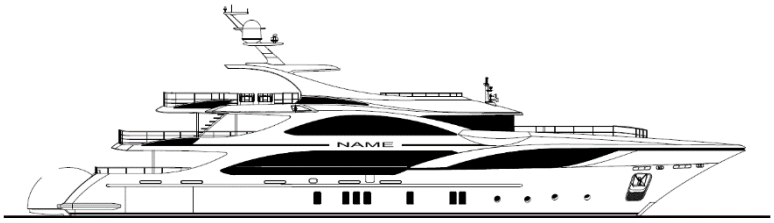
Benetti FD 125'	SEMI-CUSTOM FIBERGLASS	CURRENTLY IN PRODUCTION:
		03 January 2016 04 May 2016 01 April 2015 02 July 2015
Benetti FD 140'	SEMI-CUSTOM FIBERGLASS	CURRENTLY IN PRODUCTION:
		01 April 2015 02 July 2015 03 January 2016 04 May 2016
Benetti FB 800	GRP and ALUMINIUM	FAST DISPLACEMENT YACHT
		NO DATA AVAILABLE
Benetti FB 700	STEEL and ALUMINIUM	FAST DISPLACEMENT YACHT
		NO DATA AVAILABLE

Figure 1. The list of the semi-custom fiberglass displacement and fast displacement range of the Benetti Yachts, compared in analysis. Available from: www.benetiyachts.it

2. PRODUCT ANALYSIS - of the fundamental systems that allow the operation of a vessel.

In this part of the research, main focus will be on the internal documentation provided by "Benetti". It will include large data base of products specification which will be analyzed with attention on details which define the product and establish the quality "tag".

This part of work is in a form of comparative analysis in terms of the fundamental systems that allow the operation of a vessel. It is focused on identifying, studying, analyzing, and adapting best practices and implementing the results.
Some items comparisons require just a picture; other details may require a much deeper technical investigation. Also, the right format, content and depth of analysis is conducted depending on present interest of a shipyard and available technical documentation.
Starting from the list of all equipment parts on the yacht, comparison between models of different range will show if there is some discrepancy which will then be additionally analyzed.

The goal is improving performance by continuously identifying, understanding, and adapting outstanding practices and processes found inside and outside the organization.
For that first is necessary to highlight the areas of practice and performance requiring attention and improvement.

GENERAL STRUCTURE OF COMPARISONS:
The analysis is done at "Benetti" as a part of Internship work and includes internal technical documentations of all models compared. The result of this work is a 200 pages document with 500 items compared for each of 11 Yachts.
Below is shown, a list of every item compared in different technical areas. Some have been closely described, depending on availability of data and privacy terms of a company.
In each section, example of table of compared items is shown for semi-custom range (5 yachts) even if comparison is done also for fast displacement range. Apart of textual description and examples of specimens compared, there is also a graphical comparison between two Benetti Models: Classic 121' and Classic Supreme 132'for different technical areas shown.

*Description of technical sections such as General, Structure and Outfitting is mostly inspired by reference text noted in "References" by number 5.

2.1 General

The design philosophy for motor yachts in the sixties and seventies was succinctly summarised in one sentence by Phillips-Birt: *The variety of power yachts found in the yachting waters of the world results from mixing the four basic ingredients of design in different proportions. The ingredients are: accommodation, endurance, seaworthiness and speed. . . . The proportions of the ingredients determine the type of boat; their total amount fixes the size"*. Even if still valid for small and medium size vessels, the `ingredients' for modern motor yachts now also include the present day trends of ever increasing size and opulent comfort and luxury requirements.

Table 1. The list of all items compared in this technical section. Full list is available in appendix 1

00. GENERAL
00.10 GENERAL INFORMATION – 2 AREAS
00.20 DESIGN AND PERFORMANCES – 6 ITEMS
00.30 PROJECT MANAGEMENT – 5 AREAS
00.40 DOCUMENTS – 2 AREAS

BENETTI RANGE CLASS - CUSTOM	BENETTI CLASS				
MODEL	BD 93'	BK 108'	BC 121'	BS 132'	BY 140'
Lenght O.A. :	28.5	32.98	36.9	40.24	41.93
Lenght at W.L @ full load :	22.48	/	31.58	33.25	35.52
Hull moulded beam:					
Max beam :	7.03	7.25	8.18	8.18	9.05
Draft max @full load :	2.05	2	2.26	2.23	2.28
Fresh Water capacity about :	2300	3500	7700	7200	8000
Fuel capacity about :	16000	21500	42500	45000	58000
GRT about:	152	217	299	322	454
PERFORMANCES:					
Max speed @ half load:	13.5	13.5	15.1	15.5	15
Criuse speed @ half load:	12.5	12.5	14.1	14.5	14
Range @ 12 kn @ half load using two engined and one generator:	1500nm @ 10kn	1800nm @ 10kn	3400nm @ 11kn	3500nm @ 11kn	4000nm @ 11kn

* specimen of items compared in the Technical Comparisons, conducted during the internship in the Benetti

* specimen for semi-custom fiberglass range, even if the comparison is done also for a fast displacement range

2.1.1 Vibrations and Noise

Vibrations and noise are crucial topics for superyachts and they require detailed calculations from the earliest of design stages to verify the dynamic behaviour of hull structures and their response to exciting loads such as propellers, engines and wave encounters. Even if vibrations and noise are more critical for metallic yachts, FRP units are not immune from these phenomena. The problem is increased by higher comfort requirements and constraints imposed by the ISO 6954 (2000) with respect to the previous ISO 6954 (1984) standard, together with CS notations which ask for even lower levels of vibration and noise.
Some examples of maximum vibration levels are reported in Table 1a for BV, LR and RINA.

Table 1a: Maximum vibration levels according to Classification Societies.

Yacht length	Notation	Frequency Range	Acceleration Measurement	Maximum Level	
				Underway	Anchor
$L \leq 45\,m$	COMF (Y)	$1-80\,Hz$	a_w	$89.4\,mm/s^2$	$53.5\,mm/s^2$
			(v)	$(2.5\,mm/s)$	$(1.5\,mm/s)$
	COMF +(Y)	$1-80\,Hz$	a_w	$53.5\,mm/s^2$	$45.0mm/s^2$
			(v)	$(1.5mm/s)$	$(1.25\,mm/s)$
$L > 45\,m$	COMF (Y)	$1-80\,Hz$	a_w	$71.5\,mm/s^2$	$45.0\,mm/s^2$
			(v)	$(2.0\,mm/s)$	$(1.25\,mm/s)$
	COMF +(Y)	$1-80\,Hz$	a_w	$53.5mm/s^2$	$35.75mm/s^2$
			(v)	$(1.5mm/s)$	$(1.0mm/s)$

a_w = multi axis acceleration value calculated from the root-sums-of-squares of the weighted root mean square (RMS) acceleration values in each axis (a_{xw}, a_{yw}, a_{zw}) at the measurement point. v = spectral peak of structural velocity in mm/s.

The presence of large openings, in addition, further complicates the dynamic behaviour of the hull lowering its natural frequencies and inducing additional torsion modes.

As a general rule the only way to avoid vibrations is to keep natural frequency very high and this can be achieved only by increasing hull stiffness. In this regard the longitudinal framing system shows higher natural frequencies with respect to the transverse one; this may be ameliorated by reducing the transverse frame distance and the longitudinal stiffener spacing. As a matter of fact any action towards vibration reduction implies an increase in structural weight: as an example, it has been estimated that for a 95m megayacht the weight increase to avoid maddening vibrations amounts to more than 100 tonnes.

The noise abatement for motor yachts is another strategic issue related to onboard comfort and most difficult to achieve because of powerful and high speed propulsion engines, related gear boxes and highly loaded propellers with reduced clearances. The acoustical implications of motor yachts should be taken into account from the earliest of design phases because any subsequent interventions on an already built unit in most cases doesn't give any improvement.

Table 1b: Maximum noise levels for superyachts. Values in dB(A) are provided "in harbor" and "sailing " conditions.

Spaces	Lalangas (1983)	ABS (COMF(Y))	BV	GL (cruise ship)	LR	RINA	90 m yacht (2011)
	Harb/Sail	Harb/Sail	Harb/Sail	Harb/Sail	Harb/Sail	Harb/Sail	Harb/Sail
Owner cabin	35/73	40/45	40/50	44/52	50/50	45	40/44
Guest cabins	35/73	45/50	40/50	46/54	53/53	45	43/47
Lounges	40/77	50/50	45/55	52/60	55/55	55	45/50
External decks	50/89	60/65	55/75	64/72	63/63	55	65/70

A + 2 dB(A) measurement tolerance will be accepted on the all measured noise levels.

BENETTI RANGE CLASS - CUSTOM	BENETTI CLASS				
MODEL	BD 93'	BK 108'	BC 121'	BS 132'	BY 140'
NOISE AND VIBRATION	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)
Noise @ Aft Guests Cabins(anch ; nav)	48 ; 65	50 ; 63	47 ; 62	47 ; 72	45 ; 62
Noise @ Fwd guest Cabins(anch ; nav)	45 ; 57	45 ; 58	46 ; 57	46 ; 57	45 ; 58
Noise @ Crew Mess (anch ; nav)	45 ; 55	45 ; 60	48 ; 56	48 ; 56	48 ; 57
Noise @ Crew Cabins (anch ; nav)	45 ; 55	45 ; 60	48 ; 56	48 ; 56	48 ; 56
Noise @ Main Saloon (anch ; nav)	50 ; 63	52 ; 62	45 ; 62	50 ; 62	48 ; 62
Noise @ Dining Area (anch ; nav)	/	52 ; 62	45 ; 58	48 ; 58	/
Noise @ Owner's Cabin (anch ; nav)	45 ; 52	43 ; 50	44 ; 51	44 ; 51	44 ; 51
Noise @ Galley (anch ; nav)	45 ; 55	55 ; 65	52 ; 59	49 ; 59	48 ; 60
Noise @ Sky Lounge (anch ; nav)	/	58 ; 65	46 ; 55	46 ; 55	45 ; 56
Noise @ Captain cabin (anch ; nav)	/	/	48 ; 56	48 ; 56	48 ; 55
Noise @ Wheelhouse (anch ; nav)	48 ; 57	50; 55	56 ; 56	56 ; 56	55 ; 55
Noise @ Aft Main Deck (ext. Area) (anch ; nav)	60 ; 78	63 ; 78	58 ; 80	58 ; 80	58 : 79
Noise @ Aft Upper Deck (ext. Area) (anch ; nav)	/	58 ; 73	57 ; 73	57 ; 73	56 ; 74
Noise @ Middle Sun Deck (ext. Area) (anch ; nav)	58 ; 73	55 ; 70	56 ; 70	56 ; 70	55 ; 70
Vibration@ Owner and guests interior lux areas (Nav)	**1** RMS [mm/s]	**1** RMS [mm/s]	**2** RMS [mm/s]	**1** RMS [mm/s]	**2.5** RMS [mm/s]
Vibration @ Open Deck entertainment areas (Nav)	**1.5** RMS [mm/s]	**1.5** RMS [mm/s]	**2.5** RMS [mm/s]	**1.5** RMS [mm/s]	**3** RMS [mm/s]
Vibration @ crew Quarters (Nav)	**1.5** [mm/s]	**1.5** [mm/s]	**2.5** [mm/s]	**1.5** [mm/s]	**3** [mm/s]

* specimen of items compared in the Technical Comparisons, conducted during the internship in the Benetti specimen for semi-custom fiberglass range, even if the comparison is done also for a fast displacement range

2.2 Structure

This part is focused on Fibre Reinforced Plastics as a material in Yacht construction. Below are described main characteristics of material, structural arrangement and production methods.

Similar to sailing yachts, the history and development of motor yacht structures can be assessed and described according to various characteristics, such as size, performance, construction materials, interior and external design. The use of wood, steel, aluminium alloys and fiber reinforced plastic for motor yacht construction technological aspects in overall in overall yacht performance..

Other concepts which are extremely important in the world of yachting such as `freedom', `comfort' and `luxury' are determinant in attracting the interest of potential owners. Even if these concepts appear to be completely separate from the practical technical aspects, they must be translated by designers into real features of the yacht, which can be a huge problem for structural designer.

2.2.1 Material

Given that the driving philosophy in designing and building motor yachts is the cost reduction, the choice of the construction material also depends on their specific mission and dimensions. Materials are chosen for their appropriateness in the same way they are for vessels with other missions. As with commercial and government vessels, motor yacht material selection is predominantly based on cost (both initial and life-cycle) and weight. Insulation properties, predominantly noise and thermal, and vibration damping, are often emphasized. Unlike those other vessel types, some yacht materials are chosen for their aesthetic qualities.

In the higher range between 24 and 45m, even if fiber reinforced plastic (FRP) is the most diffused material.

The upper bound of this category represents the FRP dimensional limit owing to its low mechanical properties and elastic modulus; at the same time steel begins to become the standard.

2.2.2 Fibre Reinforced Plastics

After several experiments of partial fiberglass boats (aluminium frames with FRP shell) were started in the forties, the first FRP motor boat was a 41 ft sport fishing boat, built in the USA in 1959 utilising a combination of polyester resin and E-glass fibers manufactured with a hand lay-up procedure in a female mould. Since then great progress has been reached in composite technology applied to vessel construction.
While E-glass fibers remain the basic reinforcement owing to their acceptable mechanical properties and low cost, for more specific applications, where higher strength and stiffness are required, together with lower weight, aramid and carbon fibers are more suitable.

As the distinct advantage of FRP composites is the ability to tailor the property directionally to suit specific applications, a very large number of fabrics have been made available on the market for glass, aramid and carbon fibers..

Sandwich plating, commonly used for decks and then even more often for hull sides as well, are generally built with glass fiber skins and balsa or PVC cores; various densities are available to match different resistance requirements. Where cores are concerned the best solution in terms of weight and stiffness is represented by both Nomex or aluminium honeycomb. In this case particular care is required when bonding skins and core to each other. Sandwich construction is used in place of single skin construction to reduce weight and improve vibration damping and provide greater thermal insulation. When the weight reduction becomes mandatory more sophisticated materials are used for skins such as carbon and aramid. Core selection becomes an important consideration with trade-offs for each of the popular types. Cores are often selected by their shear strengths and the strongest for its density is end-grain balsa wood. Balsa's main drawback is its tendency to rot if exposed to moisture for a long period of time, requiring careful fabrication in the boat and adherence to high quality standards during repair or modification. PVC cores are growing in use with the cross-linked varieties more appropriate for deflection limited designs and the linear PVC cores more suited for impact resistant designs. Polyurethane cores are used when insulation is a primary concern, while honeycomb cores of aramid, aluminium or polyethylene are used when reduced weight is the main goal. Honeycomb cores are often combined with thicker, `cosmetic' face sheets for joinery.

2.2.3 Structural Arrangements

The first structural lay-out consisted in a thick, single skin shell stiffened by `box reinforcements' having a longitudinal framing system with web frame interval between 1000 and 2000mm; in Figure 2 the main section of a typical semi-planing yacht with single skin hull is shown. Reinforcements have top-hat sections (also called `box', or `omega') with empty or PVC cores.

This latter solution is now preferred because of the advantage of a simpler construction (the PVC core works as a male mould on site) and because the empty `top-hat' beams absorbed and trapped water inside. Secondary stiffener sections in FRP constructions are not smaller in scantlings as usually observed for metallic structures where the ratio of web height between secondary versus primary reinforcements must be below 0.5.

In fact, while structural connections or crossing beams represent weak points in steel and aluminium structures because of welding, in the case of FRP joints and crossings the mode of construction requires glass overlapping and extra material and they subsequently become stiffer zone. This helps compensate for FRP's low Young's modulus and achieves higher hull stiffness, avoiding structure deformations when sailing at high speed or in rough seas. In addition the number of stiffeners is reduced, therefore reducing production cost.

The low elastic modulus of this material precluded the building of very long vessels and the effort of designers and engineers was always devoted to increasing stiffness, more than the resistance, of FRP. This task has been partially achieved by `sandwich' construction, which made it possible to obtain more rigid hulls eliminating, at the same time, secondary stiffeners thus achieving a simpler and lighter structure.

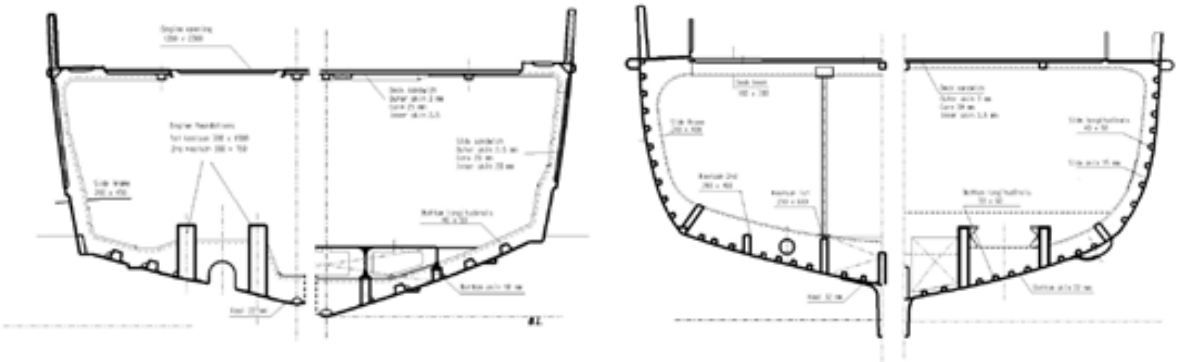


Figure 2: (Left) Main section of a 25m FRP planning yacht with sides and deck in sandwich, (Right) Main section of a 40m FRP displacement yacht with single skin hull

In addition the use of more sophisticated fibers, like carbon and Kevlar, together with new lamination techniques (resin infusion and resin pre-impregnated fiber systems), contributed to obtain stiffer sandwich panels and to increase yacht lengths up to 45m. Nevertheless carbon and epoxy laminates need more sophisticated production technologies based on the availability of large ovens to cure mouldings at high temperatures, not a cost effective production technique.

Classification societies had always been very careful in accepting sandwich for the whole hull shell because of the low resistance of the external thin skins to impacts.
On the other hand shipyards are in favour of sandwich panels because it avoids secondary stiffeners, further simplifying the construction sequence, and because it allows smoother external surfaces without the shrinkage marks of internal frames. At present the use of sandwich plating, while utilised for the entire hull on sailing yachts, is only well accepted for deck and sides for motor yachts; for bottom structures single skin remains mandatory, especially for high speed vessels. In Figure 2 the main section of a planing motor yacht with a single skin bottom and sandwich side and deck is shown.
A further complex point for FRP yachts is the hull to deck joint; this is a critical aspect for boats over 30 feet for which hull girder loads become significant.

Fuel storage on board FRP vessels is generally done in stainless steel tanks or in structural tanks integrated in the hull structure in way of a double bottom. The first solution is now well tested and reliable enough where safety and odour are regarded.
Structural tanks, in principle, showed many problems especially with regards to fuel. This has been solved by specific treatments such as gel-coating or some other impermeable barrier coat on the inside of the tank.
Collision and watertight bulkheads are FRP made with `top-hat' stiffeners; dividing bulkheads are made of plywood sandwich with insulating panels as the core.

2.2.4 Production Methods

Production methods for FRP motor yachts are very similar to those adopted for sailing yachts. The main difference is represented by the more complicated shapes of hull and superstructures which necessitate building the vessel from a higher number of components and, thus, a higher number of moulds. For smaller units, up to six to eight meters, two separate moulds for hull and deck/deckhouse are sufficient. The after body of the hull mould is generally a separate part to allow gangway stern shapes. By this solution, it is possible, at a relatively low cost, to make aesthetic changes to the after body and to obtain slightly longer vessels just by substituting the aft part of the mould.

The present trend to control production cost is represented by modular construction by which the vessel components are moulded separately and then assembled by bonding.

From this perspective an accurate study of the minimum number of moulds and their optimization becomes very important for the industrialization process and cost reduction. The first applications of this method regards the realization of FRP counter-moulds in which the housing for furniture and fittings, and some furniture

For bigger vessels, deck and superstructures are built by separate moulds as well, but the hull mould is preferably divided into two longitudinal shells to avoid lifting operations when extracting the hull. Then a number of minor components are laminated to complete the structure and the internal outfit. The majority of FRP motor boats are built by a hand lay-up technique by which every reinforcement layer is laid into an open, female mould and manually wetted and rolled. As FRP material resistance is a compromise between the as high as possible glass content and complete glass wetting, the final material quality depends heavily on workers experience and shipyard daily environmental conditions (dust, humidity and light conditions). The uncertainty of the material quality is further increased by the need to mix the resin with a catalyst to prime the hardening process: this action, generally carried out manually, heavily influences the material workability time and obliges workers to prepare small quantities of resin before lamination, thus wasting a lot of time. This inconvenience is overcome by the spray lay-up process by which resin and catalyst are sprayed at the same time and with correct proportions on reinforcements by a spray-gun fed by pneumatic air equipment. It is also possible, with a proper gun, to spray cut glass fibres together with resin to obtain an on site chopped strand mat.

However, it is not easy to control the glass volume and the resulting thickness and again the material quality depends on worker skill. Nevertheless spray lay-up has the advantage of

obtaining a constant, optimal resin/catalyst ratio, a longer workability time and yard efficiency in terms of production, but it still requires rolling operations to consolidate the laminate.

Apart from any other technical concerns, the most serious FRP problem is represented by the styrene fumes released in the working environment during the chemical process of the resin hardening in the mould, which have been proved to be toxic for human health. To overcome pollution new lay-up procedures in closed moulds have been developed and/or are under study. The first, well known solution is represented by the vacuum bag or vacuum consolidation procedure in which an airtight sheet, usually nylon, is used to cover the fibre stack in the mould. Reinforcements are wetted out as with hand lay-up. A set of plastic pipes properly placed in the mould and connected to one or more vacuum pumps allow atmospheric pressure to drive out the excess resin thus increasing glass percentage in the laminate with consequent better mechanical properties.

Table 2. List of all items compared in this technical section. Full list is available in appendix 1

01 STRUCTURE
01.10 HULL STRUCTURE – 22 ITEMS
01.20 SUPERSTRUCTURE STRUCTURE– 5 ITEMS
01.40 ASSEMBLING - 1 ITEM

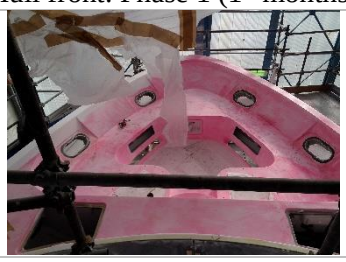
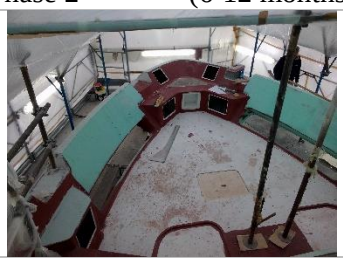
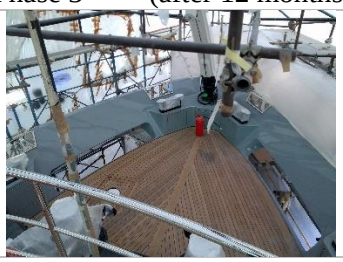
BENETTI RANGE CLASS - CUSTOM	BENETTI CLASS				
MODEL	BD 93'	BK 108'	BC 121'	BS 132'	BY 140'
Hull Materials	GRP	GRP	GRP	GRP	FRP
Windows and portholes frames	FRP porthole flanged collar, FRP window support	GRP porthole flanged collar integrated into the hull side. GRP window support for windows bonding.	FRP porthole flanged collar, FRP window support	FRP porthole flanged collar, FRP window support	FRP porthole flanged collar, FRP window support
Rubbing strake	built in FRP at main deck and WL level	Integrally built in GRP together with the hull, at main deck.	Integrally built in GRP together with the hull, at main deck and WL level.	Integrally built in GRP together with the hull, at main deck and WL level.	Integrally built in FRP together with the hull, at main deck and WL level.

Superstructure materials	GRP	GRP	Cored sandwich structure in the decks and on the sides utilising mat, unidirectional, biaxial and woven E-glass. When necessary single skin laminate will be provided.	Cored sandwich structure in the decks and on the sides utilising mat, unidirectional, biaxial and woven E-glass. When necessary single skin laminate will be provided.	Cored sandwich structure in the decks and on the sides utilising mat, unidirectional, biaxial and woven E-glass. When necessary single skin laminate will be provided.
Superstructure reinforcements	Local reinforcements when necessary	Local reinforcements when necessary	Local reinforcements when necessary, to support concentrated loads due to heavy parts and objects.	Local reinforcements when necessary, to support concentrated loads due to heavy parts and objects.	Local reinforcements when necessary, to support concentrated loads due to heavy parts and objects.

* specimen of items compared in the Technical Comparisons, conducted during the internship in the Benetti

* specimen for semi-custom fiberglass range, even if the comparison is done also for a fast displacement range

Diferent phases in production of some of the items:

Hull front: Phase 1 (1st months)	Phase 2 (6-12 months)	Phase 3 (after 12 months)
		

2.3 Outfitting

Outfitting covers the whole fit out of a vessel from the interior to the exterior, engineering to aviation, bridge integration, luxury owner supplied items or toys and stores.
As far as the conventional naval architect is concerned, weight estimates consider machinery separately from outfitting which includes the rest of the engineering systems and interior fit-out, the total lightship being made of hull structure, machinery and outfitting.

The issue of outfitting on structural requirements is crucial not only in terms of the fundamental systems that allow the operation of a vessel but in the case of luxury sailing yachts and

superyachts in the features that provide the definition of luxury, including heli-decks, large open volumes, swimming pools and internal harbours and garages. However the complexity of outfitting varies between vessel types and the regulations underpinning vessel design and operation can vary between the very limited applied to a private yacht to those unrestricted charter vessels carrying.

Particular attention in the early outfitting stages is paid to the structural complications referred to in the following sections, but clearly as outfitting progresses there is an increasing focus on systems installation. As stylists and designers become more innovative with materials and furnishings, including the increasing use of glass, dependent on the classification of the superyacht, materials used in outfit must meet SOLAS approval.

2.3.1 Structural Challenges

A typical flow chart of the construction and outfitting process of a superyacht is shown in Figure 3a. Outfitting is by far the longest and most complex process in superyacht production taking typically up to two thirds of the production time and up to 80% of the superyacht production cost. The inclusion of large spaces, maximizing internal volume and integrating systems to accommodate comfort, luxury and toys present significant structural challenges and issues relating to compliance vary from the impact of the International Convention on

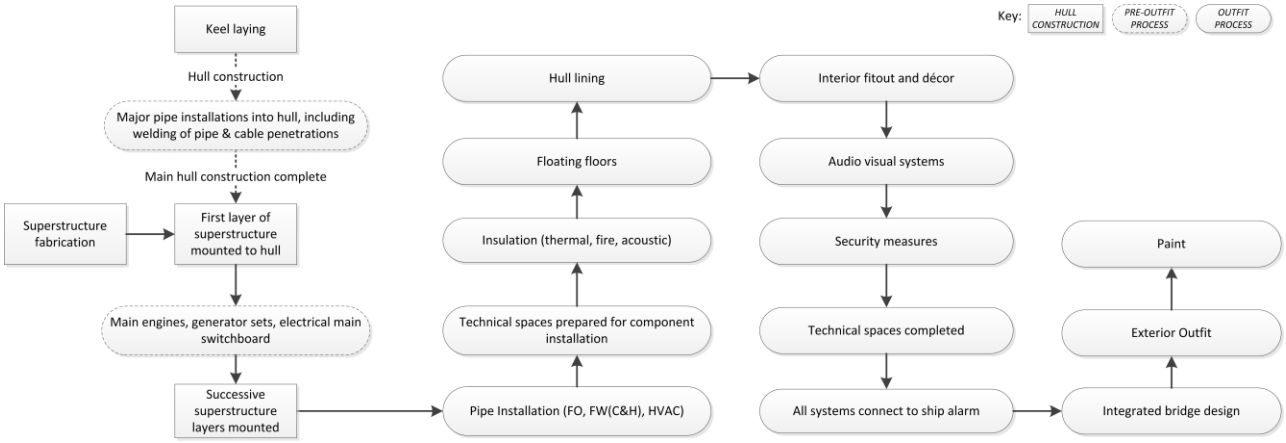


Figure 3a: A typical flow chart of the construction and outfitting process of a superyacht

Load Lines upon window sizes, to side shell openings, hybrid material connections (for example, aluminium superstructures explosively welded to steel hulls) and the stowage of toys to discontinuities in primary structure.

To reduce noise and vibration diffusion through the hull and superstructure spaces all the interior technical outfit is arranged with `floating' floors and walls in such a way as to isolate as much as possible passenger areas. Insulating systems consists of paints, filler and panels applied to the internal cabin surfaces. In some cases to reduce the noise from hull wash, some planks are directly applied to the internal shell at the waterline. All these devices heavily influence the final displacement of the ship and a very refined structure scantling becomes mandatory.

Table 3. List of all items compared in this technical section. Full list is available in appendix 1

02 OUTFITTING
02.10 EXTERNAL DECKS OUTFITTING– 4 ITEMS
02.20 FAIRING, PAINTING AND INSULATION - 18 ITEMS
02.30 NAUTICAL AND DECK EQUIPMENT – 24 ITEMS
02.40 WINDOWS, DOORS AND HATCHES – 10 ITEMS
02.50 STAIRS, LADDERS, GANGWAYS, TECHNICAL FLOORS – 7 ITEMS
02.60 HANDRAILS, PILLARS, SUN AND WIND PROTECTIONS – 4 ITEMS
02.70 LIFTING DEVICES – 3 ITEMS
02.80 VARIOUS OUTFITTINGS – 25 ITEMS
02.90 FIRE & SAFETY APPLIANCES – 12 ITEMS

EXTER. DECKS OUTFITTING					
Deck Lining	planked with teak 12mm	planked with teak 12mm	planked with teak 12mm	planked with teak 12mm	planked with teak 15mm
Teak on hull doors and swimming platforms	/	/	planked with teak 10mm	planked with teak 10mm	/
External stairs lining	planked with external stair covering 12mm. Benetti Standard 21107	planked with teak 12mm.	planked with teak 15mm	planked with teak 12mm	planked with teak 15mm
Bulwark capping rails	12mm	12mm	15mm	12mm	15mm
Anchor windlass	2 EL 230vac/3ph/50Hz, 4000W	2 EL 230vac/3ph/50Hz, 4000W	2 EL 400V/3ph/5500W	2 EL 400V/3ph	2 EL 380 VAC/3 phases, 5500W
Capstans	2 EL 230vac/3ph/50Hz, 2200W	2 EL 230vac/3ph/50Hz, 2200W	2 EL 400V/3ph/2200W	2 EL 400V/3ph	2 EL foot operated capstans fitted on aft deck. Capable to rotate in both directions.
Anchors	2x SHHP 97 kg	2 Galvanized HHP, each 160 kg	2 Galvanized HHP, each 244 kg	2 Galvanized HHP, each 225 kg	2 Galvanized HHP, each 219 kg
Engine room flooring	Neprane gasket mounted betwen the plating and supporting angle bars. Supporting structure in white painted RAL 9003 aluminium. The plating is in anodized aluminium of the titanium color.	Aluminium knocked plating with raised edge. Removable or hinged sections are fitted in way of valves, filters, etc.	Aluminium knocked plating. Removable or hinged sections are fitted in way of valves, filters, etc. Where maneuvering or access is required.	Aluminium knocked plating. Removable or hinged sections are fitted in way of valves, filters, etc. Where maneuvering or access is required.	Knocked plating with raised edge. Lean on type. Neprane gasket mounted between the plating and supporting angle bars. Removable or hinged sections are fitted in way of valves, filters, etc.

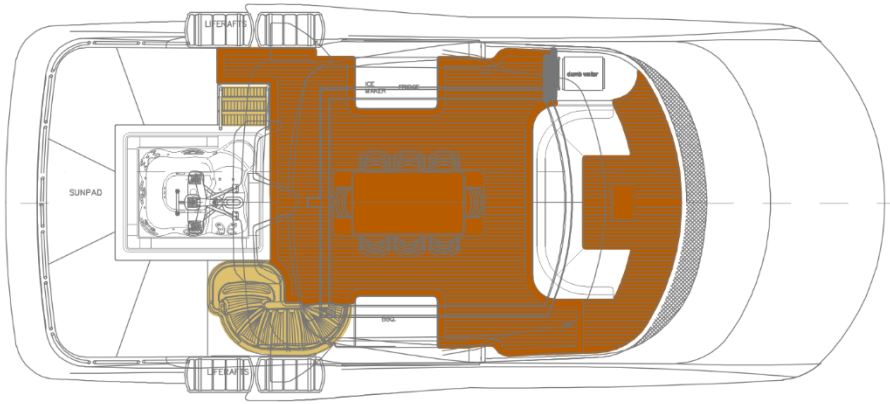
BENETTI RANGE CLASS - CUSTOM	BENETTI CLASS				
MODEL	BD 93'	BK 108'	BC 121'	BS 132'	BY 140'

* specimen of items compared in the Technical Comparisons, conducted during the internship in the Benetti

* specimen for semi-custom fiberglass range, even if the comparison is done also for a fast displacement range

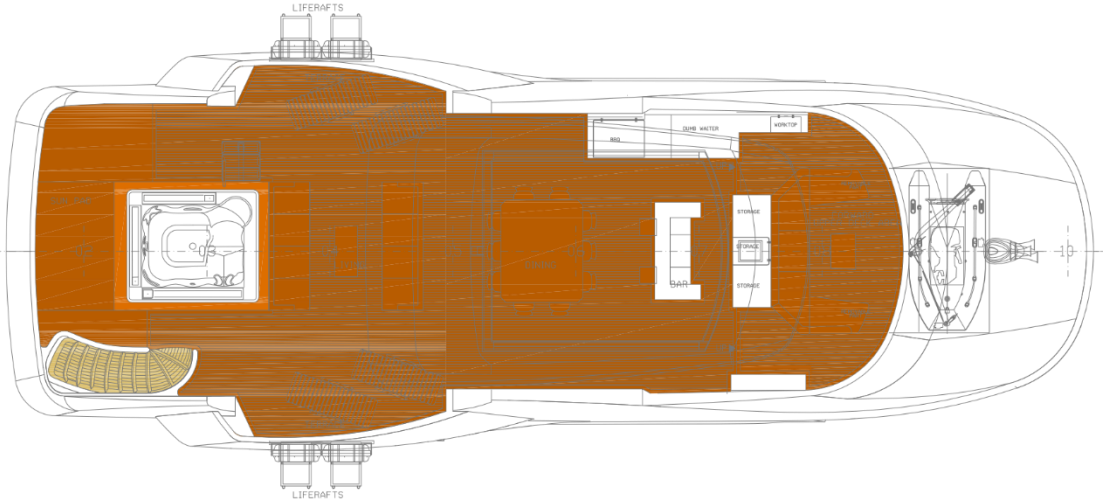
Product Analysis and Design of a Superyacht –
analysis of a semi-custom fiberglass range of Benetti Yachts, from 93’ to 145’.
Redesign of a Classic 121’ Yacht

CLASSIC 121'



TAG	TYPE
	Teak floor
	Teak steps
	Teak platform and folding doors
	Whirlpool border

CLASSIC SUPREME 132’



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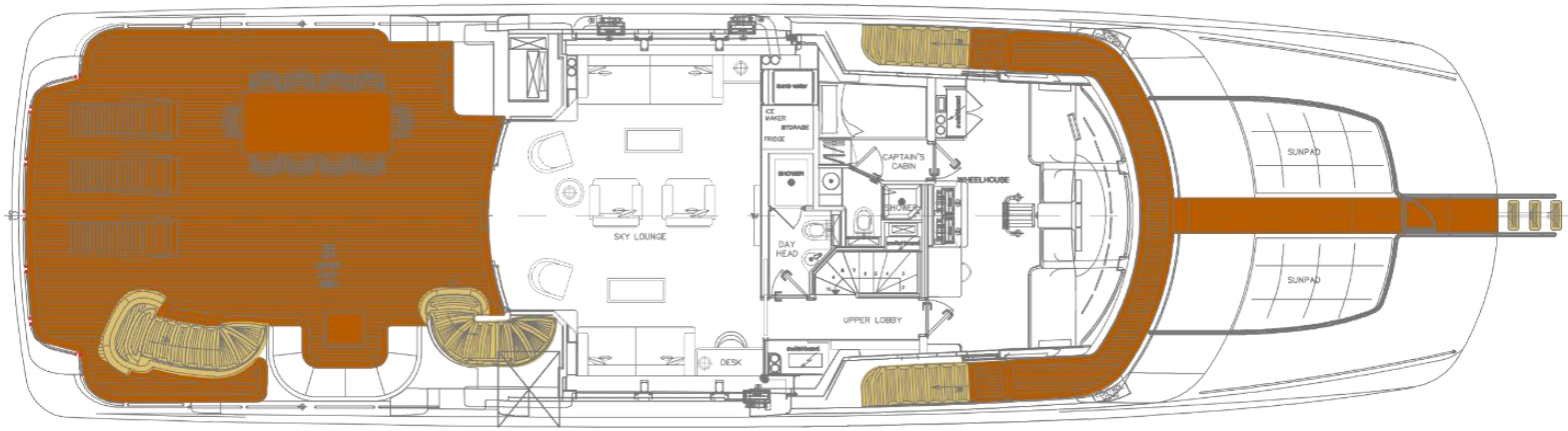
TEAK PLAN

SUN DECK COMPARISON

Benetti

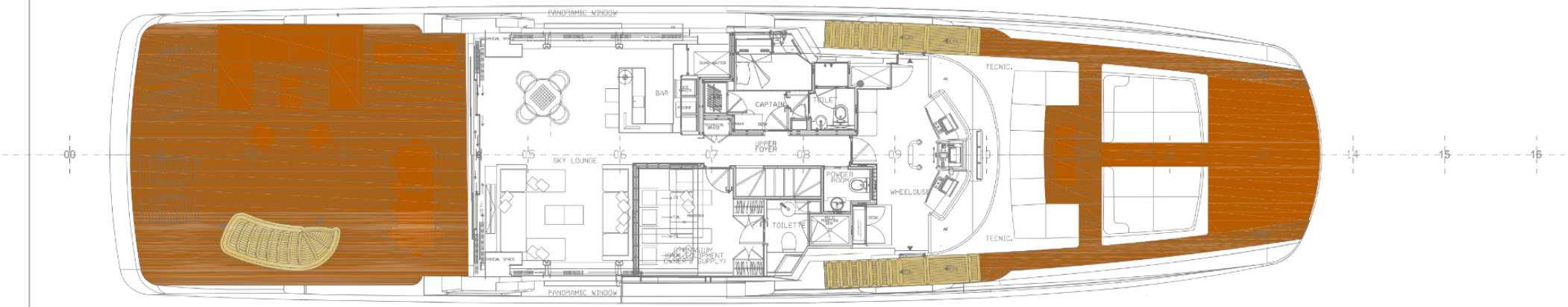
Igor Miskovic

CLASSIC 121'



TAG	TYPE
	Teak floor
	Teak steps
	Teak platform and folding doors
	Whirlpool border

CLASSIC SUPREME 132'



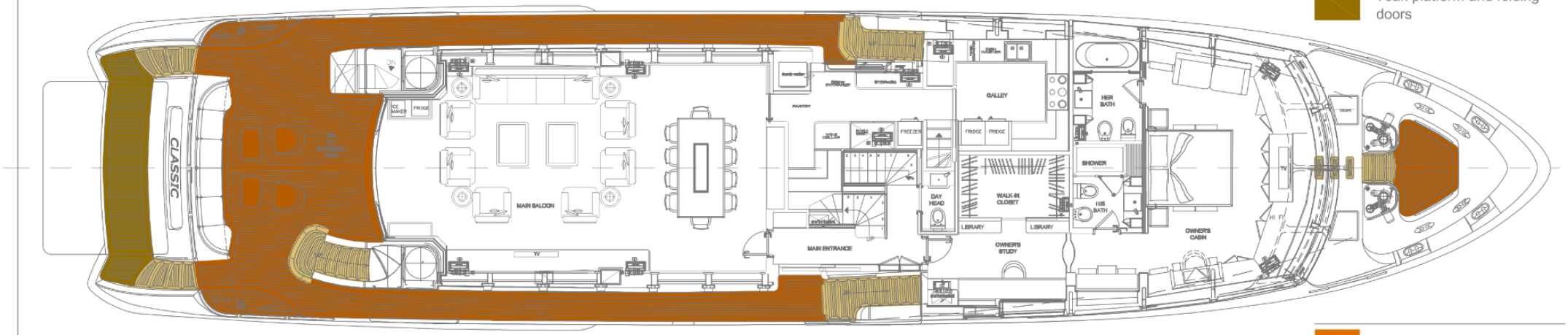
TEAK PLAN

UPPER DECK COMPARISON

Benetti

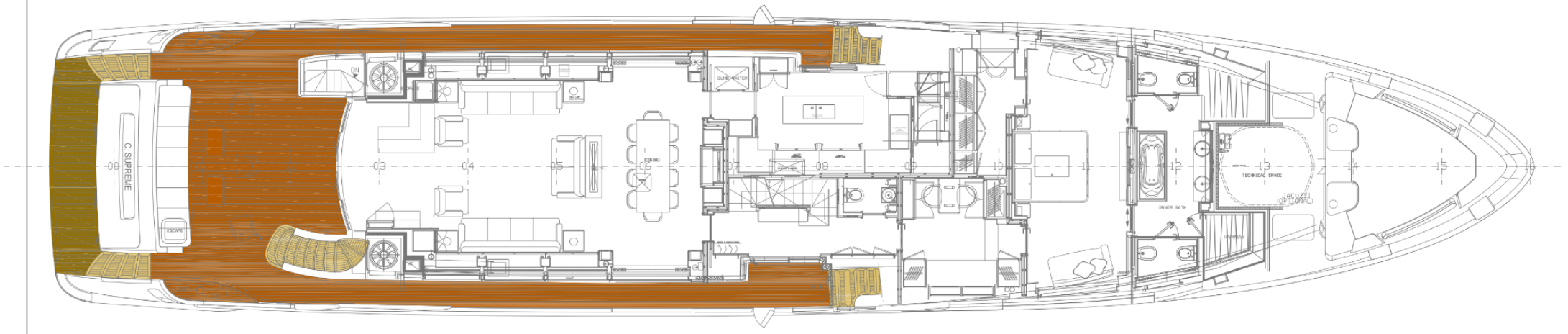
Product Analysis and Design of a Superyacht –
analysis of a semi-custom fiberglass range of Benetti Yachts, from 93’ to 145’.
Redesign of a Classic 121’ Yacht

CLASSIC 121'



TAG	TYPE
	Teak floor
	Teak steps
	Teak platform and folding doors
	Whirlpool border

CLASSIC SUPREME 132’

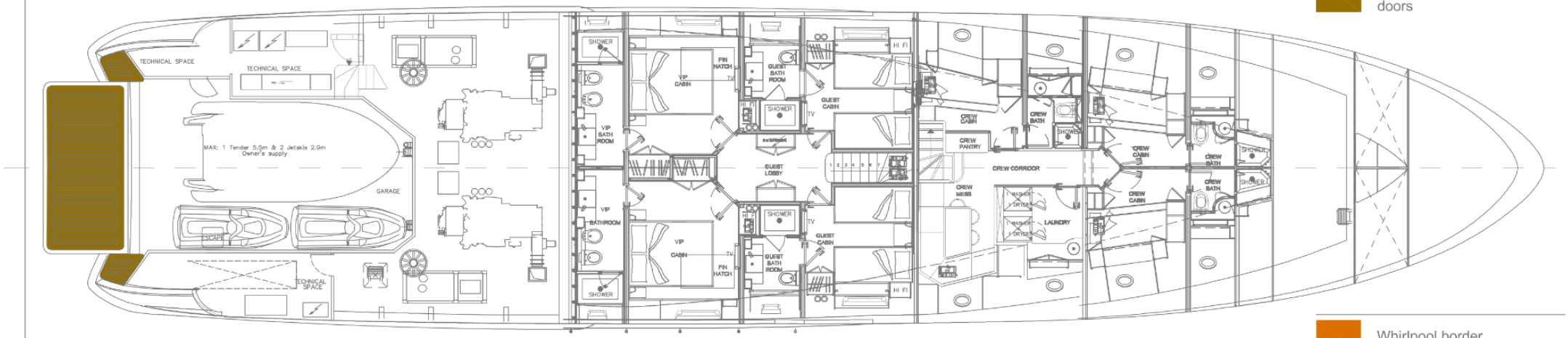


TEAK PLAN

MAIN DECK COMPARISON

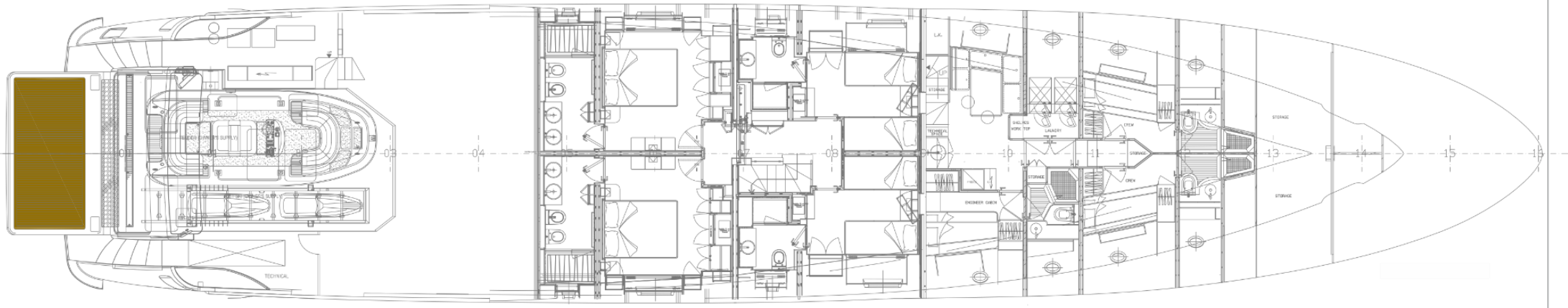
Benetti

CLASSIC 121'



TAG	TYPE
	Teak floor
	Teak steps
	Teak platform and folding doors
	Whirlpool border

CLASSIC SUPREME 132'

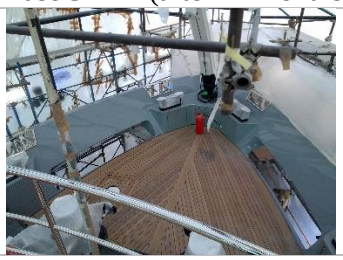


TEAK PLAN

LOWER DECK COMPARISON

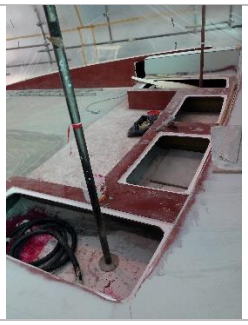
Benetti

Diferent phases in production of some of the items:

Hull FW: Phase 1(first months)	Phase 2 (6-12 months)	Phase 3 (after 12 months)
		

Ext Stairs: Phase 1 (1st months)	Phase 2 (6-12 months)	Phase 3 (after 12 months)
		

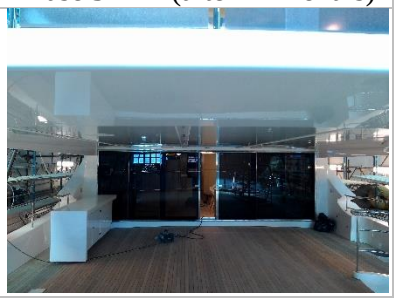
Windows: Phase 1 (1st months)	Phase 2 (6-12 months)	Phase 3 (after 12 months)
		

Ext Outfitting: Phase 1 (1st months)	Phase 2 (6-12 months)	Phase 3 (after 12 months)
		

Int. floors: Phase 1 (1st months)	Phase 2 (6-12 months)	Phase 3 (after 12 months)
		

Teak: Phase 1 (1st months)	Phase 2 (6-12 months)	Phase 3 (after 12 months)
		

Roll bar: Phase 1 (1st months)	Phase 2 (6-12 months)	Phase 3 (after 12 months)
		

Ceilings: Phase 1 (1st months)	Phase 2 (6-12 months)	Phase 3 (after 12 months)
		

2.4 Auxilary Machinery

Table 4. The List of all items compared in this technical section. Full list is available in appendix 1

03 AUXILIARY MACHINERY
03.10 BILGE AND FIRE EQUIPMENT – 4 ITEMS

03.20 FUEL OIL AND LUBE OIL EQUIPMENT – 6 ITEMS
03.30 SANITARY EQUIPMENT – 5 ITEMS
03.40 AIR PRESSURE AND HYDRAULIC EQUIPMENT – 5 ITEMS
03.50 FRESH WATER EQUIPMENT – 6 ITEMS
03.60 SEA WATER COOLING EQUIPMENT – 1 ITEM
03.70 AIR VENT AND SOUNDING EQUIPMENT – 4 ITEMS
03.80 GAS EXHAUST EQUIPMENT – 2 ITEMS
03.90 VARIOUS AUXILIARY EQUIPMENT – 2 ITEMS

BENETTI RANGE CLASS - CUSTOM	BENETTI CLASS				
MODEL	BD 93'	BK 108'	BC 121'	BS 132'	BY 140'
Fuel transfer pumps	1 EL (24Vdc) and 1 emergency hand operated pump, connected to a combined suction delivery manifold.	1 400V/3 phase electric transfer pump, 1 manual transfer pump for emergeny purposes.	Transfer system shall allow to transfer from each tank to each other by means of 1 electric transfer pump.	Transfer system shall allow to transfer from each tank to each other by means of 1 electric transfer pump.	2 El fuel oil transfer pumps (one at 380 VAC and one at 24 V DC) installed, connected to a combined suction delivery manifold.
Smoke water separators	Each generator exhaust system have a muffler and a smoke/water separator.		Each diesel generator exhaust system have a GRP gas/water separator.	Each diesel generator exhaust system have a GRP gas/water separator.	Each generator exhaust system have a muffler and a smoke/water separator.
Bilge, fire and ballast equipment					
Fire pumps	1 EL 230V/3phase/ 50Hz sea water pump	2 EL self priming pumps (capacity as per Classification Society requirements) are provided for bilge and fire extinguishing system. Pipes are made in cunipress.	1 EL self priming pump in the engine room for fire extiguinshing system	1 EL self priming pump in the engine room for fire extiguinshing system	1 EL sea water pump, with capacity in accordance with Class. Society requirements.

Bilge pumps	1 EL 230V/3phase/ 50Hz sea water pump	2 EL self priming pumps (capacity as per Classification Society requirements) are provided for bilge and fire extinguishing system. Pipes are made in cunipress.	1 EL self priming pump in the engine room for main bilge system. 1 EL pump for garage bilge system. 1 automatic submergible EL pump for the forward storage.	1 EL self priming pump in the engine room for main bilge system. 1 EL pump for garage bilge system. 2 automatic submergible EL pump for the forward storages.	1 EL sea water pump, with capacity in accordance with Class. Society requirements.

* specimen of items compared in the Technical Comparisons, conducted during the internship in the Benetti

* specimen for semi-custom fiberglass range, even if the comparison is done also for a fast displacement range

2.5 Piping

Table 5: The list of all items compared in this technical section. Full list is available in appendix 1

04 PIPING
04.10 BILGE AND FIRE PIPING – 2 ITEMS
04.20 FUEL OIL AND LUBRICATING OIL PIPES – 2 ITEMS
04.30 SANITARY AND SCUPPERS PIPES – 2 ITEMS
04.40 AIR PRESSURE AND HYDRAULIC PIPES – 2 ITEMS
04.50 FRESH WATER AND AIR CONDITIONING WATER PIPES – 2 ITEMS
04.60 SEA WATER COOLING PIPES – 1 ITEM
04.70 AIR VENT AND SOUNDING PIPES – 1 ITEM
04.80 GAS EXHAUST PIPES – 2 ITEMS
04.90 VARIOUS SYSTEM EQUIPMENT – 3 ITEMS

BENETTI RANGE CLASS - CUSTOM	BENETTI CLASS				
MODEL	BD 93'	BK 108'	BC 121'	BS 132'	BY 140'
Air conditioning system	Pipes made in CuNi in engine room insulated with Armaflex and multilayer Unipipe Type outside engine room insulated with Armaflex.	/	Pipes for air conditioning chilled/heated water are made in CuNi 90-10 in engine room and multilayer outside engine room.	Pipes for air conditioning chilled/heated water are made in CuNi 90-10 in engine room and multilayer outside engine room.	Pipes for air conditioning chilled/heated water are made in CuNi insulated with Armaflex.
Scupper boxes	FRP scupper boxes, protected by a polished stainless steel grill.	Collecting wells of GRP, scuppers are protected by stainless steel grill. Folowing pipes materials are used: srainless steel AISI 316 inside engine room, Stainless steel 316 outside engine room below main deck. PVc outside engine room above main deck.	Collecting wells of GRP materials are provided in number and position to ensure proper water drainage and discharge from the decks.	Collecting wells of GRP materials are provided in number and position to ensure proper water drainage and discharge from the decks.	FRP scupper boxes, protected by a polished stainless steel grill.

* specimen of items compared in the Technical Comparisons, conducted during the internship in the Benetti

* specimen for semi-custom fiberglass range, even if the comparison is done also for a fast displacement range

2.6 Ventilation and Air Conditioning

Table 6. The list of all items compared in this technical section. Full list is available in appendix 1

05 VENTILATION AND AIR CONDITIONING
05.10 ACCOMMODATION VENTILATION AND AIR CONDITIONING – 11 ITEMS
05.30 ENGINE ROOM AND TECHNICAL SPACES VENTILATION SYSTEM69 – 5 ITEMS

Summer conditions:	35°C, 95 F, 90% / 22 °C, 72 F, 55 % / 32 °C, 90 F	35°C, 95 F, 80% / 22 °C, 72 F, 55 % / 32 °C, 90 F	35°C, 95 F, 90% / 22 °C, 72 F, 55 % / 32 °C, 90 F	35°C, 95 F, 90% / 22 °C, 72 F, 55 % / 32 °C, 90 F	35°C, 95 F, 90% / 22 °C, 72 F, 55 % / 32 °C, 90 F
Winter conditions:	0°C, 32 F, 90% / 22 °C, 72 F, 50 % / 10 °C, 50 F	0°C, 32 F, 90% / 22 °C, 72 F, 50 % / 10 °C, 50 F	0°C, 32 F, 90% / 22 °C, 72 F, 50 % / 5 °C, 41 F	0°C, 32 F, 90% / 22 °C, 72 F, 50 % / 5 °C, 41 F	0°C, 32 F, 90% / 22 °C, 72 F, 50 % / 8 °C, 46 F
Air conditioning salt water pumps	2 pumps for chiller group.		2 pumps for chiller unit	2 pumps for chiller unit	2 pumps for chiller unit
Engine room fans silencers	Installed in the engine room air extraction and delivery trunks	Equipped with silencer inside the duct plenum in order to minimize the noise transmitted to the external passage where the outlet is located.	Installed in the engine room air intake trunks to reduce the noise generated by air flow.	Installed in the engine room air intake trunks to reduce the noise generated by air flow.	Installed in the engine room air extraction and delivery trunks

* specimen of items compared in the Technical Comparisons, conducted during the internship in the Benetti

* specimen for semi-custom fiberglass range, even if the comparison is done also for a fast displacement range

2.7 Electric and Electronic system:

Table 7. List of all items compared in this technical section. Full list is available in appendix 1

06 ELECTRIC AND ELECTRONIC SYSTEM
06.10 EMERGENCY ELECTRICAL SYSTEM– 2 ITEMS
06.20 LOW VOLTAGE SYSTEM – 9 ITEMS
06.40 LIGHTING AND PLUGS – 33 ITEMS
06.70 ENTERTAINMENT EQUIPMENT – 1 ITEM
TV AND STEREO EQUIPMENT – 19 ITEMS

BENETTI RANGE CLASS - CUSTOM	BENETTI CLASS				
MODEL	BD 93'	BK 108'	BC 121'	BS 132'	BY 140'

Batteries, general	All batteries will be GEL or AGM type according to their usage.	All batteries will be GEL or AGM type according to their usage.	All batteries will be GEL or AGM type according to their usage.	All batteries will be GEL or AGM type according to their usage.	24 V DC batteries are installed for the services. All batteries are GEL type. Installed in battery boxes as per Class. Society requirements .
Radio batteries	1 group of 24V DC	1 group of 24V DC	1 group of 24V DC	1 group of 24V DC	Essential comumunication and navigation equipment is connected to a dedicated battery bank, according to Class. Society requirements .
Service batteries	1 group of 24V DC	1 group of 24V DC	1 group of 24V DC	1 group of 24V DC	1 Group for service systems in the engine room.
Echo sounder	N° 1 BLACKBOX ECHOSOUNDER FURUNO DFF1 with dual frequency triducer (depth, log, water temp)	N° 1 BLACKBOX ECHOSOUNDER FURUNO DFF1 with dual frequency triducer (depth, log, water temp)	N 1 Blackbox graphic echosounder/ Log DFF 1 with dual frequency triducer (depth, log, water temp) , N 1 NMEA Depth/Log sensor.	N 1 Blackbox graphic echosounder/ Log DFF 1 with dual frequency triducer (depth, log, water temp) N 1 NMEA Depth/Log sensor	N 1 Blackbox graphic echosounder DFF 1 with dual frequency triducer (depth, log, water temp) ; N 2 Log integrated in NAVNET 3D B744V Transducers
Magnetic compass	N°1 Magnetic compass Riviera White Star BW3 for Wheelhouse. N°1 Magnetic compass Riviera White Star BZ1 for Fly bridge	N°1 Magnetic compass C.Plath Jupiter over head mounting for Wheelhouse N°1 Magnetic compass Riviera for Fly bridge	N 1 Plath Jupiter m, 180 mm Over head installation	N 1 Plath Jupiter m, 180 mm to autosilo connection Over head installation	N 1 Plath Jupiter m, 180 mm to autosilo connection Over head installation

* specimen of items compared in the Technical Comparisons, conducted during the internship in the Benetti

* specimen for semi-custom fiberglass range, even if the comparison is done also for a fast displacement range

Carefully positioned strip lighting, recessed ceiling lights and lamps are controlled by touch switches and can be programmed to create just the right atmosphere, for any time of day and any type of occasion.

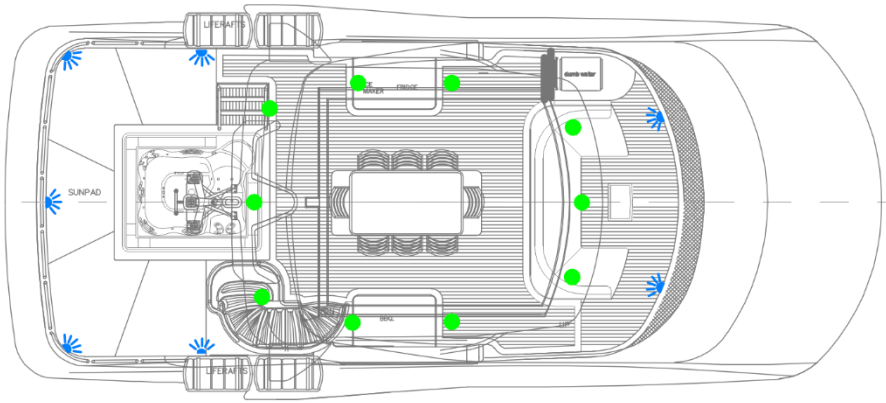
Further bellow you can see a graphical way of comparison between two Benetti Yachts, Classic 121' and Classic Supreme 132', comparing the Lighting Plan:

After that is a brief overview of a Benetti Standard Integrated Entertainment System - BEST.

Product Analysis and Design of a Superyacht –
analysis of a semi-custom fiberglass range of Benetti Yachts, from 93’ to 145’.
Redesign of a Classic 121’ Yacht

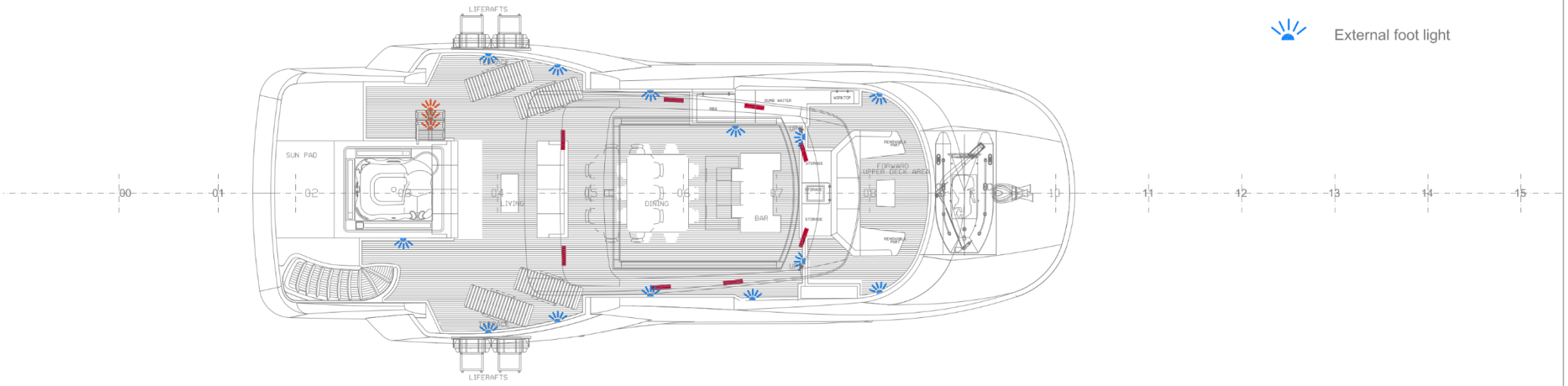
CLASSIC 121'

TAG	TYPE
	External ceiling light
	External foot light



CLASSIC SUPREME 132’

TAG	TYPE
	External ceiling light
	External foot light



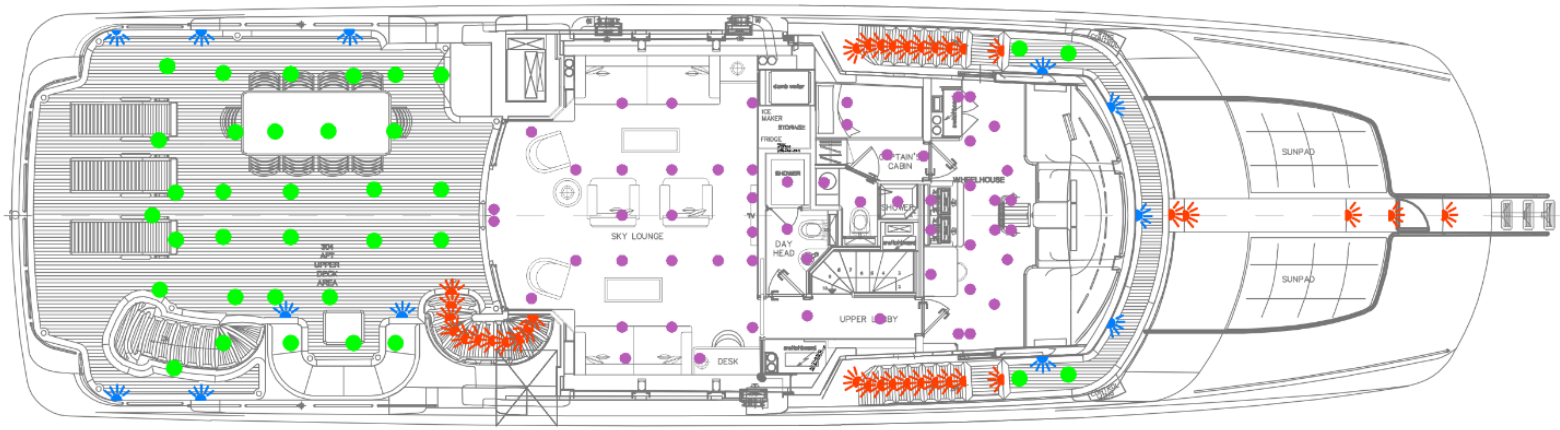
INDOOR - OUTDOOR LIGHTING PLAN

SUN DECK COMPARISON

Benetti

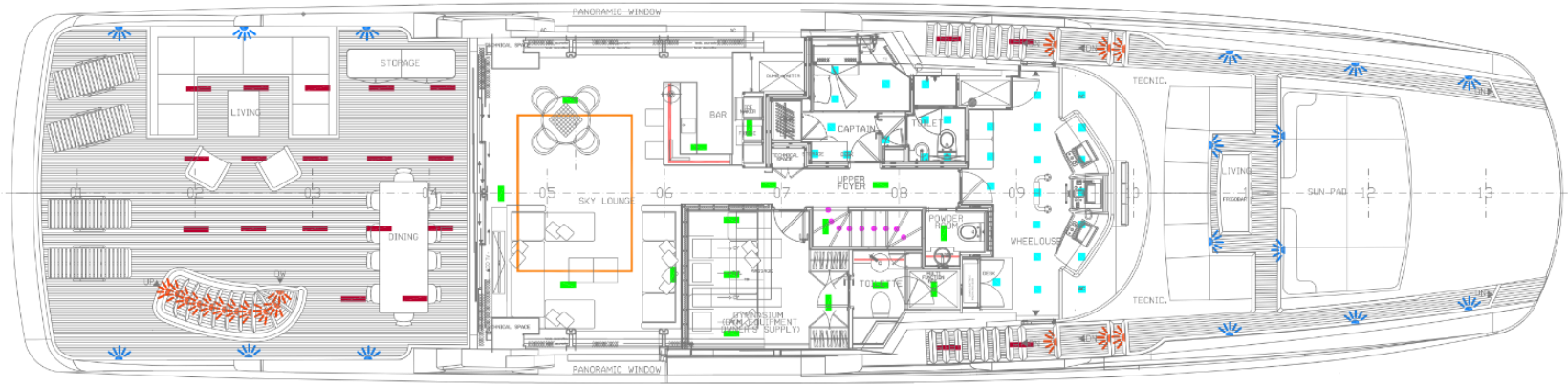
Igor Miskovic

CLASSIC 121'



TAG	TYPE
	External ceiling light
	External foot light
	External step light
	Internal ceiling light
	Internal courtesy light

CLASSIC SUPREME 132'



TAG	TYPE
	External ceiling light
	External foot light
	External step light
	Internal crew ceiling light
	Internal crew courtesy light
	Internal service areas ceiling light
	Internal ceiling light direct lighting
	Internal courtesy light
	Stripled indirect lighting
	Furniture decorative stripled

INDOOR - OUTDOOR LIGHTING PLAN

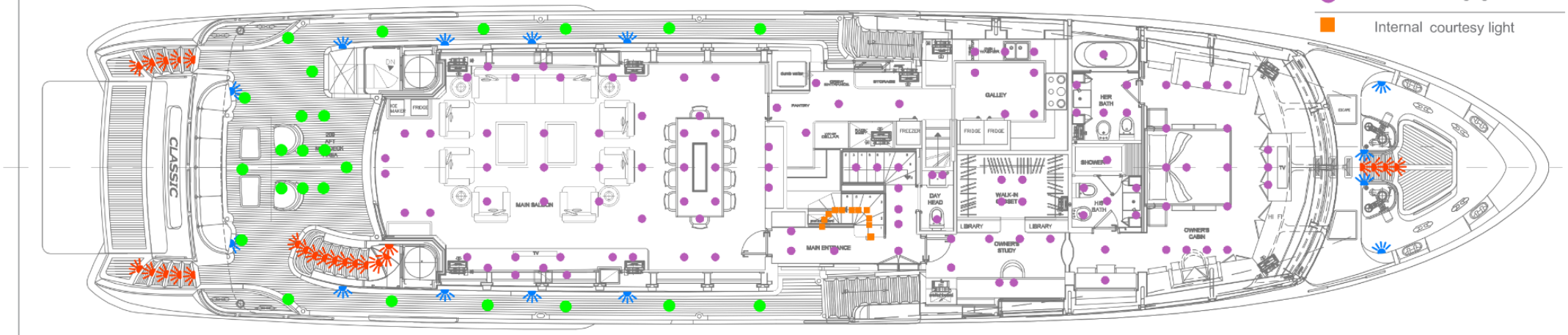
UPPER DECK COMPARISON

Benetti

Product Analysis and Design of a Superyacht –
analysis of a semi-custom fiberglass range of Benetti Yachts, from 93’ to 145’.
Redesign of a Classic 121’ Yacht

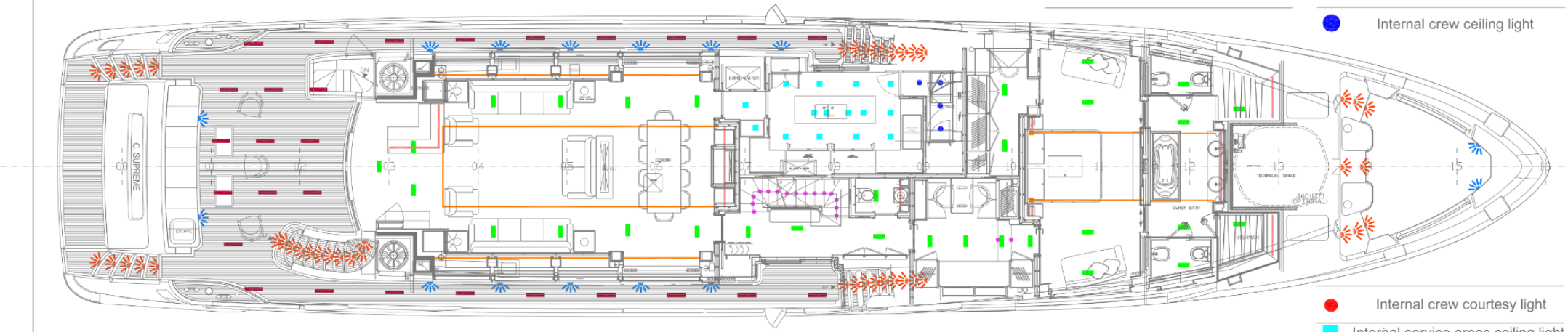
CLASSIC 121'

TAG	TYPE
	External ceiling light
	External foot light
	External step light
	Internal ceiling light
	Internal courtesy light



CLASSIC SUPREME 132’

	TAG	TYPE
Internal ceiling light direct lighting		External ceiling light
Internal courtesy light		External foot light
Stripled indirect lighting		External step light
Furniture decorative stripled		Internal crew ceiling light



	Internal crew courtesy light
	Internal service areas ceiling light

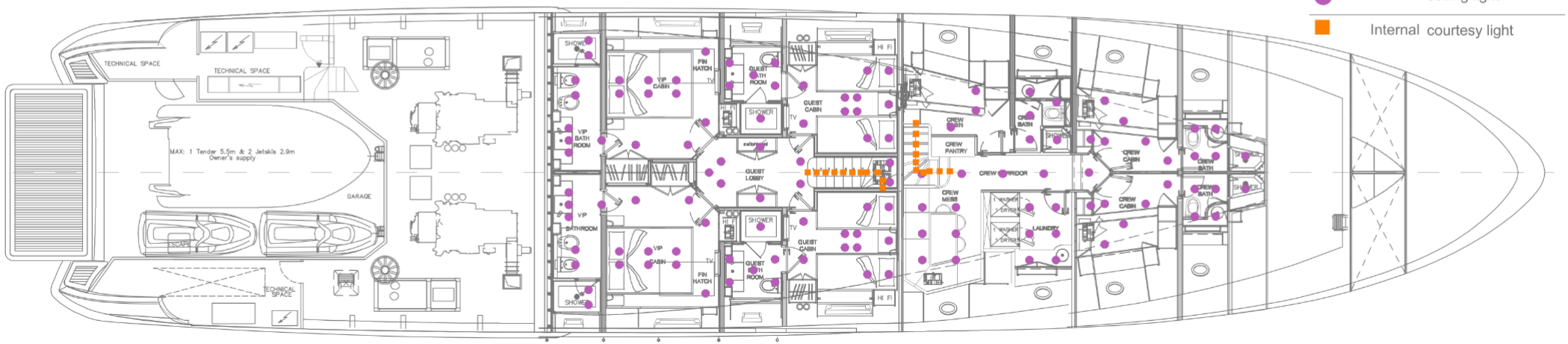
INDOOR - OUTDOOR LIGHTING PLAN

MAIN DECK COMPARISON

Benetti

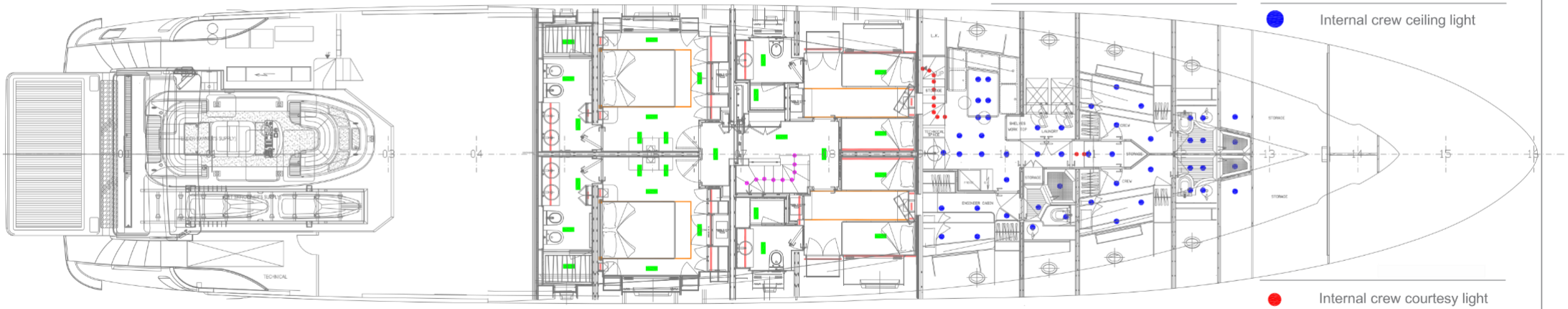
Igor Miskovic

CLASSIC 121'



TAG	TYPE
	External ceiling light
	External foot light
	External step light
	Internal ceiling light
	Internal courtesy light

CLASSIC SUPREME 132'



	Internal ceiling light direct lighting
	Internal courtesy light
	Stripled indirect lighting
	Furniture decorative stripled

TAG	TYPE
	External ceiling light
	External foot light
	External step light
	Internal crew ceiling light
	Internal crew courtesy light
	Internal service areas ceiling light

INDOOR - OUTDOOR LIGHTING PLAN

LOWER DECK COMPARISON

Benetti

2.7.1 Benetti Classic 121' Standard Integrated Entertainment system

Benetti Exclusive Sea Technology: 'BEST'

General description:
From the challenge launched by Benetti together with its technical partners a real and proper ship assistance has been created on BC121' for communications and entertainment. It is a complete and modular solution for the electronic instruments on board, a real and proper capillary distribution and elaboration system constituted by a sophisticated central server and by various devices locally handling the various functions, from audio/video to communications. A complex system but extremely easy to use that can make life on board much more comfortable both for guests and crew.

In the Saloons in the Owner's stateroom and Guest Cabins of BC121' people gets access to all television, satellite and terrestrial channels or makes a choice from the vast digital media data on board at the touch of just a single remote control.
BEST audio video system on demand can hold up to 750 dvd and hundred of thousands of musical pieces with automatically handled covers and playbills.

Every form of communication, ranging from telephone to data transmission, is handled by BEST to render available to the Owner and his Guests edge cutting services being managed through a simple interface web, such as "call hunting and paging", vocal box, public address, centralised telephone book, automatic calls re-addressing and many more.
The flexibility of the system can be enhanced as an OPTION by allowing a limitless access to internet and optimises navigation on web according to costs and availability criteria chosen by the user.
WiFi connection is provided on BC121' in the Owner's Cabin, Main Saloon, Upper Saloon, Guest Accomodation .

CCTV (option)
Your BEST on board BC121' allows you to manage the CCTV surveillance system which consists of four video-cameras positioned port and stardboard external corridor, in the engine room and on the external aft main deck. The system allows you to call up on the display the

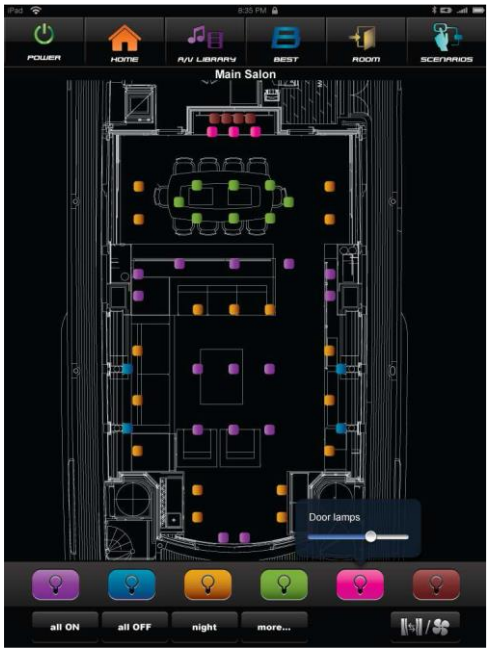
different views from each camera, the motion detection facility triggering off image recording. All the images and the cameras can be controlled by one 17" touch screen placed in the Crew Mess and by the integrated navigation equipment of the Wheelhouse. BEST has been designed to interface with every existing hardware system but with an eye for possible future technologies which may become available. The system allows to be updated through simple upgrading of the software.

"Magic touch":

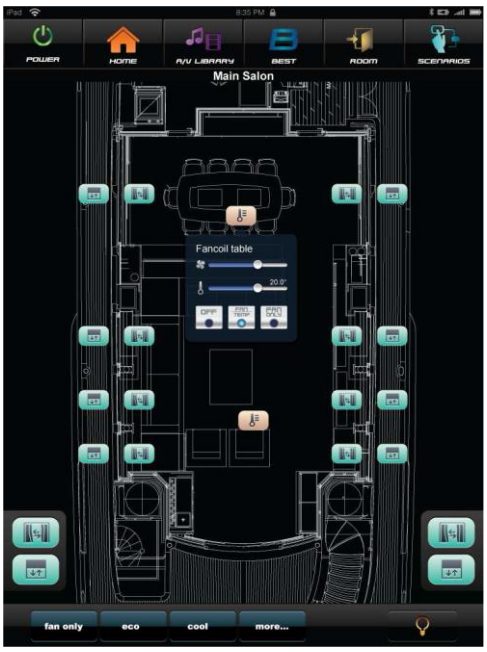
Best allows also the maximum personalization of the single environments. As a magic set designer, through a simple "touch" on the panel, it would be possible to decide on a scenery ambiance with suffused lights and ambient music, or to transform everything into an exciting disco. Thanks to the independent handling of lighting and air conditioning, of A/V effects and curtaining movement, Best allows you to almost touch a feeling of absolute comfort.

Best has been planned to interface not only with every existing hardware system, but also to be used with whatever technology that might be developed in the future. Best will always be updateable through simple upgrading of the software on board ship.

Apple iTouch/ iPad remote control:
Are the remote controls through which all BEST's functions can be accessed and controlled.



Lights Control



Electrical Curtains and Air Conditioning Control

Figure 4: Graphical Interface of Benetti Exclusive Sea Technology: '*BEST*'

BENETTI RANGE CLASS - CUSTOM	BENETTI CLASS				
MODEL	BD 93'	BK 108'	BC 121'	BS 132'	BY 140'

ENTERTAINMENT EQUIPMENT					
Satellite TV	AERIAL TV and FM RADIO Model: Mark 30 Brand:Naval ; N°3 WI-FI ANTENNAS (NO ROAMING) Model: UniFi AP Brand: UBIQUITI	AERIAL TV and FM RADIO Model: Mark 30 Brand:Naval ; N°4 WI-FI ANTENNAS (NO ROAMING) Model: UniFi AP Brand: UBIQUITI	AERIAL TV ANTENNA Model: Mark 30 Brand:Naval ; AERIAL RADIO ANTENNA Model: VPA 30 Brand:Naval ; N°6 WI-FI ANTENNAS (NO ROAMING) Model: UniFi AP Brand: UBIQUITI	AERIAL TV ANTENNA Model: Mark 30 Brand:Naval ; AERIAL RADIO ANTENNA Model: VPA 30 Brand:Naval ; N°6 WI-FI ANTENNAS (NO ROAMING) Model: UniFi AP Brand: UBIQUITI	AERIAL TV ANTENNA Model: Mark 30 Brand:Naval ; AERIAL RADIO ANTENNA Model: VPA 30 Brand:Naval ; N°8 WI-FI ANTENNAS (NO ROAMING) Model: UniFi AP Brand: UBIQUITI

* specimen of items compared in the Technical Comparisons, conducted during the internship in the Benetti

* specimen for semi-custom fiberglass range, even if the comparison is done also for a fast displacement range

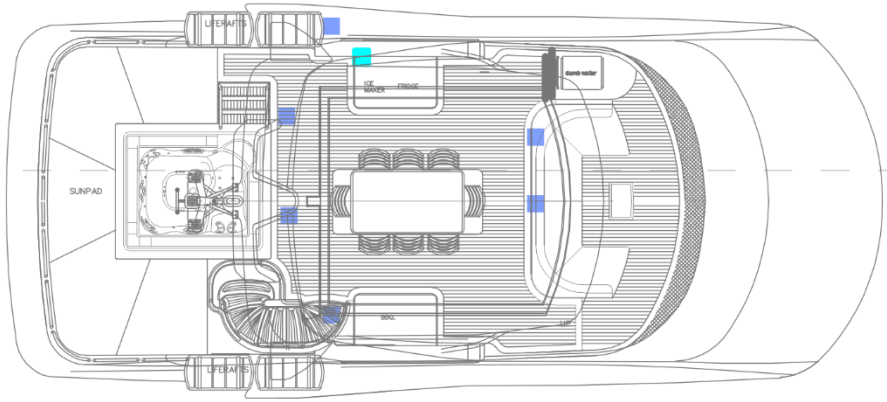
*full Entertainment equipment list, of one of the Benetti models, can be find in the appendix 2

Further bellow is a deck comparison of Audio and Video Plan, onboard *Classic 121'* and *Classic Supreme 132'*.

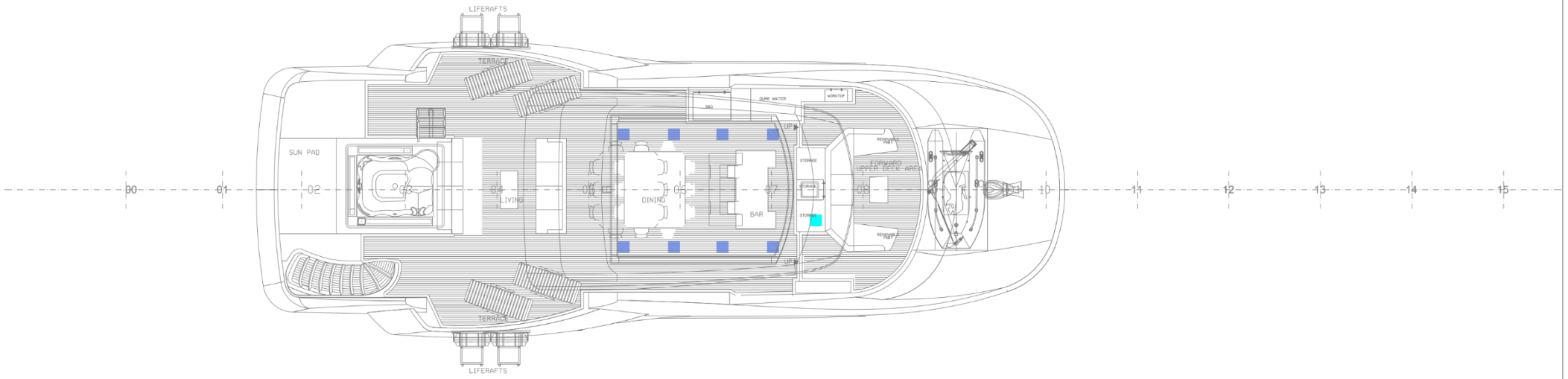
Igor Miskovic

TAG	TYPE
	Marine CD/mp3 Player - Radio Turner
	Micro Hi-Fi - sintoamplifier - CD player

CLASSIC 121'



CLASSIC SUPREME 132'



AUDIO - VIDEO PLAN

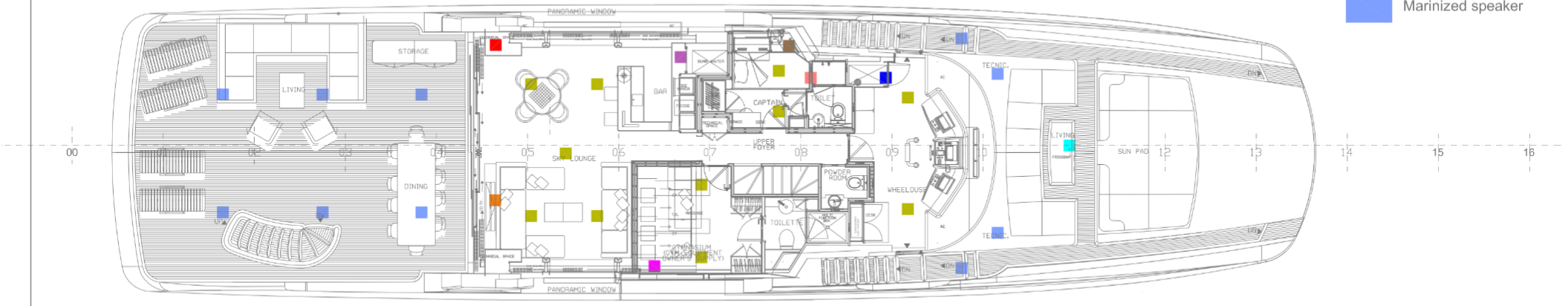
SUN DECK COMPARISON

Benetti

Product Analysis and Design of a Superyacht –
analysis of a semi-custom fiberglass range of Benetti Yachts, from 93’ to 145’.
Redesign of a Classic 121’ Yacht

CLASSIC 121'

CLASSIC SUPREME 132’



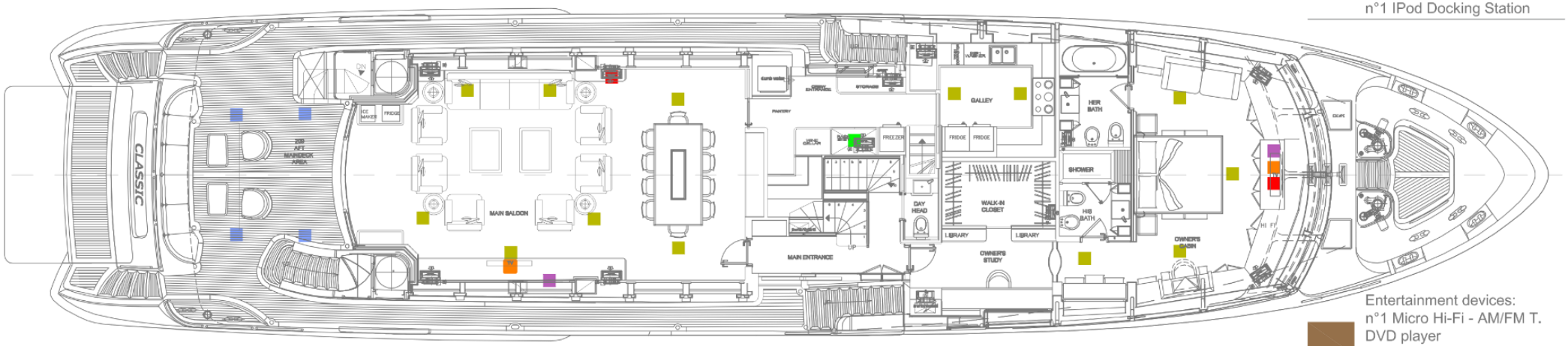
TAG	TYPE
	Entertainment devices: n°1 Audio Video Receiver - AM/FM Turner - HDMI Input/Output n°1 "Best" Audio_Video Client n°1 Integrated wi-fi remote c. n°1 IPod Docking Station
	Entertainment devices: n°1 Micro Hi-Fi - AM/FM T. DVD player n°1 Integrated wi-fi remote c. n°1 IPod Docking Station
	Entertainment devices: n°1 Micro Hi-Fi - AM/FM T. CD player n°1 IPod Docking Station
	Best audio touch panel - IPod Docking Station
	Marine CD/mp3 Player - Radio Turner
	Micro Hi-Fi - sintoamplifier - CD player
	TV LED
	TV LCD
	Subwoofer
	Speaker
	Marinized speaker

AUDIO - VIDEO PLAN

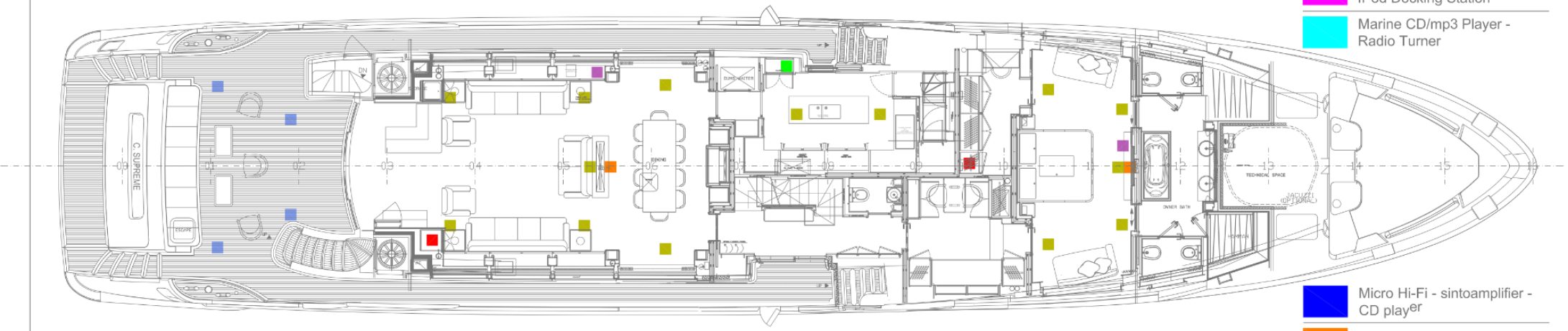
UPPER DECK COMPARISON

Benetti

CLASSIC 121'



CLASSIC SUPREME 132'



TAG	TYPE
	Entertainment devices: n°1 Audio Video Receiver - AM/FM Turner - HDMI Input/Output n°1 "Best" Audio_Video Client n°1 Integrated wi-fi remote c. n°1 IPod Docking Station
	Subwoofer
	Speaker
	Marinized speaker
	Entertainment devices: n°1 Micro Hi-Fi - AM/FM T. DVD player n°1 Integrated wi-fi remote c. n°1 IPod Docking Station
	Entertainment devices: n°1 Micro Hi-Fi - AM/FM T. CD player n°1 IPod Docking Station
	Best audio touch panel - IPod Docking Station
	Marine CD/mp3 Player - Radio Turner
	Micro Hi-Fi - sintoamplifier - CD player
	TV LED
	TV LCD

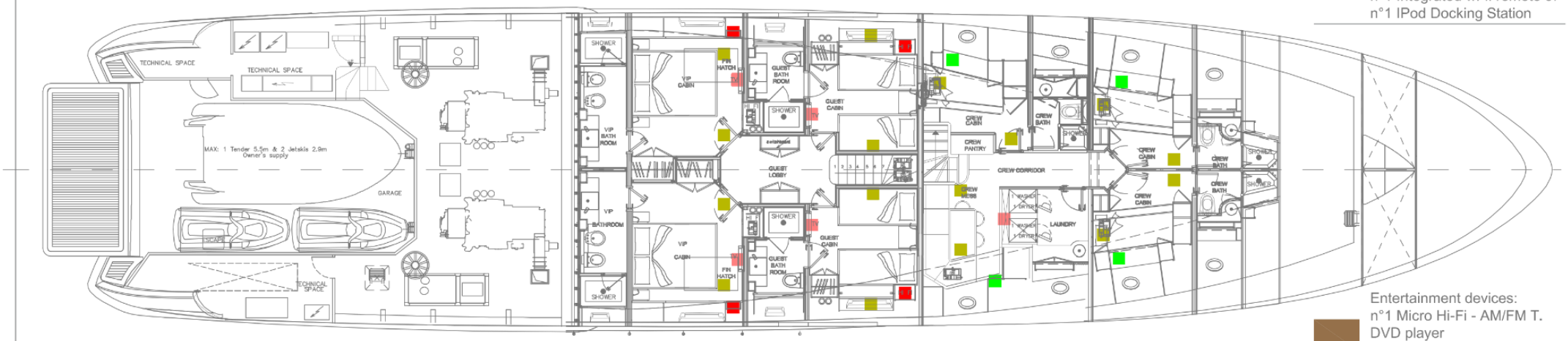
AUDIO - VIDEO PLAN

MAIN DECK COMPARISON

Benetti

Product Analysis and Design of a Superyacht –
analysis of a semi-custom fiberglass range of Benetti Yachts, from 93' to 145'.
Redesign of a Classic 121' Yacht

CLASSIC 121'



CLASSIC SUPREME 132'

TAG	TYPE
	Entertainment devices: n°1 Audio Video Receiver - AM/FM Turner - HDMI Input/Output n°1 "Best" Audio_Video Client n°1 Integrated wi-fi remote c. n°1 IPod Docking Station
	Entertainment devices: n°1 Micro Hi-Fi - AM/FM T. DVD player n°1 Integrated wi-fi remote c. n°1 IPod Docking Station
	Entertainment devices: n°1 Micro Hi-Fi - AM/FM T. CD player n°1 IPod Docking Station
	Best audio touch panel - IPod Docking Station
	Marine CD/mp3 Player - Radio Turner
	Subwoofer
	Speaker
	Marinized speaker
	Micro Hi-Fi - sintoamplifier - CD player
	TV LED
	TV LCD

AUDIO - VIDEO PLAN

LOWER DECK COMPARISON

Benetti

2.8 Main Machinery

Table 8. The list of all items compared in this technical section. Full list is available in appendix 1

07 MAIN MACHINERY
07.10 PROPULSION MACHINERY – 8 ITEMS
07.30 ELECTRIC POWER GENERATORS – 3 ITEMS
07.40 SIDE PROPULSION – 2 ITEMS
07.50 STABILIZERS – 1 ITEM

BENETTI RANGE CLASS - CUSTOM	BENETTI CLASS				
MODEL	BD 93'	BK 108'	BC 121'	BS 132'	BY 140'
Main engines	2 x MAN V8 1000, of 735 kW (1000HP) @ 2300 rpm each	2 x MAN V8 1000, of 735 kW (1000HP) @ 2300 rpm each	2x MTU 12V 2000M72 1080 kW (1468 hp) @ 2250 rpm	2x MTU 12V 2000M72 1080 kW (1450 hp) @ 2250 rpm with BlueLine plant automotion	MTU12V2000M72, of 1080 kW (1450 HP) @ 2250 rpm each, with Blue vision NG basic
Main generators	2 Diesel electric generators: No.1 40kW, 230Vac, 3 ph, 50 Hz and No.2 33 kW, 230V, 50 Hz.	2 Diesel generators: Kohler, 2x 50 EOFZD, 50kW, 400V AC/50Hz, 3 phases + Neutral.	2 Diesel generators: Kohler, 2x 80 EOFZD, 80kW, 400V AC/50Hz, 3 phases, 1500 rpm	2 Diesel generators: Kohler, 2x 80 EOFZD, 80kW, 400V AC/50Hz, 3 phases, 1500 rpm	2 Diesel electric generators: 125kW, 380V, 3 ph, 50 Hz. The generators have integrated fresh water cooling systems with integrated fresh water pump, heat exchanger and integrated sea water pump.
Bow thruster	Hydraulic motor of 48 kW (65HP)	Electric motor of 37 kW 400V/3 phase.	Hydraulic motor of 60 kW supplyed by the 2 integrated hydraulic pumps installed on the gearboxes PTO. Integrated with stabilizer fins system.	Hydraulic motor of 60 kW supplied by the 2 integrated hydraulic pumps installed on the gearboxes PTO. Integrated with stabilizer fins system.	Electric motor of 75 kW, controlled from wheelhouse and from wing stations.
Shaft bearings	Arranged with rubber bearings water lubricated.	Brackets fabricated in cast bronze.	Arranged with water lubricated bearings.	Arranged with water lubricated bearings.	Arranged with water lubricated bearings.

* specimen of items compared in the Technical Comparisons, conducted during the internship in the Benetti

* specimen for semi-custom fiberglass range, even if the comparison is done also for a fast displacement range

2.9 Interiors

Table 9. The list of all items compared in this technical section. Full list is available in appendix 1

08 INTERIORS
08.10 CREW INTERIOR – 4 ITEMS
08.20 GUESTS INTERIOR – 9 ITEMS
08.30 VARIOUS ACCESSORIES – 2 ITEMS
08.40 DOMESTIC APPLIANCES - 2 ITEMS

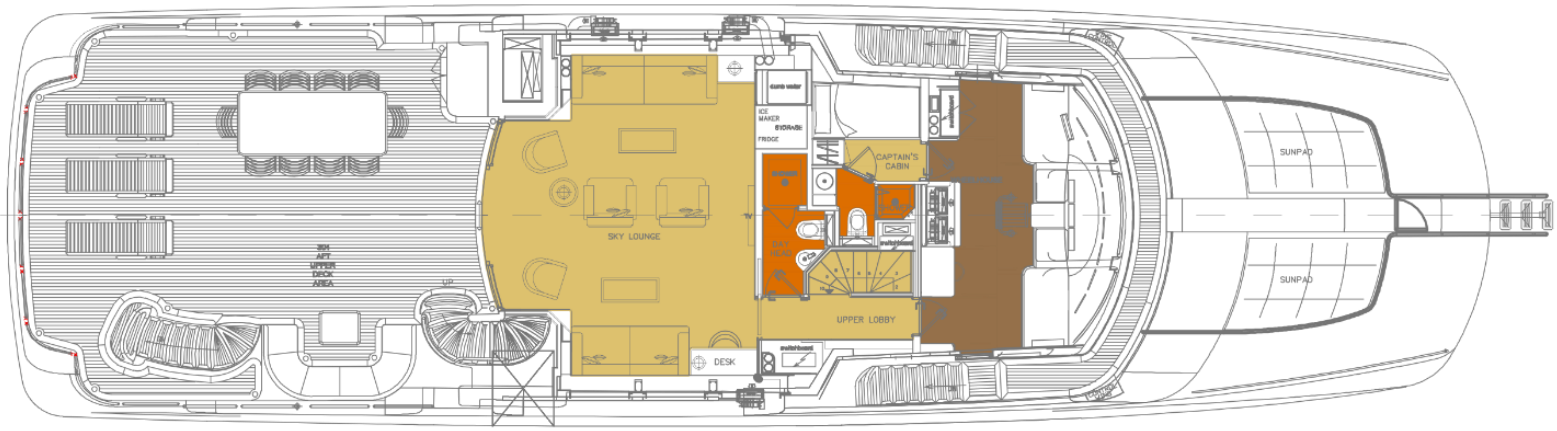
BENETTI RANGE CLASS - CUSTOM	BENETTI CLASS				
MODEL	BD 93'	BK 108'	BC 121'	BS 132'	BY 140'
Main Saloon:	2x Sofa 3 seats, 1x sofa 2 seats, 1 Coffee table, 10 dining chairs, 1 Dining table.	/	1x Sofa 4 seats, 6 Armchairs, 2 Coffe table, 10 dining chairs, 1 Dining table, 4 side table	2x Sofa 4 seats, 2 Coffe table, 10 dining chairs, 1 Dining table.	2 sofa 3 seat, 2 armchairs, 1 coffe table, 2 bar stool, 10 dining chairs, 1 dining table
Owner's study:				DESK CHAIR 2, DESK 1	DESK CHAIR 2, DESK 1
Owner's cabin:	1 Vanity Chair, 1x 2 seat Sofa.	/	1 Vanity chair, 1 desk chair (in Owner's Study)	1 Vanity chair, 2 Chaise lounge	1 Vanity chair, 1 Chaise lounge
UPPER DECK:					
External Aft Area:	DINING TABLE 1, DINING CHAIR 6		1 Coffe table, 3 Sunbed, 1 Dining table, 10 Dining chairs.	2 Sofa 3 seats, 2 Armchairs, 1 Coffe table, 1 Dining table, 10 Dining chairs.	2 Sofa 2 seats, 1 Sofa 3 seats, 2 Armchairs, 1 Coffe table.
Sky Lounge:			2 Sofa 3 seat, 2 armchair, 2 club chair, 2 Coffe table, 1 desk chair, 1 side table.	2 Sofa 3 seat, 2 Pouff, 2 Coffe table	2 Sofa 4 seat, 3 Bar stools, 2 armchairs, 1 Coffe table.
External Fwd:			/	1 Coffe table	2 Coffe table
Wheelhouse:	1 Backrest	/	1 backrest	1 Backrest, 1 Desk pouff	1 Backrest, 1 Desk chair
SUNDECK: External:	DINING CHAIR 10, DINING TABLE 1, SUNBED 3	/	10 Dining chairs, 1 Dining table,1 Coffe table,	10 Dining chairs, 1 Dining table, 4 Sunbed, 2 Bar stool, 2 Coffe table, 2 Sofa 4 seats, 1 sofa 3 seats	12 Dining chairs, 1 Dining table, 4 Sunbed, 3 Bar stool, 2 Coffe table, 2 Sofa 3 seats, 2 Sofa 4 seats

* specimen of items compared in the Technical Comparisons, conducted during the internship in the Benetti
*specimen for semi-custom fiberglass range, even if the comparison is done also for a fast displacement range

Further bellow is a deck comparison of Floor Plan, onboard *Classic 121'* and *Classic Supreme 132'*.

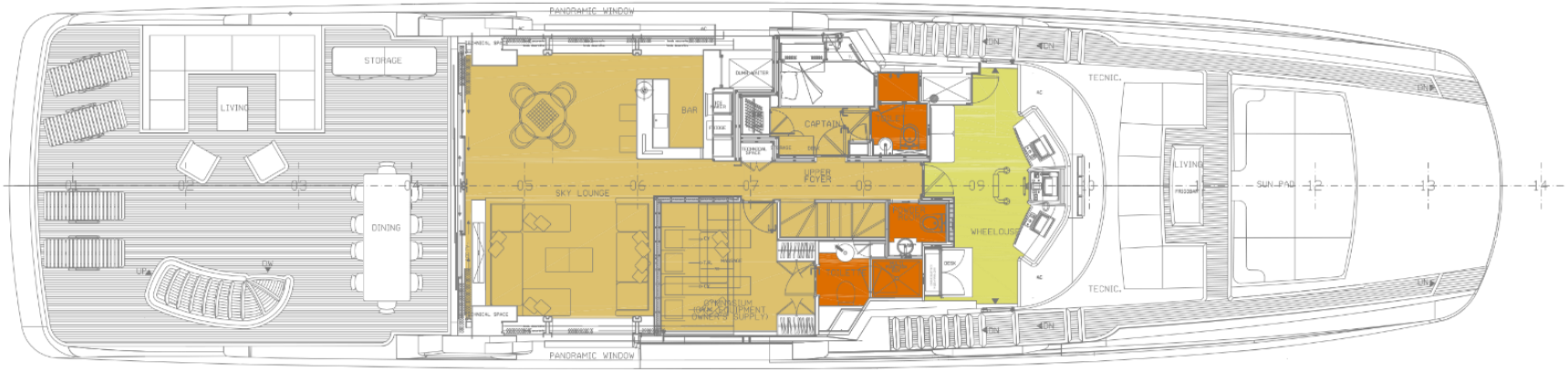
Igor Miskovic

CLASSIC 121'



TAG	TYPE
	Wood
	Carpet
	Marble
	Synthetic carpet
	Vinyl flooring
	Teak & Holy

CLASSIC SUPREME 132'



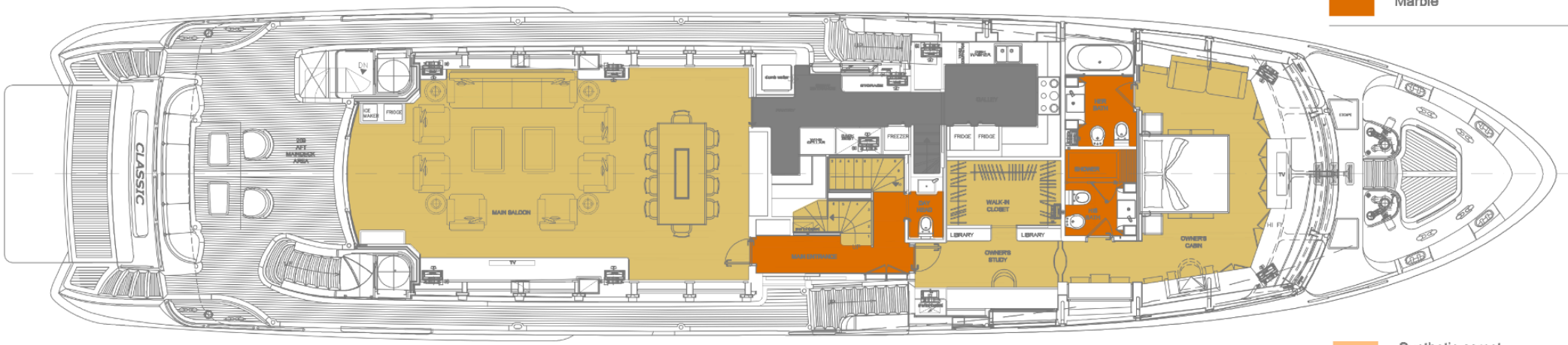
FLOOR PLAN

UPPER DECK COMPARISON

Benetti

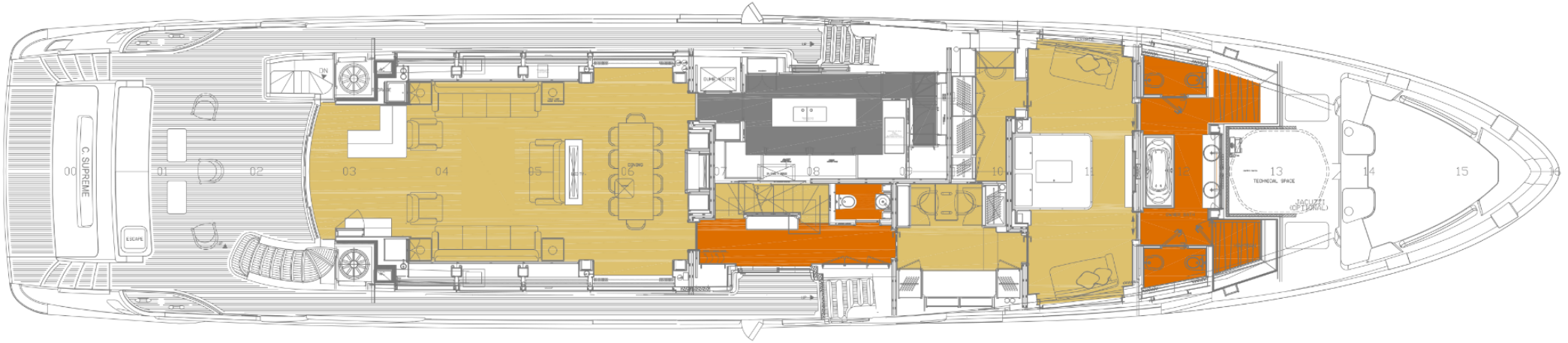
Product Analysis and Design of a Superyacht –
analysis of a semi-custom fiberglass range of Benetti Yachts, from 93’ to 145’.
Redesign of a Classic 121’ Yacht

CLASSIC 121'



TAG	TYPE
	Wood
	Carpet
	Marble
	Synthetic carpet
	Vinyl flooring
	Teak & Holy

CLASSIC SUPREME 132’



FLOOR PLAN

MAIN DECK COMPARISON

Benetti

CLASSIC 121'

TAG	TYPE
	Wood
	Carpet
	Marble

CLASSIC SUPREME 132'

	Synthetic carpet
	Vinyl flooring
	Teak & Holy

FLOOR PLAN

LOWER DECK COMPARISON

Benetti

3. THE SUPERYACHT MARKET ANALYISIS - to explain who does what, where and how, in brief terms.

This area of analysis concentrate on Superyacht Market, part of Luxury goods market. Informations are collected during the visits to Boat Shows such as: Cannes Boat Show 9-14 September 2013; Monaco Yacht Show 24-27 September 2013; and 53rd International Boat Show in Genoa 2-6 October. Also it required close collaboration with Sales department and Product specialists. It main attention is towards a future building trends, and best practices on the market.

3.1 The Superyacht Industry

A booming sector that has evolved from a relatively small niche and cottage industry into one of the world's strongest growing luxury markets.
Along with greater exposure came the underlying idea that yachting epitomizes the ultimate in luxury living. A superyacht is more expensive than a piece of jewelry, real estate or art, as anyone involved with luxury yachts would know, but to anyone else the subject of costs and how the industry operates as a whole has long been kept a secret, a virtually taboo subject to discuss. For some time, the industry has been surrounded by an air of mystery to those 'on the outside' – a lifestyle seen from the distance, like a yacht on the horizon.

The superyacht industry is unique, quite unlike any other industry in the world. As building, selling and operating superyachts is a truly global business, it involves brokers, dealers, builders, yacht managers, and crew.

As well as the volume of yacht orders increasing exponentially over recent years, the average size of yachts has also undergone a dramatic evolution. Twenty years ago a 30m (100') yacht was considered to be very large, today's figures show that yachts of 30m (100') are 'average', with around 50% of superyachts above this length over all (LOA).
The only difference we see now compared to six years ago, is the size of the yachts. While in 2007/8 and the years before this happened in all size ranges up to the very large yachts, it now happens mostly in the 30 to 50 meter size range.

Prices at the shipyards and delivery times for new yachts remain very competitive. While the number of orders in 2012 increased , the number of shipyards who signed these orders decreased, which means the market is very competitive, and shipyards have to think about new strategies for improvement of their production.

3.1.1 The Market

The market is based on superyachts and mainly deals with semi-custom or custom yachts. Each and every superyacht is 'made to measure' partly or in full, to the requirements of a given client. Yacht will meet the future owner's requirements, from interior to exterior design, technical to engineering aspects, and from price to potential resale value, and so forth.

From their sheer size, exuberance and power, to their luxury, design, performance and electronics, superyachts are built and fitted out to extremely rigorous and exacting specifications.

3.1.2 The Owners

Superyacht owners play a crucial role in the development of the superyacht industry; not just because they purchase yachts, but because they take an integral part in the business: investing in new projects and new technology on board, and chartering out their yachts for others to enjoy. Almost all superyachts are privately owned; and therefore are for private use.

In addition, it is important to remember that they are also an invaluable asset to this industry for the business that is directly or indirectly generated from yacht acquisitions – be in terms of employment (crew), business (brokerage or charter) or additional funds spent on all operational aspects (management), as well as the level of spending in the regions where they enjoy cruising.

3.1.3 The Fleet

The past decade has seen over 100 yachts launched every year, with the fleet experiencing a 77 per cent overall growth between 2001 and 2010. Figure 6. shows the progressive growth of the fleet over the last 25 years, whilst Figure 7 shows the number of yachts delivered annually over the past 25 years. Particular growth can be observed between 2006 and 2010 when more than 1,000 yachts were delivered in just five years. This accelerated growth was in response to increasing demand for superyachts and the industry's expansion to meet this demand.

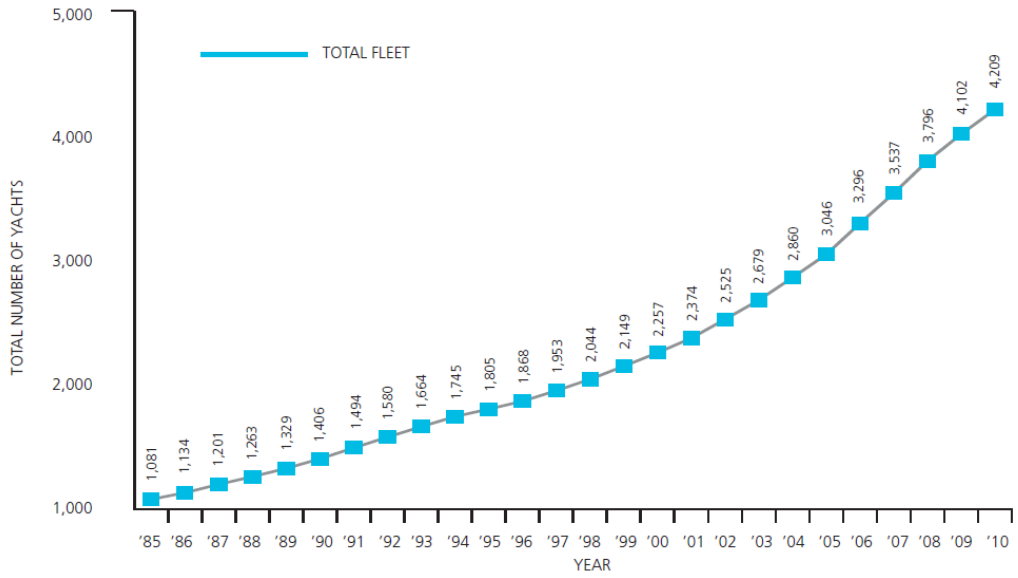


Figure 6: The progressive growth of the Superyacht fleet from 1985-2010 year. Available from: www.superyachtintelligence.com

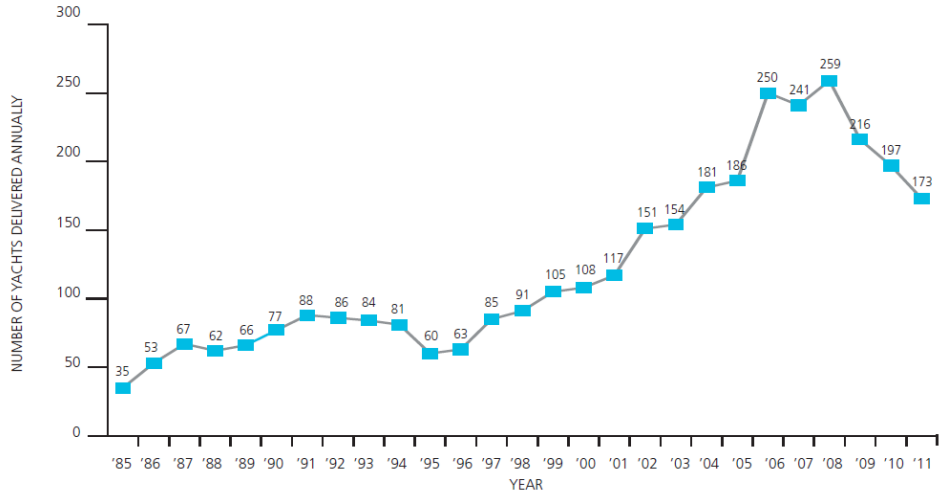


Figure 7: The number of yachts delivered annually from 1985-2010 year. Available from: www.superyachtintelligence.com

The average yacht under construction is a 45.5-metre motoryacht built in a European shipyard. Figure 8. provides a ten-year comparison for order book figures: as the graph shows, the order book figures now are roughly in line with the figures that were seen between 2005 and 2008, having shrunk somewhat following the global economic downturn at the end of 2008.

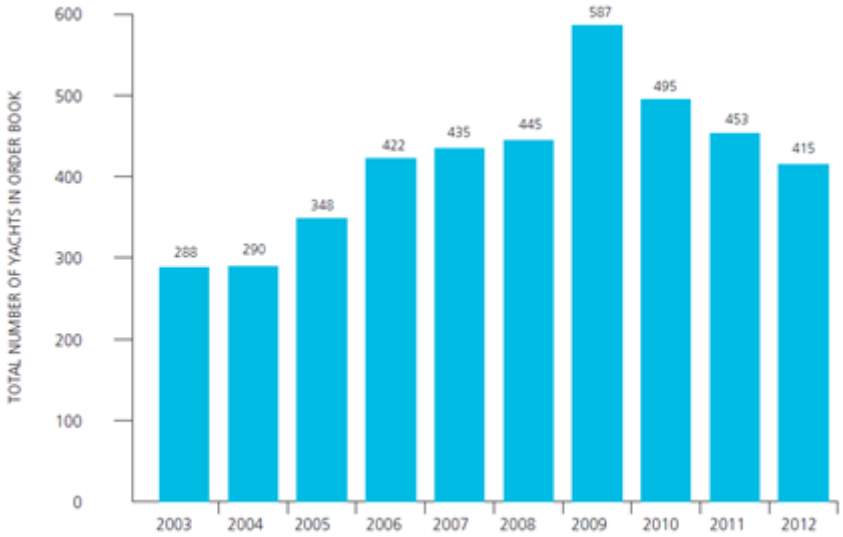


Figure 8: Total order Book 10 year comparison. Available from: www.superyachtintelligence.com

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3.1.4 Who Builds What, Where?

Superyacht construction is predominantly focused in Europe, with 69 per cent of delivered yachts originating from European yards. This is followed in numbers by the Americas with 21 per cent, and then the Rest of the World with 10 per cent.

In addition to that we can observe a yacht building activity in terms of distribution by country. The world map of builders has remained largely the same with Italy leading and still running away with top honors in the market with 272 projects.

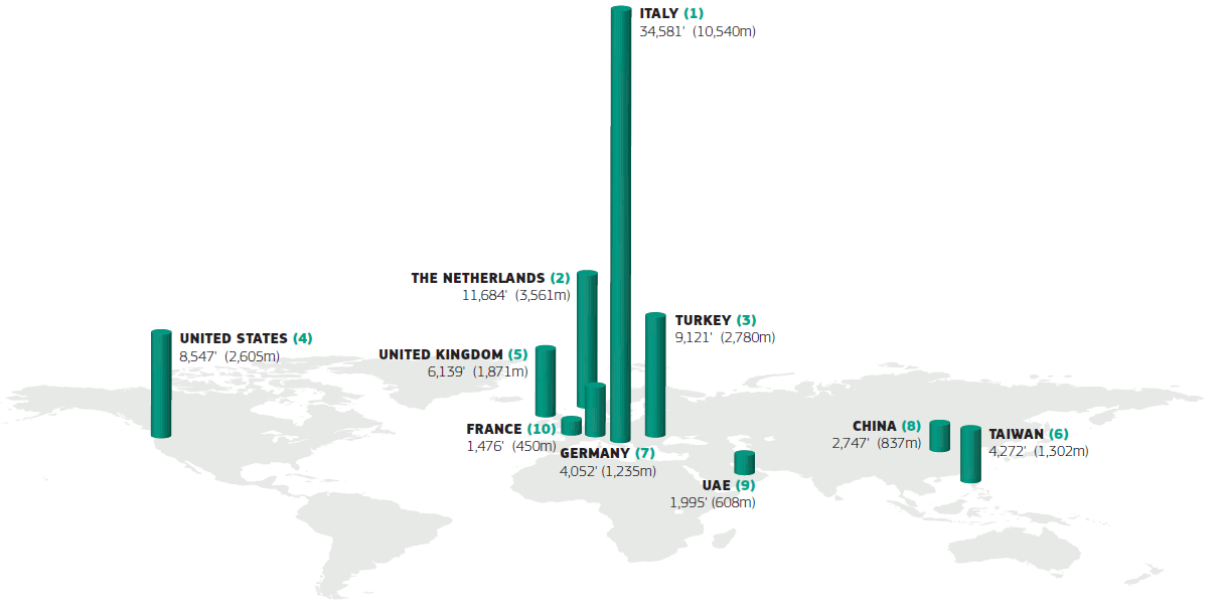


Figure 9: Yacht building activity in terms of distribution by country. Available from: www.showboats.com

Among the other top building countries, the Netherlands come second to Italy. The next tier comprises the Turkey and USA, as well as England.

2013 GOB RANK	COUNTRY	TOTAL (M)	TOTAL (FT)	PROJECTS	2012 AVG. (FT)	2011 AVG. (FT)	2012 GOB RANK
1	Italy	10,540	34,581	272	127	120	1
2	The Netherlands	3,561	11,684	66	180	165	2
3	Turkey	2,780	9,121	63	143	141	3
4	USA	2,605	8,547	66	131	130	4
5	UK	1,871	6,139	61	99	100	5
6	Taiwan	1,302	4,272	43	99	103	7
7	Germany	1,235	4,052	13	312	279	6
8	China	837	2,747	22	125	129	8
9	UAE	608	1,995	11	222	Not Ranked	Not Ranked
10	France	450	1,476	11	123	128	9

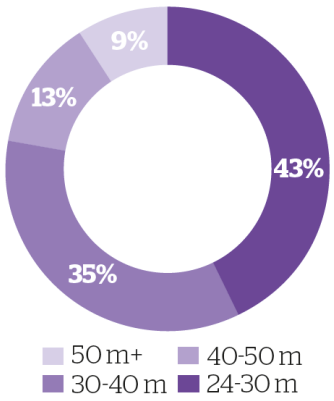
Figure 10: Table of yacht building activity in terms of distribution by country. Available from: www.showboats.com

In summary, Europe still accounts for over two-thirds of superyacht manufacturing, while the Americas and the rest of the world equally share the remaining 33%.

3.1.5 Distribution in Size, Type and Age

Distribution by size:

The current superyacht fleet of vessels over 24m (78') comprises approximately 6,290 superyachts, 267 of which were delivered in 2012. The most notable change in the number of vessels delivered was in the over 50m (164') size segment. In 2012 there were only 26 yachts delivered that were over 50m (164') in length, whilst in 2011 there were 39 yachts delivered in this size category. The 24-30m (78'–98') size segment, which consists almost entirely of semi-custom and production vessels, accounts for 43% of the total volume of superyachts with approximately 2,717 yachts. 22% of the 24-30m (78'–98') size segment consists of sailing yachts. This percentage is significantly more than we see in the larger yacht segment.



	24-30m	30-40m	40-50m	50m+	All
Motor yachts	2,127	1,867	654	490	5,138
Sailing yachts	590	362	129	71	1,152
Total	**2,717**	**2,229**	**783**	**561**	**6,290**

Figure 11: Yacht building activity in terms of distribution by size. Available from: www.camperandnicholsons.com

97 yachts between 30-40m (98'-131') were delivered in 2012, bringing the number of yachts in this size segment up to a total of 2,229 yachts, equating to a 35% share of the market.
In the larger 40-50m (131'-164') size segment there were 46 deliveries in 2012 - six less than were delivered 2011. Interestingly the number of sailing yachts delivered has not gone down, but increased to seven.
The biggest drop in deliveries in 2012 was seen in the over 50m (164') size segment. In 2011 there were 39 deliveries, whilst in 2012 there were only 26 deliveries. The over 50m (164') size segment accounts for 9% of the total fleet of all yachts over 24m (78').

The trend of orders for larger yachts has continued from last year, although there has been a 30% drop in open-style yacht orders from 63 in 2012 to 44 in 2013. The rest of the yacht types are staying within the same range, proving again that yachts consuming a lot of fuel are less in vogue.

LENGTH (IN FEET)	2013	2012	2011	2010	2009	2008	2007	2006
80-89	119	178	158	187	286	253	207	216
90-99	94	70	78	89	117	114	109	86
100-119	142	151	151	144	190	179	155	146
120-149	151	150	155	150	193	175	152	110
150-199	100	109	132	112	145	125	108	90
200-249	47	43	45	41	40	47	28	28
250+	39	27	30	30	21	23	18	12
Total	**692**	**728**	**749**	**753****	**992***	**916**	**777**	**688**

Figure 12: The table of the Trend of orders from 2006-2013 year. In red: the most active area of yacht orders. Available from: www.showboats.com

On the other side of the spectrum, we note that the category of smallest yachts, mostly series production, continues to suffer, with only 119 projects recorded this year between 80 and 89 feet, compared to 178 last year, a drop of 33.1%. One country, Italy, has particularly suffered in this corner of the market, losing net 45 hulls this year, including 26 from the Ferretti Group alone.

Distribution by age:

45% of the fleet of yachts over 24m (78') in the current superyacht fleet were built during the past seven years. This equates to 2,840 superyachts aged seven years and under. During the last seven years, an average of 406 superyachts were delivered each year, with 2008 being the best year with approximately 510 deliveries. Over the last 12 years there have been 3,820 yachts over 24m (78') delivered, which equates to 61% of the total fleet of 6,290 superyachts. The average number of deliveries per year in the last 12 years has been 318 vessels per year.

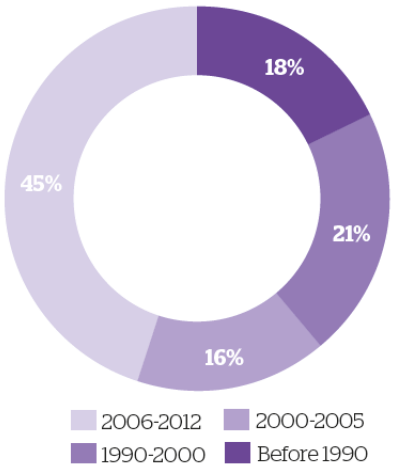


Figure 13: Yacht building activity in terms of distribution by age. Available from: www.camperandnicholsons.com

New construction:

In 2012 there were 41 displacement motor yachts, 40 semi-displacement motor yachts, 49 planning yachts, 3 catamaran motor yachts and 1 trimaran motor yacht. The displacement motor yachts are the largest with an average length of 57.07m (187'), which is a small increase compared to 2011 (56.40m (184')), while the semi-displacement yachts had an average length of 39.72m (128'), which is an increase of more than 2m (7') compared to 2011 (41.82m (135')), and planing yachts an average length of 35.02m (115'), which is a small decrease compared to 2011 (35.46m (115')).

Whilst we do not expect the rapid growth that the fleet encountered in the last decade, there is no question that the fleet will continue to grow. The number of yachts launched annually is likely to continue to far outweigh the number of yachts being written off (whether due to accidental destruction or intentional scrappage) annually for the foreseeable future. Thus, the global economic impact of superyachts seems likely to continue to increase.

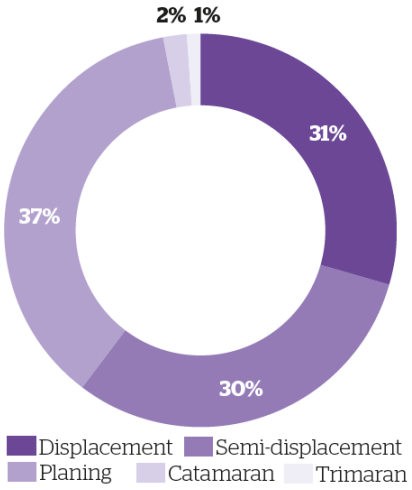


Figure 14: Yacht building activity in terms of type of a yacht.. Available from: www.camperandnicholsons.com

3.1.6 The Shipyards

Shipyards, like superyachts, can be categorized by their type of production into two distinct ranges. While many yards now build production or semi-custom yachts in the lower to medium range, up to 50m (165'), other shipyards build semi-custom to fully custom yachts, usually from 40m (130') to 160m (520').

In 2012 the number of new deliveries of superyachts over 30m (98') in length decreased by 5.6% when compared to the previous year (169 compared to 179 in 2011). Yet, even though the number of new yachts delivered in 2012 was lower than 2011, the decrease of 5.6% is a lower decrease than previous years which is a positive sign. During 2010 the number of deliveries were down on the previous year by 8.45%, and in 2011 deliveries were down by 8.2%.

When looking at the shipyards who delivered these yachts, all the regular names are once again seen in the top 10, Azimut - Benetti as the number one on the list, followed by Feretti Group. In comparison to previous years it is interesting to note the rise of Princess Yachts, who, with three models over 30m (98') in length, are taking a more prominent role in the superyacht segment.

Although 5.2 percent fewer yachts are as "under construction" in this year's Global Order Book—692 compared to 728 yachts last year—the orders confirm a future full of activity at most yards, especially for pedigree yards and those building yachts over 40 meters and custom builds.

TOP 20 BUILDERS					
2013 Rank	Company	Total (m)	Total (ft)	Projects	Avg. (ft)
1	Azimut-Benetti	2,611	8,566	70	122
2	Ferretti Group	1,749	5,738	50	115
3	Sanlorenzo	1,137	3,730	33	113
4	Sunseeker	948	3,110	29	107
5	Feadship	879	2,884	13	222
6	Lürssen	666	2,185	6	364
7	Princess Yachts	634	2,080	22	95
8	Amels	541	1,775	9	178
9	Heesen Yachts	493	1,618	10	162
10	Horizon	449	1,473	15	98
11	Westport	445	1,460	15	97
12	Oceanco	374	1,227	4	307
13	Trinity Yachts	363	1,191	7	170
14	Fipa Group	355	1,165	10	117
15	Overmarine	347	1,139	10	114
16	Perini Navi	340	1,116	6	186
17	KSE / Monte Fino	311	1,020	11	93
18	Palmer Johnson	310	1,017	5	203
19	Cerri-Baglietto	304	997	8	125
20	Christensen	299	981	7	140

Figure 15: Top 20 yacht builders in the world for 2013 year.
. Available from: www.showboats.com

The future continues to lean towards fully custom yachts, mostly coming from historically proven yards that give a perceived assurance of quality and a potential boost in lasting value for the yacht on the resale market.

Historically sound yards are recording new orders, giving those yards work until 2015, even 2016 for some

3.2 Market Considerations

The market has been driven by massive rise in semi-custom orders,

The core of the current market is in the 30m (100') to 40m (120') bracket – a market strongly dominated by the Italian shipyards. This segment is also the core of the pre-owned market.

The development of market share with regard to yacht length is indicated which shows the continuous growth of the demand for yachts over 30m from 2000 to 2009 and the slight decrease started in 2010, due to the economic global crisis. The production breakdown among the various producer countries is also reported, which shows the market leadership of Italy and Netherlands and the interesting growth of Turkey.

Although figures for current orders differ slightly depending on criteria and time periods selected, cross-analysis between collected data suggests that the current market and number of orders for yachts above 30m (100') now represents approximately 70% of the market – for an estimated 450-490 orders, against 220 orders for the 24-30m (80'-100') range.

The next step is certainly to look at the evolution of the superyachting business in 2014.

3.2.1 Present time and beyond

2013 got off to a positive start. The first six months of 2013 have seen approximately 200 yacht sales, 37% up on the first half of 2012, with an asking price value exceeding USD 1.1 billion, which equates to roughly the same value as the first half 2012. The motor yachts sold during the first half of the year represent 91% of the business and 31% were over ten years old whilst 26% of yachts were within 5 years old. 84% of the sailing yachts sold during the first half of the year were over 10 years old, the remaining 16% were between 5-10 years old.
If there is an upturn, hopefully it will not be solely in terms of value but will also impact on the volume of yachts sold. There are a growing number of Asian HNWIs, although in terms of individual countries, the US reigns supreme when it comes to centa-millionaires, and will do for some years to come. However, US clients do not tend to build the large yachts; these remain the preserve of Russian and Middle Eastern clients. China remains a target market for the yacht industry, as does Latin America, Brazil and Indonesia. Latin America, in particular, is a promising new market as its citizens are culturally more inclined towards sun and yachting than the Chinese. These emerging economies share fuelling the brokerage industry with optimism and this positive vibe is spilling into other sectors of the business.

3.3 Market Strategic Comparison – Benetti "Classic" 121'

In recent years the luxury Superyacht market (vessels over 24 meters in length) has been undergoing considerable evolution. In particular, a 28% increase in world production is forecast for the next sailing years, with an average annual growth rate of 16.4% over the last 6 years. These figures make the superyacht market a business niche with a growing level of attractiveness. Such evolution could not but result in fierce and growing international competition, marked also by the entry of new players. This change of scenario makes it necessary to carry out a competitive benchmarking analysis.
Comparison with competitors and best practices available on the market is in the purpose to be more effective in the selling process and more efficient in the design.

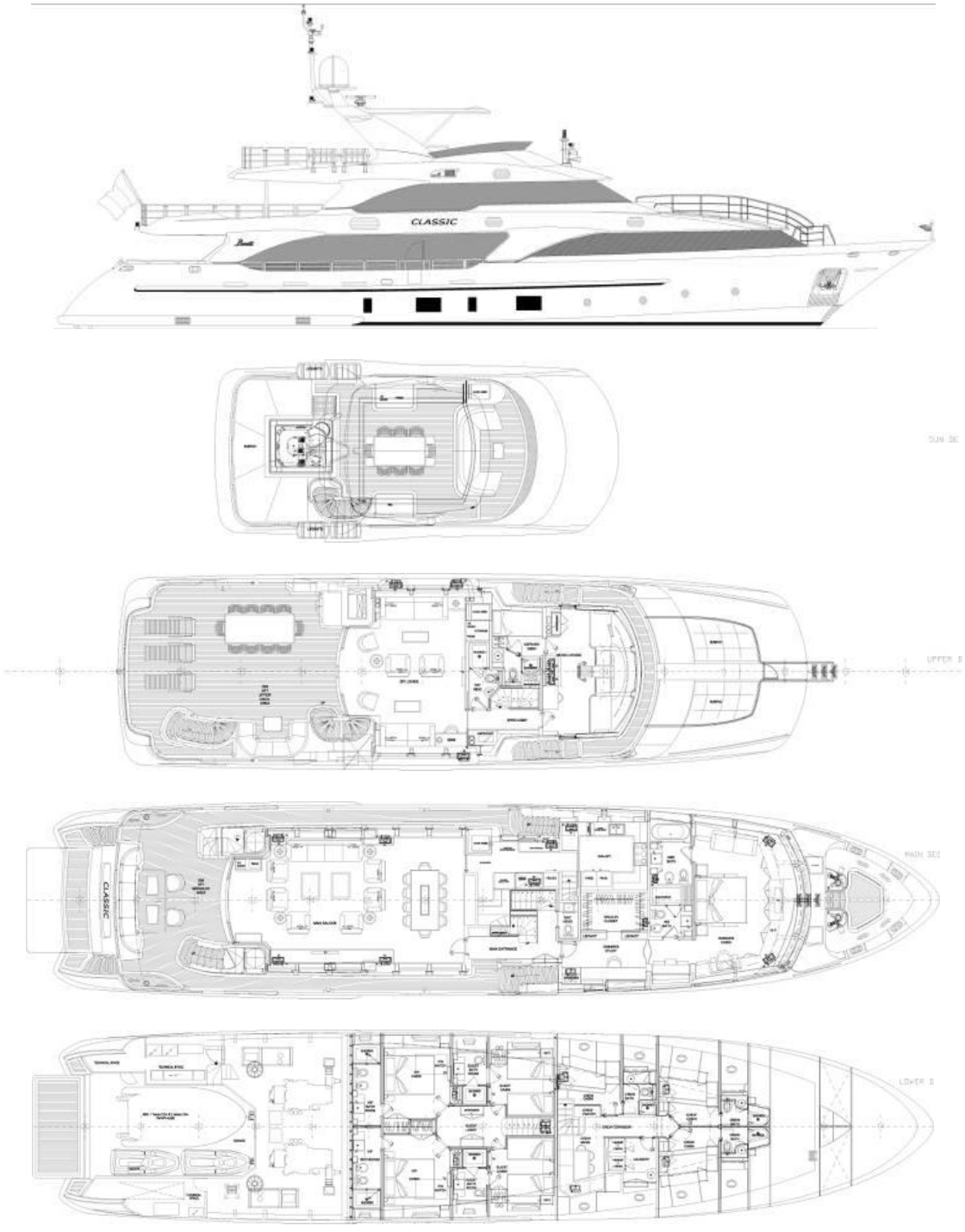
Benchmarking of business processes is usually done with top performing companies in other industry sectors. This is feasible because many business processes are essentially the same from sector to sector.

It focuses on the improvement of any given business process by exploiting "best practices" rather than merely measuring the best performance. Best practices are the cause of best performance. Companies studying best practices have the greatest opportunity for gaining a strategic, operational, and financial advantage.

The systematic discipline of benchmarking is focused on identifying, studying, analyzing, and adapting best practices and implementing the results. It is performed versus competitors and data analysis is done as to what causes the superior performance of the competitor.

Further below are main market competitors for chosen Benetti Yacht "Classic 121'. After overview on their main attributes, evaluation will be presented by comparing them against benchmarked model.

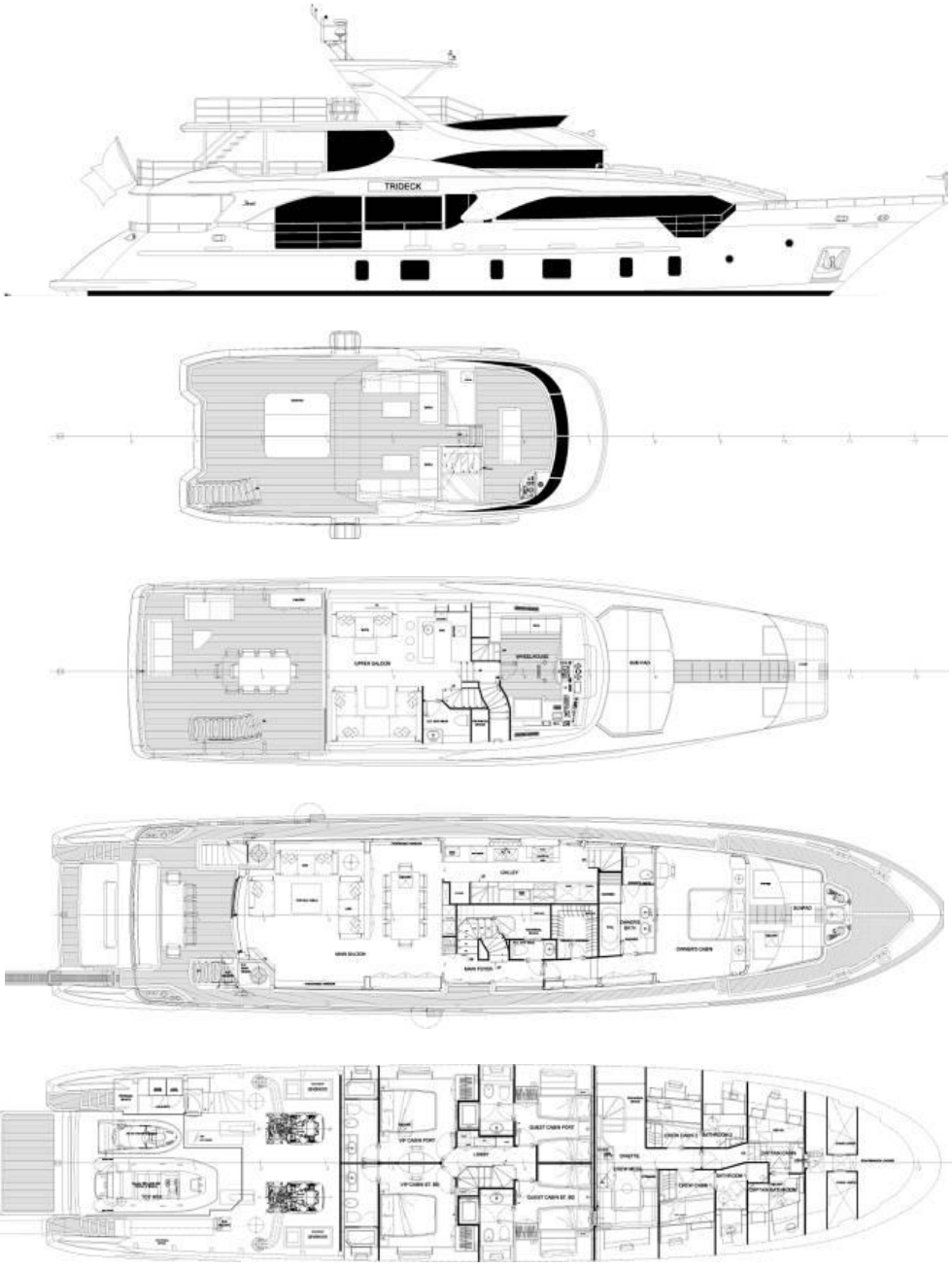
BENETTI CLASSIC 121’



LOA	36.9 m	121’	Accommodation	10 persons in 5 cabins
Beam Max	8.18 m	26’10’’	Accommodation Crew	7 persons in 4 cabins
Full load Displacement	259 tons		Generators	2x80 kW
Draft	2.26 m	6’7’’	Bow Thruster	Hydraulic 60 kW
GT	299 GT		STD Engines	2xMTU12V 1080 kW **@** 2250 rpm
Fuel Capacity	42.500 l	11.227 GAL	Cruise Speed	14.1 kn
Fresh Water Capacity	7.700 l	2.034 GAL	Max. Speed	15.1 kn
Grey Water Capacity	1.700 l	449 GAL	Range	3.400 nm @ 11kn

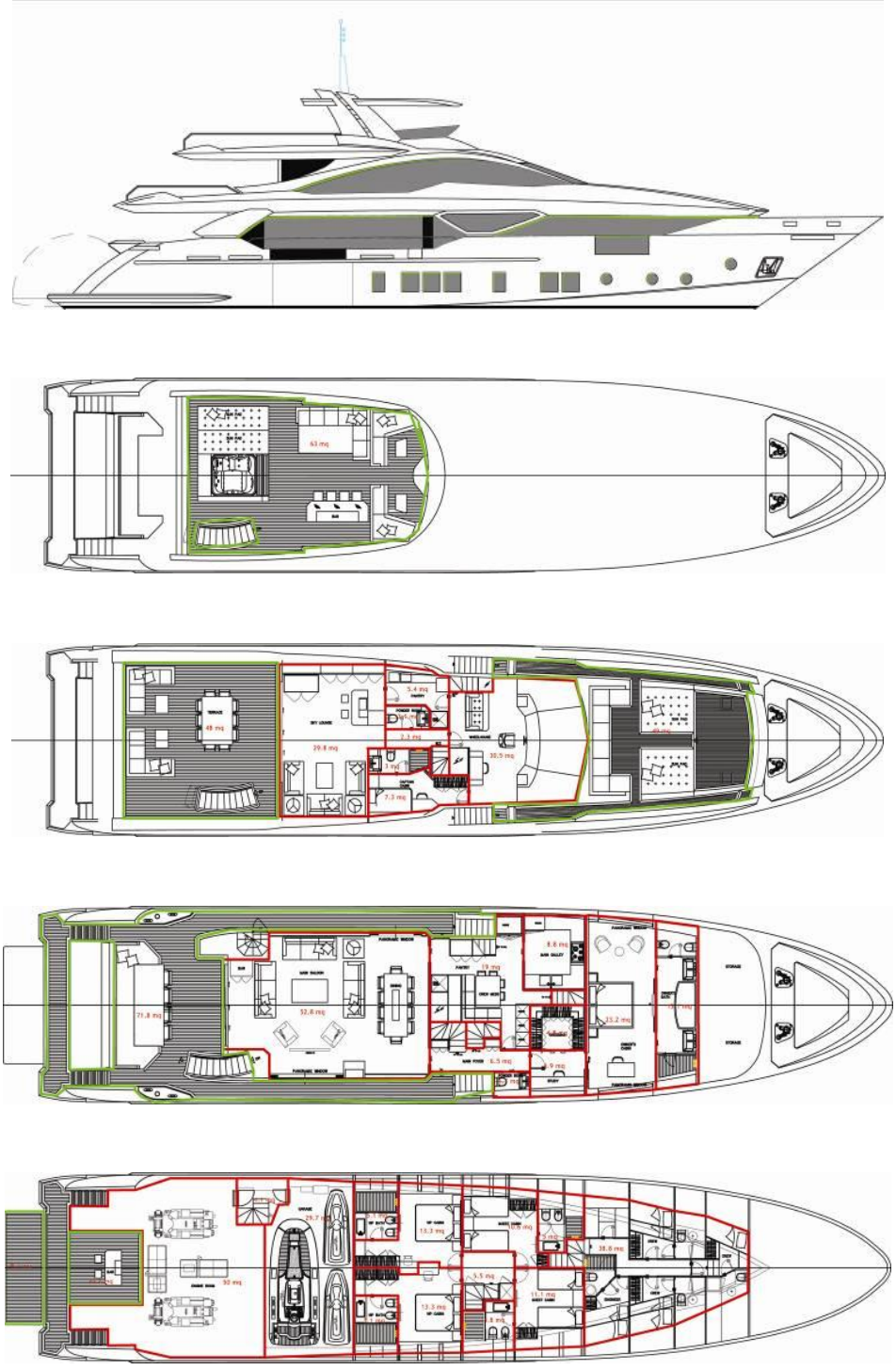
“IN-HOUSE” COMPETITORS:

BENETTI TRADITION SUPREME 108’



LOA	32.98 m	108’2’’	Accommodation	10 persons in 5 cabins
Beam Max	7.41 m	24’4’’	Accommodation Crew	6 persons in 3 cabins
Full load Displacement	170 tons		Generators	2x50 kW
Draft	2 m	6’7’’	Bow Thruster	Electric 37 kW
GT	217 GT		STD Engines	2xMAN V8 735 kW **@** 2300 rpm
Fuel Capacity	21.500 l	5.680 GAL	Cruise Speed	12.5 kn
Fresh Water Capacity	3.500 l	925 GAL	Max. Speed	13.5 kn
Grey Water Capacity	1.500 l	396 GAL	Range	1.800 @ 10kn

BENETTI GRANDE 125’



LOA	38.1 m	125’	Accommodation	10 persons in 5 cabins
Beam Max	8.45 m	27’9’’	Accommodation Crew	8 persons in 5 cabins
Full load Displacement	200 tons		Generators	2x70 kW
Draft	2.06 m	6’9’’	Bow Thruster	Hydraulic
GT	320 GT		STD Engines	2xMTU 12V 1939 kW @ 2450 rpm
Fuel Capacity	25.000 l	6.600 GAL	Cruise Speed	17.5 kn
Fresh Water Capacity	4.000 l	1.055 GAL	Max. Speed	22 kn
Grey Water Capacity	2.000 l	528 GAL	Range	1.250 nm @ 12kn

STANDARD SURFACES COMPARISON:

Table 10: Standard surfaces comparison beetwen "in-house" competitors of Benetti Classic 121'

	TRADITION SUPREME 108'	CLASSIC 121'	GRANDE 125'
LOA	32.98 m	36.9 m	38.1 m
Beam Max	7.25 m	8.18 m	8.45 m
Sun Deck	65 m^2	68 m^2	63 m^2
AFT Upper Deck	39 m^2	55 m^2	48 m^2
FWD Upper Deck	11 m^2	29 m^2	49 m^2
Sky Lounge	26 m^2	35 m^2	30 m^2
Captain's Cabin + head	/	7 m^2	10 m^2
Wheelhouse	21 m^2	18 m^2	31 m^2
Main Deck Ext. Area	70 m^2	62 m^2	72 m^2
Main saloon	41 m^2	58 m^2	53 m^2
Main foyer	6 m^2	8 m^2	7 m^2
Galley / Pantry	14 m^2	23 m^2	28 m^2
Owners area	32 m^2	57 m^2	46 m^2
VIP Cabin Port side	16 m^2	16 m^2	19 m^2
VIP Cabin Stbd side	16 m^2	16 m^2	19 m^2
Twin Cabin Port side	14 m^2	14 m^2	16 m^2
Twin Cabin Stbd side	14 m^2	14 m^2	16 m^2
Crew quarter	37 m^2	45 m^2	39 m^2
Engine room + Technical area	39 m^2	54 m^2	54 m^2
Garage	19 m^2	27 m^2	30 m^2
Swim platform	10 m^2	10 m^2	9 m^2
Beach Area	N/A	N/A	10 m^2
Crew number	6	7	8
Crew Cabins	3	4	5

Worse than Classic 121' Better than Classic 121'

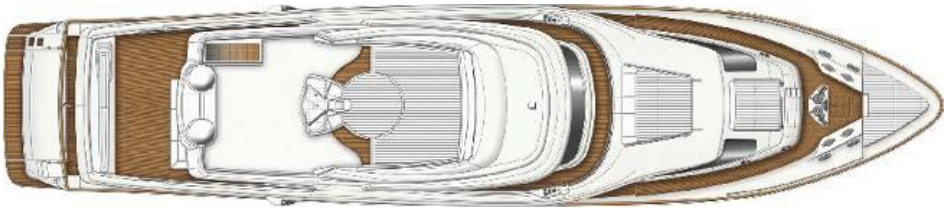
EXTERNAL COMPETITORS:

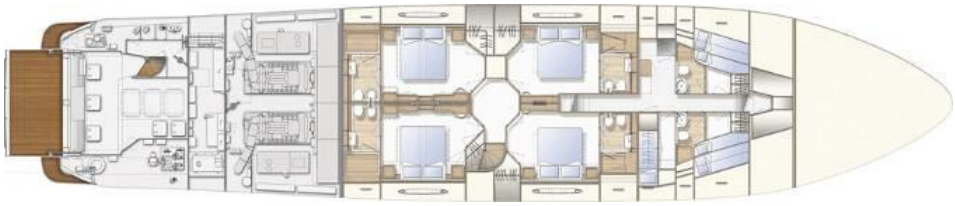
SAN LORENZO SD110 – “San Lorenzo” Shipyard

LOA	33.65 m	110’5’’	Accommodation	10 persons in 5 cabins
Beam Max	7.66 m	25’2’’	Accommodation Crew	5 persons in 3 cabins
Full load Displacement	170 tons		Generators	2x50 kW
Draft	2 m	6’7’’	Bow Thruster	TBD
GT	/		STD Engines	2xMTU 12V 1080 kW @ 2250 rpm
Fuel Capacity	23.700 l	6.261 GAL	Cruise Speed	11 kn
Fresh Water Capacity	4.000 l	1.055 GAL	Max. Speed	17 kn
Grey Water Capacity	2.000 l	528 GAL	Range	3.260 nm @ 10kn

Product Analysis and Design of a Superyacht –
analysis of a semi-custom fiberglass range of Benetti Yachts, from 93’ to 145’.
Redesign of a Classic 121’ Yacht

NAVETTA 33 CRESCENDO – Ferretti Custom Line





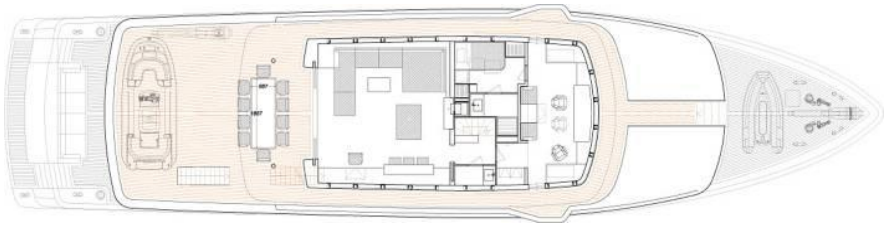
LOA	32.62 m	117’	Accommodation	10 persons in 5 cabins
Beam Max	7 m	22’12’’	Accommodation Crew	5 persons in 3 cabins
Full load Displacement	147 tons		Generators	2x33 kW
Draft	2.37 m	7’9’’	Bow Thruster	Hydraulic 37 kW
GT	/		STD Engines	2xMAN 12V 1029 kW @ 2100 rpm
Fuel Capacity	17.000 l	4.491 GAL	Cruise Speed	15 kn
Fresh Water Capacity	3.100 l	819 GAL	Max. Speed	17 kn
Grey Water Capacity	800 l	211 GAL	Range	2.300nm @ 10kn

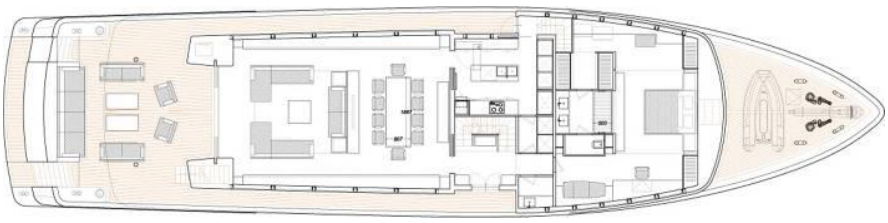
VULCAN 35M TRI-DECK – Vicem Yachts

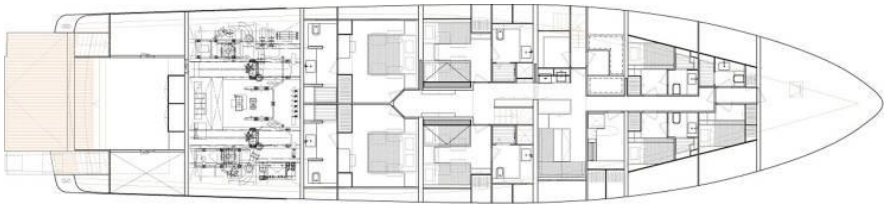
LOA	36.2 m 118’9’’	Accommodation	10 persons in 5 cabins
Beam Max	8.06 m 26’5’’	Accommodation Crew	5 persons in 3 cabins
Full load Displacement	135 tons	Generators	2x33 kW
Draft	2.3 m 7’8’’	Bow Thruster	Hydraulic 37 kW
GT	/	STD Engines	2xMTU 16V 1790 kW @ 2450 rpm
Fuel Capacity	28.000 l 7.565 GAL	Cruise Speed	21 kn
Fresh Water Capacity	5.400 l 1.460 GAL	Max. Speed	23 kn
Grey Water Capacity	No available data	Range	965 nm @ 10kn

Product Analysis and Design of a Superyacht –
analysis of a semi-custom fiberglass range of Benetti Yachts, from 93’ to 145’.
Redesign of a Classic 121’ Yacht

NAUTA AIR 115 – Cantiere delle Marche







LOA	35.4 m	116’2’’	Accommodation	10 persons in 5 cabins
Beam Max	8.4 m	27’7’’	Accommodation Crew	7 persons in 4 cabins
Full load Displacement	350 tons		Generators	2x33 kW
Draft	2.6 m	8’6’’	Bow Thruster	/
GT	/		STD Engines	2xCAT 16V 448 kW **@** 1800 rpm
Fuel Capacity	70.000 l	18.492 GAL	Cruise Speed	11 kn
Fresh Water Capacity	11.000 l	2.905 GAL	Max. Speed	13 kn
Grey Water Capacity	3.700 l	977 GAL	Range	4900 nm @ 10kn

Table 11: Standard surfaces comparison between “external” competitors of a Benetti Classic 121’

	SAN LORENZO SD110	NAVETTA 33 CRESCENDO	VULCAN 35M 3 DECK	NAUTA AIR 115
LOA	33.65 m	32.62 m	36.2 m	35.40 m
Beam Max	7.66 m	7 m	8.06 m	8.40 m
Sun Deck	42 m^2	36 m^2	63 m^2	77
AFT Upper Deck	/	/	/	/
FWD Upper Deck	/	/	/	/
Sky Lounge	/	/	/	/
Captain’s Cabin + head	/	/	/	/
Wheelhouse	15 m^2	18 m^2	18 m^2	17 m^2
Main Deck Ext. Area	/	/	/	/
Main saloon	50 m^2	40 m^2	51 m^2	54 m^2
Main foyer	/	/	/	/
Galley / Pantry	/	/	/	/
Owners area	31 m^2	32 m^2	34 m^2	35 m^2
VIP Cabin Port side	/	/	/	/
VIP Cabin Stbd side	/	/	/	/
Twin Cabin Port side	/	/	/	/
Twin Cabin Stbd side	/	/	/	/
Crew quarter	46 m^2	27 m^2	22 m^2	53 m^2
Engine room + Technical area	39 m^2	47 m^2	45 m^2	50 m^2
Garage	22 m^2	14 m^2	13 m^2	18 m^2
Swim platform	/	/	/	/
Beach Area	N/A	N/A	/	/
Crew number	5	5	5	7
Crew Cabins	3	3	3	4

- Worse than Classic 121’ - Better than Classic 121’

Table 12: Main data comparison between all of the competitors of the Benetti Classic 121’

	TRADITION SUPREME 108’	CLASSIC 121’	GRANDE 125’	SAN LORENZO SD110	NAVETTA 33 CRESCENDO	VULCAN 35m 3 DECK	NAUTA AIR 115
LOA	32.98	36.9	38.10	33.65	32.62	36.2	35.4
Beam Max	7.25	8.18	8.45	7.66	7	8.06	8.40
Full load Displ.	170 t	259 t	200 t	170 t	147 t	135 t	350 t
Draft	2.00 m	2.25	2.06	2.00	2.37	2.33	2.60
STD Engines	2xMAN 8V 1000 hp @2300 rpm	2xMTU 12V 1468 hp @ 2.250 rpm	2xMTU 12V 2636 hp @ 2.450 rpm	2xMTU 12V 1468 hp @ 2.250 rpm	2xMTU 12V 1400 hp @ 2.1000 rpm	2xMTU 16V 2434 hp @ 2.450 rpm	2xCAT C18 609 hp @ 1800 rpm
Cruise Speed	12.5 kn	14.1	17.5	11	15	21	11
Max. Speed	13.5 kn	15.1	22	17	17	23	13
Range	1800 nm @ 10 kn	3400 nm @ 11 kn	1250 nm @ 12 kn	3260 nm @ 10 kn	2300 nm @ 10 kn	965 nm @ 10 kn	4900 nm @ 10 kn
Construction material	GRP	GRP	GRP	GRP	GRP	GRP	Steel/Alu

4. REDESIGN OF A M/Y "CLASSIC" 121' - the most successful model from Benetti range, with 60 yachts built in the past 10 years

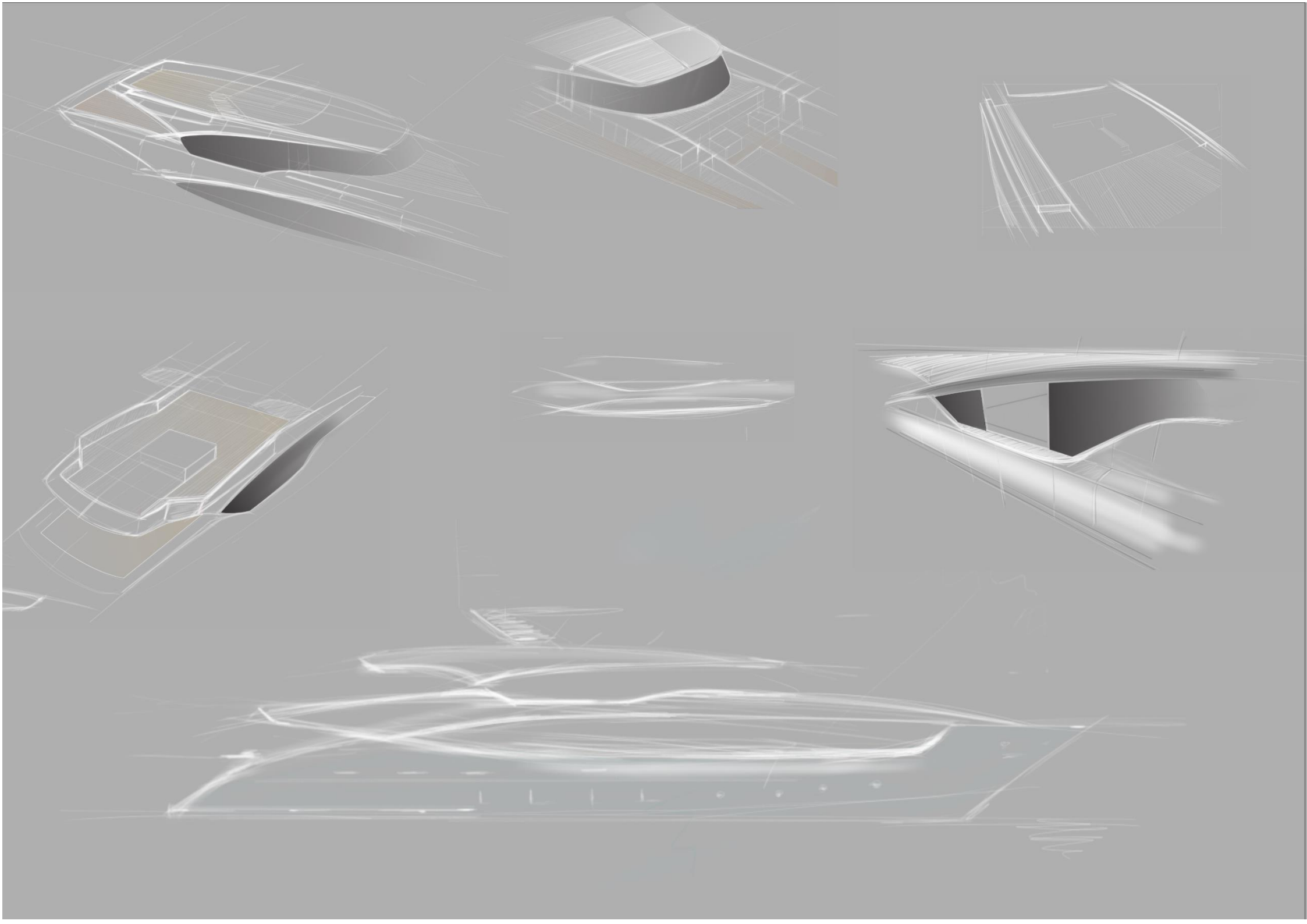
4.1 Benetti "Diamond" 121'

According to previous analysis of different technological systems inside the superyacht, together with conclusions drawn from the Market analysis, it is decided to make a proposal for a new model which will take a place of a "Benetti Classic 121'" semicustom GRP yacht.
It is necessary to keep recognizable Benetti lines together with contemporary trends of the industry. Evolving the design imprinted on Benetti yachts with 140 years of history, is an ambitious task.

There are two ways to obtain a motor yacht: to choose it from the huge number of available models or to build a new custom (or semicustom) one according to the owner specific requirements.

Despite the fact that the phases of the design for yachts are the same as those for ships and workboats, one major and very important difference exists; the aesthetics (external and interior) together with comfort and luxury requirements drive the concept, design calculation and construction of motor yachts. These qualities appear to have a major impact on the `dreams' of the potential owner, and they often become his strongest motivation to buy a yacht. Nevertheless the boat must also be safe, have high levels of performance, and yet be easily managed and handled by the crew. The basic design process must consolidate these requirements via a feasibility phase (concept design) and a preliminary design, right up to the final design. The concept design is by far the most delicate phase of the entire procedure.

In the text bellow is a description of a proposal for a new model, together with conceptual research sketches. Furthermore, is a Brief Technical Specification and Technical drawings.
For the sake of simplicity of the project, dictated by the limited time, all possible similarities with previous model are implemented in construction and design of a new project.



FINAL PROFILE SHAPE OF BENETTI “DIAMOND” 121’:

4.2 Description of Benetti M/Y “Diamond” 121’

Being ahead of design trends and technological innovation is essential to offering the most timeless and elegant yachts.
The Benetti Diamond 121’ is the latest model to join the Benetti Class range in composite material.
The standard layout of this triple-deck model has a full-beam Owner’s suite on the main deck and four guest cabins, that can comfortably accommodate eight. Additionally, the crew quarters were designed for seven.
The Benetti Diamond 121’ operates with the most advanced navigation systems developed internally by Benetti and its precision engineering is demonstrated in the advanced details like the rotating external bridge wing consoles.
This model has an innovative integrated wheelhouse that works as an interface for all instruments and communications ensuring safe, reliable navigation. Plus, it runs on the exclusive BEST technology platform, which combines all onboard electronics and systems in a single, intuitive interface.

4.2.1 Exteriors

Characterized by a harmony between elegance and innovation, between classical and modern, the new Benetti “Diamond” 121’ clearly carries the mark of Benetti while divulging a distinct, contemporary twist.
Exterior design was artistically shaped to give the model its suggestive design continuity with Benetti DNA.
This model stretches over 36 m; it boasts ample outdoor spaces, which can be covered for shade and comfort, as well as large openings in the hull and superstructure that both give the exterior a sleek, streamlined profile and maximize the amount of natural light in the interior.
The navigation lights have been designed so as to be flush with the exterior lines of the yacht, enhancing its modern style. At the stern, the garage can house two personal watercrafts and has ample space for storage.

SUN DECK
The Sun Deck is a penthouse suite at sea, a platform between the wind and sun, protected by a hard top featuring a fin in two segments.

The Benetti Diamond 121' has a sun deck that offers both comfort and privacy, while being completely independent from interior areas. It spans over 80 sqm and includes spaces for dining, lounging and sunbathing around the Jacuzzi, one of the two on board.
The central part of the hardtop roof, over the bow section, has a retractable awning that was constructed to provide protection from harsh sun or wind and create the perfect environment for guests, while in harbor or at sea.

UPPER DECK
Additional space for dining lies just outside the sky lounge and, on the flying bridge, there is outdoor seating and a Jacuzzi that can be shaded with an umbrella. Flooring is on all of the bridges is in teak and furnishings, in fiberglass.

4.2.2 Interiors

Here contemporary spaces have elevated surfaces and clean defined lines that create a spacious, open interior. Vertical metal accents, fabric panels and highly polished surfaces make everything appear weightless. Mirrored kick recesses and lacquered surfaces are a striking contrast to the luxurious gloss timber doors and feature walls.

The interior has a subdued, yet elegant coherence made by juxtaposing natural tones of oak with the warmth of wenge and diamond-worked leather. Wenge is also used throughout to create 3D depth for the furnishings and in the overall space.

MAIN SALOON
In the main saloon, full-height windows on both sides of the principle dining table offer panoramic views and the luminous interior space opens out onto a deck area, at the stern, that is perfect for entertaining.
The table is a Benetti design with a geometric top created using the linear grain of wenge and surrounded with a ribbon of satin-finished steel.

SKY LOUNGE
On the upper deck, the full-beam sky lounge is an exclusive area for the Owner and guests to relax.

Here there is an entertainment area next to a panoramic window. Again, special attention during design was attributed to full-height windows on both sides on the upper deck as well as in the main saloon.

The highest quality fabrics and materials are used to create the ideal living space - an environment that is modern and refined, yet warm and welcoming.
The interiors of the Benetti Classic Supreme 132' are designed to optimize space and comfort, while the abundance of natural light seems to bring the outdoor environment inside. After sunset, with a simple touch, the subtle LED lighting gently illuminates the rooms. Carefully positioned strip lighting, recessed ceiling lights and lamps are controlled by touch switches and can be programmed to create just the right atmosphere, for any time of day and any type of occasion.

OWNER'S SUITE

The main deck features the spacious Owner's suite.
The suite includes a studio, ample closet space and spacious bathroom, which have bronze marble counters and are finished with cream champagne marble.
Rising up from the headboard, diamond-shaped panels of natural leather in an ivory color span the ceiling over the berth to create warmth and a fluid cohesion within the cabin.

GUEST CABINS

The four guest staterooms are located on the lower deck, where airy spaces and waterline windows create an incredible cruising experience.
Each room has its own en-suite bathroom finished in limestone, leather panels and colorful mosaic around the countertops.

4.3 Brief Technical Specification - Specification written as a summary of the most important technical aspects of the yacht.

After comparing a 10 Technical Specifications of different Benetti yacht models, with each of them is a 100 pages, for this model is decided to make a theoretical Brief Tech. Specification.

BENETTI DIAMOND 121'
37m GRP Yacht

Brief Specification

1. DESCRIPTION

The vessel described in this specification is a motor yacht with a displacement hull, twin screw propellers and twin diesel engines, two spade rudder and one bow thruster. The hull and superstructure will be built in GRP.

The configuration of this Yacht is a triple deck arrangement plus sun deck.

2. DIMENSIONS AND MAIN CHARACTERISTICS OF THE YACHT

Length overall (LOA):	36.90 m	121'
Length waterline (LWL) at full load:	31.58 m	103' 7"
Hull beam (overall):	7.9 m	25' 9"
Draft at full load from underside of keel:	2.26	7' 5"
Gross Tonnage:	299 GT	
Fuel oil tanks capacity:	42,500 liters	11,227 USG
Fresh water tanks capacity:	7,700 liters	2,034 USG

Accommodations for Owner & guests: 10 persons in 5 cabins
Accommodations for crew: 7 persons in 4 cabins

3. PERFORMANCE AND MAIN MACHINERY

Main engines:	2xMTU 12V 2000M72 1.080kW (1468hp) at 2250 rpm
Propellers:	2× Fixed pitch propellers, five bladed
Generators:	2× 80 ekW

Watermakers:	1 reverse osmosis water. Nominal capacity 9000L of water per day at 25 °C sea water temperature.
Bow thruster:	1× Electric motor driven, 60 ekW
Stabilizers:	Hydraulic Stabilizer system for underway and zero speed (at anchor) conditions
Max speed (half load condition):	15.1 knots.
Cruising speed (half load condition, 85% MCR):	14.1 knots.
Range at economic speed (12 knots):	3,400 nautical miles.

4. CLASSIFICATION AND CERTIFICATES

The Yacht will be constructed in accordance with the following rules and regulations.

· "RINA" rules for classification of pleasure yachts C _ HULL · MACH Y.

· As option, the Code for large yachts (24 m and over in load line length) in commercial use for sport or pleasure, which do not carry cargo and do not carry more than 12 passengers, by the British Maritime and Coastguard Agency (LY2).

· Flag Authority requirements, additional to class notation and to the Specification,

will be evaluated case by case and quoted accordingly if feasible.

5. HULL AND SUPERSTRUCTURE CONSTRUCTION

Hull and Main Deck will be built in Glass Reinforced Plastic (GRP), single skin type and sandwich type, depending on the zone. Single skin structures and sandwich skins will be made of E-glass, in an isophthalic polyester resin.

The superstructure will be built with a cored sandwich structure in the decks and on the sides utilizing mat, unidirectional, biaxial and woven E-glass as shown on the structural drawings approved by the Italian Classification Society "RINA".

Where necessary single skin laminate will be provided.

Superstructure decks and sides will be built in sandwich-type consisting of PVC foam core and GRP skins.

The connection between the superstructure and the GRP hull will be performed by means of bolts and with bonding compound between the two flanges.

6. AIR CONDITIONING SYSTEM

The ship will be fitted with a summer/winter air conditioning system, based upon a water chilling unit, some air handling units, some fan coils and a series of exhausting/supplying fans.

The system will be sized on the basis of following features:

SUMMER TIME			
External air max	35 °C max	95 °F max 8	5% R.H.
Internal air	22 °C	72 °F R.H.	55%
Sea water temperature max	32 °C max	90 °F	
WINTER TIME			
External air min	0 °C min	32 °F	
Internal air	22°C	72°F	50% R.H.
Sea water temperature min	0 °C min	32 °F	

Each accommodation space will be equipped with a panel, including a thermostat: the panel will enable the user to adjust the desired room temperature.

7. OUTFITTING GENERAL CHARACTERISTICS

Anchor windlasses:	2× vertical windlasses, each having a wildcat gypsy and capstan driven by an electric motor (speed will be variable through proper inverter)
Anchors:	n° 2 galvanized steel HHP (high holding power) anchors of 244 kg
Chains:	n° 2 chains made of galvanized steel of 16 mm diameter with stud link DIN 766 for U2 grade of a length of 137.5 m each.
Capstans:	2 EL foot operated vertical capstans fitted on aft deck. 400 V, 3 phases and power 2,200 W
Cranes:	1 electro/hydraulic system with winch and trolley mechanism for the launching and the haulage of the tender. Another one is supplied for the two jet skis. They are locally controlled
Tenders and jet skis (Owner's supply):	1 tender + 2 jet skies
Gangway:	1× telescopic retractable, hydraulically operated stern gangway (made in polished stainless steel), arranged to be part of the transom when closed, floor in grating teak. - max 4.5 meters. m length when fully extended - walkway width equal to 550 mm

Side boarding ladder:	1 removable 8 steps ladder for side access to the main deck through the bulwark doors will be supplied.
Elevators:	1× "service dumbwaiter" from MD up to SD, max load 50 kg

8. ELECTRICAL SYSTEM

Main power system will be 400V AC 50Hz, 3 ph (with neutral) for main equipment, and 230V AC 50Hz, 1 ph for small users.

For shore connection, an isolating transformer will be provided (the vessel will be capable to receive shore power supply by means of two shore power 125 A (each) inlet sockets, one on transom and one at bow, and one shore semi-automatic stowing 125 A system in the garage).

9. NAVIGATION, COMMUNICATION & ELECTRONICS

Radars:	1x RADAR/VIDEO Plotter/Chartography Furuno Navnet 2D MFDBB 1x Navnet 2D control unit 1x Open Antenna FR1944 - 4 ft, 6 Kw, 64 nm
Echosounder:	1x Blackbox graphic echosounder/ Log DFF 1 with dual frequency traducer (depth, log, water temp) , 1xNMEA Depth/Log sensor.
GPS:	1× GPS system, with antenna 1× GPS switching with NMEA interface 1x Blackbox GPS antenna integrated into wind sensor
Chart plotter:	1x Navnet 2D BB Cartography system : Marine processor with VGA output - Charts not included
Wind speed & direction:	1x WIND Multi NMEA SYSTEM
Gyro compass:	1× Plath Navigat X Mk. 2 gyro compass
Magnetic compass:	1× C-Plath Jupiter magnetic compass
Autopilot:	1× autopilot system Navis AP3000 (Wheelmark type)
Telephone:	Complete internal telephone system, connecting all the cabins and the living areas, integrated with BEST system to allow VoIP functionality and advanced services. 14 VOIP telephones
LAN	A ship LAN Network, part of the B.E.S.T Entertainment System will be layed. Sockets will be provided in Saloons, Guest cabins, Owner Cabin, Wheelhouse, Crew Mess, Captain Cabin. Access to the internal network in noble areas, will be possible via wi-fi as well.

10. INTERIORS

In general, materials and equipment will be purchased according to the present Specification and to the attached documents.

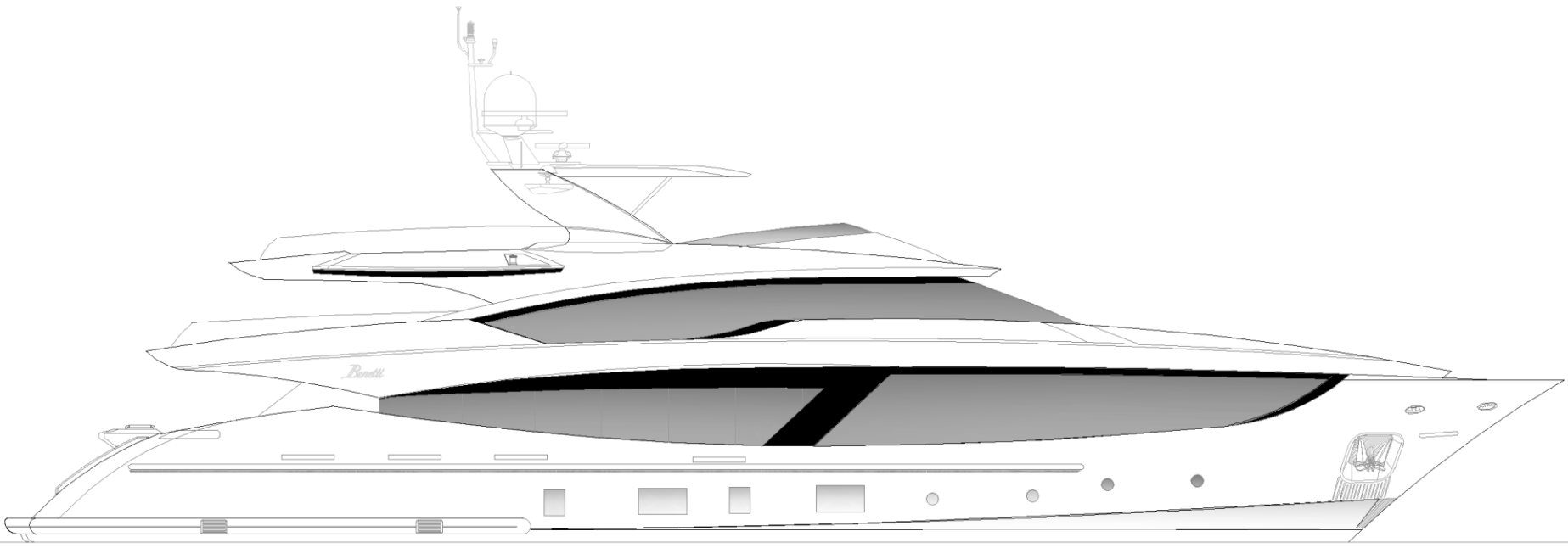
The accommodation layout will be according to the general arrangement which will be part of the building specification.

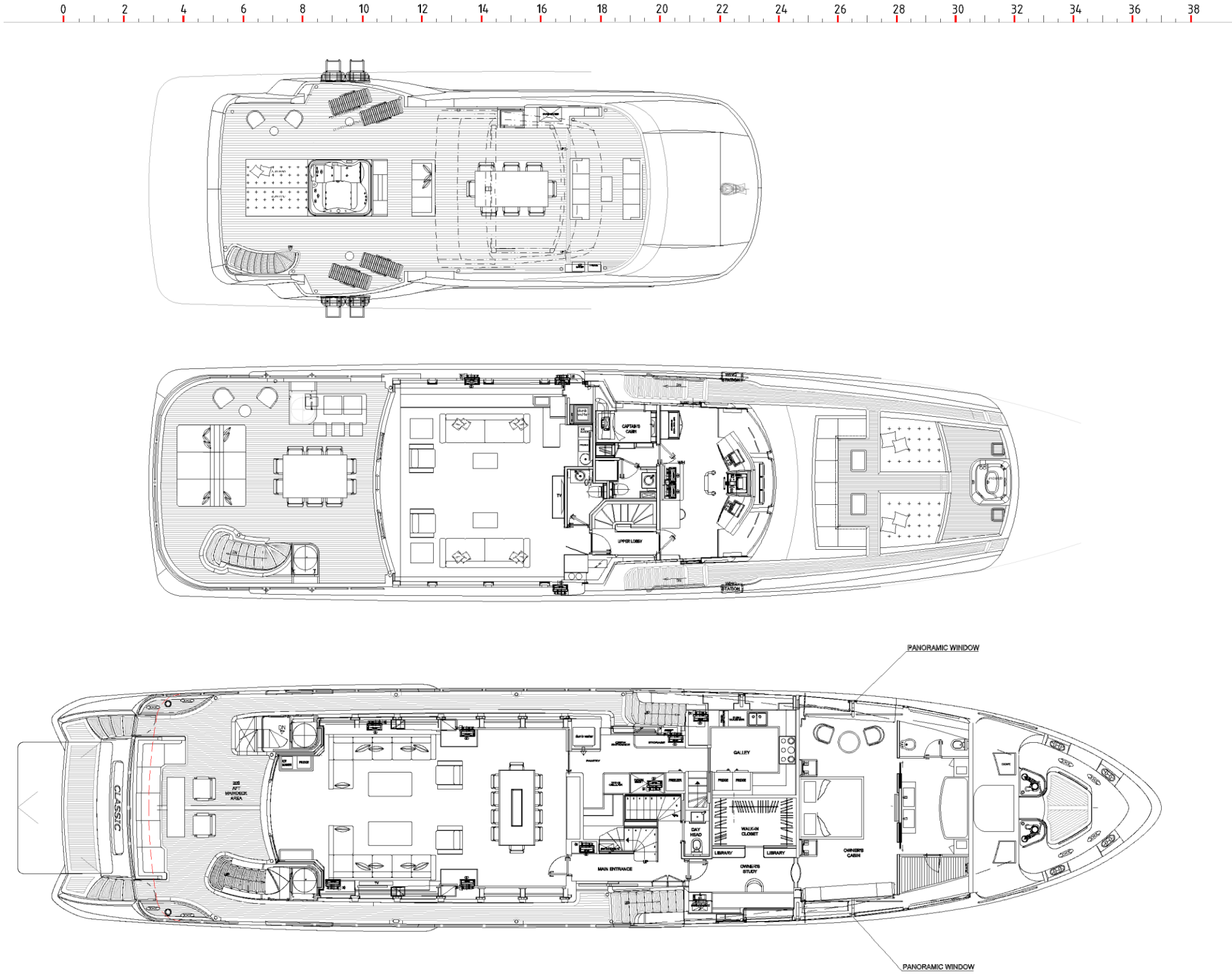
Appliances, TV & stereo equipment, air conditioning and ventilation equipment, light fittings, alarm and fire detection sensors, electrical panels, fixtures and fittings will be integrated with the chosen style.

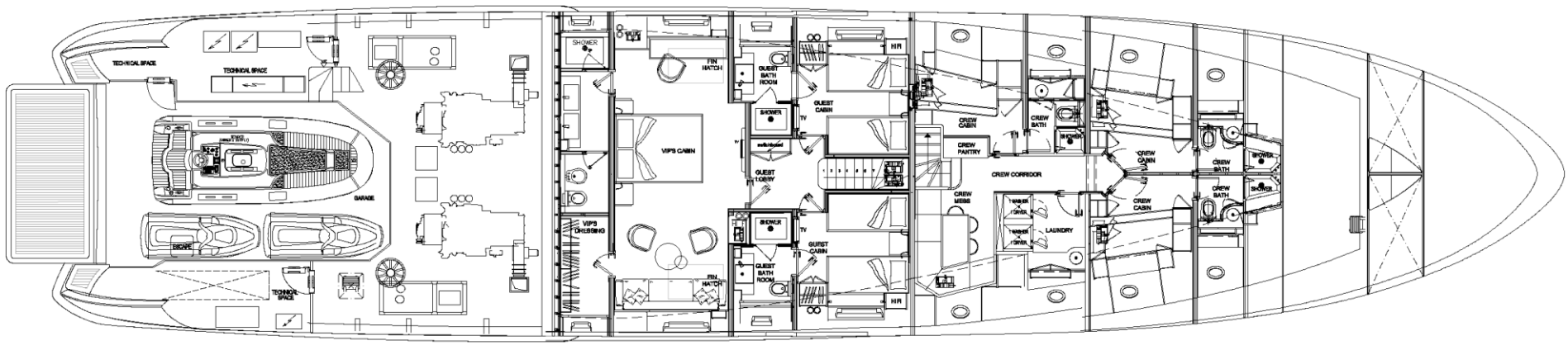
Walls:	Guests interior: linings will be veneer or lacquered, mirrored, covered with fabric, leather. Crew interior: linings will be covered with "ALPI" oak wood veneer Galley: linings will be lacquered, mirrored, covered with stainless steel, wood veneer.
Floors:	Guests interior: wood and vinyl floors will be fitted ; carpets will have underlay and will be stretched Crew interior: wood and vinyl floors will be fitted
Shower floors:	Guests area: lacquered panels will be fitted in showers and baths walls, except where marble is specified
Ceilings:	Guests interior: ceilings will be made of plywood panels fitted with Fit-Lock and will be removable where necessary; ceilings panels will be veneer, lacquered, mirrored, lined with fabric or leather Crew interior: ceilings will be made of plywood panels fitted with screwed hidden plates or Fit-Lock and will be removable where necessary; ceiling panels will be lined with synthetic leather or lacquered
Doors:	Guests interior: doors will be made of double plywood sandwich panels (except for fire doors), and will be painted, mirrored or veneered

4.4 Technical Drawings:

1. General Arrangement, scale 1:150
2. Compartment plan and Longitudinal section, scale 1:100
3. Transversal Section and Details, scale 1:100
4. Midship Section and Details, scale 1:50
5. Hull and Deck structural details, scale 1:100
6. Fashion plates and sections-1st tier, scale 1:100
7. Fashion plates and Sections, 2nd tier, scale 1:100
8. Tanks plan, scale 1:100
9. 1st Tier Layup and Details, scale 1:100
10. 2nd Tier layup and Details, scale 1:100
11. Superstructure recess plan – Profile view, scale 1:100
12. Superstructure recess plan – Plan view and Details, scale 1:100
13. Superstructure recess plan – Plan view 2 and Details, scale 1:100
14. Roll Bar, scale 1:20







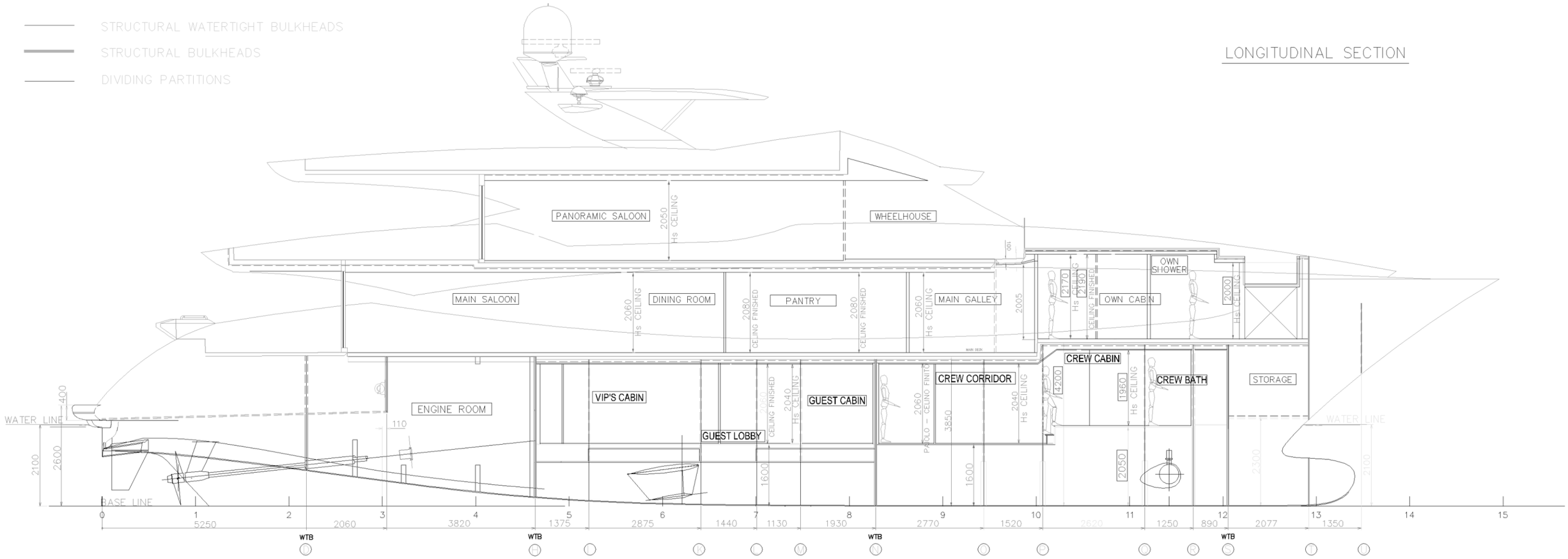
SCALE:	DESCRIPTION:	DRAWING NO:
1:150	GENERAL ARRANGEMENT	1

STRUCTURAL WATERTIGHT BULKHEADS

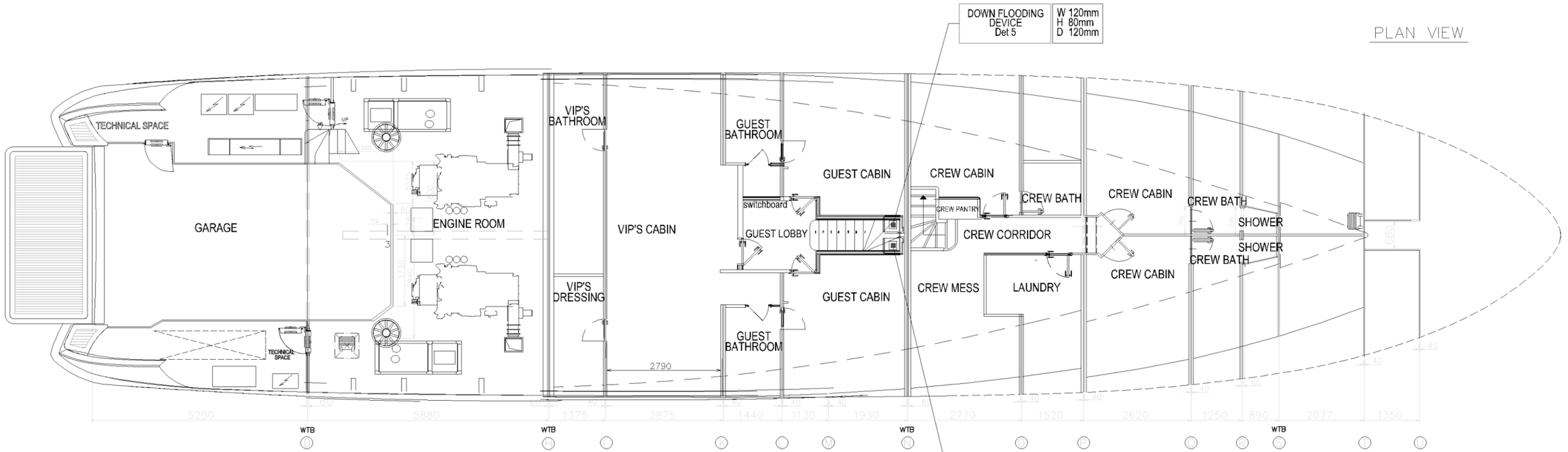
STRUCTURAL BULKHEADS

DIVIDING PARTITIONS

LONGITUDINAL SECTION

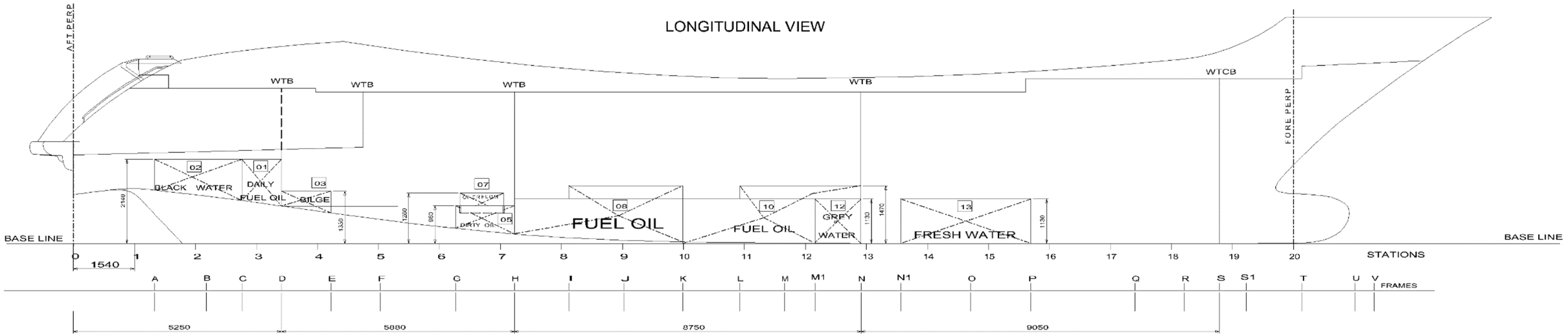


PLAN VIEW

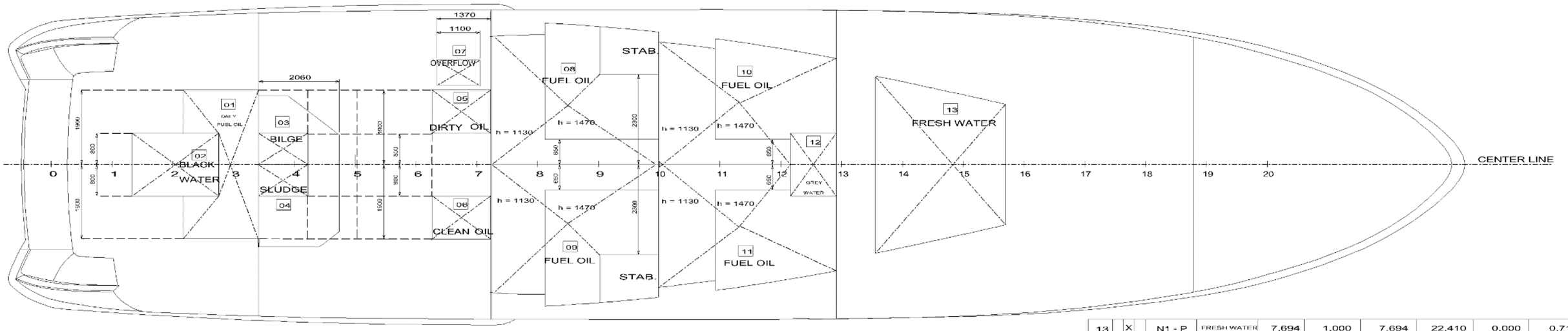


SCALE:	DESCRIPTION:	DRAWING NO:
1:100	COMPARTMENT PLAN AND LONGITUDINAL SECTION	2

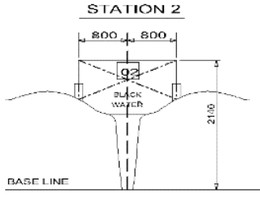
LONGITUDINAL VIEW



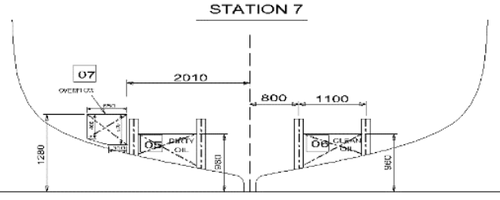
PLAN VIEW



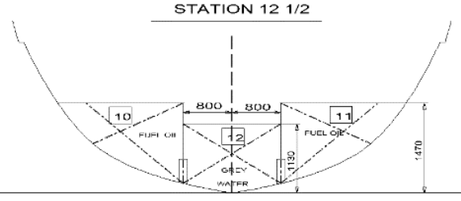
STATION 2



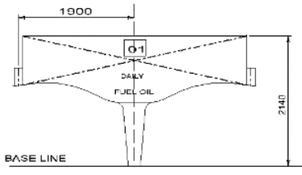
STATION 7



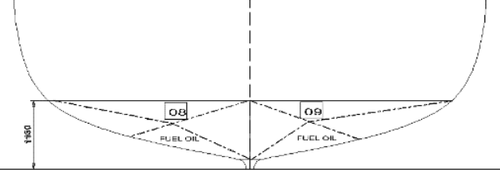
STATION 12 1/2



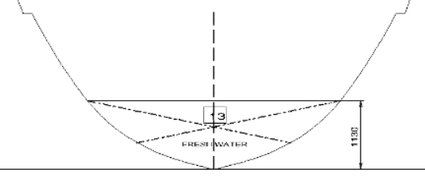
STATION 3



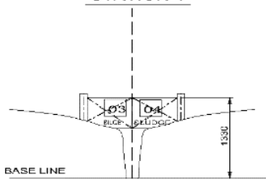
STATION 8



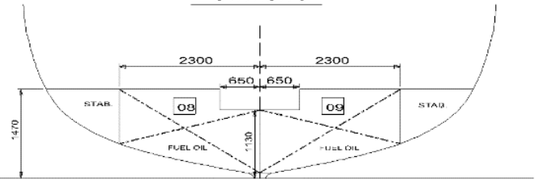
STATION 14



STATION 4



STATION 9



THE TANKS HEIGHT ARE REFERRED TO THE INNER TOP

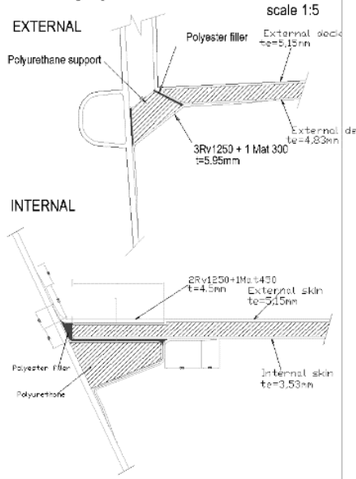
13		X		N1 - P	FRESH WATER	7,694	1,000	7,694	22,410	0,000	0,717
12		X		M1 - N	GREY WATER	1,786	1,000	1,786	19,300	0,000	0,620
11			X	K - N	FUEL OIL	9,806	0,840	8,237	17,540	1,302	0,848
10	X			K - N	FUEL OIL	9,806	0,840	8,237	17,540	-1,302	0,848
9			X	H - K	FUEL OIL	9,536	0,840	8,010	13,360	1,314	0,862
8	X			H - K	FUEL OIL	9,536	0,840	8,010	13,360	-1,314	0,862
7	X			G - H	OVERFLOW	0,308	0,840	0,258	10,910	-2,326	1,057
6			X	G - H	CLEAN OIL	0,546	0,900	0,491	10,460	1,312	0,750
5	X			G - H	DIRTY OIL	0,546	0,900	0,491	10,460	-1,312	0,750
4			X	D - E	SLUDGE	0,337	0,900	0,303	5,890	0,349	1,123
3	X			D - E	BILGE	0,337	1,000	0,337	5,890	-0,349	1,123
2		X		A - C	BLACK WATER	2,815	1,000	2,815	3,210	0,000	1,715
1		X		B - D	DAILY FUEL OIL	4,176	0,840	3,507	4,510	0,000	1,716
TANK ITEM	PORT	CNTR	STBD	FRAMES	SERVICE	CAPACITY (m^3)	SPECIFIC WEIGHT (t/m^3)	WEIGHT (t)	LCG (m) from A.P.	TCG (m) from C.L. (port +stbd)	VCG (m) from B.L.

TOTAL FUEL OIL= 42500 l
TOTAL FRESH WATER=7700 l

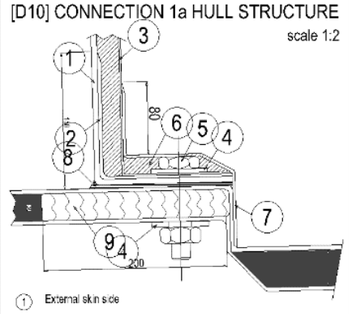
MAIN DIMENSIONS		
LOA	36,900	m
B	8,18	m
D	2,26	m

SCALE:	DESCRIPTION:	DRAWING NO:
1:100	TANKS PLAN	8

[D7] CONNECTION HULL-DECK
scale 1:5

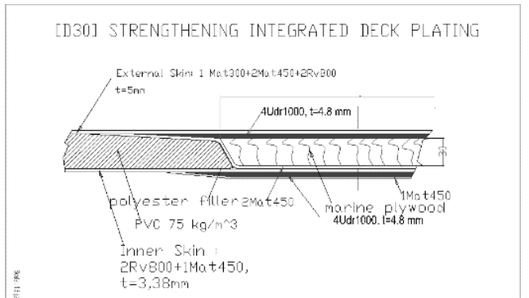


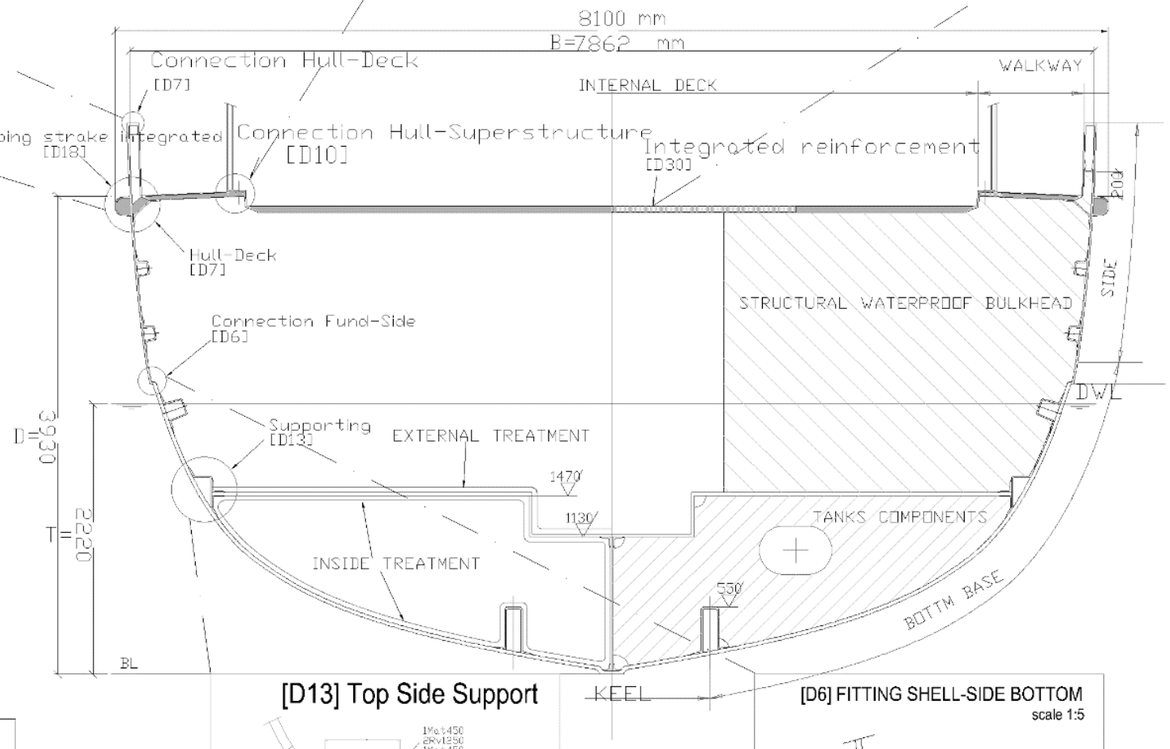
[D10] CONNECTION 1a HULL STRUCTURE
scale 1:2



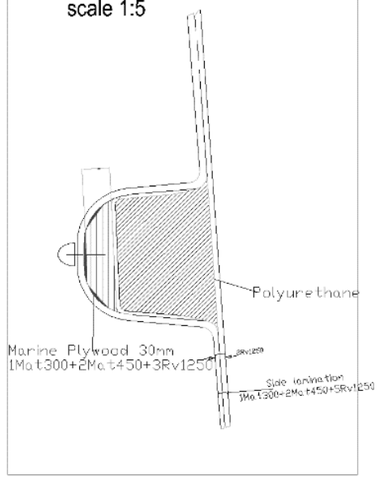
1. External skin side
2. Range reinforcement +2 Rv800
3. Internal Skin side
4. Increased stainless rings
5. Stainless steel bolts 180 mm
6. Polyester filler
7. 1Mat450+1Rv800+1Mat450, t=3.11mm
8. Structural sealant
9. Marine plywood insert

[D30] STRENGTHENING INTEGRATED DECK PLATING

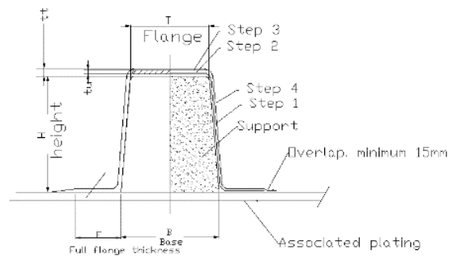




[D18] RUBBING STRAKE
scale 1:5



LAMINATION AND REINFORCED SEQUENCE



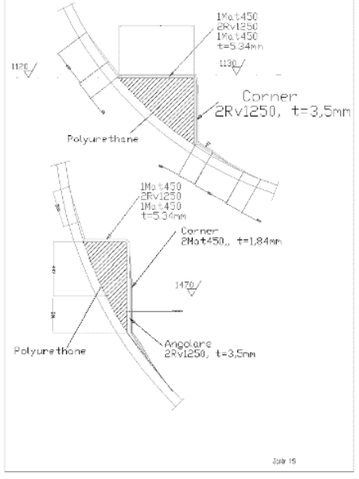
1) The face of the compound Mat450 1250 * always revolt against the mold
2) A * mat225 interposed between different sequences of deposition
3) The glass content of the Rv1250 * according to table lamination
4) Glass content UDR = 50%, carattneco. regulations
5) Lamination of the formers 2Mat450
6) In the RU zone boxes are arranged at the end of the lamination

BASE MATERIALS:

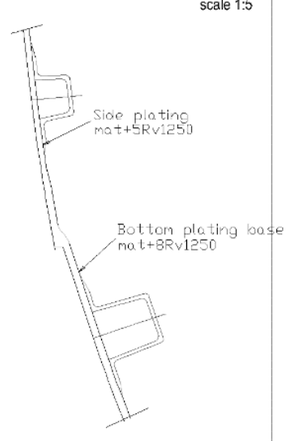
Gelcoat:	Polyester Isophtalic neopentyl
Resin:	Vinylester throughout the hull except the last layer from laminar polyester
Resin:	polyester Isophtalic
Mat300:	"E" glass surface chopped strand mat 300 gr/m^2
Mat450:	"E" glass chopped strand mat 450 gr/m^2
Rv1250:	"E" glass surface chopped strand mat 300 gr/m^2
Rv800:	Mat300 g / m ^ 2 stitched with 500 g / m ^ 2 "E" glass roving
Corefoam 75:	PVC structural core 75 kg / m ^ 2
Udr1000:	"E" glass unidirectional tape
bonder	Leda bonder Ultralight

1. The face of the compound Mat450 Rv1250 or RV800 * always faces the mold
2. The edges of the holes on the walls of the structural funds will be sealed with resin
3. The cabinets are made out of laminated blocks and assembled appropriately
4. All internal surfaces of tanks of oil / seawage / will be treated with epoxy resin hydrocarbon resistant type ECOSTAC 55631C
5. All internal surfaces of tanks of fresh water will be treated with gelcoat food type LEDA gelcoat NI or equivalent
6. All external surfaces of tanks for oil will be treated with self-extinguishing resin type LEDA 810 F.R.N. or equivalent
7. Height of owerflows: 760mm above the deck at side intersection

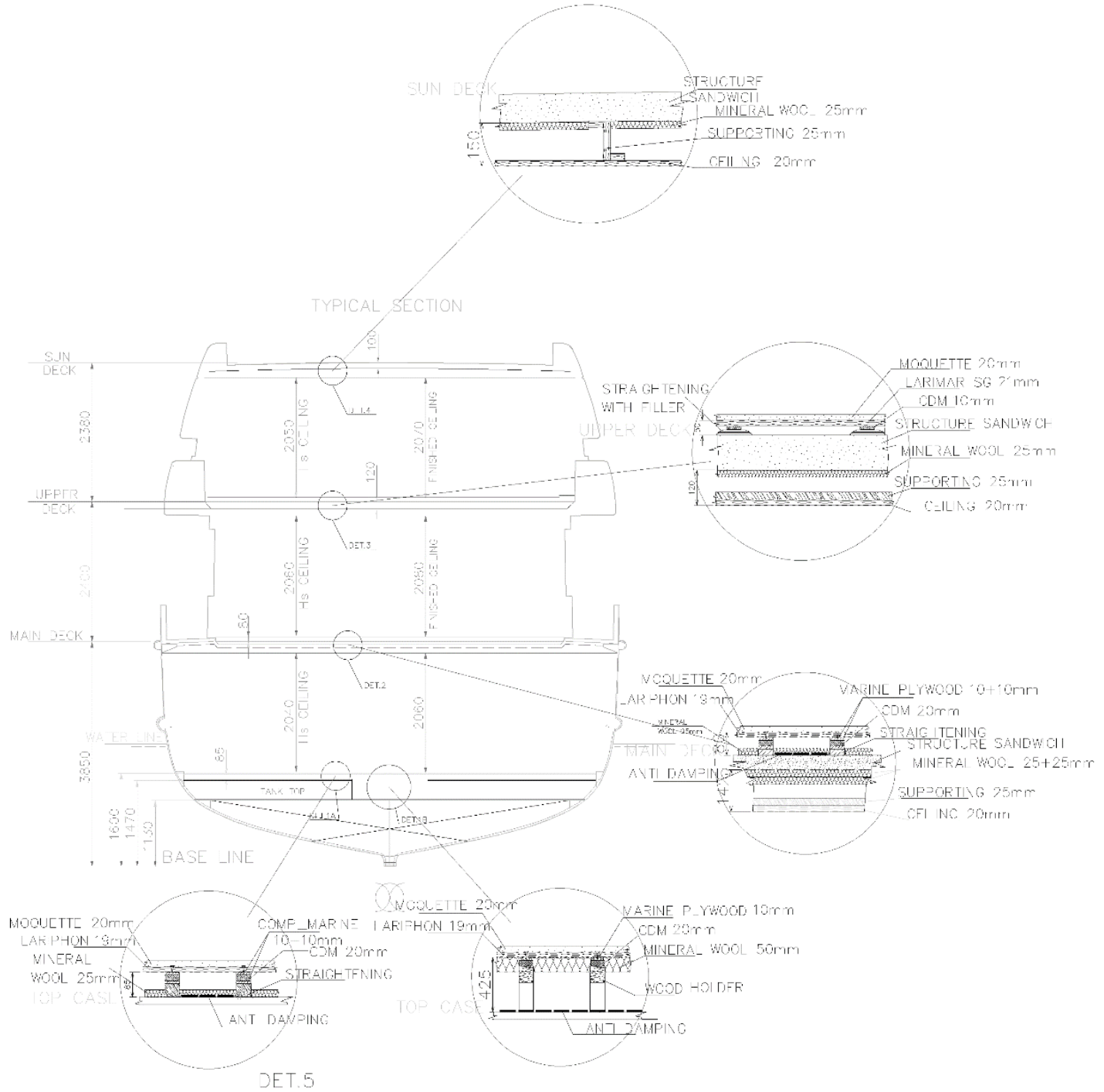
[D13] Top Side Support



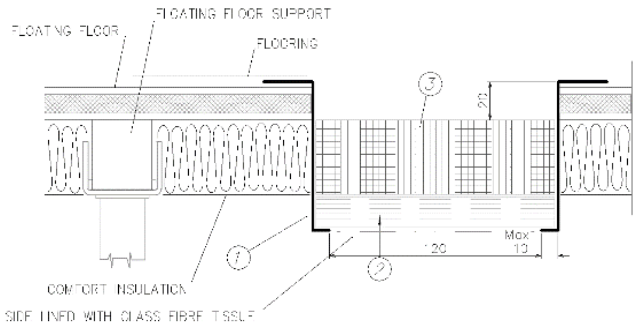
[D6] FITTING SHELL-SIDE BOTTOM
scale 1:5



SCALE:	DESCRIPTION:	DRAWING NO:
1:50	MIDSHIP SECTION AND DETAILS	4



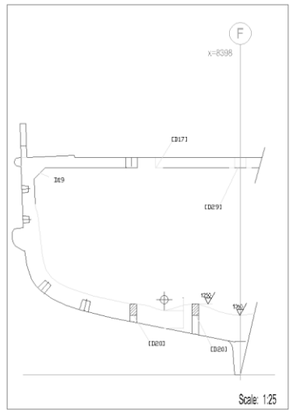
DET.5
Scale 1:2

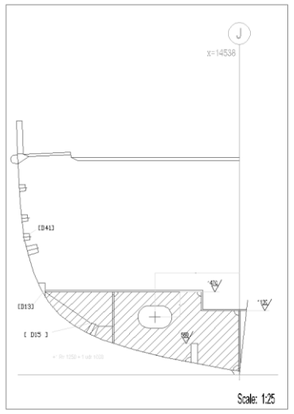


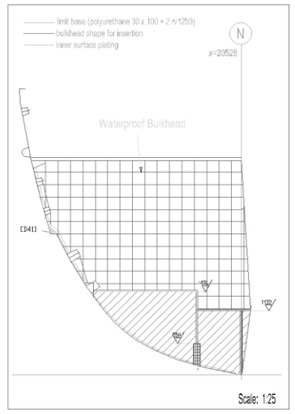
THE DOWN FLOORING DEVICE WILL BE CLOSED FLUSH WITH THE FLOORING LEVEL
THE POLYESTER FIBRE USED, ARE OF LOW FLAME SPREAD MATERIAL
THE PANELS POS. 2 AND 3 MUST BE KEEPT IN PLACE FREE NO ADESIVES SHOULD BE USED

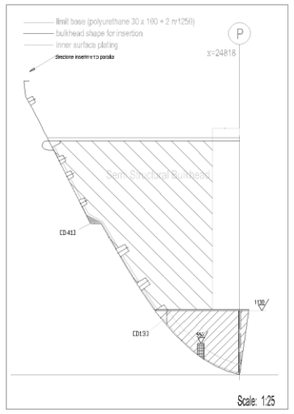
(3)	UPPER ACOUSTIC BARRIER	SOUNDTIL	POLYESTER FIBRE 40 KG. OF DENSITY 50 mm. THICK
(2)	LOWER ACOUSTIC BARRIER	SOUNDTIL TM 003	POLYESTER FIBRE 40 KG. OF DENSITY 20 mm. THICK
(1)	METAL SHEET FRAME	GALV. STEEL	THICKNESS 0.8 mm.

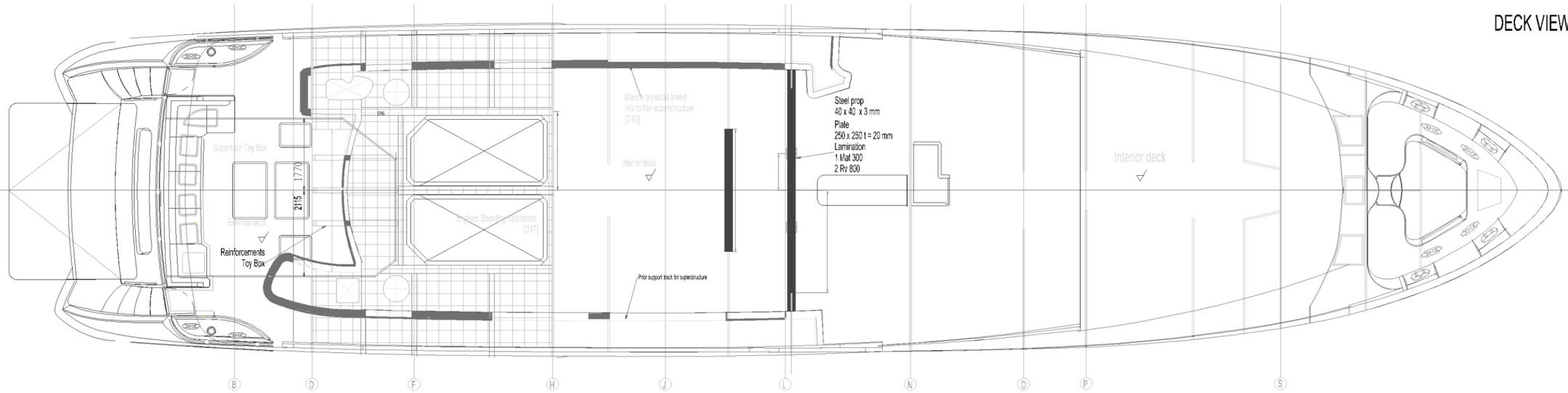
SCALE:	DESCRIPTION:	DRAWING NO:
1:100	TRANSVERSAL SECTION AND DETAILS	3

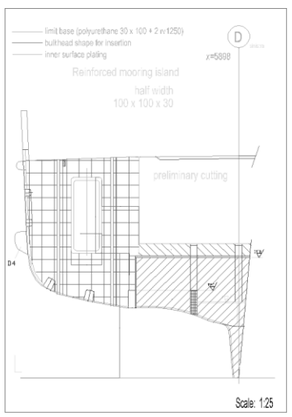


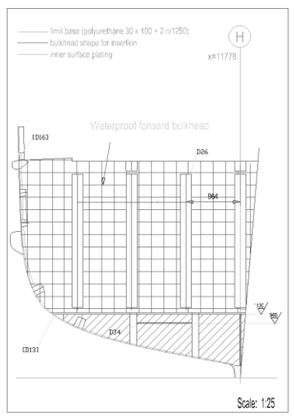


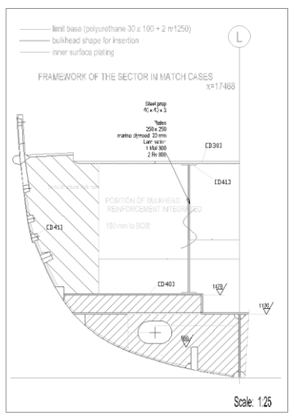


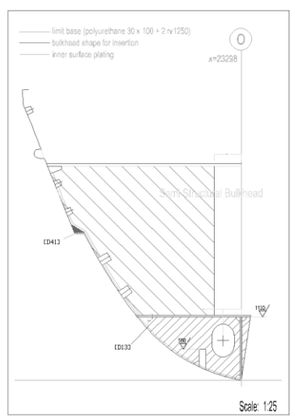


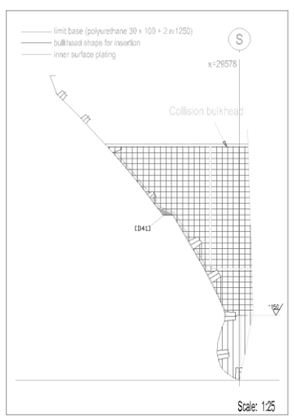








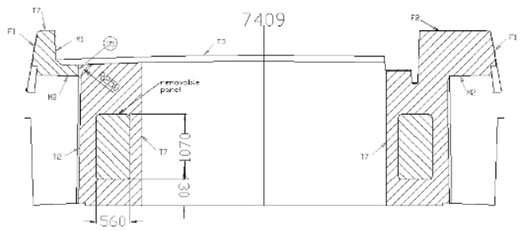


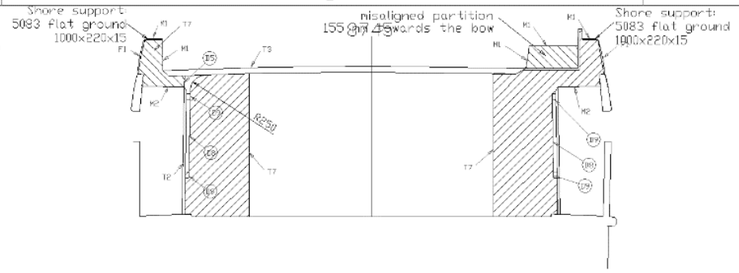


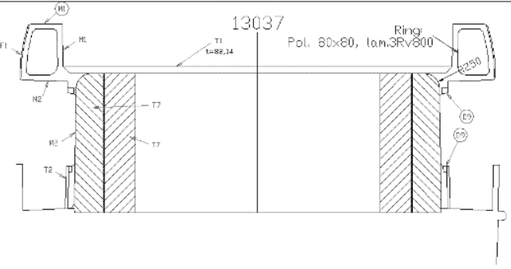
SCALE:
1:100

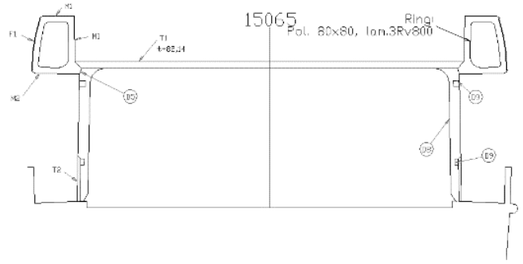
DESCRIPTION:
1st TIER LAYUP AND DETAILS

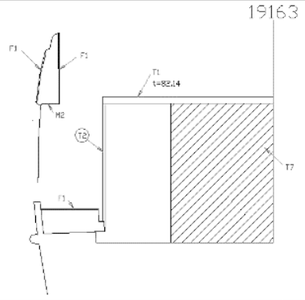
DRAWING NO:
5

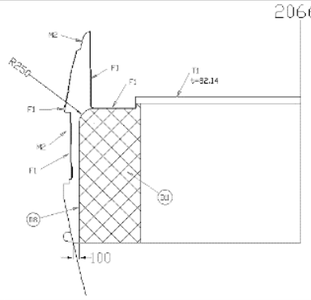


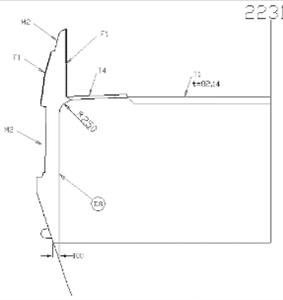


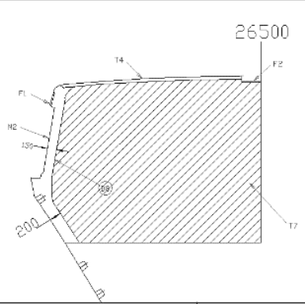


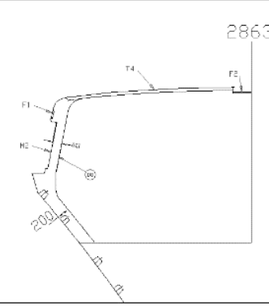


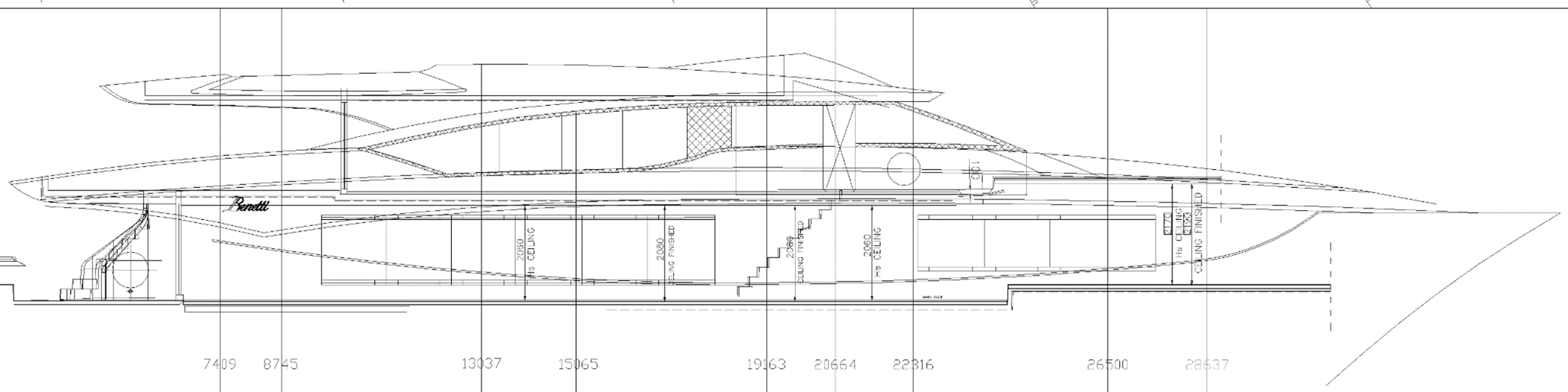












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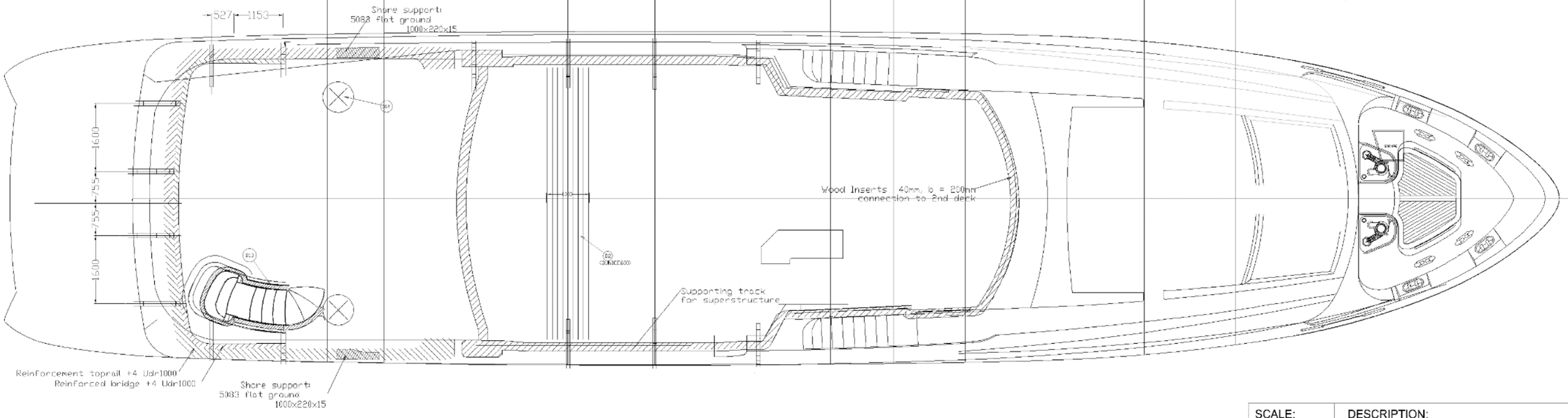
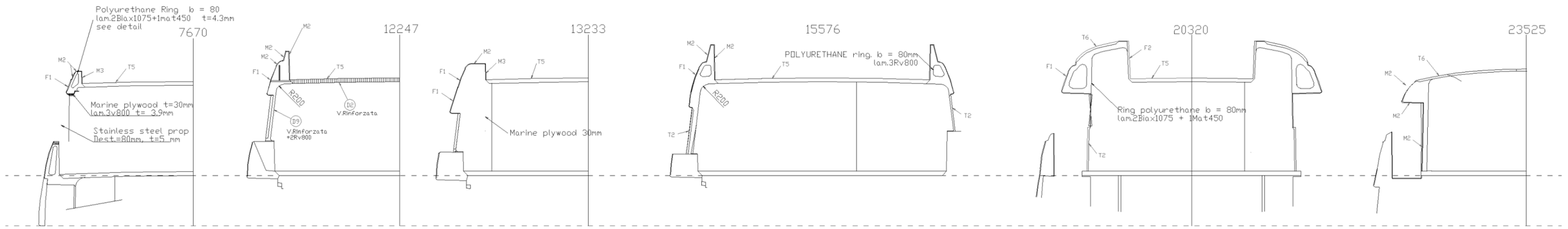
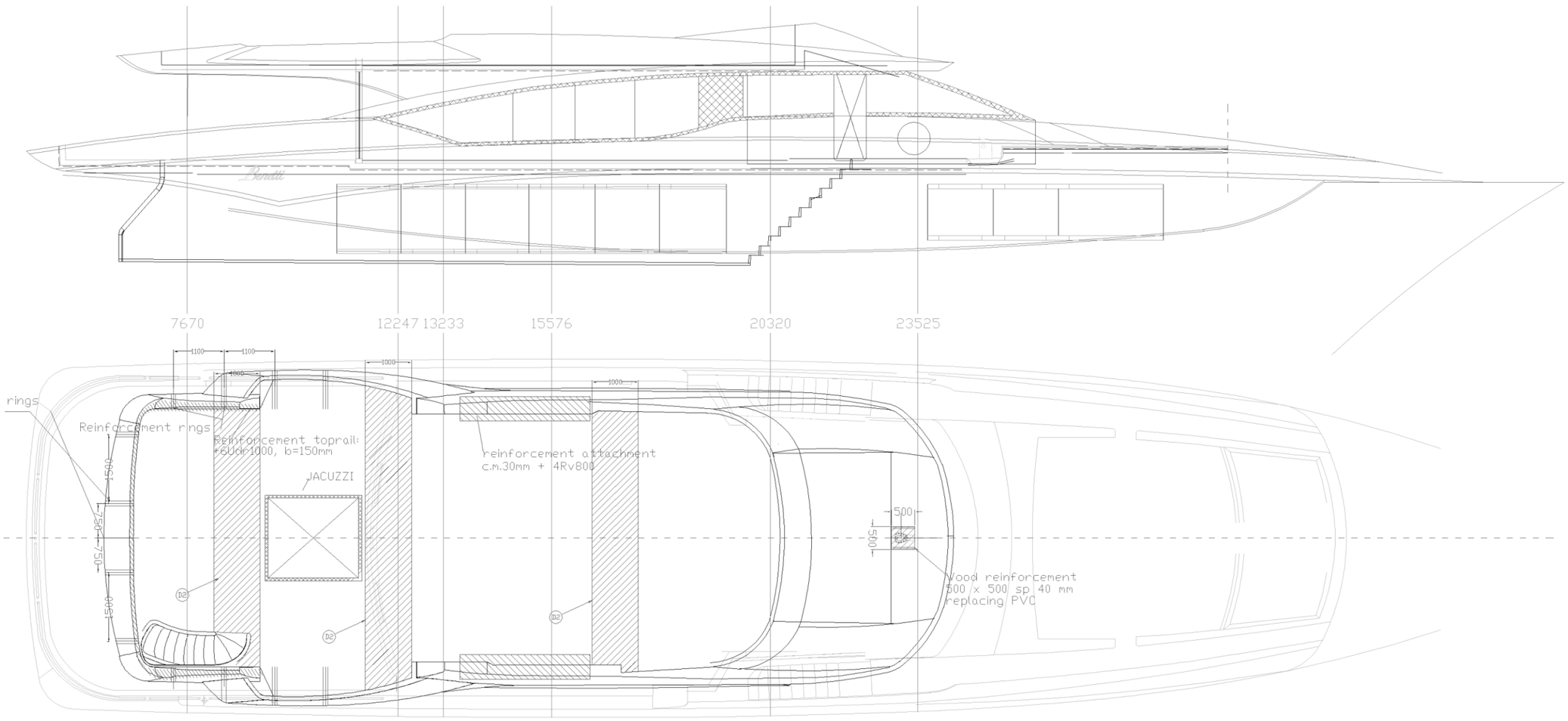


SCALE:	DESCRIPTION:	DRAWING NO:
1:100	FASHION PLATES AND SECTIONS 1st TIER	6



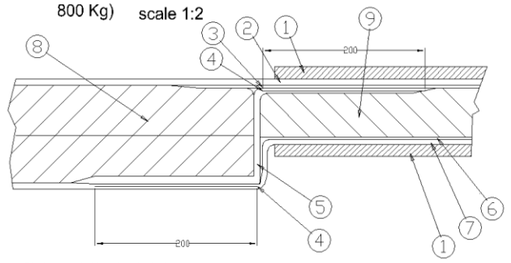


SCALE:	DESCRIPTION:	DRAWING NO:
1:100	FASHION PLATES AND SECTIONS 2nd TIER	7

EXTERNAL SKIN LAYOUT - SEQUENCE AND APPLICATION
EXPLODED VIEW MOLD

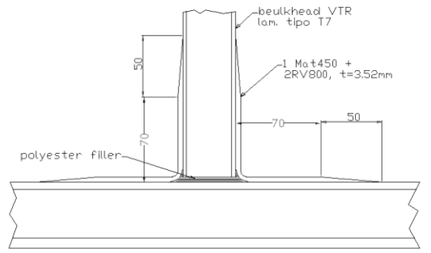
ZONE / SEQUENCE	M1	M2	M3	F1	F2	T1	T2	T3	T4
Gelcoat	X	X	X	X	X	X	X	X	X
1Mat300	X	X	X	X	X	X	X	X	X
2Mat450	X	X	X	X	X	X	X	X	X
2Rv800	X	X	X	X	X	-	X	X	X
2 CEBXS600M150		-	-	-	-	X	-	-	-
Udr1000	-	-	-	-	-	-	-	-	-
UNICE600	-	-	-	-	-	-	-	-	-
1Rv800	-	-	XX	-	X	-	-	X	X
1 CEBXS600M150	-	-	-	-	-	X	-	-	-
PVC 75Kg, 50mm	-	-	-	-	-	-	-	-	-
PVC 75Kg, 40mm	-	-	-	-	-	X	-	XX	X
PVC 75Kg, 30mm	-	-	-	-	-	X	X	-	-
C.Coremat, 4 mm	-	-	-	X	X	-	-	-	-
2 Rv800	X	X	X	X	X	-	X	X	X
2 CEBXS600M150	-	-	-	-	-	X	-	-	-
2 Rv800	-	-	-	-	-	-	-	X	X
2 CEBXS600M150	-	-	-	-	-	X	-	-	-
1 Rv800	X	-	-	-	X	-	-	-	-
1 CEBXS600M150	-	-	-	-	-	X	-	-	-
Udr1000	-	-	-	-	-	-	-	-	-
UNICE600	-	-	-	-	-	-	-	-	-

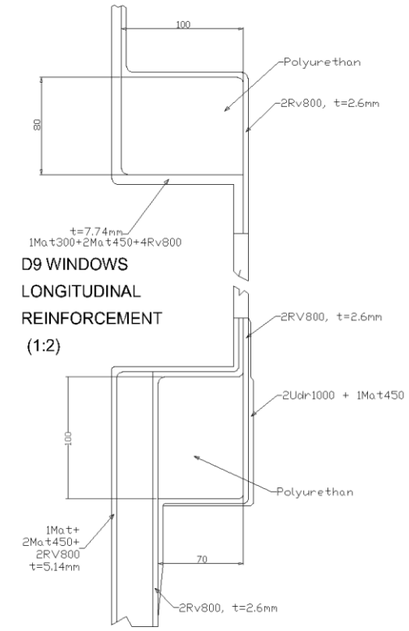
D12 REINFORCEMENT INSTALLATION GRU '(3.5m @ 800 Kg) scale 1:2



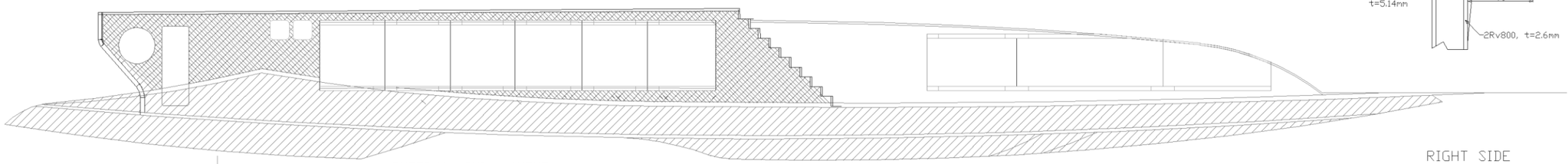
1. Plate and the backplate
2. Outer skin
3. (1 Mat 300 + 2 Mat 450 + 3 Rv800; t= 6,44) Reinforced outer skin (2 Rv 800; t= 2,6)
4. strip (6 udr 1000 width 200 ; t= 7,26)
5. Blade reinforcement (4 Rv 800, t = 5.2)
6. Closing reinforcement (1 Rv 800; t=1,3)
7. Inner skin (4 Rv 800; t= 5,2)
8. PVC 75 Kg/mc (2 PVC da 40 mm; t= 80)
9. PVC 200 Kg/mc or higher

D4 COLL.Bulkhead (1:2)



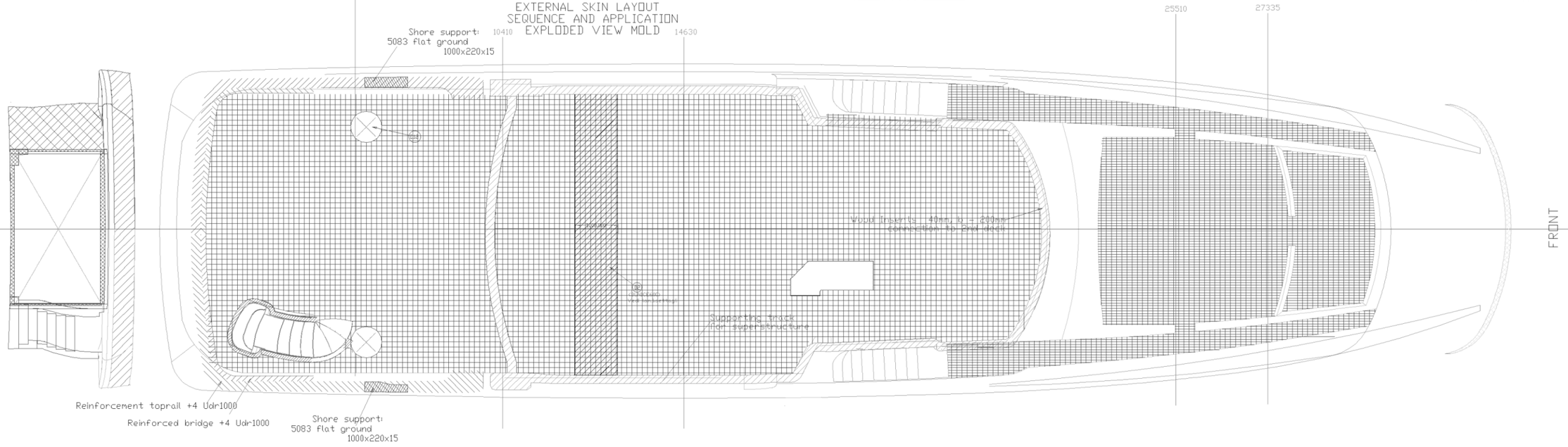


D9 WINDOWS LONGITUDINAL REINFORCEMENT (1:2)

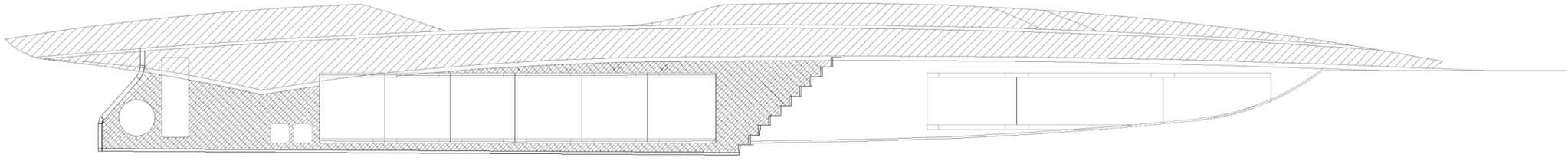


RIGHT SIDE

EXTERNAL SKIN LAYOUT SEQUENCE AND APPLICATION EXPLODED VIEW MOLD



LEFT SIDE



SCALE:	DESCRIPTION:	DRAWING NO:
1:100	1st TIER LAYUP AND DETAILS	9

TABLE OF LAMINATION

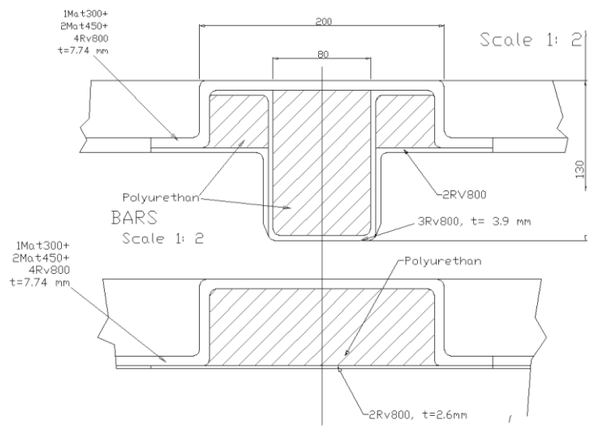
N*	MATERIAL	Weight kind.	Ro tio	gc	Thickness	Weight lam	UP_DECK	UP_DECK	UP_DECK	SIDE	BULKHEAD	STIFF	STIFF	MONOLIT.	MONOLIT.	PLANULLI
		gr/m²	R/V	t	mm	gr/m²	I1	I3	I4	I2	I7	I1	-2	M1	M2	V3
1	Gelcoat					700	X	X	X	X		X	X	X	X	X
2	mat300	300	2,33	30,0	0,70	1000	X	X	X	X		X	X	X	X	X
3	mat450	450	2,00	33,0	0,92	1351	XX	XX	XX	XX		XX	XX	XX	XX	XX
4	~v800	800	1,50	40,0	1,30	2000		XX	XX	XX	XX	XX	XX	XX	XX	XX
5	~v800	800	1,50	40,0	1,30	2000		X	X				X	XX	XX	XX
6	~v800	800	1,50	40,0	1,30	2000								X		XX
7	CEBXS60CM150	750	1,50	40,0	1,20	1875	XX									
8	CEBXS60CM150	750	1,50	40,0	1,20	1875	X									
9	~v800	800	1,50	40,0	1,30	2000										
10	~v800	800	1,50	40,0	1,30	2000										
11	coremat3	180	17		5	3240						X	X			
12	PVC75,30	2250	0		30	2250	X			X	X					
13	PVC75,40	3000	0		40	3000	X	XX	X							
14	PVC75,50	3750	0		50	3750										
15	~v800	800	1,50	40,0	1,30	2000		XX	XX	XX	XX	XX	XX			
16	~v800	800	1,50	40,0	1,30	2000		XX	XX				XX			
17	CEBXS60CM150	750	1,50	40,0	1,20	1875	XX									
18	CEBXS60CM150	750	1,50	40,0	1,20	1875	XXX									
19	~v800	800	1,50	40,0	1,30	2000										
20	mat450	450	2,00	33,0	0,92	1351										
P	REINFORCEMENT TOTAL WEIGHT (g / m²)						7200	6800	6800	4400	3200	4400	6800	5200	4400	6000
Q	TOTAL WEIGHT OF FULL (g / m²)						18703	17703	17703	11703	8000	11703	17703	13703	11703	15703
St_est	THICK SKIN EXTERNAL LAM.SANDWICH (mm)						6,24	6,75	6,45	5,15	2,60	5,15	6,45	9,06	7,75	10,36
St_int	THICK SKIN INTERIOR LAM.SANDWICH (mm)						6,00	5,22	5,22	2,61	2,60	2,62	5,22	0,00	0,00	0,00
St	TOTAL THICKNESS OF FULL (mm)						82,14	91,67	51,67	37,75	35,20	22,75	16,67	9,06	7,75	10,36
Gr=P/Q	CONTENTS OF REINFORCEMENT IN LAYERED						37,19%	38,41%	38,41%	37,60%	40,00%	37,60%	38,41%	37,95%	37,60%	38,21%
Ptot	TOTAL WEIGHT (compressed gelcoat & termarto) (g/m²)						26153	24403	21403	14653	10250	15583	18583	14403	12403	16403

DESCRIPTION:

TABLE OF LAMINATION

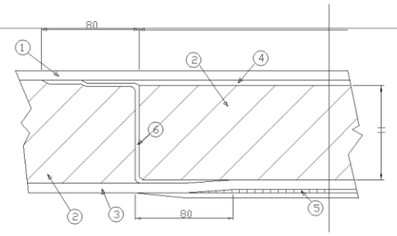
1st TIER

D8 RIBS and BARS



D2 INTEGRATED REINFORCEMENT SCHEME

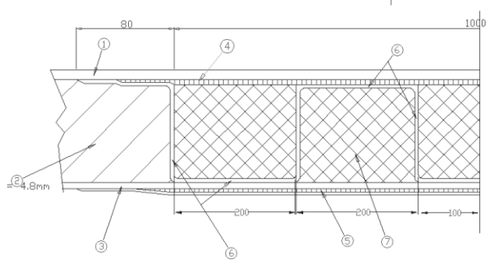
not in scale



① External skin
② PVC 75 kg/m3, 60 mm
③ Internal skin
④ UNICE600 wing covered 1Mat450
⑤ UNICE600 wing covered 1Mat450 } see plans
⑥ Angular reinforcing 2CEBXS600M150 + 1Mat450

REINFORCED VERSION

not in scale



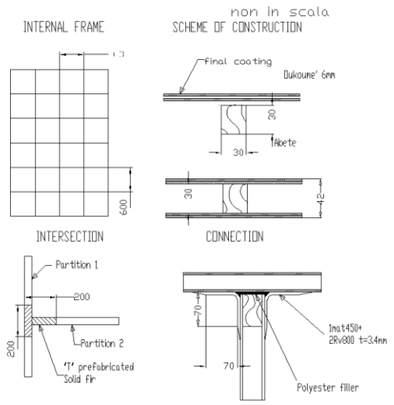
① External skin
② PVC 75 kg/m3, 60 mm
③ Internal skin
④ UNICE600 wing covered 1Mat450
⑤ UNICE600 wing covered 1Mat450
⑥ Internal reinforcement 4CEBXS600M150, t =
⑦ Polyurethane H 50 mm

PLANKING LAYOUT - SEQUENCE AND APPLICATION
EXPLODED VIEW MOULD

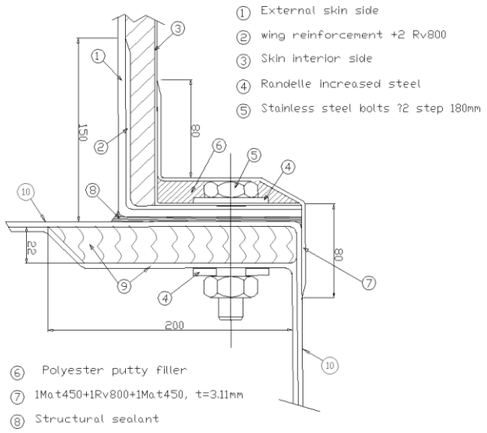
ZONA / SEQUENZA	M1	M2	M3	F1	T2	T5	T6	MAGGIORAZIONI A DISEGNO
Gelcoat	X	X	X	X	X	X	X	-
1Mat300	X	X	X	X	X	X	X	-
2Mat450	X	X	X	X	X	X	X	-
2Rv800	X	X	X	X	X	-	X	-
2CEBXS600M150	-	-	-	-	-	X	-	-
UNICE600	-	-	-	-	-	-	-	n
2Rv800	-	-	X	-	-	-	-	-
PVC 75Kg, 40mm	-	-	-	-	-	-	X	-
PVC 75Kg, 30mm	-	-	-	-	X	XX	-	-
C.Coremat, 4 mm	-	-	-	X	-	-	-	-
2 Rv800	X	X	X	X	X	-	X	-
2CEBXS600M150	-	-	-	-	-	X	-	X
1 Rv800	X	-	-	-	-	-	X	-
1CEBXS600M150	-	-	-	-	-	XX	-	-
UNICE600	-	-	-	-	-	-	-	n

[D11] PARTITIONS FITTING

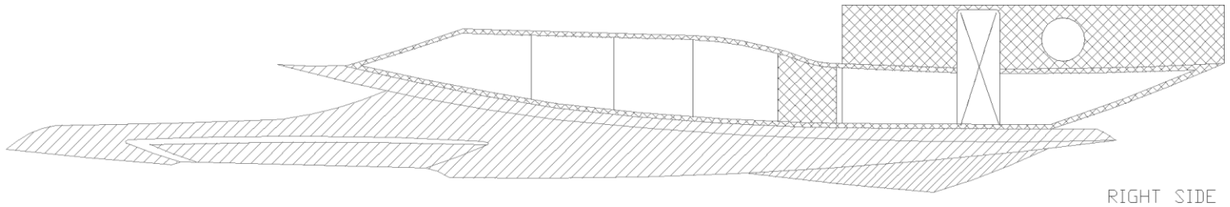
non in scala



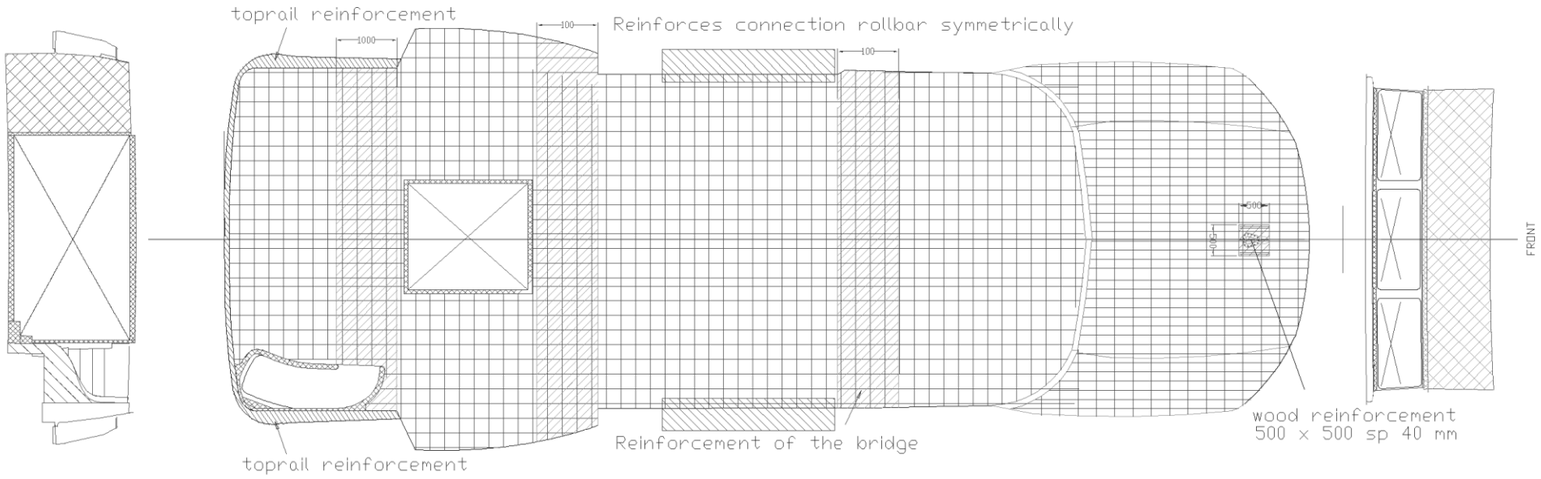
D6 CONNECTING TO OVEREXP first. (1:2)

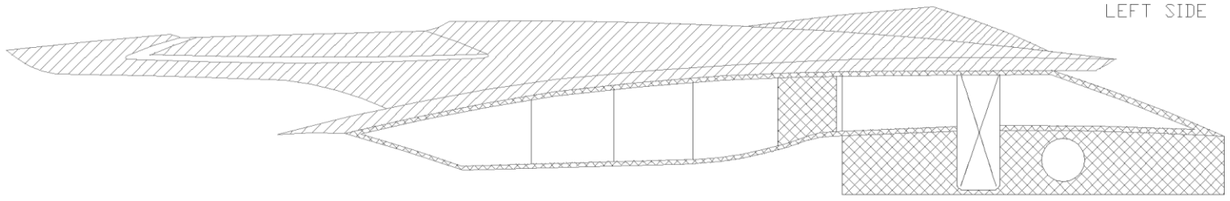


① External skin side
② wing reinforcement +2 Rv800
③ Skin interior side
④ Randelle increased steel
⑤ Stainless steel bolts ?2 step 180mm
⑥ Polyester putty filler
⑦ 1Mat450+1Rv800+1Mat450, t=3.11mm
⑧ Structural sealant
⑨ Reinforced marine plywood lam.3Rv800
⑩ Before plating superstructure



RIGHT SIDE





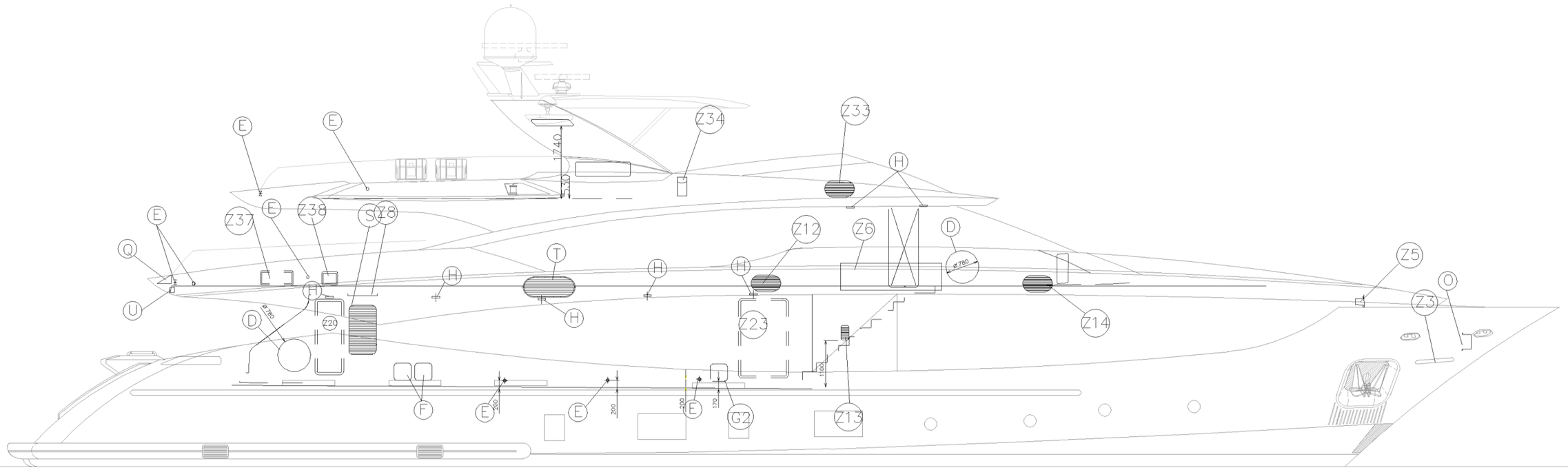
LEFT SIDE

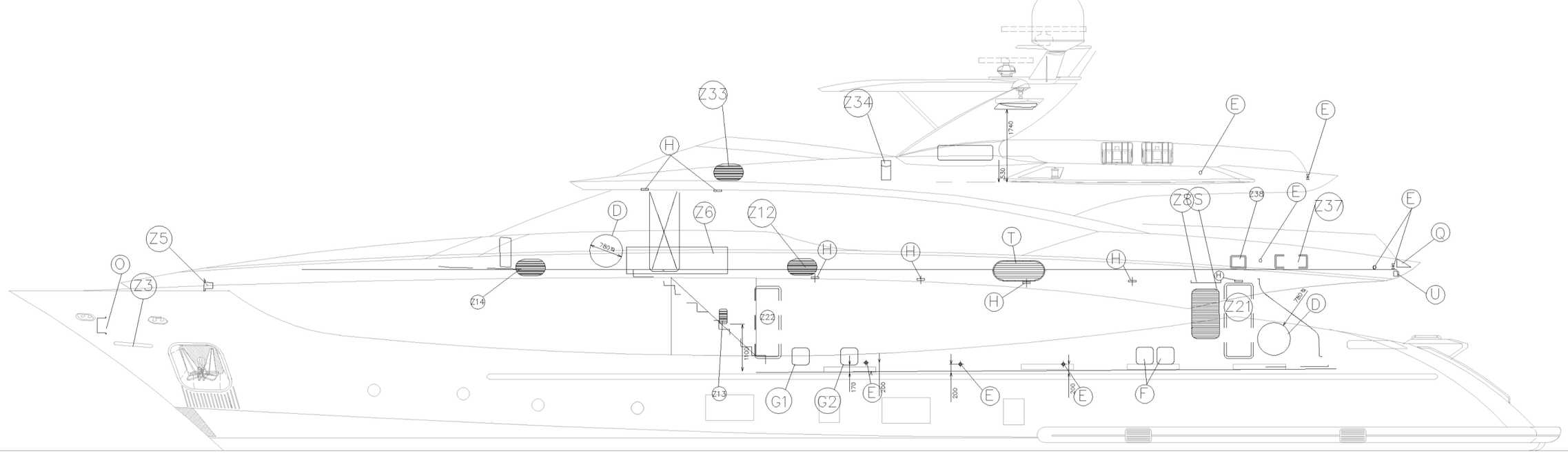
SCALE:	DESCRIPTION:	DRAWING NO:
1:100	2nd TIER LAYUP AND DETAILS	10

TABLE OF LAMINATION

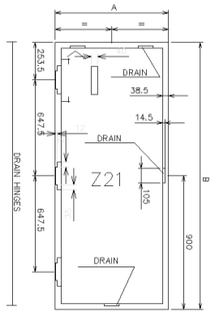
N*	MATERIAL	Weight Ref. gr/m²	Ratio R/V	gc t	thickness mm	Weight lam. gr/m²	SUN_DECK T5	COVER T6	SIDE T2	SIDE F1	MONOLIT. M1	MONOLIT M2	MONOLIT. M3
1	Gelcoat					700	X	X	X	X	X	X	X
2	mat300	300	2,33	30,0	0,70	1000	X	X	X	X	X	X	X
3	mat450	450	2,00	33,0	0,92	1351	XX	XX	XX	XX	XX	XX	XX
4	rv800	800	1,50	40,0	1,30	2000		XX	XX	XX	XX	XX	XX
5	rv800	800	1,50	40,0	1,30	2000					XX	XX	XX
6	rv800	800	1,50	40,0	1,30	2000					X		XX
7	CEBXS600M150	750	1,50	40,0	1,20	1875	XX						
8	CEBXS600M150	750	1,50	40,0	1,20	1875							
9	CEBXS600M150	750	1,50	40,0	1,20	1875							
10	CEBXS600M150	750	1,50	40,0	1,20	1875							
11	coremat5	180	17		5	3240				X			
12	PVC75,30	2250	0		30	2250	XX		X				
13	PVC75,40	3000	0		40	3000		X					
14	PVC75,50	3750	0		50	3750							
15	rv800	800	1,50	40,0	1,30	2000		XX	XX	XX			
16	rv800	800	1,50	40,0	1,30	2000		X					
17	CEBXS600M150	750	1,50	40,0	1,20	1875	XX						
18	CEBXS600M150	750	1,50	40,0	1,20	1875	XX						
19	CEBXS600M150	750	1,50	40,0	1,20	1875							
20	mat450	450	2,00	33,0	0,92	1351							
P	REINFORCEMENT TOTAL WEIGHT (g / m²)						5700	5200	4400	4400	5200	4400	6000
Q	TOTAL WEIGHT OF ROLL (g / m²)						14952	13703	11703	11703	13703	11703	15703
St_est	THICK SKIN EXTERNAL LAM.SANDWICH (mm)						4,94	5,15	5,15	5,15	9,06	7,75	10,36
St_int	THICK SKIN INTERNAL LAM.SANDWICH (mm)						4,80	3,91	2,61	2,61	0,00	0,00	0,00
Sti	TOTAL THICKNESS OF ROLL (mm)						69,74	49,06	37,75	12,75	9,06	7,75	10,36
Gc=P/Q	CONTENTS OF REINFORCEMENT IN LAYERED						38,12%	37,95%	37,60%	37,60%	37,95%	37,60%	38,21%
Ptot	TOTAL WEIGHT (including gelcoat & topmarto) (g / m²)						19452	17403	14653	12583	14403	12403	16403

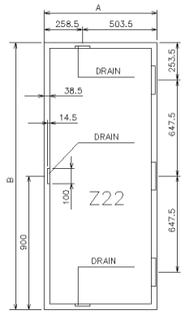
DESCRIPTION:
TABLE OF LAMINATION
2nd TIER LAYUP AND DETAIL

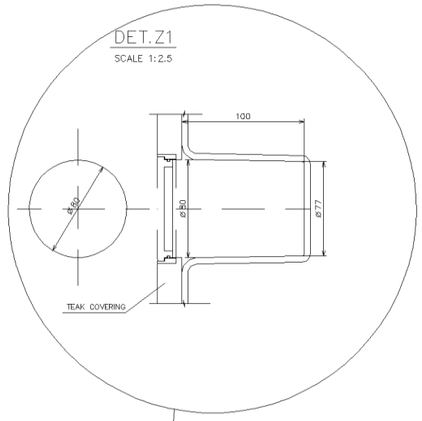


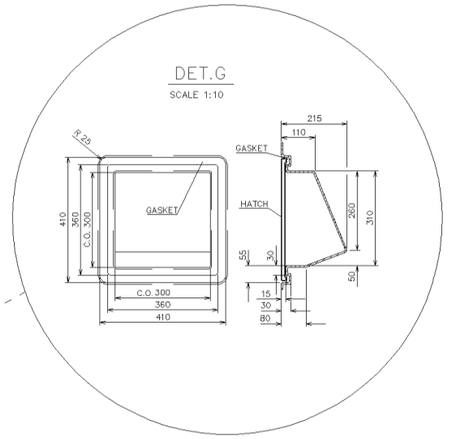


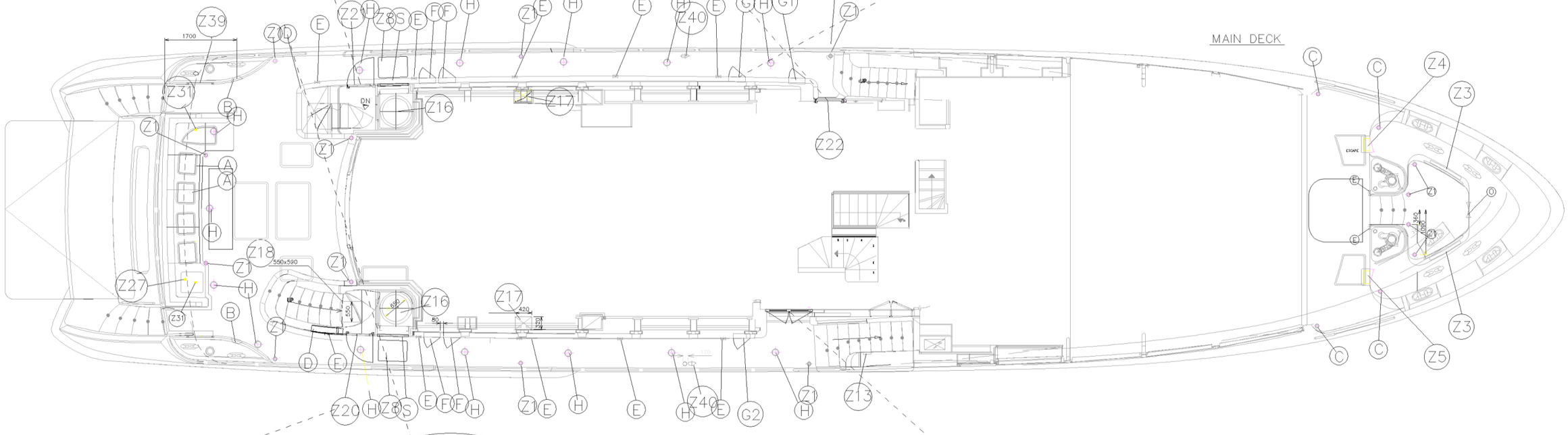
SCALE:	DESCRIPTION:	DRAWING NO:
1:100	SUPERSTRUCTURE RECESS PLAN PROFILE VIEW	11

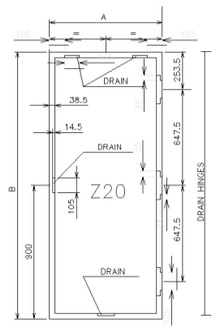


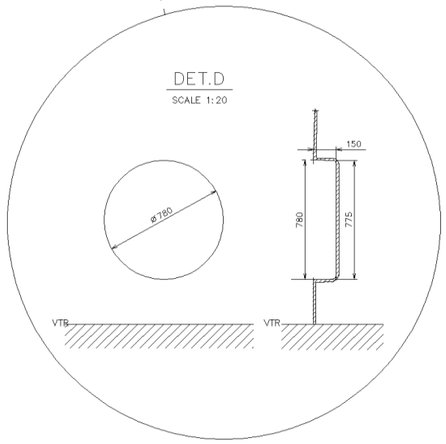


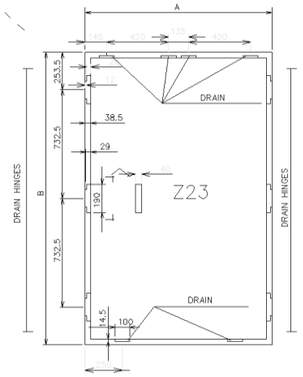






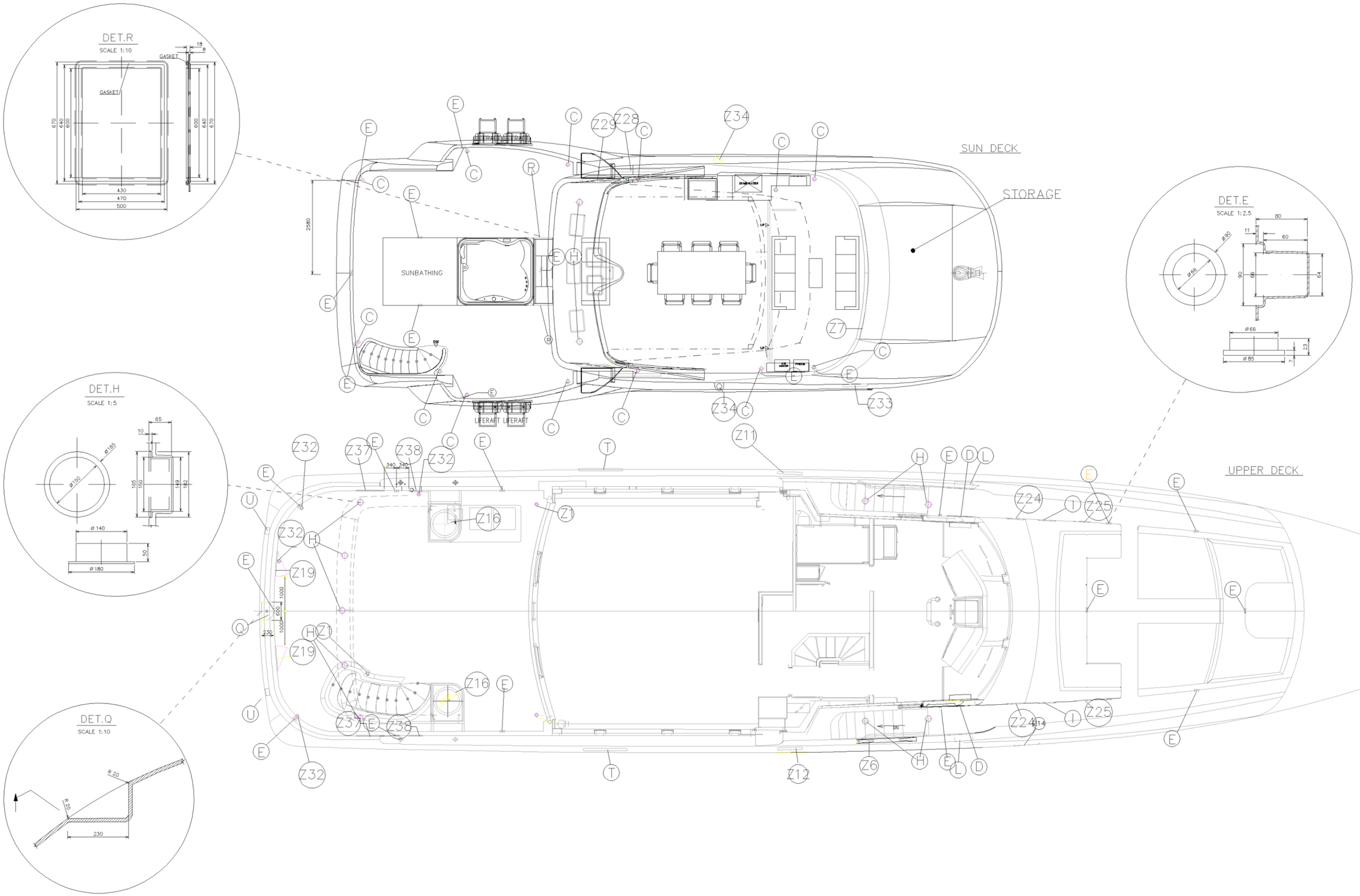






Z23	1080x1790	1262	1972	12	150	1185	1895
Z22	580x1620	762	1802	12	270	685	1725
Z21	580x1620	762	1802	12	270	685	1725
Z20	580x1620	762	1802	12	270	685	1725
	L.N.	A	B	C	D	E	F

SCALE:	DESCRIPTION:	DRAWING NO:
1:100	SUPERSTRUCTURE RECESS PLAN VIEW 1 AND DETAILS	12



SCALE:	DESCRIPTION:	DRAWING NO:
1:100	SUPERSTRUCTURE RECESS PLAN VIEW 2 AND DETAILS	13

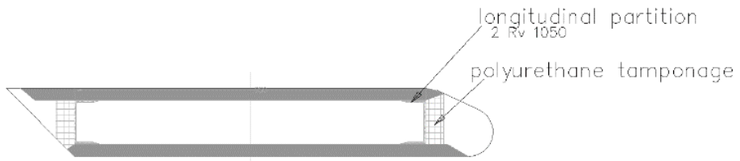
POS.	DENOMINATION	Q.TY
Z40	OVAL SCUPPER	2
Z39	OPENING C.O. 580x320	2
Z38	OPENING C.O. 310x250	2
Z37	OPENING C.O. 710x270	2
Z36	350x180 GRATING DRYER AIR OUTLET	1
Z34	GRP GLASS FOR MOA CRANE	2
Z33	1700x400 GALLEY AIR OUTLET	1
Z32	SCUPPERS	3
Z31	SOFA OPENING	2
Z30	OPENING FOR ELECT.CONNECT. C.O.550x550	2
Z29	AIR VENT GRID C.O. 930x140	2
Z28	AIR VENT CONNECT OPENING C.O. 1300x350	2
Z27	GARAGE ESCAPE C.O. 550x590	1
Z26	HATCH WITH GRID OPENING C.O. 980x750	1
Z25	UTA2-UTA3 AIR INLET GRID	2
Z24	HATCH WITH GRID OPENING C.O. 980x750	1
Z23	MAIN ENTR. DOOR OPENING C.O. 1080x1780	1
Z22	GALLEY DOOR OPENING C.O. 580x1620	1
Z21	E.R. DOOR OPENING C.O. 580x1620	1
Z20	STORAGE DOOR OPENING C.O. 580x1620	1
Z19	320x720 STORAGE OPENING	2
Z18	E.R. ESCAPE C.O. 550x590	1
Z17	E.R. VENTIL. OUTLET DUCT OPENING	1
Z16	E.R. EL. BLOWER OPENING	2
Z15	400x400 UTA1 AIR INLET	1
Z14	700x400 E3 - E4 AIR OUTLET	1
Z13	350x180 GRATING BATTERY AIR OUTLET	1
Z12	700x400 E1 - E5 AIR OUTLET	1
Z11	700x400 UTA4 - UTA5 AIR INLET	1
Z10	350x180 GRATING COLD ROOM COMPR. AIR OUTLET	1
Z9	180x350 GRATING COLD ROOM COMPR. AIR INLET	1

POS.	DENOMINATION	Q.TY
Z8	GRATING ENGINE ROOM AIR INLET	2
Z7	OPENING FOR TENDER STORAGE	1
Z6	MARQUIPT SEA STAIR	1
Z5	HYDRANT-WASH DOWN-AIR COMPR. BOX	1
Z4	SHORE SUPPLY	1
Z3	LOCKER	2
Z2	LOCKER	2
Z1	SCUPPERS	19
V	SUN DECK WASHING	1
U	STERN FLOODLIGHT	2
T	GRATING ENGINE ROOM AIR OUTLET	2
S	GRATING ENGINE ROOM AIR INLET	2
R	WASHER INSPECTION HANDS HOLE	2
Q	STERN LIGHT BRAKET	2
P	BAR HANDS HOLE	2
O	HYDRANT-AIR COMPR.-WASH DOWN BOX	1
N	LOCKER	1
M	STORAGE BOX	1
L	CONTROL WING	2
I	HATCH WITH GRID OPENING C.O. 490x750	2
H	CEILING LIGHT BOWL	26
G2	EMBARC WATER E MAIN DECK WASHER	1DS
G1	EMBARC WATER AND SOUNDING AIR	1SN
G	MAIN DECK WASHER-FIRE HYDRANT	2
F	EMBARC GASOLINE SUPPLY BOX	2
E	FOOTLIGHT	36
D	LIFEBUOY	4
C	SCUPPER	13
B	CAPSTAIN CONTROL	2
A	LOCKER	4

DESCRIPTION:

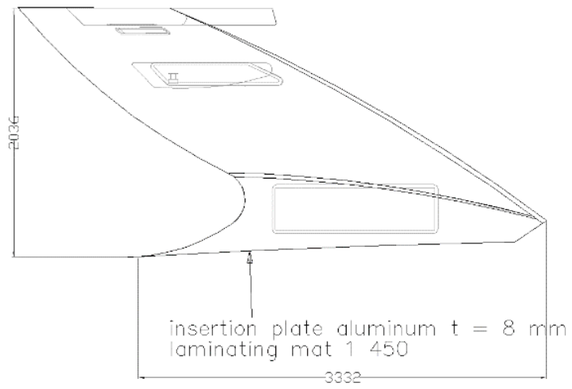
TABLE OF DENOMINATION -

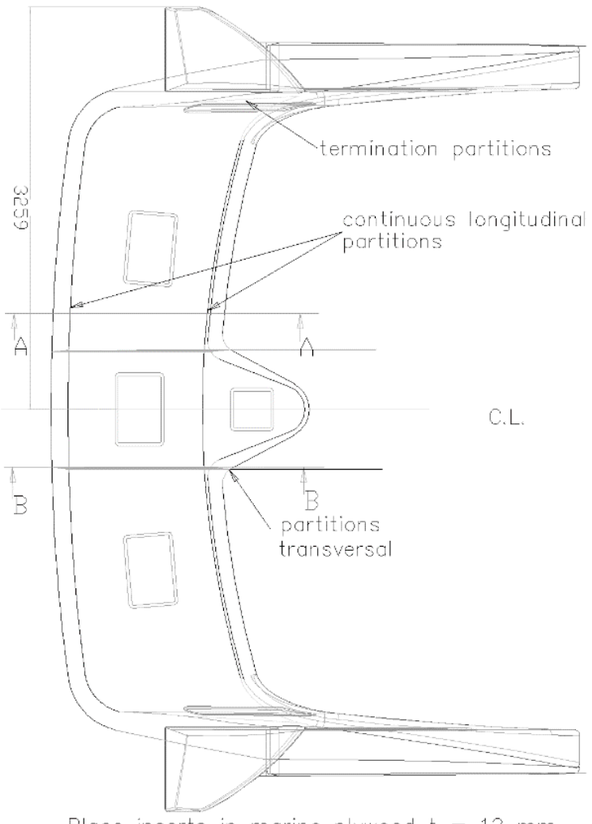
SUPERSTRUCTURE RECESS PLAN



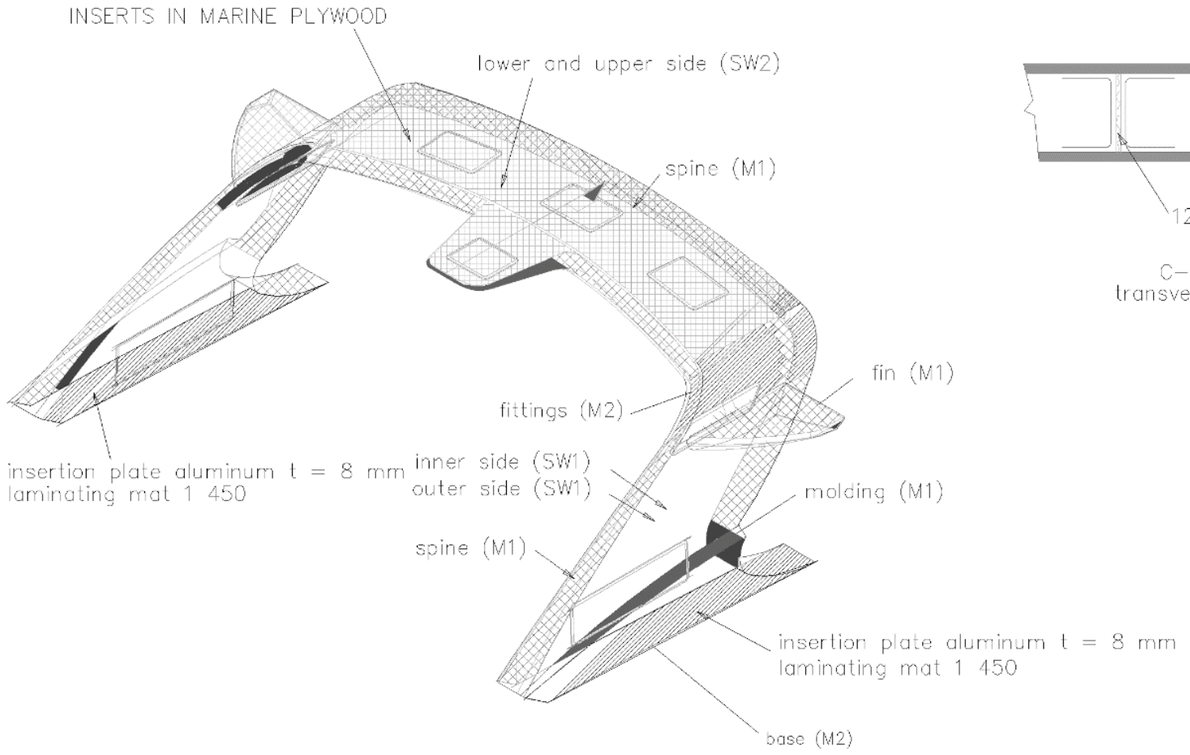
A–A
scale 1:5
Longitudinal section

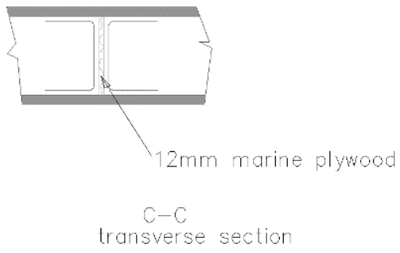
ZONE / SEQUENCE	M1	M2	SW1	SW2	INSERTS
Area of application	Fins, backs and molding	Base and fittings	Sides (internal and external)	Plans (upper and lower)	According to antennas plans
Gelcoat	X	X	X	X	X
1Mat300	X	X	X	X	X
2Mat450	X	X	X	X	X
1Rv1050	X	X	X	X	X
2Rv1050	–	X	–	–	–
PVC 75Kg, 12mm	–	–	–	X	inserts in maryne plywood
PVC 75Kg, 20mm	–	–	X	–	
2Rv1050	X	X	X	X	X
Theoretical thickness	7.33	10.53	27.33	19.33	19.33 / 27.33



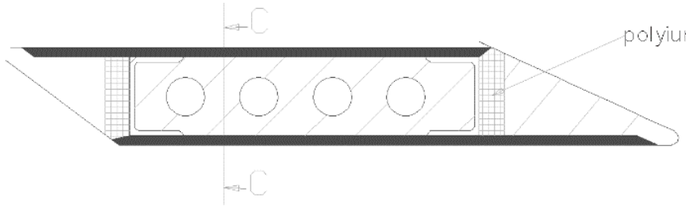


Place inserts in marine plywood t = 12 mm
(replacing PVC 12 mm)





C–C
transverse section



B–B
transverse section

SCALE:	DESCRIPTION:	DRAWING NO:
1:20	ROLL BAR	14

5. CONCLUSION

Being ahead of design trends and technological innovation is essential to offering the most timeless and elegant yachts. The aesthetics (external and interior) together with comfort and luxury requirements drive the concept, design calculation and construction of motor yachts. These qualities appear to have a major impact on the `dreams' of the potential owner, and they often become his strongest motivation to buy a yacht. The basic design process must consolidate these requirements via a feasibility phase (concept design) and a preliminary design, right up to the final design. The concept design is by far the most delicate phase of the entire procedure.

The core of the current market is in the 30m (100') to 40m (120') bracket – a market strongly dominated by the Italian shipyards. The development of market share with regard to yacht length is indicated which shows the continuous growth of the demand for yachts over 30m from 2000 to 2009 and the slight decrease started in 2010, due to the economic global crisis. In short words, the Superyacht market has been driven by massive rise in semi-custom orders.

Making the previous analysis of different technological systems in 10 different yachts, we got insight on Benetti standards, which have to be continued in a new coming models. Spotted discrepencies are subject of further work by technical department and strategic planning of a future models. Getting the insight in the process of building the superyacht was a crucial for further development of a new model. Many components involved in that process testify a complexity of such a work and they must not be forgotten when thinking about a new designs, even in early concept stages.

The Benetti Diamond 121' is the latest model to join the Benetti Class semi-custom range in composite material. She's main features including size, external lines, details in interiors style and main performances were carefully benchmarked by previous analysis.
The standard layout of this triple-deck model has a full-beam Owner's suite on the main deck and four guest cabins, that can comfortably accommodate eight. Additionally, the crew quarters were designed for seven.

Further work would include a closer inspection on costs analysis and basic design development towards a preliminary design, right up to the final design.

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Main data sources are from the Benetti internal documentation:

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Benetti Grande 140', Technical specification, May 2013

Benetti FB700, Technical specification, August 2013

Benetti FB800, Technical Specification, September 2013

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APENDIXES

APENDIX 1

Full list of all compared items in section Product Analysis.

BEHIND EACH LINE IN THE LIST BELOW IS THIS TYPE OF DATA COMPARISON:

Example 1: Typical engineering data comparison

	BD 93'	BK 108'	BC 121'	BS 132'	BY 140'	FB700	FB800	BV145
Noise and vibration								
Noise @ Aft Guests Cabins (anch ; nav)	48 ; 65	50 ; 63	47 ; 62	47 ; 72	45 ; 62	47 ; 62	50 ; 58	49 60
Noise @ Fwd guest Cabins (anch ; nav)	45 ; 57	45 ; 58	46 ; 57	46 ; 57	45 ; 58	46 ; 57	48 ; 55	47 55
Noise @ Crew Mess (anch ; nav)	45 ; 55	45 ; 60	48 ; 56	48 ; 56	48 ; 57	48 ; 56	52 ; 54	52 57
Noise @ Crew Cabins (anch ; nav)	45 ; 55	45 ; 60	48 ; 56	48 ; 56	48 ; 56	48 ; 56	50 ; 54	51 56
Noise @ Main Saloon (anch ; nav)	50 ; 63	52 ; 62	45 ; 62	50 ; 62	48 ; 62	50 ; 62	52 ; 62	50 62
Noise @ Dining Area (anch ; nav)	/	52 ; 62	45 ; 58	48 ; 58	/	48 ; 60	52 ; 62	50 57
Noise @ Owner's Cabin (anch ; nav)	45 ; 52	43 ; 50	44 ; 51	44 ; 51	44 ; 51	45 ; 51	47 ; 50	47 50
Noise @ Galley (anch ; nav)	45 ; 55	55 ; 65	52 ; 59	49 ; 59	48 ; 60	55 ; 60	56 ; 60	
Noise @ Sky Lounge (anch ; nav)	/	58 ; 65	46 ; 55	46 ; 55	45 ; 56	pan saloon 44 ; 55	upper saloon 50 ; 56	50 57
Noise @ Captain cabin (anch ; nav)	/	/	48 ; 56	48 ; 56	48 ; 55	48 ; 56	50 ; 55	
Noise @ Wheelhouse (anch ; nav)	48 ; 57	50; 55	56 ; 56	56 ; 56	55 ; 55	56 ; 60	50 ; 56	50 ; 54
Noise @ Aft Main Deck (ext. Area) (anch ; nav)	60 ; 78	63 ; 78	58 ; 80	58 ; 80	58 : 79	58 ; 80	55 ; 75	
Noise @ Aft Upper Deck (ext. Area) (anch ; nav)	/	58 ; 73	57 ; 73	57 ; 73	56 ; 74	57 ; 73	55 ; 70	
Noise @ Middle Sun Deck (ext. Area) (anch ; nav)	58 ; 73	55 ; 70	56 ; 70	56 ; 70	55 ; 70	56 ; 70	55 ; 70	
Vibration@ Owner and guests interior lux areas (Nav)	1	1	2	1	2.5	2	2	2
Vibration @ Open Deck entertainment areas (Nav)	1.5	1.5	2.5	1.5	3	2.5		3
Vibration @ crew Quarters (Nav)	1.5	1.5	2.5	1.5	3	2.5		2.5

Example 2: Typical architectural data comparison

	BD 93'	BK 108'	BC 121'	BS 132'	BY 140'	FB700	FB800	BV145'
Engine room and technical spaces lights	Neon lights. Technical spaces ae fitted with 24V DC lights in IP54 housing. Some emergency lights will be incorporated in the exsiting fixtures.	Neon lights. Technical spaces ae fitted with 24V DC lights in IP54 housing. Some emergency lights will be incorporated in the exsiting fixtures. Fluorescent fixtures and waterproof sockets will be provided	Neon lights. Technical spaces ae fitted with 24V DC lights in IP54 housing. Some emergency lights will be incorporated in the exsiting fixtures. Engine room technical spaces and stores: fluorescent fixtures and waterproof sockets will be provided.	Neon lights. Technical spaces ae fitted with 24V DC lights in IP54 housing. Some emergency lights will be incorporated in the exsiting fixtures. Fluorescent fixtures and waterproof sockets will be provided.	Neon lights of 2x18 W. Technical spaces ae fitted with 24V DC lights in IP54 housing. Some emergency lights will be incorporated in the exsiting fixtures.	In the engine room neon lights of 2x18 W will be fitted. Technical spaces will be fitted with 24 V DC lights in IP54 housing. Some emergency lights will be incorporated in the existing fixtures.	In the engine room lights of 2x18 kW will be fitted on the in order to avoid hidden areas. Cold lights (neon tubes type) will be provided for technical spaces. A switch will be fitted on each line.	Neon lights of 2x18 W. Technical spaces ae fitted with 24V DC lights in IP54 housing. Some emergency lights will be incorporated in the exsiting fixtures.

THE LIST OF ITEMS:

00. GENERAL
00.10 GENERAL INFORMATION – 2 AREAS
00.10.01 GENERAL
00.10.02 PARTIES
00.20 DESIGN AND PERFORMANCES – 6 ITEMS
00.20.01 MAIN CHARACTERISTICS
00.20.02 HULL DESIGN, STABILITY
00.20.03 PERFORMANCES
00.20.04 NOISE & VIBRATION
00.20.05 STANDARD AND WORKMANSHIP
00.20.06 CLASSIFICATION
00.30 PROJECT MANAGEMENT – 5 AREAS
00.30.01 REPRESENTATIVES
00.30.02 CHANGE ORDERS
00.30.03 DISCREPANCIES
00.30.04 ACCEPTANCE AND DELIVERY
00.30.05 SEA TRIALS AND QUAY TESTS

00.40 DOCUMENTS – 2 AREAS
00.40.01 CERTIFICATES
00.40.02 DRAWINGS

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01.10 HULL STRUCTURE
01.11.00 HULL MATERIALS
01.11.01 HULL STERN STRUCTURE
01.11.02 HULL CONSTRUCTION
01.11.03 HULL BOW STRUCTURE
01.11.05 MAIN SEA CHESTS
01.11.08 STRUCTURAL REINFORCEMENTS
01.11.10 KEEL
01.11.11 BULWARK
01.11.12 HULL DOORS
01.11.99 HULL MANUFACTURE
01.13.01 ANODES AND SENSORS HOUSING
01.13.02 PROTECTION FROM ANCHORS AND CHAINS
01.13.04 REMOVABLE PLATES
01.13.05 WINDOWS AND PORTHOLES FRAMES
01.13.08 PROPELLER SHAFT BRACKETS
01.13.09 DOUBLE PLATES AND INSERTS
01.13.10 MAIN ENGINES OVERBOARD DISCHARGE
01.13.11 GENERATORS OVERBOARD DISCHARGE
01.13.12 RUBBING STRAKE
01.13.14 HAWSE PIPES AND ANCHORS POCKETS
01.13.17 STRUCTURAL METAL REINFORCEMENTS (BEAMS AND PILLARS)
01.14.01 HULL BASEMENTS AND SUPPORTS
01.20 SUPERSTRUCTURE STRUCTURE
01.21.00 SUPERSTRUCTURE MATERIALS
01.21.01 SUPERSTRUCTURE CONSTRUCTION
01.21.07 SUPERSTRUCTURE REINFORCEMENTS
01.23.02 MAIN MAST
01.23.05 SUPERSTRUCTURE PILLARS
01.40 ASSEMBLING
01.41.00 SUPERSTRUCTURE TO HULL FASTENING

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02.15.01 EXTERNAL LOOSE FURNITURE
02.20 FAIRING, PAINTING AND INSULATION
02.21.00 UNACCESSIBLE SPACES TREATMENT
02.22.00 TECHNICAL SPACES FLOORING
02.25.00 PAINT, GENERAL
02.25.01 HULL TOP SIDE PAINTING
02.25.02 UNDERWATER HULL PAINT
02.25.03 SUPERSTRUCTURE PAINT
02.25.04 INTERNAL PAINT
02.25.07 TANK TREATMENT
02.25.08 PIPING PAINT
02.25.09 MACHINERY AND OUTFITTING EQUIPMENT PAINT
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02.27.03 PIPES INSULATION
02.27.04 AIR CONDITIONING DUCTS INSULATION
02.27.05 RESILIENT MOUNTING OF BULKHEADS, CEILINGS AND PARTITIONS
02.27.07 VIBRATION DAMPING TREATMENT
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02.27.09 FIRE AND COMFORT INSULATION
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02.31.02 RUDDER HOLES
02.31.03 RUDDERS BUSHES
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02.32.13 CHAIN QUICK RELEASE
02.32.14 ANCHOR CHAINS
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02.33.02 FOREMAST
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