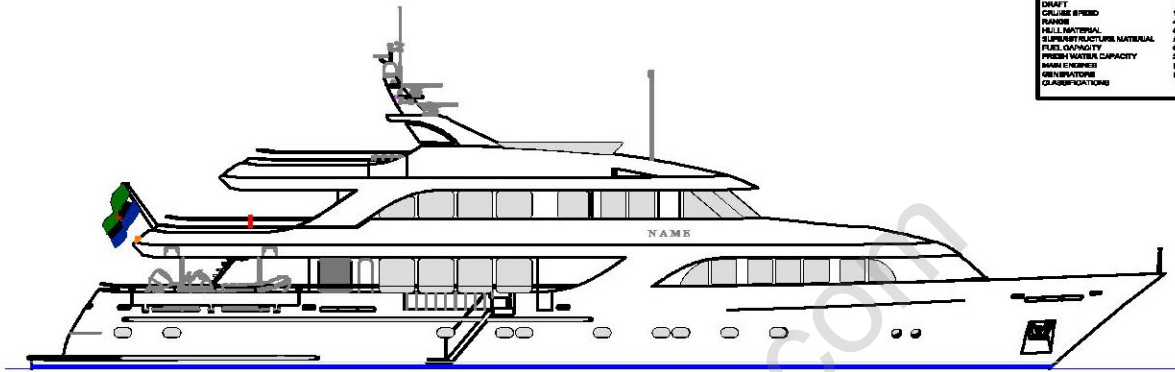
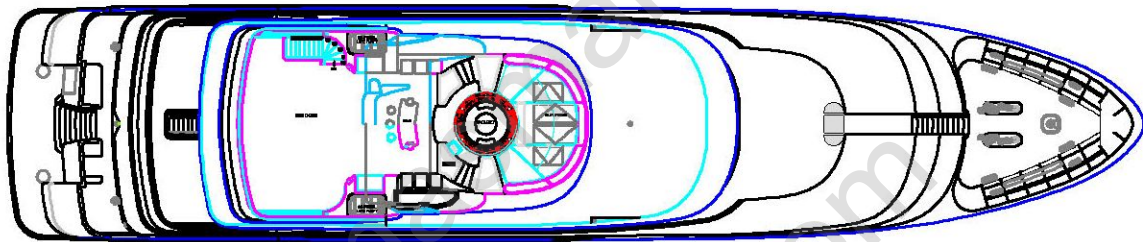


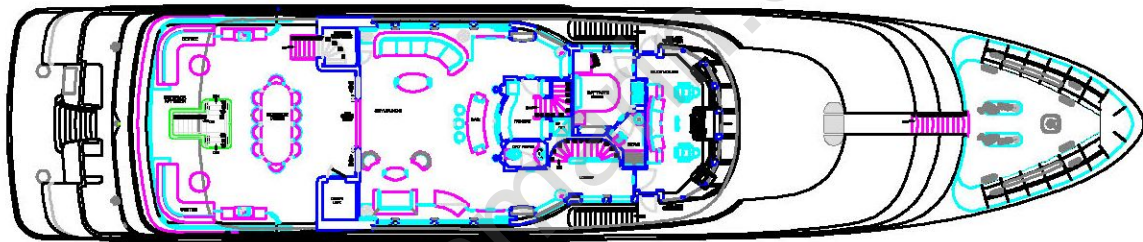
SPECIFICATIONS	
LENGTH OVERALL	44.00 METERS (144'-0")
LENGTH OF THE WATERLINE	35.00 METERS (115'-0")
BREADTH	6.00 METERS (20'-0")
DRAFT	2.20 METERS (7'-0")
CRAZE SPEED	18 KNOTS
RANGE	4000 N.M.
HULL MATERIAL	ALUMINUM
SUPERSTRUCTURE MATERIAL	ALUMINUM
FUEL CAPACITY	60,000 LITERS (17,000 GALLONS)
FRESH WATER CAPACITY	20,000 LITERS (5,300 GALLONS)
MAX. CREW	100 PERSONS (MAX. 10)
GENERATORS	10 PORTWAIN LIGHTS
CLASIFICACIONES	-



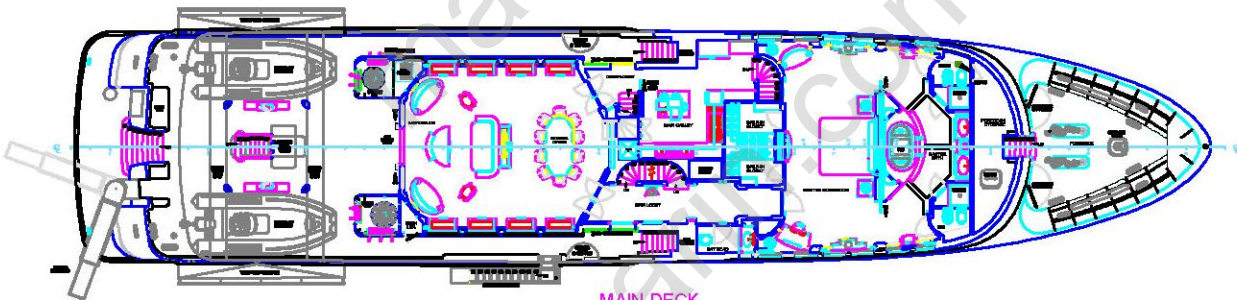
PROFILE



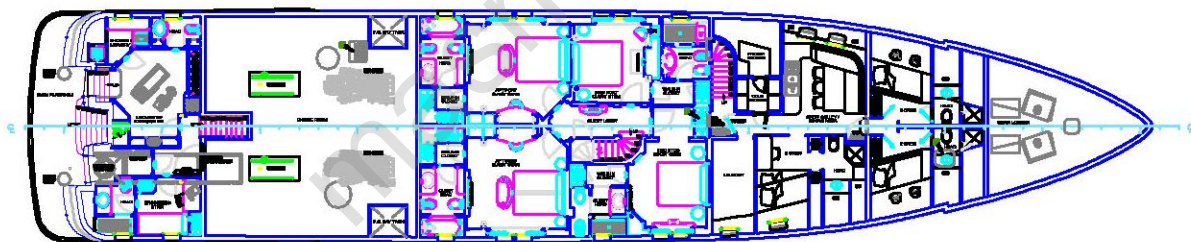
FLYBRIDGE DECK



UPPER DECK



MAIN DECK



LOWER DECK

44.00 M. TRI-DECK MOTOR YACHT

SCALE 1/100

144' x 29'6" DISPLACEMENT TRI-DECK MOTOR YACHT
CONSTRUCTION SPECIFICATION

Prepared by:

TABLE OF CONTENTS

1. GENERAL PROVISIONS.....	8
1.1 Intent.....	8
1.2 Definitions.....	8
1.2.1 Terms.....	8
1.2.2 Abbreviations & Symbols.....	8
1.3 Main Particulars.....	9
1.3.1 Dimensions.....	9
1.3.2 Performance.....	10
1.3.3 Tank Capacities.....	10
1.4 Project Management.....	10
1.5 Design Consultants.....	10
1.6 Builder.....	10
1.7 Classification and Regulatory Compliance.....	11
1.7.1 Classification.....	11
1.7.2 Tonnage.....	11
1.7.3 Maritime and Coastguard Agency Compliance.....	11
1.7.4 International Convention on Load Lines, 1969.....	11
1.7.5 International Convention on the Prevention of Pollution from Ships.....	11
1.7.6 COLREGS.....	11
1.7.7 Certificate and Documents to be Carried Onboard.....	11
1.8 Change Orders.....	12
1.9 Drawings and Design Information.....	12
1.10 Discrepancies.....	15
1.11 Weight, Trim and Stability.....	15
1.12 Delivery and Commissioning of Yacht.....	16
1.13 Overall equipment on board vessel.....	16
1.14 Storage of Equipment / Goods.....	16
2. HULL CONSTRUCTION.....	17
2.1 General.....	17
2.2 Material Specifications & Handling.....	17
2.3 Welding Standards.....	17
2.3.1 Welding Consumables.....	17
2.3.2 Welder Qualifications.....	17
2.3.3 Welding Procedures.....	17
2.3.4 Welding Preparation.....	18
2.4 Principles of Design.....	18
2.4.1 General Scantlings.....	18
2.4.2 Hull Tanks.....	19
2.5 Watertight Bulkhead Penetrations.....	19
3. SUPERSTRUCTURE CONSTRUCTION.....	20
3.1 General.....	20
3.2 Material Specifications and Handling.....	20
3.3 Welding Standards.....	20
3.3.1 Welding Consumables.....	20
3.3.2 Welder Qualifications.....	20
3.3.3 Welding Procedures.....	21
3.3.4 Welding Preparation.....	21
3.4 Principles of Design.....	21
3.4.1 Scantlings.....	21
3.4.2 Bi-metallic Structural Transition Joint.....	22

4.	JOINER WORK	23
4.1	General	23
4.2	Quality Standard for Wood.....	23
4.3	Owner Party and Guest Accommodations.....	24
4.4	Crew Quarters.....	24
4.5	Exterior.....	24
4.6	Engine Room.....	25
4.7	Finish Details.....	25
4.7.1	Furniture, Hardware	25
4.7.2	Ceilings	25
4.7.3	Window Shades.....	25
4.7.4	Furniture.....	25
4.7.5	Mirrors & Glass.....	26
4.7.6	Lockers & Drawers	26
4.7.7	Doors.....	26
4.7.8	Air-conditioning Vents.....	27
4.7.9	Counter and Vanity Tops	27
4.7.10	Floors and Bulkheads.....	27
5.	NOISE AND VIBRATION CONTROL	28
5.1	General	28
5.2	Bulkhead Treatments, Hull Linings, and Piping.....	28
5.3	Equipment Mounting.....	28
5.4	Accommodations.....	29
5.5	Noise and Vibration Level Requirements.....	29
5.5.1	Definitions.....	29
5.5.2	Noise Levels.....	30
5.5.3	Acoustic insulation.....	30
5.5.4	General Alarm and Public Address Systems.....	30
5.5.5	Vibration Levels.....	30
5.5.6	Test Conditions	31
5.5.7	Referenced Standards:.....	31
6.	HULL FITTINGS AND DECK EQUIPMENT	33
6.1	Deck Equipment	33
6.1.1	Anchoring Gear.....	33
6.1.2	Mooring Gear.....	33
6.2	Doors, Windows, and Hatches.....	34
6.2.1	Watertight Doors.....	34
6.2.2	Weather Tight Doors.....	34
6.2.3	Watertight Hatches.....	34
6.2.4	Fire Doors	34
6.2.5	Portlights	34
6.2.6	Superstructure Windows	35
6.2.7	Testing.....	35
6.2.8	Storm shutters.....	35
6.2.9	Exterior stairs	35
6.3	Underwater Lighting.....	35
6.4	Stanchions and Railings.....	35
6.5	Rub Rails	36
6.6	Nameboards.....	36
6.7	Windshield Wipers & Demisting.....	36
6.8	Flybridge Windscreen.....	36
7.	PROPULSION SYSTEMS.....	37

7.1	Main Engines.....	37
7.1.1	Main Engine Particulars.....	37
7.1.2	Scope of Supply.....	37
7.2	Reduction Gear.....	39
7.2.1	Reduction Gear Particulars.....	39
7.3	Running Gear.....	39
7.3.1	Propellers.....	39
7.3.2	Propeller Shafting.....	39
7.3.3	Struts.....	39
7.3.4	Bearings and Shaft Seals.....	39
7.4	Engine Room Ventilation System.....	40
7.4.1	System Description.....	40
7.4.2	System Components.....	41
7.5	Main Engine Exhaust System.....	41
7.6	Piping Material Specifications.....	42
7.7	Fuel Oil Supply and Return System.....	42
7.8	Fuel Oil Fill and Transfer System.....	42
7.9	Fuel Oil Vent System.....	42
7.10	Lubrication Oil System.....	42
7.11	Hydraulic System.....	43
7.11.1	General Description of System.....	43
7.11.2	Hydraulic Powered Equipment.....	43
7.11.3	Integrated System Power Pack Details.....	43
7.12	Bow Thruster.....	44
7.13	Engine Room Fire Suppression System.....	44
8.	HULL AND SHIP SYSTEMS.....	45
8.1	Piping Material Specifications.....	45
8.2	Systems Pressure Testing.....	45
8.3	Freshwater System.....	45
8.3.1	General.....	45
8.3.2	Plumbing.....	46
8.3.3	Freshwater Tanks.....	46
8.3.4	Pressure Pumps.....	46
8.3.5	Hot Water System.....	46
8.3.6	Watermakers.....	46
8.3.7	Freshwater Treatment System.....	47
8.3.8	Deck Wash Outlets.....	47
8.4	Accommodation Air Conditioning System / Chilled Water System.....	47
8.4.1	Performance Criteria.....	47
8.4.2	System Components.....	48
8.5	Grey Water System.....	49
8.6	Black Water System.....	49
8.7	Steering Gear System.....	49
8.8	Rudders.....	49
8.9	Sea Water System.....	50
8.9.1	General.....	50
8.9.2	Sea water pumps.....	50
8.9.3	Sea Chest.....	50
8.9.4	Sea Strainers.....	50
8.10	Compressed Air System.....	51
8.11	Fire Main System.....	51
8.12	Hi-Fog™ Fire Suppression System.....	51
8.12.1	Protected Areas.....	51
8.12.2	Materials.....	51
8.12.3	System design.....	53

8.12.4	Approval applications	53
8.12.5	Installation guidance and Commissioning.....	53
8.12.6	Regulations and Approvals	53
8.13	Quantum Zero Speed – Four Fin System.....	53
8.14	Bilge System.....	54
8.14.1	General	54
8.14.2	Pumps.....	54
8.14.3	Piping and Valves	54
8.15	Deck Drain System.....	55
8.16	Engine Room Access System	55
8.17	Central Vacuum System	55
9.	ELECTRICAL SYSTEM	56
9.1	Generators.....	56
9.1.1	Generator Particulars.....	56
9.1.2	Generator Exhaust System	56
9.2	Shorepower Equipment	56
9.2.1	Frequency Converters	56
9.2.2	Shorepower Cords and Equipment.....	56
9.3	Power Distribution Systems	56
9.3.1	AC Systems, Panels, and Switchboards	56
9.3.2	DC Systems, Panels and Switchboards	57
9.4	Lighting Fixtures	57
9.4.1	Interior Lights.....	57
9.4.2	Exterior Lights	58
9.4.3	Emergency Lights.	58
9.4.4	Search Lights.....	58
9.5	Receptacles	58
9.6	Navigation Lights	58
9.7	Electric Cable Standards.....	60
9.8	Cathodic Protection	60
9.9	Controls and Monitoring	60
9.9.1	Sensors	61
9.9.2	SiMON Controller.....	64
9.9.3	SiMON Management Software.....	64
9.9.4	SiMON Computers.....	64
9.9.5	NMEA Data Management.....	65
9.9.6	SiMON – Alarm Controller.....	65
9.9.7	Software License	65
10.	OUTFIT	66
10.1	Domestic Appliances.....	66
10.1.1	Cold Storage.....	66
10.2	Lifesaving Equipment.....	66
10.3	Portable Fire Fighting Equipment	67
10.4	Navigation and Communication Equipment.....	68
10.5	Electronic Entertainment Equipment.....	68
10.6	Plumbing Fixtures	68
10.6.1	General.....	68
10.6.2	Bath and Shower Fittings	68
10.6.3	Head Vanity Fittings	68
10.6.4	Tubs, Shower Pans, and Shower Doors.....	68
10.6.5	Miscellaneous Sinks and Faucets	68
10.6.6	Toilets.....	69
10.6.7	Spa.....	69
10.6.8	Flybridge	69

10.6.9	Exterior Hand Showers	69
10.7	Security Systems and Devices	69
10.7.1	Electronic Intrusion Detection System	69
10.7.2	Locks	69
10.7.3	Safes	69
10.8	Miscellaneous Deck Gear	69
10.9	Boarding Equipment	70
10.9.1	Passerelle	70
10.9.2	Boarding Stairs	70
10.9.3	Bulwark Doors/Step Plates	71
10.9.4	Doorbell/Doorphone System	71
10.10	Tenders and Davit	71
10.10.1	Overhead Sliding Davit	71
10.10.2	Folding Bulwarks	71
10.10.3	Hydraulic Deck Cranes	72
10.10.4	Removable Tender Cradles	72
10.11	Dive Compressor	72
10.12	Bedding	72
10.13	Tools	72
11.	PAINT SYSTEM.....	73
11.1	General	73
11.1.1	Shop primer	73
11.2	Surface Preparation	74
11.2.1	Steel	74
11.2.2	Aluminium	74
11.2.3	Other Metal Substrates	74
11.3	Coating Systems	74
11.3.1	Hull-Under Water	74
11.3.2	Hull-Above Water	75
11.3.3	Superstructure-Exterior Surfaces	75
11.3.4	Exterior Decks-Exterior, under wood deck covering	75
11.3.5	Exterior Decks-Underside of decks, behind ceiling panels	75
11.3.6	Exterior Decks-Cranes, Gantry Overhead Cranes, Passerelle	75
11.3.7	Hull-Interior	75
11.3.8	Bilges And Other Moisture Exposed Areas	75
11.3.9	Technical Spaces, Forepeak, Cofferdams, Engine-Aux. Rooms, Lazarette, Store Rooms	76
11.3.10	Engines, Equipment in Engine Room	76
11.3.11	Chain Locker	76
11.3.12	Exterior Wood-Bulwark linings, Ceiling panels	76
11.3.13	Interior Wood	76
11.4	Tank Coatings	76
11.4.1	Fresh Water Tanks	76
11.4.2	Black/Grey water	76
11.4.3	Lube Oil/Fuel Tanks	77
11.5	Quality Control	77
11.6	Acceptance Criteria	77
11.6.1	Non Faired Paint Work	77
11.6.2	Faired Paint Work	77
11.6.3	Gloss	77
11.6.4	Dust	78
11.6.5	Orange Peel	78
11.6.6	Fairness	78
11.6.7	Sags/Runs	78
11.6.8	Buffing	78
11.7	Exterior Coating System	78

11.7.1	Tank Coatings	78
12.	TEST AND TRIALS.....	79
12.1	General	79
12.2	Shop Test.....	79
12.3	Commissioning Engineers.....	80
12.4	Dockside Trials.....	80
12.5	Stability Test/Inclining Experiment.....	80
12.6	Sea Trials.....	81
12.6.1	Trial Conditions	81
12.6.2	Trials and Test to be conducted.....	81
12.6.3	Report of Sea Trial Results	82
12.6.4	Acceptance of Sea Trial Results.....	82

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1. GENERAL PROVISIONS

1.1 Intent

- It is the intent of the specification to establish as completely and accurately as possible a description of the ocean going displacement twin-screw tri-deck motor yacht.
- Conditions to be fulfilled in the construction of the yacht shall be set forth in the yacht construction agreement.
- Omissions from the specification or design drawings of any items required by any regulatory bodies or classification societies shall not release the builder from supplying any such required items at the builders expense solely.
- Specifications are subject to detailed development during the course of design and construction of the yacht.
- It is intended that the yacht be a turnkey yacht excluding specific Owner's supplied items.

1.2 Definitions

1.2.1 Terms

Approval:	The words "approval of the Owner" or "approval" shall mean an approval in writing signed by the Owner or her authorized representatives, and "approval" shall also mean approval by a regulatory authority or Classification Society.
Full Load:	The yacht complete in every aspect including outfit and tenders; with normal fluids circulating in all systems; with the standard complement and their effects aboard; with 100% percent of the total capacity of freshwater, grey water, black water, auxiliary gasoline, lubrication oil, and provisions and stores; and with fuel oil tanks loaded to 98%.
Half Load:	The yacht complete in every aspect including outfit, and tenders with normal fluids circulating in all systems, with the standard complement and their effects aboard, with one half the total capacity of diesel oil, fresh water, grey water, black water, auxiliary gasoline, lubrication oil, and provisions and stores.
Interior Decorator:	Evan K. Marshall
Naval Architect:	Murray and Associates, LLC
Yacht:	The 144' x 29'6" displacement yacht to be constructed.
Shipyard:	The words "Metalnave" or "Metalnave, Brazil" shall mean the Metalnave Group and all subsidiaries as may be involved in the construction of this yacht.

1.2.2 Abbreviations & Symbols

Ø:	Diameter
∠:	Angle
ABS:	American Bureau of Shipping
ASTM:	American Standards for Testing of Materials
AWS:	American Welding Society
BHP:	Brake Horsepower
CFM:	Cubic Feet per Minute
CO ₂ :	Carbon Dioxide
COLREGS:	International Regulations for the Prevention of Collisions at Sea
CPVC:	Chlorinated Polyvinyl Chloride
Cu:	Copper
CVK:	Center Vertical Keel
DFT:	Dry Film Thickness
DIN:	Deustche Industrie Norm
DNV:	Det Norkse Veritas

FB:	Flat Bar
GFCI:	Ground Fault Circuit Interrupt
GRT:	Gross Registered Tons
HP:	Horsepower
Hz:	Hertz (cycles per second)
HVAC:	Heating Ventilation and Air Conditioning
ID:	Inside Diameter
ILLC:	International Load Line Convention
IMO:	International Maritime Organization
ISO:	International Standards Organization
IWO:	In Way Of
kW:	Kilowatts
LH:	Left Hand
PLC:	Programmable Logic Controller
MCA:	Maritime and Coastguard Agency
MCR:	Maximum Continuous Rating
MDF:	Medium Density Fiberboard
NACA:	National Advisory Committee for Aeronautics
NC:	Numerically Controlled
Ni:	Nickel
NM:	Nautical Miles
NUC:	Not Under Command
NVIC:	Navigation and Vessel Inspection Circular
OD:	Outside Diameter
PSI:	Pounds per Square Inch (Gage Pressure)
PTO:	Power Take off
PVC:	Poly-vinyl Chloride
Qty	Quantity
RH:	Right Hand
SAE:	Society of Automobile Engineers
SNAME:	Society of Naval Architects and Marine Engineers
SOLAS:	Safety of Life at Sea
TEFC:	Totally Enclosed Fan Cooled
TV:	Television
UHMW:	Ultra High Molecular Weight (Plastic)
USCG:	United States Coast Guard
VAC:	Volts Alternating Current

1.3 Main Particulars

1.3.1 Dimensions

Length overall	44.0	Meters	144'	Feet
Length on waterline	39.1	Meters	128'3"	Feet
Beam	9.0	Meters	29'6"	Feet
Draft	2.77	Meters	9'1"	Feet (Approx.)
Lightship Weight	345	Metric tons	340	Long tons (Approx.)
Full Load Displacement	465	Metric tons	458	Long tons (Approx.)

The metric measurements shall be governing.

1.3.2 Performance

Top Speed	14.5 Knots (Approx.)
Normal Cruising Speed	13.25 Knots (Approx.)
Long Range Cruising Speed	12.0 Knots (Approx.)
(Trans-Pacific Range)	11.5 Knots (Approx.)

All speeds shall be defined at half load. Top speed shall be obtainable at the maximum instantaneous rating of the engine as defined by the engine manufacturer (Zone 2-4). Normal cruising speed shall be obtainable at the maximum periodic rating of the engine (Zone 1-2). The long-range cruising speed shall be obtainable at 100% of the MCR as defined by the engine manufacturer (Zone 1). Sea and weather conditions shall be as defined in the Sea Trials section of this specification.

1.3.3 Tank Capacities

Diesel Oil	76400	Liters	20183	Gallons
Fresh Water	22000	Liters	5812	Gallons
Grey Water	5525	Liters	1460	Gallons
Black Water	3400	Liters	900	Gallons
Lubrication Oil Tanks	4000	Liters	1057	Gallons

These capacities are considered desirable target values. The Naval Architect shall determine definite volumes based on range and other operational requirements. The liters shall be governing, with the U.S. gallon values shown here only for convenience.

1.4 Project Management

Metalnave shall manage the project. It shall be Metalnave's responsibility for all project scheduling and planning. Metalnave shall in conjunction with the Naval Architect, develop a schedule for the delivery of all required engineering information such as drawings. It shall be the responsibility of the Naval Architect to meet that schedule, however, the Naval Architect shall not be held responsible for any delays in delivery of as a result of shipyard changes. Furthermore, Murray & Associates current schedule of drawing delivery to Metalnave shall be based on a three-week approval process from the classification society. Murray & Associates, LLC will not be responsible for any project delays as a result of the longer than expected approval time.

Owner will provide their own project manager per the terms of the Construction Agreement and the shipyard will provide furnished office space, telephone service, and e-mail service for this person. Office space will have no cost. Telephone and email services shall be billed to the Owner at cost.

1.5 Design Consultants

The naval architecture, marine engineering, structural engineering, and mechanical engineering shall be responsibility of Murray and Associates, LLC. Murray and Associates shall supply the required drawings for the construction of the yacht with the exception of any interior details.

The detailed interior and decoration of the yacht shall be the responsibility of Evan K. Marshall. He shall be referred to as the interior decorator or designer.

The vessel builder and owner reserve the right to utilize the services of other consultants at any time during the project without prior notification and/ or acceptance by the aforementioned design consultants.

1.6 Builder

The builder shall be Metalnave, Brazil.

1.7 Classification and Regulatory Compliance

1.7.1 Classification

The yacht and its systems shall be designed to and constructed to the requirements of the Det Norske Veritas (DNV). The yacht shall carry the following class notation: ✱ 1A1 LC R0 E0 Yacht. Each symbol indicating:

- ✱ Indicating yacht built under the supervision of DNV
- 1A1 Indicating yacht with machinery and equipment are found to be in compliance with the Rules.
- LC Indicating light craft
- R0 Indicating a service area restriction:
Service area restrictions R0 to R6, given in nautical miles and representing the maximum distance from near harbor or safe anchorage. For R0 the restriction is 300 nautical miles during winter, no restrictions in summer or tropical waters. For the various service notations the restrictions are related to the zones, areas and seasonal periods as defined in the International Convention of Load Lines, 1966.
- E0 Indicating the yacht will have special equipment or systems for periodically unattended machinery space

Metalnave shall be responsible for all records as required by DNV, such as material and equipment certificates.

1.7.2 Tonnage

The yacht shall be admeasured under *The International Convention on Tonnage Measurement of Ships, 1969*. The tonnage of the yacht will be less then 500 Gross Registered Tons but more then 400 GRT at time of delivery.

1.7.3 Maritime and Coastguard Agency Compliance

Furthermore, the yacht will be designed and constructed to comply with *The Code of Practice for Safety of Large Commercial Sailing & Motor vessels*. The code applies to vessels over 24 meters in load line length that are in commercial use for sport or pleasure and do not carry more then 12 passengers. Since it is anticipated that the tonnage will be less then 500 GRT, the sections of the code for vessel's less then 50m and less then 500 GRT shall be used. It is anticipated that the yacht will be flagged in the Cayman Islands.

1.7.4 International Convention on Load Lines, 1969

Since the yacht is intended for commercial service, the yacht will comply with the International Load Line Convention, 1996, and as such will be fitted with load markings.

1.7.5 International Convention on the Prevention of Pollution from Ships

The yacht shall comply with the International Convention on Prevention of Pollution from Ships, 1973 (Marpol 73/78) as currently amended.

1.7.6 COLREGS

Additionally, the yacht shall be outfitted and equipped as required by the International Regulations for the Prevention of Collisions at Sea, COLREGS 1972, as amended November 1989.

1.7.7 Certificate and Documents to be Carried Onboard

The builder shall provide the Owner at delivery all the certificates and documents required by international regulations, the classification society, and the flag state. The certificates and documents supplied shall include the following:

- Full Term Certificate of Classification
- ITC 1969 Tonnage Certificate
- Panama Canal and Suez Canal Tonnage Certificates
- Maritime and Coast Guard Agency Large Yacht Certificate of Compliance

- International Load Line Certificate
- Safety Radio Certificate
- Radio Equipment Certificate
- Intact and Damaged Stability Booklet(s) (Approved)
- Oil Record Book
- Shipboard Oil Pollution Emergency Plan (SOPEP)
- International Oil Pollution Prevention Certificate
- Derating Certificate
- Any other certificates which shall be required at time of commissioning by any authority having such jurisdiction

1.8 Change Orders

- Amendments to these specifications, whether initialized by the Owner or by the Builder shall at all instances be documented on a sequentially numbered change order form, regardless whether or not any costs are involved.
- These change orders must specify any changes in costs, weights, trim and the delivery schedule.
- In case the Owner has during the course of construction communicated to the Builder his desire to make a certain change, requested additional work to be carried out or additional items to be installed, then the Builder shall within the shortest possible time, submit to the Owner a written quotation of the increase or the decrease in the costs and the additional time, if any, needed for executing the additional work.
- The Owner or his representative shall, within ten working days, respond by returning to the Builder the corresponding change order, either duly signed for acceptance or rejected.
- During the process of negotiating the change order, no work covered under the change order shall be carried out. Under no circumstance can the Owner be held liable for any costs or delays resulting from unapproved additional work.
- Additional costs or credits resulting from any duly signed change order shall be invoiced with the final payment unless otherwise agreed by the Owner and the builder.

1.9 Drawings and Design Information

All drawings of general management, design detail and invention, are the property of Murray and Associates, LLC and may be used solely for the work contracted or by express written permission of Murray and Associates, LLC. All drawings are subject to detail development during the course of construction.

Section	Dwg.#			Title
Arrangements & Profiles (1000 Series)	M-	241	- 1101	Lines Plan
	M-	241	- 1102	Profile and General Arrangement
	M-	241	- 1201	Profile Arrangement
	M-	241	- 1202	Main and Lower Deck Arrangement
	M-	241	- 1203	Upper and Flybridge Arrangement
	M-	241	- 1206	Engine Room Arrangement
	M-	241	- 1207	Tank Capacity Plan
	M-	241	- 1208	Fire And Safety Plan
	M-	241	- 1209	Structural Fire Protection
	M-	241	- 1401	Cathodic Protection Plan
	M-	241	- 1402	Docking Plan
	M-	241	- 1501	Anchor System And Chain Box Detail
	M-	241	- 1502	Anchor Windlass Arrangement
	M-	241	- 1601	Boot top stripe layout/ Draft Marks
	M-	241	- 1901	Mooring Arrangement
M-	241	- 1902	Tender Layout	

	M-	241	-	1903	Freeing Ports Arrangement
Structural (2000 Series)	M-	241	-	2101	Midship Section
	M-	241	-	2102	Hull and Main Deck Scantlings
	M-	241	-	2103	Hull Frames (yard)
	M-	241	-	2104	Hull Plates Arrangement
	M-	241	-	2105	Tank Top Plate Arrangement
	M-	241	-	2106	Curved Plate Bending Instructions
	M-	241	-	2107	Hull Welding Details and Instructions
	M-	241	-	2108	Centerline Bulkhead Arrangement
	M-	241	-	2109	Foredeck Stair Detail
	M-	241	-	2110	Transverse Sections
	M-	241	-	2201	Upper Deck & Main Deck House Scantlings
	M-	241	-	2202	Superstructure Frames (Yard)
	M-	241	-	2203	Flybridge Deck & Upper House Scantlings
	M-	241	-	2204	Superstructure Welding Details
	M-	241	-	2205	Bi-metallic Offsets
	M-	241	-	2206	Longitudinal Sections
	M-	241	-	2207	Shell Plates Expansion
	M-	241	-	2208	Superstructure Bulkhead Main Deck
	M-	241	-	2209	Superstructure Bulkhead Upper Deck
	M-	241	-	2301	Mast & Arch Design
	M-	241	-	2302	Mast Equipment Layout
	M-	241	-	2401	Aft Deck Lockers & Head Box
	M-	241	-	2402	Fly Bridge Bar
	M-	241	-	2403	Hot Tub Design/Installation
	M-	241	-	2950	Stiffener Endcuts Details
	M-	241	-	2951	Hull Modules 1-4
	M-	241	-	2952	Superstructure Modules 5-9
	M-	241	-	2956	Fore Deck Storage
	M-	241	-	2960	Typical Tank Detail
	M-	241	-	2961	Tank Pad Layout
	M-	241	-	2963	Transom Arrangement
	M-	241	-	2964	Exterior Stair to Bridge Wings
	M-	241	-	2965	Transom Door Arrangement
M-	241	-	2966	Aft Stairs to 01 Deck	
M-	241	-	2967	Forward Crew Stairs	
M-	241	-	2968	Lazarette Stairs	
M-	241	-	2969	Main Stairs	
M-	241	-	2970	Aft Crew Stairs	
M-	241	-	2971	Upper Main Stairs	
M-	241	-	2972	Fly Bridge Stair	
M-	241	-	2980	Rubrail Detail	
M-	241	-	2981	Upper Deck Settee's	
M-	241	-	2982	Port Light Details	
M-	241	-	2983	Wingstation Details	
Mechanical (3000 Series)	M-	241	-	3101	Shafting Line Arrangement
	M-	241	-	3102	Main Engine Exhaust (vendor Supplied)

	M-	241	-	3103	Shaft Details
	M-	241	-	3104	Strut Design/Installation
	M-	241	-	3105	Main Engine Mounting Brackets
	M-	241	-	3201	Generator Foundations
	M-	241	-	3203	Generator Exhaust (Vendor Supplied)
	M-	241	-	3301	Fuel Supply and Return System
	M-	241	-	3302	Fuel Transfer System
	M-	241	-	3401	Lubricating Oil System
	M-	241	-	3501	Steering Gear Foundations & Installation
	M-	241	-	3502	Steering System (Vendor Supplied))
	M-	241	-	3503	Rudder Design & Construction
	M-	241	-	3504	Rudder Stock Details
	M-	241	-	3505	Passarelle Installation
	M-	241	-	3506	Hydraulic System Layout (Vendor Supplied)
	M-	241	-	3507	Roll Stabilizer Installation
	M-	241	-	3508	Bow Thruster Installation
	M-	241	-	3509	Welding Specifications for Rudder
	M-	241	-	3510	Steering Gear Arrangement (Vendor)
	M-	241	-	3511	Overhead Crane (Vendor Supplied)
	M-	241	-	3512	Tender Doors Construction and Layout
	M-	241	-	3513	Side Boarding Ladder Arrangement
	M-	241	-	3701	Chilled Water System
	M-	241	-	3702	Engine Room Ventilation
	M-	241	-	3801	Compressed Air System
	M-	241	-	3802	Transom Door Details (Mechanism Gullwing)
	M-	241	-	3803	Passarelle Door & Bulwark Gate Details
	M-	241	-	3804	Liferaft Door Details
	M-	241	-	3805	Handrail Details
	M-	241	-	3806	Typical Window Installation Details
	M-	241	-	3807	Typical Door Installation Details
	M-	241	-	3808	Watertight Door Installation Detail
	M-	241	-	3809	Lifering Stowage
	M-	241	-	3810	Forward Walkway Rail Details
	M-	241	-	3811	Exterior Overhead Layout Details
	M-	241	-	3812	Foredeck Bell stand and Anchor Locker Hatch
	M-	241	-	3813	Hi-Fog Placement Details
	M-	241	-	3814	Windscreen Flybridge
Plumbing (4000 Series)	M-	241	-	4101	Fresh Water System
	M-	241	-	4201	Sea Water System
	M-	241	-	4202	Sea Chest Details
	M-	241	-	4301	Grey Water System
	M-	241	-	4302	Black Water System
	M-	241	-	4401	Bilge and Fire Main System
	M-	241	-	4501	Exterior Drainage System
Electrical (5000 Series)	M-	241	-	5101	Electrical One Line Diagram
	M-	241	-	5301	Lighting and Receptacle Plan
	M-	241	-	5302	Emergency Lighting Plan

	M-	241	-	5401	Navigation Lights
	M-	241	-	5902	Sub Panels
Documents (6000 Series)	M-	241	-	6000	Construction Specification
	M-	241	-	6001	Equipment Number Calculation
	M-	241	-	6100	Weight Estimate
	M-	241	-	6200	Speed and Powering Prediction
	M-	241	-	6300	Electrical Load Analysis
	M-	241	-	6301	Emergency Load Analysis
	M-	241	-	6401	Incline Test Procedure
	M-	241	-	6402	Incline Test Report
	M-	241	-	6403	Stability Information Booklet
	M-	241	-	6404	Damage Stability Information
	M-	241	-	6405	Watertight Integrity Plan
	M-	241	-	6500	Tonnage Model/Calculations Review

This is a preliminary list of drawings and documents; additions, or changes in drawing descriptions, or deletions of drawings not deemed appropriate by the Naval Architect, may be made during the course of the project. This drawing list includes drawings, which may not be modified from the original design if not required for construction or classification review.

Drawings may be provided supplied by the vendor for the appropriate system or equipment. The Architect shall provide the vendor with the layout of the yacht as required for the complete integration of the system into the yacht. Installation drawings shall be provided by Architect assuming that the vendor can provide CAD drawings of items they are supplying. The tender arrangement drawing will be supplied based on the tenders selected.

1.10 Discrepancies

In the case of any discrepancies between the various documents relating to the construction of the yacht, the following shall be the priority:

- Yacht Construction Agreement
- Regulatory Requirements (note: contract relief may be granted in the event of a conflict with respect to regulatory requirements, but must be approved in writing)
- Construction Specification
- Specification Drawings

1.11 Weight, Trim and Stability

The Naval Architect shall produce a preliminary weight and centers estimate for the yacht. The weight estimated shall be updated as required by the Naval Architect using empirical data supplied by the builder. Periodic weighing of the yacht at various stages of the construction, using certified & calibrated load cells at the shipyard expense, shall further monitor the yacht's weight.

When the yacht is complete in every aspect, and with a full load of fuel aboard, the yacht shall not trim more than 5" between perpendiculars by the stern nor more than 1" by the head. The builder shall be permitted to place on the yacht no more than four (4) metric tons of ballast in order to achieve the above-required trim. The yacht shall be design to meet the intact and damage stability requirements of MCA Code.

The Naval Architect as part of the dock trials shall conduct an inclining experiment on the yacht. The test shall be witnessed as required by the MCA. The Naval Architect shall supply Metalnave with a stability booklet for the yacht per the requirements of MCA based on the inclining test. The stability booklet shall show the yacht complies with the requirements of the MCA code without any laminations imposed.

1.12 Delivery and Commissioning of Yacht

The yacht shall be delivered to the Owner complete in every aspect with all systems functioning and ready in every aspect for use. All decks shall be wiped dry and thoroughly clean of all foreign matter. Upon delivery and acceptance of the yacht by the Owner, two (2) sets in books of all documents, including manuals for equipment and as-built drawings, shall be supplied to the Owner.

1.13 Overall equipment on board vessel

For future maintenance items the yacht shall be outfitted with equipment that readily accessible in both the United States and Europe.

1.14 Storage of Equipment / Goods

The Builder shall provide storage for all of the yacht's equipment and goods from the moment of acceptance of their delivery to the shipyard. All equipment shall be stored under cover in an enclosed, segregated, separately secured, climate controlled area. All items are to be logged in to an inventory system and labeled with the project number and inventory number. It is the builder's responsibility to protect and inspect all equipment and goods prior to installation, during installation, and after installation until the point of delivery of the finished yacht. All items are to be available for inspection by the Owner's representative during all normal business hours.

2. HULL CONSTRUCTION

2.1 General

All frames shall be NC (numerically controlled) cut using information supplied by the Naval Architect. The Naval Architect shall nest all frames for cutting. Coding shall be the responsibility of Metalnave or the subcontractor selected for cutting. The exposed sections of the main deck shall have 100 mm camber over the full beam while the interior sections of the deck shall be flat.

2.2 Material Specifications & Handling

- a) The structural steel for the construction of the yacht shall be DNV grade NVA normal strength steel.
- b) The builder is to maintain purchasing documents containing a clear description of the materials ordered for use in construction and the standards to which the material must conform, together with the identification and certification requirements.
- c) The builder is to be responsible to ensure that all incoming plates, sections, castings, components, fabrications and consumables and other materials used in the construction are inspected or otherwise verified as conforming to purchase order requirements.
- d) The builder is to record on receipt the manufacturing date, or use-by date of all time critical materials.
- e) The builder is to establish and maintain a procedure to ensure that materials and consumables used in the construction process are identified from arrival in the yard through to fabrication in such a way as to enable the type and grade to be readily recognized.
- f) Where materials are found to be defective, they are to be rejected in accordance with the builder's quality control procedure.

2.3 Welding Standards

2.3.1 Welding Consumables

- a) All welding consumables are to be approved by the DNV and are to be suitable for the type of joint and grade of material.
- b) All brand names, under which a tested and approved welding consumable is marketed, are to be registered by the DNV. In order to avoid duplication of test, the manufacturer is to certify that the welding consumables marketed under alternative brand names are identical with the consumable tested for approval.
- c) Only approved filler wires are to be used.

2.3.2 Welder Qualifications

- a) The responsibility for selection, training and testing of weld operators rests with the Builder. The Builder is to test welding operators to a suitable National Standard. Records of tests and qualifications are to be kept by the builders and made available to the DNV so that they can be satisfied that the personnel employed during the construction of the craft can achieve the required standard of workmanship.
- b) Important welding operations are to be carried out under daily supervision of an inspector, who has the experience and qualifications, which enable him to judge this type of work. The work of each welder is to be regularly examined.
- c) The welding processes for which qualifications are required are those, which are designated as manual or partly, mechanized welding.
- d) Welding operator using fully mechanized or fully automatic processes need generally not pass an approval testing. However, operators are to receive adequate training in setting or programming the operating the equipment.

2.3.3 Welding Procedures

- a) The approved arrangements, sequence and procedures are not to be departed from without the prior approval of the DNV.
- b) Careful consideration is to be given to assembly sequence and overall shrinkage of plate, panels, assemblies, etc., resulting from welding processes employed. Where practicable, welding is to commence

at the center of an assembly and progress outwards toward the perimeter so that each part has freedom to move in one or more directions. Generally, the welding of stiffener members including transverses, frames, girders, etc., to welded plate panels by automatic processes is to be carried out in such a way as to minimize angular distortion of the stiffener.

- c) Butt welds are to be finished full at the ends and cut back before welding the seams.
- d) Precautions are to be taken to screen and pre-warm as necessary the general and local weld areas. Surfaces are to be clean and dry.
- e) The owner reserves the right to perform non-destructive weld tests on the vessel at any time during construction. The cost of the test will be billed to the owner if the tested weld passes. If the tested welds fail the shipyard will cover the cost of the test.

2.3.4 Welding Preparation

- a) The preparation of plate edges is to be accurate and essentially free from blemishes. All joints are to be properly aligned and closed before welding. Excessive force is not to be used in fairing and closing the work. Means are to be provided for holding the work in proper alignment without rigid restraint during welding operations. Where excessive gaps exist between surfaces or edges to be joined, the corrective measures adopted are to be to the satisfaction of the classing agency.
- b) Parts are to be set up and welded in such a way that contraction stresses are kept to a minimum.
- c) Before a manual-sealing run is applied to the back of a weld, the original root run is to be cut back to sound metal.
- d) Joint edges are to be scratch brushed (or other acceptable method), immediately before welding, in order to remove oxide or adhering films or dirt and filings.
- e) The surfaces in way of all parts to be welded are to be clean, dry, and free from grease and other contaminants which might adversely affect weld quality by cleaning with suitable chemicals or solvents.

2.4 Principles of Design

2.4.1 General Scantlings

The general scantlings for the yacht are as follows:

Item	Size
Side shell plate	6 mm
Bottom plate- Forward of Fwd Engine Room Bulkhead	8 mm
Bottom plate- Aft of Fwd Engine Room Bulkhead	10 mm
Tank top plate	8 mm
Side shell web frames	150 x 6 mm with 80 x 10 mm Face Plate
Main deck plate	6 mm
Side shell longitudinals	65 x 6 mm Flat Bar
Bottom longitudinals	80x 8 mm Flat Bar
Center vertical keel	6 mm
Tank baffles plate	6 mm
Tank end plates	6 mm
Tank end vertical stiffeners	75 x 6 mm Flat Bar
Harpin	8 mm
Bulkhead plating	6 mm
Bulkhead stiffeners	100 x 75 x 6 mm ∠
Main deck longitudinals	50 x 8 mm Flat Bar
Main deck longitudinal girder	330 x 6 mm with 120 x 10 mm Flange
Main deck transverse web frames	330 x 6 mm with 80 x 10 mm Flange (typical)
Keel Bar	230 x 20 mm

The hull frame spacing shall be 760 mm with half frames in the forward portion of the yacht.

2.4.2 Hull Tanks

The yacht shall be fitted with the following hull tanks that shall be built integral with hull structure:

Tank	Capacity Liters	Location
<i>Fuel Oil Tanks</i>		
Fwd Port Fuel Oil	12,300	Port, Frame 26 to Frame 30, outboard to shell
Fwd Starboard Fuel Oil	12,300	Starboard, Frame 26 to Frame 30, outboard to shell
Aft Port Fuel Oil	11,000	Port, Frame 18 to Frame 24, 1230 mm to shell
Aft Starboard Fuel Oil	11,000	Starboard, Frame 18 to Frame 24, 1230 mm to shell
Aft Centerline Fuel Oil	19,000	Centerline, Frame 18 to Frame 26, outboard to 1230 mm
Fuel Oil Day Tanks (P &S)	10,800	Port & Starboard, Frame 16 to 18, outboard corner of engine room
<i>Freshwater Tanks</i>		
Fwd Port Fresh water	6,700	Port, Frame 33 to Frame 36, outboard to shell
Fwd Starboard Fresh water	6,700	Starboard, Frame 33 to Frame 36, outboard to shell
Aft Fresh water	8,700	Centerline, Frame 2 to 7, outboard to 2100 mm
<i>Lubrication Oil Tanks</i>		
Dirty Lube Oil Tank	2,400	Centerline, Frame 13 to Frame 15, outboard to 1230 mm
Clean Lube Oil Tank	1,600	Centerline, Frame 15 to Frame 17.5, outboard to 1230 mm
<i>Waste Tanks</i>		
Grey Water	5,540	Centerline, Frame 37 to Frame 39, outboard to 1230 mm
Black Water	3,400	Port and starboard, Frame 24 to Frame 26, 1230 mm to 2100 mm

All tanks shall be provided with Gem tape located in the deepest part of the tank for sounding.

Deep suction stripping piping from each fuel tank to the engine room pumping system to allow the convenient removal of water and sludge from each tank.

2.5 Watertight Bulkhead Penetrations

Watertight bulkhead penetrations shall conform to the DNV requirements and standards and shall be manufactured by CSD systems:

CSD North America
880 Candia Road
Manchester, NH 03109

3. SUPERSTRUCTURE CONSTRUCTION

3.1 General

All frames shall be NC (numerical controlled) cut using information supplied by the Naval Architect. The Naval Architect shall nest all frames for cutting. Coding shall be the responsibility of Metalnave or the subcontractor selected for cutting.

All exterior decks shall have camber while the interior decks shall be flat.

3.2 Material Specifications and Handling

- a) The materials used in construction of the superstructure shall be DNV class approved. In general the aluminum used for the construction of the superstructure is to be, 5083-H116. Aluminum for some extrusions, and certain other applications shall be 6061-T6 or suitable Marine-Grade equivalent.
- b) The builder is to maintain purchasing documents containing a clear description of the materials ordered for use in construction and the standards to which the material must conform, together with the identification and certification requirements.
- c) The builder is to be responsible to ensure that all incoming plates, sections, castings, components, fabrications and consumables and other materials used in the construction are inspected or otherwise verified as conforming to purchase order requirements.
- d) The builder is to record on receipt the manufacturing date, or use-by date of all time critical materials.
- e) The builder is to establish and maintain a procedure to ensure that materials and consumables used in the construction process are identified from arrival in the yard through to fabrication in such a way as to enable the type and grade to be readily recognized.
- f) Where materials are found to be defective, they are to be rejected in accordance with the builder's quality control procedure.

3.3 Welding Standards

3.3.1 Welding Consumables

- a) All welding consumables are to be approved by the DNV and are to be suitable for the type of joint and grade of material.
- b) All brand names, under which a tested and approved welding consumable is marketed, are to be registered by the DNV. In order to avoid duplication of test, the manufacturer is to certify that the welding consumables marketed under alternative brand names are identical with the consumable tested for approval.
- c) Only approved filler wires are to be used.
- d) The 5083 and 5086 alloys are nominally welded using the 5356,5556 or 5183 consumables and the 6061 and 6082 alloys are normally welded using the 4043 consumables.
- e) Cast Aluminum alloys are not in general to be welded directly to wrought high magnesium alloys unless the welding is carried out in accordance with an agreed procedure.
- f) The owner reserves the right to perform non-destructive weld tests on the vessel at any time during construction. The cost of the test will be billed to the owner if the tested weld passes. If the tested welds fail the shipyard will cover the cost of the test.

3.3.2 Welder Qualifications

- a) The responsibility for selection, training and testing of weld operators rests with the Builders. The Builders are to test welding operators to a suitable National Standard. Records of tests and qualifications are to be kept by the builders and made available to the DNV so that they can be satisfied that the personnel employed during the construction of the craft can achieve the required standard of workmanship.
- b) Important welding operations are to be carried out under daily supervision of an inspector, who has the experience and qualifications, which enable him to judge this type of work. The work of each welder is to be regularly examined.
- c) The welding processes for which qualifications are required are those, which are designated as manual or partly, mechanized welding.

- d) Welding operator using fully mechanized or fully automatic processes need generally not pass an approval testing. However, operators are to receive adequate training in setting or programming the operating the equipment.

3.3.3 Welding Procedures

- a) The approved arrangements, sequence and procedures are not to be departed from without the prior approval of the DNV.
- b) Careful consideration is to be given to assembly sequence and overall shrinkage of plate, panels, assemblies, etc., resulting from welding processes employed. Where practicable, welding is to commence at the center of an assembly and progress outwards toward the perimeter so that each part has freedom to move in one or more directions. Generally, the welding of stiffener members including transverses, frames, girders, etc., to welded plate panels by automatic processes is to be carried out in such a way as to minimize angular distortion of the stiffener.
- c) Butt welds are to be finished full at the ends and cut back before welding the seams.
- d) Precautions are to be taken to screen and pre-warm as necessary the general and local weld areas. Surfaces are to be clean and dry.

3.3.4 Welding Preparation

- a) The preparation of plate edges is to be accurate and essentially free from blemishes. All joints are to be properly aligned and closed before welding. Excessive force is not to be used in fairing and closing the work. Means are to be provided for holding the work in proper alignment without rigid restraint during welding operations. Where excessive gaps exist between surfaces or edges to be joined, the corrective measures adopted are to be to the satisfaction of the classing agency.
- b) Parts are to be set up and welded in such a way that contraction stresses are kept to a minimum.
- c) Before a manual sealing run is applied to the back of a weld, the original root run is to be cut back to sound metal.
- d) Joint edges are to be scratch brushed (or other acceptable method), immediately before welding, in order to remove oxide or adhering films or dirt and filings.
- e) The surfaces in way of all parts to be welded are to be clean, dry, and free from grease and other contaminates which might adversely affect weld quality by cleaning with suitable chemicals or solvents.

3.4 Principles of Design

3.4.1 Scantlings

The yacht's midship section shall detail the superstructure scantlings. The frame spacing for the superstructure is 760 mm. The general scantling for the yacht shall be:

Item	Size
House side plating	5 mm
House side longitudinals	50 x 6 mm Flat Bar
Deck transverse frames	250 x 5 mm with 80 x 10 mm Face Plate
House side verticals (main deck)	150 x 5 mm with 80 x 10 mm Face Plate
House side verticals (upper deck)	150 x 5 mm with 75 x 8 mm Face Plate
Window headers	150 x 5 mm with 50 mm Flange
Main Deck plate	6 mm (Steel)
Upper Deck plate	5 mm
Deck longitudinals	50 x 6 mm Flat Bar
Longitudinal deck girders	250 x 5 mm with 80 x 10 mm Face Plate

Details of the structural design of the arch are to be determined per drawing, M-241-2301, Mast and Arch Design.

3.4.2 Bi-metallic Structural Transition Joint

The yacht shall be fitted with a bi-metallic strip at the intersections of the hull and the superstructure. Detacouple® 9009 or similar, 0.75" in thick by 0.75" wide, or equal shall be used. In accordance with standard practice, the steel welding shall be done prior to the aluminum welding to eliminate the possibility of distortion.

4. JOINER WORK

4.1 General

- The quality of the interior of the entire yacht shall be of highest northern European yacht standards on par with other world-class mega yacht Shipyards. The quality of the joiner work is to be of First European Yacht Quality and comparable to current Feadship of The Netherlands yacht standards.
- No space shall be left unused. Wherever possible the builder shall make all “dead” space suitable to be used for bookshelves, storage lockers, etc.
- The minimum headroom shall be 2150 mm for all public spaces.
- The shipyard will ensure that the accommodation joinery shall be in no way stressed by flexing of the hull structure.
- All locker doors and drawers will have push-pull catches, and doors will have magnetic closing holds.
- Care will be taken that the joinery does not obstruct any equipment or systems that require access.
- All upholstery and fabrics throughout shall comply with the MCA Code with regard to ignition and flammability.
- All full height partitions shall be studded walls with acoustic plywood dB panels, or panels with acoustic treatment in between panels. All interior partitions, walls to be sealed to deckheads with insulating material to prevent sound transmission between compartments. Joiner panels for shower and bath surrounds are to be constructed using water resistant materials.
- Floors will be of the floating type, floors, linings and ceilings will be isolated from the structure as per the recommendations of the acoustic specifications.
- Care is to be taken in the installation of all joiner work to ensure that all parts of the hull are adequately ventilated.
- Joiner work will not be commenced until the runs for principal piping, electric cables, vent ducts, etc., are in place and any possible interference with the joiner work has been determined.
- Linings and ceilings will be fitted with removable panels in way of piping, ventilation ductwork or electrical wiring requiring periodic inspection.
- Joiner bulkheads, linings and ceilings will not be used to support heavy items of equipment. The ship’s structural bulkheads, framing or wood furring will support such items.
- All plywood and MDF if permitted by MCA regulations, to be multi-layered, marine type waterproof grade “A” quality.
- All fastening holes of molding and trim to be counter bored and plugged using the same material.
- Interior woodwork of Owner and guest areas to be executed by yacht specialist cabinetmakers. Wood to be selected by the designer from samples provided by the shipyard. Veneers for interior to show as little contrast as possible and be book matched. All cabinets and drawers are to be lined as per builders standard.
- All hidden inside areas of cabinetry, paneling and overheads etc. will be coated with a suitable sealer to prevent swelling/shrinkage, insects, vermin and fungal attack.
- All beds shall have storage underneath, with access provided by lifting the bed deck with the aid of pneumatic rams. Bed deck to have positive locks for securing in the closed position.
- All interior joinery will be built per the interior designers specifications, renderings, drawings and designs.

4.2 Quality Standard for Wood

- All the wood and wood products used onboard shall be first class quality and shall be well-seasoned, free of splits, checks, insects, insect larva, sap, or knots.
- Furthermore all wood and wood products shall be of a kind and quality well suited for the use intended.
- The woods moisture content shall be between 14% and 18% and shall be stored in a covered and ventilated storage area. I shall be purchased well in advance of it intended use so it can acclimate to the climate. The wood shall be observed for any abnormalities during this period.

4.3 Owner Party and Guest Accommodations

- Rooms shall be decorated per the selections of the decorator and per the general arrangement, to be clarified and defined.

4.4 Crew Quarters

- Rooms shall be constructed and decorated in conjunction with the interior specifications
- Forward starboard crew stateroom to have key in a glass fronted red box mounted next to the entrance door for access to escape hatch located in forward starboard crew head.

4.5 Exterior

- All exterior furnishing shall be bolt on aluminum. They shall be designed per the interior designer to include refrigerator, ice maker, BBQ grille, bar and sink, sun pads, two tables, stereo system and speakers.
- The teak deck installed on main deck carries two layers of wood: a plywood substrate and, atop that, a TDS pre-assembled teak decking element.

The plywood substrate shall be ¾" XL-50 pressure-treated marine plywood, kiln dried to 12% moisture content, glued to the steel using TEAKDECKING SYSTEMS specialized flexible epoxy, FE180A, which was developed for this purpose.

The yard shall follow coating manufacturer's instructions for surface preparation and coating of steel, eg: the steel deck shall be sandblasted per SSPC-SP63 to a 3-4 mil profile, then primed with 2-3 coats of a commercially approved epoxy primer to adequately fill blast profile. The surface should then be faired to within a 4 mm variance over 1m² area. Good boat building practice must be followed to ensure that there are no voids between the steel deck and the plywood.

The plywood shall be glued into place with TDS FE180A fitting epoxy, using threaded steel studs spot-welded to the steel deck, fastened with compatible washers and nuts to fix the plywood in place and apply pressure. These fasteners shall be left in place, but finished below the surface of the plywood substrate. Plywood edges should fit within ¾" steel flatbar continuous welded to the deck plate, ¾" steel angle bonded to the steel deck, or be edge-banded with solid teak where necessary to seal the plywood edges. Individual plywood panels shall be spaced a minimum of 2.5 mm apart, with the space filled with TDS FE180A fitting epoxy to allow for expansion.

Following completion of the plywood substrate, the entire surface of the plywood shall be sealed with an epoxy sealing, such a West 105/205 or equivalent.

The TDS teak decking elements are then glued and fastened to the plywood substrate in the specified manner. Margin planks in way of steel flat bar or angle edging shall cover and overlap the top of the steel edging, allowing water to shed directly into the adjacent waterway.

- Teak shall be TECTONA GRANDIS, FEQ (First European Quality) Burmese teak, quarter sawn (45°-90°) and specially selected to yacht decking clear grade standard, kiln dried to 10-12 % moisture. All planks to be free from injurious worm or bee holes, splits, shakes, sapwood, knots, ingrown bark, wane, heart centers or imperfections due to heart center, excessive discoloration, rot, or other injurious defects.

Teak planks in field to deck to be fitted to a fiberglass or phenolic backer, creating a panel system. This practice will minimize fastener penetrations while providing an additional water barrier, stabilizing plank movement, and allowing for full depth caulk seams between planks – increasing the useful life of the teak.

- Exterior overhead shall be cellular marine polymer (9.5-mm thickness) with a density of 0.024 lb/in³ such as King Starboard XL, finished per designers' arrangements.

- Grab rails shall be fitted in order to permit the safe movement of persons during severe weather conditions.

4.6 Engine Room

- The insulation shall be covered with 33% perforated aluminum, painted white.

4.7 Finish Details

4.7.1 Furniture, Hardware

- All interior hardware is subject to interior designer requirements
- In the crew areas, all furniture hardware shall be satin-finish stainless steel.
- In the Owner's and guest areas, all furniture hardware shall be polished brass finish.
- All doors and drawers shall be provided with seagoing catches and/or positive locking devices to prevent rattling or spontaneous opening in a seaway.
- All doors to have three ball-bearing hinges, with middle hinge reversed.
- Handrails shall be fitted in order to permit the safe movement of persons during severe weather conditions. Interior handrails shall be polished stainless steel, varnished wood, or wrapped wood as selected by the interior designer.
- As shall be requested/indicated by the Owner or the designer, invisible secure hanging/fixing of pictures, sculptures and similar items shall be provided.
- Unobtrusive/concealed access panels shall be fitted where necessary or advantageous.

4.7.2 Ceilings

- Unless specifically mentioned otherwise, all ceiling panels are to be flush and easily removable.
- Ceilings shall conceal all ducting, cables and other services.
- No fittings or fixtures shall be installed on ceiling panel joints.
- Largest ceiling panel size not to exceed 1000 mm x 2000 mm

4.7.3 Window Shades

- Main deck saloon, dining room, Owner' Stateroom, and captain's cabin to be fitted with electronically operated and fully closing dress curtains.
- Guest cabins and bathrooms to be fitted with electronically operated blinds or full drapes
- Narrow duet blinds in all sleeping cabins for the portlights shall be provided.
- Portlight box lining and internal lining, where visible, will be painted white with .

4.7.4 Furniture

- Fiddles are to be applied to top surfaces where appropriate per designer and class society requirements.
- Where required the joinery work shall be modified to allow for air conditioning grills.
- The insides of cupboards and wardrobes are to be finished in a manner to match the exterior finish and are to include drawers, hanging rails, shoe racks, shelves, storage racks, bookshelves and built-in provisions for TV, video, and stereo and other entertainment equipment per Designer.
- All drawers shall operate on telescoping sliders with nylon runners and be fitted with "lift-up and pull-out" arrangement.
- All wardrobes and cupboards are to have automatic interior lighting.
- All wardrobes and cupboards shall be provided with natural ventilation.
- Furniture is to be securely fixed to bulkheads and/or cabin soles.
- Any loose or freestanding furniture is to have securing arrangements for use at sea.
- Loose furnishings shall be Owner-furnished. List to be specified.
- All walk-in wardrobes to have HVAC ducting and return ventilators.

4.7.5 Mirrors & Glass

- Unless specifically stated otherwise, all mirrors shall be of silver-plated glass, properly glued and sealed to prevent moisture entrapment.
- All edges of mirrors to be polished. No sharp edges shall be allowed. All interior glass shall be “safety glass”, which does not produce sharp pieces when broken.
- Where glass is used in the joinery it will be tempered and shall be at least 10 mm in thickness.

4.7.6 Lockers & Drawers

- All hanging lockers are fitted with the maximum possible length hanging rail.
- Lockers to be lined with cedar veneer.
- Adequate shelving with fiddles shall be provided where necessary per Interior Designer.
- All drawers to incorporate roller tracks with locking ability.

4.7.7 Doors

- All interior doors shall be a minimum of 2 inches thick, and Fireblock as required.
- Door height to be 2000 mm in all spaces and all doors shall be radiused on top.
- Shower doors shall be framed and shall use clear tempered glass (10 mm thickness).

4.7.8 Air-conditioning Vents

- Provision for air-conditioning vents in all cabins, head spaces, and closet spaces.
- Vents are to blend in with the surrounding cabinetry as detailed by the Interior Designer.
- In all cabins, vents shall be of diffuser type to avoid any direct blow of cold air onto sleeping persons.
- HVAC return air to be provided per the Interior Designers specifications.

4.7.9 Counter and Vanity Tops

- All Owner's party vanity tops to be Grama Blend Stone Granite (13 kg/m²) with lightweight aluminum honeycomb backing.
- All vanity tops shall include a 2-inch backsplash of Grama Blend with a radius fillet between all horizontal and vertical surfaces (including the fiddle) for ease of cleaning.
- Crew vanity tops to be of Corian or similar with 6 inch backsplash of same material, with radius fillet between all horizontal and vertical surfaces including fiddle for ease of cleaning.
- Galley worktop, and wet room counter tops to be Stainless Steel.
- Galley worktop, and wet room counter tops shall include a 6-inch Stainless Steel backsplash with a radius fillet between all horizontal and vertical surfaces (including the fiddle) for ease of cleaning.
- Main Salon bar top shall also be Grama Blend Stone (13 kg/m²).

4.7.10 Floors and Bulkheads

- Structural bulkheads are to be fitted solidly to the floors as per Naval Architect's drawings.
- Flooring shall be carpet with appropriate sound insulating backing in all staterooms.
- Flooring shall be Grama Blend Stone (13 kg/m²) in all Owners' party heads and "vinyl plank" or Amtico™ in all crew heads.
- Main Galley, Main Foyer, and Crew Foyer flooring shall be Grama Blend Stone (13 kg/m²), or vinyl plank", or Amtico™.
- Crew Lounge, Ship's Laundry, Lazarette Exercise room and Wetted Room flooring shall be "vinyl plank or Amtico™.
- Navigation Bridge, Owner's party public spaces such the Formal Dining Room, Main Salon, shall be Grama Blend Stone (13 kg/m²), wood or carpet per designer's specification with appropriate sound insulation backing.
- Stone wall treatments (Grama Blend Stone (13 kg/m²) shall be applied to:
 - Owner's shower and whirlpool tub
 - Guest tub Surrounds
 - Lower half of all bulkheads in the Owner's, guest, and day heads

5. NOISE AND VIBRATION CONTROL

5.1 General

- The yacht is intended to be quiet and vibration free. Builder will use its best construction and fabrication practices to meet this goal.
- A Builder's specialist in acoustic and vibration systems shall make a complete noise and vibration calculation.
- The accommodations will have floating floors and walls utilizing a system approved by Owner or Naval Architect.
- All foundations and structures to support engines, pumps, motors etc., will be stiff and rigid.
- The main engines shall be installed on flexible mounts as specified by the Naval Architect.
- All pipe connections are to be through stainless steel expansion joints, rubber bellows and stainless steel armored flexible hoses. All metal piping is to be isolated from support brackets by a minimum 5mm thick elastomer isolating rubber.
- Electrical cables shall be neatly bundled and looped. The isolation performance of the piping and electrical elements of resiliently mounted equipment shall meet the performance of the associated resilient mounts.
- Noise levels and acoustic privacy will be measured during official sea trials in all spaces of the yacht, fully outfitted with furnishings, drapery and all equipment in place.

5.2 Bulkhead Treatments, Hull Linings, and Piping

- Acoustical and thermal insulation will be provided on the inside of all weather-exposed surfaces of the hull sides. Acoustical insulation will be fitted on joiner bulkheads throughout the yacht where those bulkheads serve as a partition for adjoining rooms. Where tanks or piping radiate heat, insulation is to be provided to ensure that exterior temperature of insulated unit does not exceed 55 °C in an ambient temperature of 32° C.
- Engine room insulation for heat protection and noise reduction will be installed on hull sides, end bulkheads, overhead, fan spaces and main air trunks. In all machinery spaces insulation shall be covered with perforated stainless steel or aluminum sheeting with vapor barrier.
- All insulating material is to be clipped or glued to avoid sagging due to aging. Aluminum foil film with taped seams on the final layer of mineral wool or fiberglass batts shall be applied in all areas.
- All vacuum piping shall be fitted with noise deadening insulation to prevent any disturbance in accommodations or living areas.
- All chilled water piping will be insulated with Armaflex or equal, (of sufficient thickness and quality of installation for tropical conditions to eliminate sweating due to condensate and minimize heat transfer/losses to the adjacent areas) minimum thickness 30 mm in the engine room and for the distance to where branch lines start, from this point minimum thickness of insulation shall be 20mm. All joints will be glued and taped, with special care to insulate piping at supports. Special attention is to be paid to the tight fit of insulation around all chilled water piping and valves. All fresh water piping will be insulated with Armaflex or equal, minimum thickness 20mm.
- Asbestos and asbestos based insulation materials shall not be used in this yacht.

5.3 Equipment Mounting

- Any vibration producing equipment shall be installed on resilient mounts of oil-resistant material (rubber or synthetic) for vibration reduction. The mounts shall be sized and located as recommended by the manufacturer. The foundations, with resilient mounting, shall be designed with high stiffness to be compatible with the mounting system. The natural frequency of the selected isolation system shall effectively isolate the equipment.
- Flexible flanged stainless steel or rubber type bellows and fittings to the standard required by DNV, shall be installed on any piping 1" diameter and over, to provide the necessary piping flexibility and to decrease transmission of noise through piping connected to resilient mounted equipment. Below 1" diameter piping, braided stainless steel flexible hoses with threaded fittings shall be used. Flexible

connections shall handle the maximum designed excursions of the mounted equipment without overstressing the attached piping. To reduce the need for spares, flexible hoses shall as much as possible be of uniform lengths for a given hose type, size, and service.

- Electric cables connected to resilient mounted equipment shall have a minimum length between the terminals of the equipment and last point of support of the cable of 500mm, with sufficient slack to allow for movement of the equipment.
- Each main engine will have one stainless steel dry silencer in the main exhaust line, supported on flex mounts mounted on a frame from the engine room floor frames. Main exhaust is to exit the hull underwater. The bypass exhaust is to exit hull in boot top stripe above the waterline.
- Generators to have “water drop” exhaust system with one generator capable of being discharged out of either the vessel’s mast/arch or the hull side.
- Shock absorbent hangers shall support the main engine and diesel generator exhaust piping with flexible sections mounted to rigid foundations on the hull structure. The pipe hangers shall be selected and loaded to minimize the transmission of vibration and noise into the hull and decks.
- A flexible four-ply stainless steel bellows system shall be used to connect exhaust piping to the main engines and to the diesel generator engines. Each flexible bellows system shall be thermally and acoustically shielded.
- Each of the two diesel generators shall be installed with Alaska Diesel generator duel hydrostatic mounting system.
- All engine room ventilation fans shall be resiliently mounted, and ventilation ducts shall be connected to the fans by means of flexible joints. Ducts will be lined with acoustic treatment material, and fans will be remotely mounted from inlet grills to reduce on-deck noise. Inlets and trunks will be designed for proper air velocity to reduce sound levels. Inlet and exhaust air silencers to be provided and air speed is not to exceed 4 meters per second at external grills.
- Provisions must be made for structural vibration damping treatment in the lazarette above the propellers.
- Propellers shall be of five blade, skewed design, as calculated by Builder and designed in accordance with ISO “S” to Class S standard, including dual-plane balancing. They will be designed for low vibration and cavitation operation at cruising speed. The propellers will be provided with an anti-singing edge treatment. Vertical propeller tip clearance to be advised by the Navel Architect. This clearance to be such to provide minimum impact on vibration and sound levels.

5.4 Accommodations

- The HVAC system shall also ensure maximum acoustic privacy between cabins by eliminating transmission through ducts. Air returns will also be via lined ducts, without use of door grills at privacy perimeters. All air ducts to be internally insulated with silencers if required. Maximum air speed at grills shall be 4 meters per second [normal operation 2.5 m/s]
- All carpeting will be installed with a sound deadening closed cell, 12 mm thick carpet pad. In areas requiring greater noise abatement, a leaded vinyl barrier attached to the carpet pad will be installed.
- Accommodation spaces shall be insulated to reduce structural born noise transmission and have thermal insulation to reduce the heat transfer to/from the outside.

5.5 Noise and Vibration Level Requirements

5.5.1 Definitions

Guest spaces are defined as all areas intended for Owner and guest use, and including the following areas:

- Owner and guest staterooms and associated corridors
- Public spaces
- Open deck recreation areas.

Where both guest and crew occupy spaces normally, the space shall be considered a guest spaces for the purposes of this section.

Crew spaces are defined as all area intended for crew use only, and include the following:

- Accommodations spaces (e.g. cabins, corridors, offices, mess rooms, and recreation rooms)
- Workspaces
- Navigation spaces.

Noise level is defined as the A-weighted sound pressure level measured in accordance with ISO 2923.

Vibration level is defined as the single amplitude peak value of deck structure vibration during a period of steady-state vibration, representative of maximum repetitive behavior, in mm/s peak, over the frequency range 1 to 100 Hz.

Speech interference level is defined as the arithmetic average of the sound pressure level of the ambient noise in the four octave bands: 500 Hz, 1000 Hz, 2000 Hz, and 4000 Hz.

5.5.2 Noise Levels

When the ship is proceeding in its normal operating condition and in accordance with test conditions specified, the applicable noise levels specified in the table below are not to be exceeded.

Location	At Anchor	At Cruise
	Noise Level dB(A)	
Crew Cabins	42 dB(A)	55 dB(A)
Guest Suites	42 dB(A)	55 dB(A)
VIP Suites	42 dB(A)	55 dB(A)
Owner's Suite	42 dB(A)	48 dB(A)
Dining (main deck)	43 dB(A)	55 dB(A)
Main Deck Lounge	45 dB(A)	60 dB(A)
Captain's Cabin	42 dB(A)	48 dB(A)
Wheelhouse	42 dB(A)	50 dB(A)
Flybridge	42 dB(A)	50 dB(A)
Main Galley	55 dB(A)	60 dB(A)
Engine Room	95 dB(A)	110 dB(A)

5.5.3 Acoustic insulation

Acoustic insulation of bulkheads and deck between passenger spaces is to be in accordance with the values of the airborne sound insulation index (I_a) given in the table below, calculated using ISO 717/1:

Location	Index Level
Stateroom to Stateroom	40
Cabin to public space	50

5.5.4 General Alarm and Public Address Systems

During the noise measurement program the general alarm and public address system are to be demonstrated by test. The tests are to be undertaken under conditions specified. When the yacht is underway in normal conditions, the minimum sound pressure levels of the public address system for broadcasting emergency announcements are to comply with the following:

Location	Noise Level dB(A)
Interior Spaces	75 and at least 20 dB(A) above the speech interference level
Exterior Spaces	80 and at least 15 dB(A) above the speech interference level

5.5.5 Vibration Levels

Vibration limits are given in the units of:

Peak acceleration (mm/s^2), single amplitude, in the range 1 to 5 Hz., and peak velocities (mm/s), single amplitude, in the range 1 to 100 Hz.

Measured vibration levels are to be assessed over the frequency range 1 to 100 Hz. The limits apply to each single frequency component of vertical, fore and aft, and athwart ships vibration, which are to be assessed separately. Level are to be assessed with the yacht proceeding in its normal condition and in accordance with the provision setout in this section. The vibration levels specified in the following table are not be exceeded:

Location	1 to 5 Hz Peak acceleration mm/s^2	5 to 100 Hz Peak Velocity, mm/s
Owner/Guest Staterooms	63	2.0
Owner/Guest Public Spaces	79	2.5
Wheelhouse	94	3.0
Open Decks	110	3.5

5.5.6 Test Conditions

The test conditions for the all noise and vibration level surveys are to be in accordance with those detailed in ISO 2923 and ISO 4868 unless the standard contain herein differ in which case the standard contained herein apply. The conditions shall be as follows:

All Test:

- The yacht is to be at a displacement and trim corresponding to the normal operation condition.
- Measurements locations are to be chosen so that the assessment represents of the overall noise environment onboard the yacht, but in any cases noise levels in all guest spaces are to be measured.
- Vibration measurements are to be made with an electronic system capable of providing vibration frequency spectra in the range of 1 too 100 Hz.
- Vibration levels are to be given in the maximum repetitive values measured over the period of not less then one minute.
- In staterooms, vibration levels are to be taken in the center of the floor area. The measurements are to indicate the vibration of the deck structure. Where deck covering make transducer attachment impracticable, use of a small steel plate having a mass of at least 1 kg is permissible.
- Galley and head extraction fans shall not be running during the testing.
- Bow thruster shall not be running during the testing.
- Deck cranes shall not be running during the testing.
- Audiovisual equipment shall not be running during the testing.

At Anchor:

- Levels shall be measured with the auxiliary machinery and HVAC systems running at their normal rated capacity.
- The vessel will be anchored on one anchor only.
- Water depth shall be at least a minimum of five (5) times the draft below the keel.

At Cruise:

- The power absorbed the propellers are to be not less then 85 of the maximum continuous rating of the engine.
- Measurements are to be taken with the ship proceeding ahead, a constant speed and course, in a depth of water not less then five times the draft of the ship, in a sea state not exceeding sea state 3.
- Rudder angle variations are to be limited to $\pm 3^\circ$ of the amidship position and rudder movements are to be kept to a minimum throughout the measurement period.
- Auxiliary machinery essential for the yacht's operation together with the HVAC systems are to be running at their normal rated capacity.

5.5.7 Referenced Standards:

The following International Standards for noise and vibration are referred to in this section:

- ISO 2923, “Acoustics – Measurement of Noise onboard yachts”
- ISO 717/1 “Acoustics – Rating of sound insulation in building and building elements: Part 1: Airborne sound insulation”
- ISO 4868, “Code for the measurement and reporting of local vibration data of ship structure and equipment”

6. HULL FITTINGS AND DECK EQUIPMENT

6.1 Deck Equipment

6.1.1 Anchoring Gear

The yacht shall be outfitted with two (2) high hold power (as defined by DNV) anchors, galvanized steel, 500 lb. each per DNV requirements. The shipyard shall supply copies of the type approval certificates for the anchors, connecting links, and chains. They shall be stowed in hull pockets fully clad with stainless steel hull protection. A polished S.S. cutwater and anti-scuffing plates/bars are to be installed on the bow to prevent damage due to anchor handling operations. Each anchor shall be fitted with 135 m of 19 mm-galvanized anchor chain, NV K2 grade. The yacht shall also be fitted with a pair of hydraulic, Maxwell Marine Windlasses, Model VWC 11,000 - Hydraulic. The windlasses installed to permit simultaneously operation of both windlasses, and be powered by the central hydraulic power pack. The system shall feature the follow:

- Fully automatic dual direction operation.
- Rope hauling from any direction using warping drum with disengagement of chainwheel.
- High-quality finish, heavy-chrome over marine alloy bronze on all above deck components.
- Integral chain pipe and stripper are aligned for jam-free operation.
- Cone-type brake/clutch permits manual anchor lowering.
- Chainwheel locking pawl.
- Band Brake
- 316 L stainless studs for easy installation.
- Gearbox features a high efficiency output drive and heavy duty, wide-face, precision, bronze spurs.
- Marine-grade alloy gearbox housing – primed and with
- Oil level sight glass and drain plug for easy draining of gearbox oil.
- Bridge Control.
- Hand-Held Roving Control
- Chain Stoppers
- Devil's Claw
- Hawse and Spurling pipe closure devices

6.1.2 Mooring Gear

All mooring gear including bollards, bitts, cleats, hawse eyes and fair leads etc. should be mirror polished marine grade stainless steel. The yacht shall be fitted with two (2) 20" bollards on swim platform, four (4) 20" bollards on fore deck, four (4) bollards amidships, and four (4) 20" bollards on the aft deck. There shall be a hawse ring, ID 12" x 6", in the bulwarks for each of the bollards. On the aft deck, the yacht shall be fitted with a pair of Maxwell Marine, Model VC 3500, tall drum, hydraulic capstans. Hydraulic power shall come from the yacht's integrated central hydraulic system. The system shall feature the following:

- Fully automatic single, or dual direction operation.
- High-quality finish, heavy chrome over marine alloy bronze on all above deck components.
- Gearbox features a high efficiency output drive and heavy duty, wide-face, precision, bronze spurs.
- Marine-grade alloy gearbox housing – primed and with
- Oil level sight glass and drain plug for easy draining of gearbox oil.
- Deck switch Control via solenoid (deck mounted foot switch with cover).

All deck hardware shall be polished stainless steel with smooth and rounded edges. In no case will any deck fittings or hardware that cause undue chaffing of mooring lines under normal conditions be acceptable.

6.2 Doors, Windows, and Hatches

6.2.1 Watertight Doors

The doors shall meet the requirements of both DNV and the MCA code, and be provided by Freeman Marine or Pacific Coast Marine. Special attention shall be paid to ensure that the sill heights required by regulations are met. The following doors shall be fitted:

- Crew Door, Bulkhead in Crew Area at Frame 33 and Frame 41. Door shall be hinged and shall have chain-driven quick acting dogs and shall have a 14" round window.
- Engine Room Door, From Engine Room to Lazarette at Frame 6. Door shall be hinged and shall have chain-driven quick acting dogs and shall have a 14" round window if permitted by DNV (otherwise no window).
- Transom door, gull wing style, at Frame 1.5 from the swim platform to the Lazarette,
- Engine Room Escape Door, From Main Deck to Escape Trunk near Frame 15, Door shall have pantograph hinges and shall also have chain driven quick acting dogs.

6.2.2 Weather Tight Doors

The doors shall meet the requirements of both DNV and the MCA code, and be provided by Freeman Marine or Pacific Coast Marine. Special attention shall be paid to ensure that the sill heights required by regulations are met. Doors to have radiused corners. The following doors shall be fitted:

- Main Entry Door, Starboard, French Doors, Rectangular Windows
- Crew Entry Door, Port, Sliding Door, Rectangular Window
- Aft Main Deck Door, Curved Glass Slider in polished stainless steel
- Locker Door, near Frame 15, shall be hinged
- Bridge Wing Doors, Port and Starboard, Rectangular Windows
- Aft Upper Deck Door, Curved Glass Slider in polished stainless steel
- Sliding Companion way door, near frame 24, on flybridge

6.2.3 Watertight Hatches

The yacht shall be fitted with the following Freeman Marine hatches:

- Chain Locker Hatch, square hinged aluminum cover, mild steel ring, Aluminum finish, flush hinges, and neoprene gasket, painted white. The hatch shall have counterbalanced spring to assist opening the hatch
- Boatwain's Locker Hatch, Details as shown in the design drawings
- Flush Deck escape hatch on aft deck from lazarette.
- Media Room escape hatch to foredeck storage locker as shown in the arrangement drawing

6.2.4 Fire Doors

The doors at both ends of galley and the doors at both ends of main lobby shall be automatic sliding fire doors

6.2.5 Portlights

The yacht shall be fitted with Freeman Marine portlights. There shall be (20) Rectangular Model 12-24R FB, and four (4) model 12 RO FB as shown in the outboard profile of the yacht. The port lights shall be fitted with stainless steel deadlight covers.

6.2.6 Superstructure Windows

Pacific Coast Marine shall manufacture the superstructure windows. Tempered monolithic glass shall be used throughout the yacht with the glass thickness as required by DNV. Frames finish shall be primed and printed. Forward pilothouse windows shall be windshield grade and shall be fabricated from templates.

Location	Qty	Model
Main Deck		
Media Room (Port and Starboard)	3	PCM-1036-FX
Formal Dining Room (Starboard)	4	PCM-1036-FX
Formal Dining Room (Port)	3	PCM-1036-FX
Day Head (Starboard)	1	PCM-1036-FX
Galley (Port)	2	PCM-1036-FX
Main Salon (Port and Starboard)	8	PCM-1114-FX
Upper Deck		
Pilothouse Forward Facing	7	PCM-1036-FX
Pilothouse Side (Triangular)	2	PCM-1036-FX
Captain Suite (Port)	2	PCM-1036-FX
	1	PCM-1114-FX
Lobby (Starboard)	2	PCM-1036-FX
Owner's Study (Starboard)	1	PCM-1036-FX
	1	PCM-1114-FX
Owner's Suite	8	PCM-1114-FX

6.2.7 Testing

All watertight doors, weather tight doors, watertight hatches, portlights, and superstructure windows shall be subject to fire hose testing and Owners representative approval prior to interior joinery/fit-out in the affected areas commencing. This is to assure the Owner that the yacht is weather tight/watertight as appropriate prior to interior areas becoming inaccessible for inspection and/or repair.

6.2.8 Storm shutters

Storm shutters shall be provided for all superstructure windows as required by DNV and MCA requirements. Onboard storage and appropriate attachment method shall be provided.

6.2.9 Exterior stairs

All exterior stairs shall be mirror-polished stainless steel with teak treads. The stainless should be a "free floating" style with minimal structure for impact on views.

6.3 Underwater Lighting

A total of seven (7) Underwater Bullets 316L stainless steel lights will be installed, three (3) across the stern, and two (2) on each side at approx frames 4 and 7. These lights will be class approved and a type to allow servicing and bulb changes with the boat in the water. They shall be 150 watts each.

6.4 Stanchions and Railings

All railings shall be teak, 100 mm wide x 50 mm thick, and all stanchions shall be polished 50 mm diameter and 316L stainless. Locations and details for stanchions and railings are as show on the yacht's profile. The railing and bulwark height in combination, and the spacing of the stanchions shall comply with ILLC requirements. The design details of the stanchions upper and lower attachment points are to be reviewed and approved by the owner prior to construction.

6.5 Rub Rails

The yacht shall be outfitted with steel extrusion rub-rails as shown on the yacht profile, with a polished stainless steel 40mm “D” section welded to the outer side of the rub rail. Rub rail shall be as shown on drawings M-241-2980 and shall extend outboard of the teak caprail.

6.6 Nameboards

The yacht shall be fitted with individual raised letters port and starboard, as shown on the outboard profile of the yacht over the main entry door and the crew entry door. The nameboards shall be backlit with a serviceable illumination system.

6.7 Windshield Wipers & Demisting

Five [5] 24 VDC, electric, pantograph windshield wipers, with stainless steel trim and shafts, will be installed on the front windows of the pilothouse. Selective operation of each wiper will be provided by means of variable speed/intermittent electric switches located in wheelhouse. A fresh-water line with spray nozzle, with provision for the injections of anti freeze liquid, together with hot/cold demister ventilation system will be provided for each window having a wiper. A de-misting system is to be provided for all pilothouse windows. System to have two variable-speed blower fans with heaters, located under console with ducting to the bottom of windows. These fans to have three way switching, on/off/heater-fan/fan only functions, and will draw air from the pilot pilothouse vents in the toe kick. Owner’s representative prior to installation will approve final selection of wiper manufacture.

6.8 Flybridge Windscreen

The yacht shall be fitted with a flybridge windscreen fabricated with polished stainless steel and Plexiglas.

7. PROPULSION SYSTEMS

7.1 Main Engines

7.1.1 Main Engine Particulars

- Make: Caterpillar
- Quantity: 2
- Model: 3412E (DITTA), 4 Stroke-Cycle-Diesel (DNV type approved)
- Rating at maximum rpm: 1100 bhp @ 2300 rpm
- Drawing Number: 183-1405
- Performance Curves: DM4125 00
- Bore x Stroke: 137 x 152 mm
- Number of Cylinders: 12
- Displacement: 27 liters
- Rotation (from flywheel end): Counterclockwise
- Compression Ratio: 14.1:1
- Capacity for Liquids: Cooling System: 72.5 Liters
Lubrication Oil System: 138 Liters (Deep Sump)

The engines shall comply with the IMO regulations regarding NO_x emissions.

7.1.2 Scope of Supply

7.1.2.1 Air Inlet System

- Corrosion Resistant Coated (Air Side) Aftercooler Core
- Air Cleaner, Heavy Duty, Open System

7.1.2.2 Control System

- Governor, Electronic
- Hydraulic Electronic Unit Injection (HEUI) Fuel System
- Throttle Position Sensor
- Electronic Control Module (ECM)
- Technician service module interface capability

7.1.2.3 Cooling System

- Oil Cooler
- Thermostats and Housing, Full Open Temperature 92 °C, Outlet Regulated
- Jacket Water Pump, Gear Driven, and Centrifugal
- Auxiliary Sea Water Pump, Gear Driven, Rubber Impeller, Self-priming
- Heat Exchanger, Titanium Plate with Expansion Tank Coolant Recovery System
- Block Heaters, One each side, 1500 watt, 120 volt AC, Current Draw 12.5 Amps, with Straight Blade Male Plug 2 Pole with Ground NEMA 5-15P for Customer Connection

7.1.2.4 Exhaust System

- Manifold & Turbocharger, Water-cooled, 130 mm (5.12 in) Round Flanged Outlet

7.1.2.5 Flywheels and Flywheel Housing

- Flywheel, SAE No. 1, 113 teeth
- Flywheel Housing, SAE No. 1
- SAE Standard Rotation

7.1.2.6 Fuel System

- Fuel Filter, RH Service on Port, and LH service on Starboard
- Fuel Transfer Pump
- Fuel Priming Pump
- Flexible Fuel Lines all SS braided covers
- Primary Fuel Filter/Water Separator

7.1.2.7 Instrumentation

- Instrument Panel:
- Electronic Service Meter
- Start/Stop Switch
- Emergency Stop Button
- Maintenance Due Light
- Diagnostic Light
- Warning Light
- 15A Breakers
- Start Motor Magnetic Switch
- Instrument Panel, RH on Port, LH on Starboard
- 5 Hole Panel with:
 - Engine Oil Pressure Gauge
 - Engine Water Temperature Gauge
 - Fuel Pressure Gauge
 - Transmission Pressure Gauge
 - Transmission Temperature Gauge

7.1.2.8 Lube System

- Crankcase Breather System by Air-Sep
- Oil Filter, RH Service on Port, and LH service on Starboard
- Oil Filler in Valve Cover
- Dipstick, RH Service on Port, LH service on Starboard
- Deep Sump Oil Pan

7.1.2.9 Mounting System

- Front Support - Adjustable
- Resilient Mounts as selected by the Naval Architect* and approved by the engine supplier.

7.1.2.10 Protection System

- Electronic – 24 Volt Only

7.1.2.11 Torsional Vibration Calculations*

Caterpillar shall complete torsional vibrations calculations for the yacht's drive train with information supplied by the Naval Architect. Caterpillar shall determine if a barred speed range is required. Every effort will be made by the Caterpillar and the Naval Architect to create a system with no barred speed range.

7.1.2.12 General

- Vibration Damper
- Paint, White
- Lifting Eyes
- RH or LH Service Options
- *Literature including. Full Technical Service Manuals, Complete Parts Manual, Shop Manuals
- *Electronic diagnostic interface with reader and printer
- Variable Engine Wiring

- Customer Wiring Connector and Service Tool Connector
- *24 Volt Starting Motors Isolated ground
- Engine Controls Bridge Controls*
- 24 vdc di-pole sensors

*Indicates items excluded from Caterpillar's standard scope of supply

7.2 Reduction Gear

7.2.1 Reduction Gear Particulars

- Make: ZF Marine
- Quantity: 2
- Model: ZF 2560
- Ratio: 4.133
- Rating: 1445 @ 2100 RPM
- Bell Housing SAE No. 1, 113 teeth
- Oil pressure gauge
- Oil temperature gauge
- Trailing lube oil pump
- Oil Cooler inlet and outlet temp gauges

7.3 Running Gear

7.3.1 Propellers

For sea trials, the yacht shall be fitted with a pair of 5-bladed Teignbridge or Michigan propellers. The propeller finish shall meet ISO Class "S" standards and tolerances. These propellers shall become the yacht's spare propellers and shall be stored on the yacht. Using the sea trial data, a final set of 5-bladed propellers shall be fitted. These propellers shall be manufactured to ISO Class "S" standards and tolerances. Both sets of propellers shall be cast from nickel-aluminum-bronze. The propeller hub shall be manufactured to fit a SAE J755 standard shaft taper and the propeller shall be keyed and pinned to the shaft. The propellers shall have standard rotation, i.e., when viewed from the stern the starboard propeller shall turn clockwise and the port propeller counter clockwise. Both sets of propellers shall be fitted with anti-singing edges. The match point for the propeller pitch calculations shall be half load, clean hull, full rated power, and full rated RPM.

7.3.2 Propeller Shafting

The propeller shafts shall be Aquamet 22 HS and shall be sized to meet DNV standards by the Naval Architect. The shaft diameter shall be 5". The shaft shall be machined to an SAE J 755 Standard Taper. The shaft shall be connected to the gears via a machined ZF supplied companion flange per the Naval Architect's drawings. Both shafts shall be fitted with spur line cutters.

7.3.3 Struts

The struts shall be manufactured from steel plate and shall have a rounded leading edge and a taper trailing edge. There shall be V-struts with the tubes fabricated from steel pipe. The bearings shall be Thordon sleeve bearings and shall be installed with chockfast orange.

7.3.4 Bearings and Shaft Seals

Each shaft shall be supported by two saltwater lubricated bearings. The bearings shall be Johnson Duramax rubber or equal sleeve bearings, and shall be installed with chockfast orange. The propeller shaft seals shall be water lubricated with water supplied from the main engines with a cross over. The yacht shall also be fitted with a Wartsila Lips Manuguard FSE propeller shaft seals with emergency seals and spares. The stern tubes shall be steel pipes, extra heavy construction, coated with anti-corrosive material. Tides Marine soft wall hoses

shall be used between the shaft seal and the stern tube. The yacht shall be fitted with a positive means to verify the follow of water to the shaft seals.

7.4 Engine Room Ventilation System

The engine-room ventilation system shall be designed and manufactured by Delta “T” Systems, Jupiter, FL.

7.4.1 System Description

Engine room cooling to be provided by a push/ pull air flow system with one (1) variable speed axial type intake and one (1) variable speed axial type exhaust fan to remove convection and radiation heat from the engine room space. The system will also maintain a temperature difference at or below the maximum limit specified by the engine manufacturer when underway operating in tropical conditions. Main engine combustion air to be supplied by the intake fan via pressure control to maintain neutral or slightly negative pressure within the engine room, regardless of the engine RPM.

7.4.1.1 Cooling / Combustion Air Fan, Inlet Opening and Moisture Eliminators/DEMISTERS

Cooling and Combustion air for operating machinery to be introduced into the engine room space by one (1) marine duty axial fan. Fan is designed for use in marine applications and is constructed with aluminum – flanged housing, aluminum hub with PPG composite fan blades, stainless steel hardware and an aluminum frame continuous duty motor for lightweight. Intake air to enter superstructure and pass through moisture eliminators with integrated frame and drain sump. Velocity and flow through the eliminator profile is critical to proper moisture separation and pressure drop.

7.4.1.2 Exhaust Fan, Discharge Opening and Moisture Eliminators/DEMISTERS

Radiation and convection heat from operating machinery to be extracted from the engine room by one (1) marine duty axial fan. Fan is designed for use in marine applications and is constructed with aluminum – flanged housing, aluminum hub with PPG composite fan blades, stainless steel hardware and an aluminum frame continuous duty motor for lightweight. Exhaust fan air to discharge via openings provided by the builder in the superstructure and pass through moisture eliminators with integrated frame and drain sump. Velocity and flow through the eliminator profile is critical to proper moisture separation and pressure drop.

7.4.1.3 P/T2 Ventilation Control System

Automatic Operation - Fan operation to be digitally controlled via proprietary **P/T2** Ventilation Control System using the **FCI – T2** touch screen control interface located in the engine room. When the main engines are started, the control system will automatically switch to the Auto Run mode and start the fans, adjusting fan speed and air flow to maintain the correct volume and flow of cooling and combustion air to the engine room space. As engines speed up and air requirements increase, the intake fan will automatically respond to the additional airflow demands and increase the incoming air volume. No interface to the engines or throttles is required. The exhaust fan speed is automatically controlled based upon the temperature of the engine room space, maintaining the operating temperature at or below the engine manufacturer’s maximum temperature difference when underway. By automatically speed controlling the fans, the electrical loads and noise levels are kept to a minimum level based upon the prevailing operating conditions.

Upon main engine shut down, the **P/T2** Ventilation Control System will automatically switch the fan operation to the quiet run mode to remove excess heat and cool the engine room. The operator can set the fan speed limit the when operating in the quiet run mode so fan sound characteristics never exceed the desired level. When the engine room reaches the user settable engine room temperature value, all fans will shut down. As the engine room temperature rises, the fans will continue to start and stop automatically, thus providing true thermostatic control of the engine room when dockside or when operating generators. When main engines are restarted, the system will then automatically switch to the auto run mode.

Manual Operation – In the event that engine room ventilation is required, such as when performing engine room maintenance or removing fumes, the fans can be turned on and manually controlled in both forward and reverse directions from the **FCI-T2** ventilation control system interface.

7.4.1.4 System Safety Functions

All fans and inlet openings to be fitted with flange mounted stainless steel fire / smoke dampers. In the event of a fire and subsequent discharge of the fire system, a class-approved actuator will close the damper automatically. This assists the fire system in maintaining the proper concentration of extinguishing agent by preventing dilution via the ventilation air openings. Actuation will be by the CO₂ fire systems and requires no electrical components. The dampers will have an access provided at the plenum to facilitate periodic testing and resetting.

The **P/T2** Ventilation Control System will automatically shut down all fans upon discharge of the fire system. A simple pressure actuated switch that is provided by the fire system manufacturer provides the signal to the system for the automatic shutdown of the fans.

7.4.2 System Components

- Engine Room Intake Fan, 30" ID Axial Fan, Welded Aluminum Housing, 10 HP 230-460/3/60, 1800 RPM High Efficiency Motor, Aluminum Hub/PPG Composite Blades 40 Degree Pitch, 9 Blade Wheel Duty: 23400 CFM Free Air Flow/18200 CFM @ 1.5" SP, Item # 230183-40/9
- Engine Room Exhaust Fan, 30" ID Axial Fan, Welded Aluminum Housing, 7.5 HP 230-460/3/60, 1800 RPM High Efficiency Motor, Aluminum Hub/PPG Composite Blades 32.5 Degree Pitch, 9 Blade Wheel, Duty: 18700 CFM Free Air Flow/14400 CFM @ 2" SP, Item #230183-32.5/9
- Engine Room Intake, 30" Inlet Air Diverter, Welded Aluminum Construction to Fit 30" Axial Fan or 30 PD Round Damper Assembly. Type 5. Power Coat Inlet Diverter, White. Item #ID30.
- Engine Room Exhaust, 30: Fan Inlet Guard, Black Powder Coat Finish, Item IG30
- Stainless Steel Fire/Smoke Damper with U.S.C.G. and A.B.S. Approved Pneumatic Actuator. One (1) each for Intake and Exhaust fans. Item # 30PDS
- Automatic Ventilation Control System, Includes MCE-P/T2 Main Enclosure, FCI-T2 Touch Screen Interface, CBCC487421 FCI Cable RTS Temperature Sensor, Installation Drawings and Wiring Diagrams. Item #P/T2.
- Engine Room Intake, 10 HP Standard Adjustable Speed Drive, 208-230/60/3 Input Maximum 33 Amp Output
- Engine Room Exhaust, 7.5 HP Standard Adjustable Speed Drive, 208-230/60/3 Input Maximum 25 Amp Output
- RTS to MCE Cable, 18 AWG, 1 Pair, Shielded
- Shield Control Wire, 4 Pair, 18 AWG MCE to ASD Control Cable & C1-FCI to MCE Cable
- Engine Room Intake, 7" Custom PVC Moisture Eliminator with PVC Frame (White Profiles & Frame), Net Air Inlet Opening of 2363 in².
- Engine Room Exhaust, 7" Custom PVC Moisture Eliminator with PVC Frame (White Profiles & Frame), Net Air Inlet Opening of 1816 in².

7.5 Main Engine Exhaust System

The yacht shall be fitted with a wet underwater exhaust system. The system shall include properly sized exhaust piping with lagged insulation (hard coat), stainless steel expansion joints, a raw water injection rings, and low speed by-passes with a water lift mufflers. The wall thickness of all exhaust piping shall be per DNV requirements. All exhaust piping where exhaust gases and saltwater are mixed shall be Incoloy 25-6MO or Inconel 625, including water injection rings. The exhaust shall exit the hull through the hull side just under the water and just aft the engines. The system shall be fitted with erosion / corrosion resistant shut off valves at the shell. Drainage of the system shall also be provided as needed. The exhaust piping shall be supported using resilient mounts from the machinery or from the hull bottom structure but not the main deck structure above. The system shall be designed to exceed the engine manufacturer's requirements for exhaust backpressure. The system shall be designed and manufactured by DeAngelo Marine Exhaust, Inc. Fort Lauderdale, Florida.

7.6 Piping Material Specifications

All metal piping in the yacht shall be constructed using welded flanged connections at all joints. The use of threaded pipe connections or "Straub" type connectors shall be only with specific approval of Owner's representative. All piping and valves shall be clearly marked with name or purpose of each valve, and a system of color-coding indicating pipe contents and flow direction.

All piping systems shall be pressure tested via the hydro test method for leaks at 150% of normal working pressure as appropriate for minimum 12 hrs before systems are placed in operation. Owner's representative to approve test results.

The following piping material shall be used for the flowing systems:

Fuel Oil Piping	Schedule 80 Steel ASTM A-53
Lubrication Oil Piping	Schedule 80 Steel ASTM A-53
Hydraulic Piping	Stainless Steel Tubing ASTM A-249
CO ₂ Piping	Schedule 80 Steel Piping ASTM A-53

7.7 Fuel Oil Supply and Return System

The system shall include all necessary piping to supply fuel from either of the two (2) day tanks to the main engines and generators. Electronic remote fuel shut off valves fitted at the day tanks shall be provided. The day tanks shall be fitted with flat type sight glasses with self-closing valves between the gage and the tank. The system shall include properly sized Racor Brand filters for both the main engines (75/1000MAXM-P-10) and the generators (500MAM-P-10). The bowls of the filters shall be metal and units shall also include heat shields and water probes. The system shall be pressure tested to 150% of the normal working pressure of the system

7.8 Fuel Oil Fill and Transfer System

The yacht shall be fitted with a fuel oil transfer system including all required manifolds and two (2) properly sized transfer pumps. The manifold shall be connected to deck fills port and starboard for pressure filling of all the tanks using Cam-Lock type connectors.

The system shall be piped through the manifold to allow the centrifuge to constantly fill the day tanks, which should then overflow to the main center fuel tank from which the centrifuge normally draws. The system also, should be so piped to allow the centrifuge to draw through the manifold from one storage tank and discharge to any other tank, to allow polishing of fuel in the double bottom tanks.

The transfer pumps shall be sized to transfer the quantity of fuel normally used in a full days operation in about eight (8) hours. Oberdorfer bronze gear pump, Model 990, 2HP 230/3/60, 40 GPM with viton seals shall be used. The motors shall be total enclosed fan cooled (TEFC), with one AC and one DC pump piped in parallel with isolating valves. Additionally the system shall have a flow meter (Fill-Rite, FR 901) and shall have a back-up hand rotary-vane pump 10 GPM (McMaster Carr, #4236K1). The system shall include an Alpha Laval, Model MIB 303, 230/60/3, fuel oil separator. The system shall be pressure tested to 150% of the normal working pressure of the system.

7.9 Fuel Oil Vent System

The tank vents system shall be arranged so that all the tanks are vented to an overflow tank. Overflow tank shall be fitted with a level alarm and shall be so located as to allow for visual monitoring from the fuel fill/transfer manifold. Overflow tank shall be sized to hold a minimum of 1 minute flow at maximum fueling rate. The overflow tank shall then have one vent to weather deck suitably arranged to prevent the spillage of oil into the sea. Tanks shall also be fitted with manual sounding tubes with Gem-Tapes system.

7.10 Lubrication Oil System

The lubrication oil system shall include one clean and one dirty lube oil tank. The tanks shall be approximately 1500 liters each. The system shall include a deck fill and a deck pump out. The dirty oil system shall be

plumbed directly to the engines and generators and shall also have necessary valves to discharge dirty oil to deck fitting or hose for disposal. The clean oil system shall include necessary valves to allow loading oil from deck fill or hose, and a self-contained, self-retracting hose reel assembly with a length of hose sufficient to allow manual filling of engines, transmissions, and generators. The hose shall be fitted with a quick-acting fill nozzle, and Fill-Rite meter. The system shall be pressure tested to 150% of the normal working pressure of the system. There shall be two (2) pumps, one for clean oil and one for dirty oil. The lubrication oil pumps shall be OB 992M-F36, 1/3 HP, 230/60/3, 3.0 GPM @ 1140 RPM with viton seals. The motors shall be (TEFC). The pumps shall be reversible, and there shall be a 30-micron simplex filter assembly on the suction side of each pump, and a manual hand operated backup pump. Manifold to be designed to allow either pump to back up the other in case of failure.

7.11 Hydraulic System

7.11.1 General Description of System

The yacht shall be fitted with an integrated central hydraulic system. The system shall be power by hydraulic power take-off pumps from the gearboxes and from an electric motor. There shall be a PTO on each Gearbox. The electric motor shall be sized to provide sufficient hydraulic fluid pressure and flow to power the largest of the hydraulic power consumer except the bow thruster. The motor will not be size to permit simultaneous operation all the consumers. Using the electric motor all the hydraulic equipment except the bow thruster will be available when the main engines are shut down such as when dockside or at anchor. This motor should be solenoid activated remotely from each consumer. All fitting shall be stainless steel.

7.11.2 Hydraulic Powered Equipment

This hydraulic equipment driven by the system is to include:

- Anchor Windlasses (See Hull Fittings and Deck Equipment)
- Aft Warping Capstans (See Hull Fittings and Deck Equipment)
- Passerelle (See Outfit)
- Flybridge Deck Davit (See Outfit)
- Stern Deck Overhead Crane (See Outfit)
- Folding Bulwarks (See Outfit)
- Side Boarding Ladder (See Outfit)
- Bow Thruster (See Propulsion Systems)
- Stabilizers (See Hull and Ship Systems)

7.11.3 Integrated System Power Pack Details

The integrated system power pack shall be a Quantum, Model QIS 170/3 configured to operate all the hydraulic users listed above. Quantum shall also provide Builder, Owner, Consultant, and Murray & Associates with a detailed schematic of the system showing all required connections. Drawing shall meet all DNV requirements. It additional full technical manuals will be supplied at time of the commissioning of the system. The unit shall consist of:

- Two (2) "D" flanged 140 cc variable delivery piston pumps with DFR compensator controls to be closed coupled to the main engine PTOs. Maximum thruster capacity will be available from approximately 650 rpm and upwards. Note: Optional 100 cc + 45 cc pumps in piggyback configuration are also available.
- One hundred and twenty (120) gallon aluminum oil reservoir, equipped with return filter, digital level gauges, digital temperature indication, adjustable temperature switch, filler cap with filter/breather, temperature and level-switch suitable for interface with ships alarm system, three (3) suction shut-off valves and necessary connections.
- Two (2) Pump motor units with 30 HP, three phase 208 VAC/60Hz electric motors to be installed under tank assembly with close-coupled 56 cc variable displacement type piston pumps.
- One (1) 15 HP 208 VAC/60Hz electric motor with close coupled, 28 cc variable displacement type pump.

- Two (2) Variable frequency drive for load management and electric motor start.
- Two (2) four pass copper nickel heat exchanger; salt water supply should be supplied via ships service.
- One (1) custom bow manifold for operation of bow thruster and equipped with two directional control valves including flow controls for anchor winches.
- One (1) auxiliary manifold for operation of aft capstans. Manifold to include directional control valves, pressure reducing and flow controls.
- Hydraulic manifold blocks to be installed on tank cover assembly:
 - One (1) proportional valve to control the pump pressure.
 - One (1) Oil control valve for davit.
 - One (1) pressure gauge with quick connector hose.
 - One (1) closing valve for forward manifold.
- HydraLogic panel mounted cabinet with microprocessor and controls to energize up to 24 separate hydraulic consumers. The HydraLogic controller is fitted with alarm fault notification, data logging capability and remote access via modem.
- Directional valves are complete with the required sandwich type flow and pressure control valves.

7.12 Bow Thruster

The yacht shall be fitted with a 120 HP, Hydraulic, dual prop counter-rotating full proportional tunnel thruster, Quantum Model, QT 120. System shall include:

- One (1) Steel tunnel with saddle attached to receive the drive unit.
- One (1) Bronze drive unit with heavy-duty bevel gear.
- Two (2) Four-Blade Nibral Kaplan propellers with zinc units.
- One (1) high torque bent axial piston type motor with coupling
- Three (3) fully proportional joystick control stations (Bridge, and Port and Starboard Bridge Wings)

7.13 Engine Room Fire Suppression System

An automatic CO₂ fire suppression system shall be fitted. Six (6), 100 lb., CO₂ cylinders shall be mounted in the lazarette to service the engine room. The engine-room ventilation fans shall be stopped, engine and generator fuel supply pipes shall close, and the fire dampers shall close when the system is activated. The system shall be pressure tested to 150% of the normal working pressure of the system. The vendor shall supply details of the piping system. The system manufacturer and design must be approved by the owner.

8. HULL AND SHIP SYSTEMS

8.1 Piping Material Specifications

All metal piping in the yacht shall be constructed using welded flanged connections at all joints. The use of threaded pipe connections or “Straub” type connectors shall be only with specific approval of Owner’s representative. All piping and valves shall be clearly marked with name or purpose of each valve, and a system of color-coding indicating pipe contents and flow direction. All piping exposed to weather (i.e. vents and fills) is to be polished 316 L stainless steel.

The following piping material shall be used for the following systems:

Freshwater System	Distribution:	Fusiotherm, polpypro or equal
	Fill/Vent:	Schedule 40 Stainless Steel
Chilled water System		Schedule 80 CPVC ASTM-2846
Black water System	Drains:	Schedule 80 CPVC ASTM-2846
	Tank Vents	Schedule 40 Black Steel ASTM-A-53
Grey water System	Drains:	Schedule 80 CPVC ASTM-2846
	Tank Vents:	Schedule 40 Black Steel ASTM-A-53
Steering Hydraulic System		Stainless Steel Tubing ASTM A-249
Sea Water System		Cu/Ni 90/10.
Compressed Air System		Schedule 80, Seamless Stainless Steel, ASTM A-53
Fire Main System	Hull:	Cu/Ni 90/10
	Superstructure:	Schedule 80, Aluminum
Bilge Suction System		Cu/Ni 90/10
Deck Drain System	Hull:	Cu/Ni 90/10
	Superstructure:	Schedule 80, Aluminum
Central Vacuum System		Schedule 40 PVC ASTM-1785

8.2 Systems Pressure Testing

All piping for the hull and ship systems shall be pressure tested to 150% of the system’s normal working pressure (via the hydro test method) for minimum 12 hours to ensure the complete system is free from leaks. Owner’s representative to approve test results. All pumps shall be fitted with pressure relief valves.

8.3 Freshwater System

8.3.1 General

- Tanks to be properly coated on the interior and service/maintenance valves fitted at feeds to taps/appliances
- A complete fresh water system will be installed throughout the yacht.
- The system can be divided into the following main units:
 - Plumbing of schedule 80 CPVC or copper
 - fresh water tanks internally coated with an approved epoxy system, cement wash not acceptable
 - pressure pumps and pressure tank dual/redundant pressure pumps capable of self priming from a “dry tank suction piping system”
 - hot water loop system
 - watermakers
- Pressure gauges shall be installed throughout the system as appropriate.

8.3.2 Plumbing

- The fill system shall be suited for gravity filling only.
- The system shall be fitted with draining valves at strategic locations.
- All lines to outside consumers and in areas susceptible to freezing in cold climates shall be insulated and fitted with readily accessible local drain/isolating valves.

8.3.3 Freshwater Tanks

- All tanks can be filled via one filling pipe on each side of the boat, via crossover connections or manifold system.
- Manholes, sufficient in size and number, to perform proper tank cleaning will be fitted. Manhole access to be considered and accommodated during installation.
- The tanks are to have a vent line/overflow to main deck level which discharges/vents to main deck outboard bulwark waterway within 150 mm of a deck drain which discharges at or near the vessels full load waterline.
- The vent line is to be protected against incoming seawater with ball check valves
- Filling stations on deck will have stainless steel, "Water" engraved screw on caps,
- Water tanks fitted with level indicator to gauge on the synoptic panel.
- All potable water tanks shall be appropriately coated per DNV requirements.
- An overboard over flow shall be fitted.

8.3.4 Pressure Pumps

- Hydropaq Duplex water pressure system with stainless and cast iron pumps modified for installation with a suction lift, including a priming pump. Pumps shall be 208/3/60 12.2 Amperes (2HP) 60 gallons per minute at 64 psi.
- Two (2) pressure accumulator tanks of about 33 gallons with a working pressure of 4 bar will be mounted to keep the system pressurized.
- Each pump to have its own pressure switch set with a 1.37 bar difference for low and high-pressure cut-off.
- The system shall be plumbed so that the either pump can be used a transfer pump while the system is operating. In addition, piping shall be arranged to allow the removal of one pump for repair while still providing adequate pressure to the vessel.

8.3.5 Hot Water System

- The system shall include two electric hot water boilers manufactured by G/R (3 Phase, 60Hz) of a minimum of 85 gallons each.
- There shall also be a boost heater for the hot tub
- The hot water is supplied to the consumers via a circulating line.
- The circulating line to have two (2) bronze body hot water circulation pumps, 1/4 HP.
- The system will have necessary devices, for example: thermometers, thermostats, boilers, bail-dry safety, pressure relief valves, expansion accumulator, non-return valves etc. Builder to submit piping and equipment plans to owner for approval prior to construction.

8.3.6 Watermakers

- Two (2) Watermakers, Inc. watermakers, reverse osmosis, Model WMS-1500, capacity 1500 gallons per day. The modular configuration shall be provided if space limitations require. Electrical power shall be 208/60/3. System shall include:
 - Automatic Salinity Control, LED Digital Read-out
 - 316 Stainless Steel Fittings
 - Installation Kit
 - Corrosion-proof Booster Pumps (2x the manufacturers recommended capacity)
 - Fresh Water Rinse and Clean Feature (with Charcoal Filter)
 - TEFC Motors, Hi-efficiency

- 316SS Direct-Drive Diaphragm RO Pump
- Product Water Sample Port from each Membrane
- Media Filter Assembly w/ Backwash piping fitted
- The systems shall draw seawater from a dedicated through-hull fitting which shall be located deep enough below the waterline to exclude the possibility of drawing air or running dry under all conditions.
- The system shall include all plumbing and components for cleaning the system.
- A permanent flushing line from the freshwater pressure system shall be fitted.
- Brine and reject product shall be discharged overboard via a dedicated skin fitting above the waterline.
- Two (2) high-pressure pumps.

8.3.7 Freshwater Treatment System

- Prior to being distributed to the consumers, the water shall pass through a freshwater treatment system with media filters, suitable for a fresh water flow of 4 m³ per hour.
- The system shall consist of:
 - A 5-micron cartridge filter, Mc-Master Carr, 44075K61.
 - An ultra violet sterilization unit, to provide at least 99.9% bacterial reduction across the water treatment unit, Mighty Pure, model MP49, 20 GPM
 - One filter shall be fit at each consumable (i.e. Bar, Sink, Ice maker, etc.) by SEAGULL.

8.3.8 Deck Wash Outlets

- At least seven (7) fresh water hose connections, allowing the efficient washing down of the yacht. Chrome plated or polished SS hose taps located in dedicated lockers (no visible taps when not in use) on the exterior of the vessel.

8.4 Accommodation Air Conditioning System / Chilled Water System

8.4.1 Performance Criteria

- In warm (tropical) climates, the air conditioning system shall be designed to provide mean internal conditions of +68°F/+20°C and a relative humidity of 50% under the following ambient conditions:
 - Outside air temperature max. +100°F/+38°C
 - Outside air relative humidity max. 95%
 - Seawater temperature max. +90°F/+32°C
- The mean temperature of +68°F/+20°C shall be controllable from each individual accommodation space within a range of 6°C: down to 57°F/14°C and up to 79°F/ 26°C.
- In cold climates, the heating system shall be designed to provide internal conditions of +75°F/+24°C and a relative humidity of 50% under the following ambient conditions (Tropical package):
 - Outside air temperature min. +14°F/-10°C
 - Sea water temperature min. +28°F/-2°C
- Other design criteria shall be:
 - The noise levels may never exceed 40 dB (A).
 - The maximum air speeds shall be:
 - mechanical ventilation 22.0 ft./6.7 meters/second
 - natural ventilation 10.8 ft./3.3 meters/second
 - air conditioning system 16.4 ft./5.0 meters/second
 - The minimum fresh air (make-up air from the exterior of the vessel that has been pre-conditioned, i.e. cooled/heated, dehumidified and filtered for dust, odors and particulate matter) rate shall be 25 m³/hour per person for each occupied room.
 - Nine (9) air changes per hour shall be the minimum norm for all accommodation areas.

- The air exchange rates for each separate accommodation space shall be adjustable, in order to permit adjustment of the system to the requirements of each individual space.
- From the main saloon, the dining area, the lounge, the crew mess, the galley, the closets and the sanitary spaces, air shall be continuously withdrawn and discharged mechanically.
- The air conditioning and ventilation systems shall be pressure regulated in order to maintain an internal balance onboard. A 1”/25mm water column, positive air pressure to be maintained in the interior accommodations areas during full power operations (to prevent the intrusion of exhaust gas from the propulsion machinery.)

8.4.2 System Components

The system shall be supplied by Dometic Corporation, Pompano Beach, Florida (formally Marine Air System and Taylor Made Environmental). Design of the system shall be approved by manufacturer for proper sizing and equipment compatibility, and correct installation, including plumbing, electrical, and insulation. Manufacturer’s representative is to commission system and certify all requirements have been met.

8.4.2.1 Compressor

Compressor shall be model SCW 540SRC/EH CWMC 230/60/3. Unit is a 45 Ton 3 Stage chiller system with featuring scroll compressors, and reverse cycle and electric heat. System will be equipped with three-stage electric heat total of 60KW. Heater shall be Barrell mounted on board the base with scroll compressors. There shall be a remote electrical box with digital CWMC and frequency drives. Unit shall have copper chilled water and PVC Saltwater Manifolds.

8.4.2.2 Pumps

- Saltwater pump to be bronze body and impeller, model P7110, ¾ Horsepower, with 4” impeller, 230/60/3
- Chilled water pumps to be model P715, 2 horsepower, with 4” impeller, 230/30/3.
- All pumps to be frequency driven
- There will be a pre-charged expansion tank and fill assembly.
- Spare saltwater and chilled water circulation pumps shall be plumbed-in with isolated by valves.

8.4.2.3 Air Handlers

The vessel shall be fitted with the following air handlers:
TBD from manufacture recommendations

- Make up air as necessary shall be supplied through trapped louvers.
- Fan coil condensate drain pans to be plumbed to generator exhaust or deck drain system with p-traps on each drain line.
- A model AH Elite Digital Air Handler Control shall control each air handler except engine room.
- Engine room air handlers shall be controlled by AH Passport I/O Air Handler Control.
- Air handlers in selected locations are to be equipped with auxiliary electric heating coils “chill chasers” to provide local compartment heat while the main chill water system is operating in the “cool mode”.

8.4.2.4 Additional Items

- All other supply and return air grilles shall match surrounding color and material in the joinery.
- Extraction fans, Broan model MS 130, shall be fitted in head above the stool, and vented to the exterior through vents in superstructure with wind blocking louvers.

8.5 Grey Water System

The grey water system shall consist of a single holding tank with an overboard discharge pump with a three way switch for manual on, off, or activated by a level switch in the tank. Piping materials shall be as specified above. There shall also be a high-level alarm switch fitted and interfaced to ship's alarm system. Pump control shall be provided by a headhunter tank sentry system. The pump shall be Headhunter, Bone Dry, 20 GPM, model 120ELB203P200 with a 3-phase motor. All sink drains and shower and tub drains shall be plumbed to the grey water tanks except that the galley sinks shall have under their respective sinks a diverter valve for direct over board discharge. The deck drains shall not be connected to the grey water system. The black water transfer pump shall be used as a back up pump.

8.6 Black Water System

The black water system shall consist of a black water holding tank, Headhunter toilets, and a Headhunter treatment system. The system shall include the following components:

Item	Qty	Description
SBS-0	15	Superbowl Toilets (Color selected from standard selection by interior designer)
AK-24	15	Adder Kit, 24 VDC includes union, isolation ball valve, and inlet cone shaped monel strainer
TW-200B/3PAC	1	Tidal Wave USCG Certified Type II and IMO approved 200 US gallon per day Marin Sanitation Device featuring Aluminum Construction with Ceram Coating Finish, Multivoltage 3 phase Blower, Chemical Injection Pump, and 12 Gallon Polyethylene Chlorine Solution Tank
120ELB203P200	2	Bone Dry Diaphragm Pump, 200 GPM, 2" NPT Connections, 3 Phase 208-230/460 VAC ½ HP motor
SVC-2000C	4	2" Swing Check Valve
TWCP-BBWL	1	Electrical Control Panel for Installation of the Tidal Wave below the waterline, and holding tank below the waterline. Includes switches, motor starters and motor controllers for transfer pump, holding tank blower, MSD blower, MSD Chemical Injection Pump, and MSD Discharge Pump
BLW-LA-120-230	1	High Volume Linear Blower-230 VAC
PZIII-NOS	1	H-B Neutralizing Odor System (Ozone Generator with Air Pump)

The holding tank which will be cross connected shall be aerated to reduce smell and assist in the treatment process. The Headhunter toilets, SB, Royal Flush Superbowl station, shall be plumbed to the tank. Toilet colors shall be selected from headhunter's standard selection. Black water tank shall be vented in accordance with Headhunter specifications to a point at the top of the mast, vent line to be fitted with a fan, ionization unit, charcoal filter, and screen on the top of the vent. System shall be fitted with direct overboard bypass and dockside pumpout capabilities.

8.7 Steering Gear System

The yacht shall be fitted with a Jastram hydraulic steering system. The system shall feature one helm pump, and reservoir tank on the Navigation Bridge with a jog lever full follow up control. In addition, full follow-up jog lever controls on the bridge wings shall be also be fitted. The hydraulic actuators (2) shall be connected to the rudders via tiller arms and the rudders shall be connected together by means of an adjustable Stainless Steel tie bar. The system shall also have a rudder feed back unit and rudder angle indicators (bridge and bridge wings) and shall have a single hydraulic power pack with dual electric motors and pumps. There shall be an independent back-up emergency steering system in the lazarette in compliance with DNV and MCA requirements.

8.8 Rudders

The rudders shall be double plate, modified NACA section rudders. The structure of the rudder shall consist of two (2) horizontal diaphragms and one vertical diaphragm. The top and bottom plates as well as the diaphragms shall be 6 mm plate. The side shell plating of the rudder shall be 5 mm plate. All plating shall be stainless steel. The leading edge shall be 2 ½" Schedule 80 stainless pipe, and the trailing edge shall be flat bar.

The rudder shall be fitted with drain plugs top and bottom. The rudder shall be float coated, and hydraulically tested in accordance with the DNV rules.

The rudderstock shall be 5" Aquamet 22HS in accordance with DNV rules. The rudderstock shall extend to the bottom plate of the rudder. The rudderstock shall be machined in accordance with the naval architect's drawings and specifications. The upper bearing shall be Tides Marine Double Seal, RPB-C-6000, Type C, and the lower bearing shall be Johnson Duramax Part # 871532100-GALE. The thrust bearings shall be of an approved anti corrosive type. The rudder stock seals are to be Wartsila Lips (John Crane Marine) face type ManeBar EJ/EK. The standpipe shall be 8 1/2" OD and 7 1/2" ID (suitably internally coated to limit corrosion and fitted with suitable grease injection fittings). There shall be a 350 mm diameter doubler plate installed at the shell.

8.9 Sea Water System

8.9.1 General

- Two (2) welded steel sea chest, each fitted with identical rubber lined butterfly isolation valves and strainers on the outlet branches, and interconnected by means of a crossover pipe.
- Except for the reverse osmosis watermakers, all seawater consumers will draw from the crossover.
- A butterfly valve is fitted at each branch pipe on the crossover.
- All seacocks to be according to DNV requirements, sized to allow all consumers to be fed from one side, fitted with valves accessible from above deck plates.
- All spindles will be easily accessible for operation and maintenance.
- No red brass fittings shall be used anywhere in the sea water system.
- Sea water consumers are:
 - Main engines and gearboxes
 - Generators
 - Watermakers (dedicated connection)
 - Fire fighting system (connection direct to sea chest)
 - Propeller shaft lubrications, (via main engine)
 - Engine and generator exhausts, (via engine and generators)
 - Air conditioning
 - Integrated Hydraulic System (Oil Coolers)

8.9.2 Sea water pumps

- Each system using seawater for cooling will have its own circulation pump.
- All pumps to have mechanical seals.
- Use same model of pump as much as possible to minimize spares requirements.

8.9.3 Sea Chest

- Sea chests shall be fabricated from schedule 80 black steel pipe and shall include a gate valve at the exit of the hull.
- Additionally, there shall be connections for compressed air to permit the blowing out of the sea chests.
- Sea chests lid shall be a bolted clear plastic blank flange. and shall be at least 12" above the design waterline.

8.9.4 Sea Strainers

- The yacht shall be fitted with four (4) Groco, 4" Model ASEF-4000, Flanged. Strainers shall have #304 stainless steel filter baskets.
- Two (2) strainers shall service the generators and auxiliary equipment, and two (2) shall service the main engines.
- It shall be possible to clean strainer filters without shutting down any equipment.

8.10 Compressed Air System

- Workshop compressor, Speed Air, single stage, 230 VAC, 60 Hz, 3 phase, with 2 HP motor
- Capacity 6.2 CFM at 100 psi
- Air receiver: 30 Gallons
- Compressed air outlets in boat storage area, engine room, boatswain locker, and flybridge. Each outlet fitted with hose and nozzle.
- Connection to sea chest for blowout.
- Horn to be Kahlenberg, Fig 211 as required by the COLREGS.
- There shall be a dedicated air receiver for the horn.

8.11 Fire Main System

The yacht shall be fitted with a fire main system. The system shall be cross-connected to and serviced by the electric bilge pumps. The system shall also include a spray ring in each anchor-chain hawse ring for chain washing upon retrieval. The chain wash shall be activated from the fore deck by mean of valve and remote start switch for pump. The system shall be also feature six (6) fire stations fitted complete with 50 feet of hose and combination fog/stream nozzles. Stations are to be located to provide complete fire protection coverage of the yacht, with the goal to be able to reach all areas with two hoses. The pump and other system components shall be sized per MCA requirements. Fire main valves to be chrome plated bronze style. There shall be an international shore connection provided as required.

8.12 Hi-Fog™ Fire Suppression System

The HI-FOG system shall provide fire protection in the public, accommodation and service areas, and as a total application system in the machinery spaces. Marioff Corporation Oy shall supply the system including materials, design and engineering, documentation, guidance and commissioning.

The HI-FOG system shall fulfill regulation II-2/12 of the 1974 SOLAS Convention, IMO Resolution A.800 (19) (accommodation), MSC/Circ. 668, as amended by MSC/Circ. 728 (machinery spaces). The *MCA Code* has been used for the dimensioning of the pump unit.

8.12.1 Protected Areas

The protected spaces included are:

- Accommodation, public and service areas
- Main engine room

8.12.2 Materials

8.12.2.1 Gas pump unit

The Gas pump unit consists of one rack with totally 12 pcs of 50 l / 200 bar nitrogen cylinders. The gas pump itself with corresponding control valves will be located on the end of this rack. Additionally the system will be supplied with a water tank for one-minute redundancy.

Maximum pressure:	200 bar
Working pressure:	80 bar
Maximum flow:	75 l/min
Unit dimensions (approx.):	2203 x 770 x 1907 mm (LxWxH)
Service space required:	700 mm around units
Unit weight, total (approx.):	2200 kg
Color, frames and water cylinders:	Red, RAL 3000

The gas pump unit units are delivered factory tested and inspected by a class surveyor.

8.12.2.2 Electric panels

- Bridge panel for accommodation areas: Panel contains indications and alarms as per SOLAS requirements. It can be supplied either as a separate cabinet or of embedded type. It is to be connected to the section valves and to the pump unit.
- Remote control panel for machinery spaces: Panel includes push buttons and a pressure indicator. It is to be connected to section valves and to the pump unit.

The panel front is black. The cabinets are painted grey, RAL 7032.

8.12.2.3 Section valves

- Accommodation: 3 pcs of section valves. The valves are equipped with a flow indicator, check valve, pressure gauge, stop valve and test valve. They are to be connected to the bridge panel.
- Machinery spaces: 1 pcs of section valves. These valves are remote and manually controlled solenoid valves, and are equipped with a flow indicator. They are to be connected to the release panel and the pump unit.

8.12.2.4 Sprinklers

Totally about 70 chrome plated brass HI-FOG sprinklers shall be fitted. The sprinklers are primarily used in public, accommodation and service spaces. The sprinklers are connected to the piping through separate sockets attached to the end of the pipe. Each sprinkler socket is equipped with a check valve. This arrangement offers several benefits:

- In accommodation spaces model Type 1B 1ME 6MF 10RA
- In Storage areas model Type 1B 1MC 6VD 10RA
- In machinery spaces model Type 4S 1MC 8MC 1000
- Sprinkler installation is simplified
- Sprinklers are not vulnerable to damage during the construction of the ship, as they can quickly be installed shortly before commissioning
- The piping system can be pressure tested after installation, using temporary plugs instead of sprinklers
- The piping can be efficiently flushed to ensure total cleanness
- The piping is easily emptied of air in all sprinkler branches
- The exchange of sprinklers, when the ship is in operation, is much simplified, especially as the check valve means that the pipes do not have to be drained

Each sprinkler is delivered with one socket, two locking plates and one cover plate.

8.12.2.5 Spray heads

Totally 4 stainless steel HI-FOG spray heads with separate stainless steel sockets for connection to the piping. The spray heads are primarily used in machinery spaces. Model Type 4S 1MC 8MC 1000

8.12.2.6 Pipes

The pipes are of welded type and made of stainless steel AISI 316 L. They follow DIN standards and the following sizes are used: $\varnothing 38 \times 3$, $\varnothing 30 \times 2.5$, $\varnothing 12 \times 1.5$.

8.12.2.7 Fittings

Cutting ring couplings of DIN 2352 standard of S-class are used. They feature a design pressure of 400 bar. This “over-dimensioning” of the connections is done in order to allow for stresses in the piping caused by the ship’s bending and torsion motions.

8.12.2.8 Spare parts

Marioff shall supply spare parts in accordance with IMO regulations.

8.12.3 System design

Marioff shall supply the design package and will include:

- One-line diagram of piping arrangement, showing principal routing of pipes, location of section valves, and approximate location of sprinklers and spray heads
- Layout drawing of pump and accumulator units, showing main dimensions and location of pipe connections and attachment points
- Cabling principles
- Connection diagram
- Internal circuit diagram of all electric cabinets and panels delivered by Marioff
- Panel layouts
- Systems documentation, containing the above drawings and diagrams, system description, operations manual, and service and parts manual. This document can alternatively be delivered on CD ROM.

8.12.4 Approval applications

Marioff will prepare and submit to the relevant classification society and maritime administration documents needed for approval of the system. The system will be supplied with final approvals.

8.12.5 Installation guidance and Commissioning

Marioff shall provide a supervisor for installation guidance to the shipyard, when the installation work starts. A Marioff representative shall only do the start-up of the HI-FOG system with the assistance for the shipyard.

8.12.6 Regulations and Approvals

The system will fulfill the following IMO requirements:

- International Convention for Safety of Life at Sea, 1977
- Resolution A.800 (19) (accommodation)
- MSC/Circ. 668, as amended by MSC/Circ. 728 (machinery spaces) excluding bilge protection

In addition the system will be delivered with the following approvals:

- MCA

8.13 Quantum Zero Speed – Four Fin System

The system shall consist of Quantum Model QC 1500/2 - Zero Speed™ – Four Fin System fin stabilizers. System shall be powered by the integrated hydraulic power system. System shall include:

- Four (4) dual cylinder actuator units with High Load™ stainless steel shafts.
- Four (4) Custom, 2.4 m² high lift Zero Speed™ design steel fin blades.
- Four (4) steel welding flanges.
- Four (4) hull unit mounting kits inclusive of mounting bolts and hardware.
- Four (4) bladder type accumulators
- Four (4) amplifiers for fin position control.
- Four (4) alloy manifold blocks with 100L electro-hydraulic servo valves, three-micron pressure filters, dual load control valves and emergency bypass valve for centering.
- All hydraulic connections for shipyard installation will be supplied in either male JIC or male BSPP type fittings. Only stainless steel fittings shall be used in system.
- One (1) ARC 3001 adaptive logic, electronic control unit with LED fin position indication, three-term algorithm, two amplifiers for the servo valves, automatic fin centering when backing-up, adjustable “damping” level, automatic “natural list” adjustment, electronics for Zero Speed™ operation and MODULATION control integrated alarm system for low oil level, high temperature and filter clogging. (see attached specification)
- Two (2) solid-state angle and velocity sensors, with sensor replicator.

The shipyard shall install insert plates as required for the proper installation of the system.

8.14 Bilge System

8.14.1 General

- Bilge system to be designed to DNV and MCA requirements.
- From the bilge manifold in the engine room, suction lines will run to the individual bilges throughout the yacht. The suction pipes shall be arranged that any compartment can be effectively drained when the yacht is heeled to an angle of 10°.
- The bilge manifolds shall use stop-check type valves as appropriate.
- Emergency bilge suctions shall be provided to allow main engine Raw water pumps to de-water engine room
- The bilge compartments shall comprise of :
 - Forepeak
 - Crew Area Forward
 - Crew Area Aft
 - Guest Accommodation Block
 - Engine Room [emergency pumping only]
 - Lazarette
- Each water tight compartment shall have, at the lowest point, its own bilge, each to be with a fully enclosed electronic level alarm sensors, a suction pipe directly connected to the bilge manifold, a strainer and a non-return valve. All strainers to be provided with service access with minimal disruption to interior furnishings.
- The chain lockers shall be pumped out by (an eductor driven by the fire main system). There shall also be a waterline level drain with clamshell cover in the boot top.
- Extra attention has to be given to simple operation of these systems and a good access to valves, manifolds, and pumps.
- The yacht shall be fitted with an oily water separator, Heli-Sep, Model 500, with suctions to the engine room bilge and the bilge tank. A 24 vdc submersible pump Rule 4000 or equal is to pump engine room bilge water into to bilge tank for treatment by the oily water separator.
- The yacht shall be fitted with a dedicated bilge level alarm for the engine room. The alarm should provide an audible and visual warning in the master's cabin, engineer's cabin, and in the wheelhouse.

8.14.2 Pumps

- There will be two independently powered pumps installed as follows:
 - 5-HP, Bronze, 3-phase, 60 Hz, 230 volt, TEFC motor, model MP FM15B-5.530X36CT
- Pumps to be seawater resistant, self-priming and will have mechanical seals.
- Pumps shall be fitted with strainers.
- An emergency diesel driven bilge pump to be provided in the Lazarette, and plumbed as required by MCA. Pump and valves to be provided with clearly marked valves and controls and instruction placard posted.
- An additional portable emergency diesel driven fire/de-watering pump provided with fire hose with fog/stream nozzle and sufficient suction hose for reaching the sea from the main deck shall be provided for storage in the boatswain's locker forward.

8.14.3 Piping and Valves

- In case a watertight compartment has, due to the locations of tanks or other structures, multiple water collecting points, then these points are to be opened up to each other by means of bonded-in heavy wall pipe sections.
- All valves to be bronze.
- Piping to be kept straight wherever possible.
- Vented discharge pipe will have an in-line non-return valve with vented loops.
- Bilge wells will be provided with strum boxes, Groco BS Series, and non-return valves.

8.15 Deck Drain System

- The yacht shall be fitted with sufficient deck drains in order to remove normal rainwater and washdown water from the deck of the yacht. Every effort shall be made to eliminate non-draining pockets of water anywhere on any deck. Freeing ports shall be installed for the removal of green water from the deck and shall be sized per ILLC requirements
- Waterways will be approximately 100mm wide and run the length of all decks exterior decks. The deck drains will be located within the waterway.
- All deck drains shall be fitted with overboard discharges at or below the waterline of the yacht. No drain shall spill out on any other area or deck.
- Deck drain plates shall be perforated stainless steel, size and configuration to be determined with stainless steel and removable strainers similar to Cantieri di Pisa design.

8.16 Engine Room Access System

The yacht shall be fitted with an engine-room escape hatch with a stainless steel escape ladder as shown on the general arrangement drawing. The engine room shall also have 1/4" diamond tread anodized aluminum plate for floor plates supported by a welded framework of stainless steel angles. The plates shall be hinged with pneumatic rams and 1/2" upward rolled lip for access to the engine room bilge. Every effort shall be made to avoid pumps and electric motors being mounted below deck plates except as require for suction requirements. Every effort shall be made to allow for minimum 2000mm overhead clearance in all machinery spaces. All valves should be accessible for routine cycling and maintenance.

8.17 Central Vacuum System

The vacuum shall be NuTone™. The system shall have outlets in all companionways, public areas, and staterooms and be plumbed so as to avoid rough edges or sharp bends, and provide cleanout access for each branch. The vacuum unit shall be located in the accommodations of the yacht, and shall be arranged to provide for easy service and cleaning.

9. ELECTRICAL SYSTEM

9.1 Generators

The yacht shall be fitted with two (2) Northern Lights electrical generators. The generator shall have fire-retardant sound enclosures. The generator shall be heat exchanger cooled, shall have double hydrostatic mounts, wet exhaust elbows, and steel base frames. Generators shall be provided with electronic governors and voltage regulators. Each generator shall be fitted with a small CO₂ system in the sound enclosure.

9.1.1 Generator Particulars

Model:	MP668H
Rating:	99kW(123 kVA), 60 Hz, 220 volt, 1800 RPM, wye connect
Phase:	3-phase
Voltage Regulation:	±0.25%
Power Factor:	0.8
Generator Full Load Temperature Rise:	95°C at 50°C
Lugger Marine Diesel:	LP668H
Inline Cylinders	6
Displacement	6.8 Liters
Bore x Stroke	106 x 127
Horsepower @ 1800 RPM	149

9.1.2 Generator Exhaust System

The generators shall be fitted with wet exhaust systems including water lift mufflers. In addition, at least one generator shall be fitted with a dry-exhaust by-pass system to be used in the Mediterranean or where wet exhaust is not permitted by environmental regulations. The system shall use a water separator cool stack and shall and if required a soot trap and removal system. Exhaust system shall be designed and provided by De Angelo.

9.2 Shorepower Equipment

9.2.1 Frequency Converters

The yacht shore power system shall be fitted with one (1) Atlas ShorPOWER Classic frequency converter rated 100kVA. The input voltage shall be 190 to 250VAC and 340 to 500VAC, single or three phase and the input frequency shall be 40 to 70Hz. The output shall be 120/208VAC, three phase, four-wire, 60Hz. The Atlas ShorPOWER shall have serial data communication with the Atlas TecPOWER Main AC Switchboard described below. One (1) Atlas SmartBOX shall also be provided to allow connection of two (2) shore cords to supply the frequency converter.

9.2.2 Shorepower Cords and Equipment

The yacht shall be equipped with three (3) Glenndenning cablemaster systems, Model CM-8, 24 volt DC, two (2) located in the lazarette, and one (1) in the bosun locker. The system shall include 100 feet of 100 Amp Hubbell shorepower cord for each cablemaster, and one 50-foot extension for use on any cord.

9.3 Power Distribution Systems

9.3.1 AC Systems, Panels, and Switchboards

The yacht electrical power system shall be fitted with one (1) Atlas TecPOWER Main AC Switchboard, which shall provide automated power management capabilities to the yacht. The main bus system shall operate at 120/208VAC, three phase, four-wire, 60Hz and be rated at 800A total. Generator paralleling and seamless transfer capabilities between generators and shore power and generator-to-generator shall be provided.

Automatic generator start-on-demand and load shedding (and reconnection) shall be provided. Automatic generator rotation and automatic start upon loss of shore supply shall be provided. Touch screen control and digital metering shall be provided as well as a serial data communication with the yacht alarm, monitoring and control system. Serial data communication with the Atlas ShorPOWER frequency changer described above shall also be provided. Only Merlin Gerlin /or Siemens equipment shall be utilized in the construction of the all AC panels. All panels shall be sized for space breakers to provide for future expansion. There shall be the following sub-panels:

- Navigation Lights, Bridge Equipment
- Engine Room Equipment, Lazarette and Engineers Cabin
- Flybridge and Upper Deck Equipment
- Owner Stateroom and Guest Stateroom, Ship's Laundry and Equipment
- Interior Lighting & Receptacles
- Main and Crew Galley Equipment, Crew Lounge and Staterooms and Captain Berth

9.3.2 DC Systems, Panels and Switchboards

The yacht shall be fitted with a 24 Volt DC Power system fed from the ship's batteries and controlled from the main AC panel and sub-panels. Only Merlin Gerin or Siemens equipment shall be utilized in the construction of the all DC panels. All panels shall be sized for space breakers to provide for future expansion

The DC system will include the following Battery Banks:

Bank	Voltage	Qty of Batteries
Main Battery Bank (engine room)	24	10
Main Engine Starting	24	4
Generator Starting	24	2
Emergency Radio Bank [Bridge]	24	2
Emergency Lighting Bank (Bridge)	24	2

All batteries shall be Mastervolt™ gels. All battery charges to be Mastervolt™ as follows:

- House battery bank. 100amp, 24 vdc. 12 x 2 volt cells 1000 amp/hrs
- Main engine starting 25 amp 24 vdc. 2x 12 volts cells with CCA as required.
- Generator starting 15 amp 24 vdc 2x 12 volts cells with CCA as required.
- Emerg. Radio bank 15 amp 24 vdc Capacity as required by MCA.
- Emerg. Lighting Bank 15 amp 24 vdc Capacity as required by MCA.
- 12vdc supply to be supplied by 24/12 vdc converters where necessary.

Each generator to have stand alone battery bank for starting, with paralleling switches to each other and main engine start bank. It should be possible to parallel house battery bank with main engine start bank. It should be possible to parallel house battery bank with emergency lighting and radio banks. Generators should have alternators for charging start batteries. Main engine should have alternators for charging start/house batteries. Multi-stage charger(s) to be provided for charging all banks, isolated to prevent feedback from alternators. Areas where batteries are installed shall be provided with adequate forced ventilation, and provisions made for accessibility for service and replacement.

9.4 Lighting Fixtures

All Interior and Exterior Lighting shall be built and installed to the Interior Designers specifications and designs.

9.4.1 Interior Lights

Interior lighting fixtures in the accommodation spaces shall be selected by the interior decorator. Forepeak, chain locker, all bilge spaces and lazarette shall have 24vdc lighting. Main engine room shall have 24vdc lighting in addition to the normal A.C. lighting per the Interior Designer.

9.4.2 Exterior Lights

There shall be exterior lights as required for the safety of people on board the yacht. Bridge side deck and fore deck lighting shall be provided with a master switch at the wheel station. The yacht shall also be fitted with one (1) Perko #329 meal and absent light, to be mounted in the main starboard yardarm. Mealtime light is white and absent light is blue. Two halogen weatherproof floodlights are to be mounted on the mast to illuminate yacht fore and aft. There shall be foot lighting and overhead lighting on all exterior passageways per designer, accent and flood lighting per designer. (Recommend Savage Marine, Ltd.; U.K. or equal for fixtures)

9.4.3 Emergency Lights.

Emergency 24vdc lights to be provided throughout the interior of yacht, and at liferaft location and liferaft boarding area as required by MCA.

9.4.4 Search Lights

The yacht shall be fitted with one RCL – 600A on the arch or mast and shall feature the following:

Material: Aluminum
Color: White
Operation: Remote joystick control
Beam Angle: Variable
Elevation Angle: 18° up, 30° down
Elevation Speed: 7.5° per second
Rotation: 360° continuous
Rotation Speed: 11° per second low, 27° per second high
Lamp: 150 watt Xenon

The yacht shall be fitted with two RCL-100D on the bridge wings and shall feature the following:

Material: Aluminum
Color: White
Operation: Remote joystick control
Beam Angle: 5° Vertical and 7° Horizontal
Elevation Angle: 9° up, 17° down
Elevation Speed: 2° to 7° per second
Rotation: 360° continuous
Rotation Speed: 18° per second low, 28° per second high
Lamp: 55 watt Halogen

9.5 Receptacles

There shall be dual 120-volt receptacles throughout the accommodation spaces spaced no more than 10' apart, and in all heads and all nightstands as required for equipment and as determined by the interior decorator and/or naval architect. GFCI outlets shall be used in all circuits. There shall be wall-mounted switches for overhead lights at the entry of each space, with additional switches at beds or second doorways as appropriate.

9.6 Navigation Lights

The yacht shall be fitted with the following 120 V, Aquasignal Series 55 navigation lights:

- Mast Head Light, 225°
- Anchor Light, 360°
- Red Side Light, 112 1/2°
- Green Side Light, 112 1/2°
- Stern Light, 135°
- Two N.U.C. Lights 360°
- Towing Lights (Masthead white 225 and Stern Amber 112 1/2)

Placement of the lights shall be per the COLREGS, as shown on the M-241-5401, navigation lights. Navigation lights plan to be submitted to Flag State Administration for approval. Care shall be taken to prevent navigation lights creating light pollution or reflections on any areas visible from bridge, by use of shields or other means as necessary. Yacht shall be fitted with a dedicated navigation lights panel including controls with switching, and status indication.

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9.7 Electric Cable Standards

- All cables will be marked at both ends and elsewhere as appropriate with an alphanumeric code.
- Individual cores will also be coded with either a color or alphanumeric code.
- All switches, breakers, junction boxes, *wires* and relays will also be clearly marked with alphanumeric code at all access points keyed to the yacht as-built drawings
- Wiring diagrams throughout the yacht will conform to the following standards:
 - All names of positions, cabins et cetera will be designated in the general arrangement drawings,
 - Separate drawings for each electrical system,
 - Block diagrams showing the location of all equipment, junction boxes, terminal strips and cable runs,
 - All codes used on the cables and terminals will be indicated on the drawings,
 - Detailed drawings indicating the operation of equipment and switchboards.
- As part of the ship's manual, the builder will furnish two complete, updated, indexed sets of all electrical drawings and diagrams at the time of delivery of the yacht.
- The following considerations will prevail for cable routing:
 - Cables passing through decks and watertight bulkheads will be fitted with watertight through deck/full fittings. Fittings to be DNV type approved.
 - Cables passing through deck to be protected against mechanical injury.
 - Cables will run on cable tray or in trunks that will be secured to the structure.
 - Care will be taken at all times to avoid and protect against chafing.
 - Spurs from the trays trunks will be run in flexible conduit to the equipment.
 - Cables to be attached to cable trays and fixed with metal or nylon straps.
 - All connection boxes to be accessible.

9.8 Cathodic Protection

The yacht shall be fitted with zinc anodes, sized for a three-year life, attached with 316 stainless steel studs to the hull. Special attention shall be paid to locating sufficient zincs near and on the running gear and rudders. The yacht shall be fit with a Capac Cathodic Monitoring system (with analogue read out in the engineering control room), with interface to the vessel monitoring system.

9.9 Controls and Monitoring

Control and monitoring will utilize a SiMON System provided by Palladium Technologies, Inc. SiMON offers the latest technology in monitoring and will become the single-point resource for integrating your vessel's operational data. It collects real-time information from sensors monitoring the critical systems and notifies the captain of any deviation, allowing the captain in essence to be proactive versus reactive. SiMON constantly checks the various systems.

All the data and critical inputs will be illustrated by SiMON through the ship's computer. The richness of this capability includes the building of conditional alarms based upon decision tree logic. In addition, by using a greater number of linear sensors in place of the digital sensors, a larger quantity and variety of alarm set points can be established. The graphical interface within SiMON provides the user a "yacht view" into the operation of each of the monitoring systems. Analog and digital values can be displayed along with trend charting of values for any of the sensor points being monitored.

In addition, our SiMON system comes with the capability of displaying up to 15 Ships Displays (MIMIC), which can be the yacht line drawings of the vessel with sensor indicators positioned on these drawings. These replace the typical plastic panels engraved with the yacht's line drawings, with LED indicator lights. By monitoring and displaying this data (bilge alarms, fire zones, navigation, lights, etc.) within SiMON, the yacht receives the added benefit of redisplaying these views/information at other locations on the vessel including rebroadcast on the entertainment system for view in the Owner's and/or Captain's quarters.

SiMON goes beyond the normal monitoring systems with an interface to the bridge electronics via the NMEA 0183 data. By connecting the SiMON computer to the depth, wind, GPS outputs, SiMON displays and alarms on a variety of navigation data, which extends the integration of yacht data.

Palladium Technologies will achieve DNV Yacht classification of SiMON for this vessel in support of the E0 class notation.

9.9.1 Sensors

The system shall include the following Sensors:

Palladium supplied sensors	200
Caterpillar supplied sensor points (14 per engine)	18
SiMON Atlas Power Management Interface data points	40
Total Sensor Points	258

System	Sensor Data Point Full Name
Alarms	Alarms Equipment Output
Alarms	Alarms Fire Output
Alarms	Alarms Safety Output
Atlas Techpower Interface	Atlas Techpower Interface Engine Room Actual Load
Atlas Techpower Interface	Atlas Techpower Interface Engine Room Dock Capacity
Atlas Techpower Interface	Atlas Techpower Interface Engine Room Shorepower Capacity
Atlas Techpower Interface	Atlas Techpower Interface Engine Room Shorepower CB Failed to Close
Atlas Techpower Interface	Atlas Techpower Interface Engine Room Shorepower CB Failed to Open
Atlas Techpower Interface	Atlas Techpower Interface Engine Room Shorepower CB Tripped
Atlas Techpower Interface	Atlas Techpower Interface Engine Room Shorepower DC Bus Contractor Failure
Atlas Techpower Interface	Atlas Techpower Interface Engine Room Shorepower DC Bus Fuse Blown
Atlas Techpower Interface	Atlas Techpower Interface Engine Room Shorepower Input SFMR Over Temp
Atlas Techpower Interface	Atlas Techpower Interface Engine Room Shorepower Inverter Control PS Undervoltage
Atlas Techpower Interface	Atlas Techpower Interface Engine Room Shorepower Inverter DC Over Voltage
Atlas Techpower Interface	Atlas Techpower Interface Engine Room Shorepower Inverter General Fault
Atlas Techpower Interface	Atlas Techpower Interface Engine Room Shorepower Inverter Ground Fault
Atlas Techpower Interface	Atlas Techpower Interface Engine Room Shorepower Inverter Output Short Circuit
Atlas Techpower Interface	Atlas Techpower Interface Engine Room Shorepower Inverter Over Current
Atlas Techpower Interface	Atlas Techpower Interface Engine Room Shorepower Inverter Overheat Alarm
Atlas Techpower Interface	Atlas Techpower Interface Engine Room Shorepower Inverter Overheat Shutdown
Atlas Techpower Interface	Atlas Techpower Interface Engine Room Shorepower Inverter Overload 1
Atlas Techpower Interface	Atlas Techpower Interface Engine Room Shorepower Inverter Overload 2
Atlas Techpower Interface	Atlas Techpower Interface Engine Room Shorepower Main Control Under Voltage
Atlas Techpower Interface	Atlas Techpower Interface Engine Room Shorepower Output Voltage Fault
Atlas Techpower Interface	Atlas Techpower Interface Engine Room Shorepower Output XFRM Over Temp
Atlas Techpower Interface	Atlas Techpower Interface Engine Room Shorepower Soft Start Contractor Fault
Atlas Techpower Interface	Atlas Techpower Interface Engine Room Shorepower Transfer Fault
Atlas Techpower Interface	Atlas Techpower Interface Engine Room Shorepower VCTR Relay Fault
Atlas Techpower Interface	Atlas Techpower Interface Engine Room Switchboard Average Power Factor
Atlas Techpower Interface	Atlas Techpower Interface Engine Room Switchboard Bus KVH
Atlas Techpower Interface	Atlas Techpower Interface Engine Room Switchboard Frequency
Atlas Techpower Interface	Atlas Techpower Interface Engine Room Switchboard Main Bus L1 Amps
Atlas Techpower Interface	Atlas Techpower Interface Engine Room Switchboard Main Bus L1 to L2 Volts
Atlas Techpower Interface	Atlas Techpower Interface Engine Room Switchboard Main Bus L1 to L3 Volts
Atlas Techpower Interface	Atlas Techpower Interface Engine Room Switchboard Main Bus L1 to N Volts
Atlas Techpower Interface	Atlas Techpower Interface Engine Room Switchboard Main Bus L2 Amps
Atlas Techpower Interface	Atlas Techpower Interface Engine Room Switchboard Main Bus L2 to L3 Volts
Atlas Techpower Interface	Atlas Techpower Interface Engine Room Switchboard Main Bus L2 to N Volts
Atlas Techpower Interface	Atlas Techpower Interface Engine Room Switchboard Main Bus L3 Amps
Atlas Techpower Interface	Atlas Techpower Interface Engine Room Switchboard Main Bus L3 to N Volts
Atlas Techpower Interface	Atlas Techpower Interface Engine Room Switchboard Total VA
Atlas Techpower Interface	Atlas Techpower Interface Engine Room Switchboard Total Watts
Atlas Techpower Interface	Atlas Techpower Interface Engine Room Switchboard Watt Hours
Bilge	Bilge Aft Crew Area Bilge High Level #6
Bilge	Bilge Aft Engine Room Bilge High Level #2
Bilge	Bilge Aft Guest Rooms Bilge High Level #4
Bilge	Bilge Aft Lazarette Bilge High Level #1

Bilge	Bilge Aft Lazarette Bilge High Level #1
Bilge	Bilge Chain Locker Bilge High Level #8
Bilge	Bilge Fwd Crew Area Bilge High Level #7
Bilge	Bilge Fwd Engine Room Bilge High Level #3
Bilge	Bilge Fwd Guest Rooms Bilge High Level #5
CAT Electronic Engine Interface	CAT Electronic Engine Interface Port Boost Pressure
CAT Electronic Engine Interface	CAT Electronic Engine Interface Port Coolant Pressure
CAT Electronic Engine Interface	CAT Electronic Engine Interface Port Engine RPM
CAT Electronic Engine Interface	CAT Electronic Engine Interface Port Fuel Pressure
CAT Electronic Engine Interface	CAT Electronic Engine Interface Port Fuel Rate
CAT Electronic Engine Interface	CAT Electronic Engine Interface Port Inlet Air Temperature
CAT Electronic Engine Interface	CAT Electronic Engine Interface Port Oil Pressure
CAT Electronic Engine Interface	CAT Electronic Engine Interface Port Percent Engine Load
CAT Electronic Engine Interface	CAT Electronic Engine Interface Port Throttle Position
CAT Electronic Engine Interface	CAT Electronic Engine Interface Stbd Boost Pressure
CAT Electronic Engine Interface	CAT Electronic Engine Interface Stbd Coolant Pressure
CAT Electronic Engine Interface	CAT Electronic Engine Interface Stbd Engine RPM
CAT Electronic Engine Interface	CAT Electronic Engine Interface Stbd Fuel Pressure
CAT Electronic Engine Interface	CAT Electronic Engine Interface Stbd Fuel Rate
CAT Electronic Engine Interface	CAT Electronic Engine Interface Stbd Inlet Air Temperature
CAT Electronic Engine Interface	CAT Electronic Engine Interface Stbd Oil Pressure
CAT Electronic Engine Interface	CAT Electronic Engine Interface Stbd Percent Engine Load
CAT Electronic Engine Interface	CAT Electronic Engine Interface Stbd Throttle Position
Compressor	Compressor Port Main Air 1
Door	Door Aft Engine Room Entrance
Door	Door Aft Main Salon Entrance
Door	Door Aft Master State Room Entrance
Door	Door Flybridge Sliding Door Entrance
Door	Door Lazarette Exercise Room Entrance
Door	Door Lazarette Exercise Room Entrance
Door	Door Port Main Deck Entrance
Door	Door Port Pilot House Entrance
Door	Door Stbd Main Deck Entrance
Door	Door Stbd Pilot House Entrance
Electrical DC	Electrical DC Emergency 24V Battery Voltage
Electrical DC	Electrical DC Engine Port 24V Battery Voltage
Electrical DC	Electrical DC Engine Starboard 24V Battery Voltage
Electrical DC	Electrical DC GMDSS 24V Battery Voltage
Electrical DC	Electrical DC House 24V Battery Voltage
Engine	Engine Port Exhaust Left Temperature
Engine	Engine Port Exhaust Right Temperature
Engine	Engine Port Gear Box Oil Pressure
Engine	Engine Port Gear Box Oil Temperature
Engine	Engine Port Shaft Gland Bearing Temperature
Engine Room	Engine Room Main Engine Room Air Pressure Differential
Engine Room	Engine Room Main Engine Room Air Temperature IN
Engine Room	Engine Room Main Engine Room Air Temperature Out
Engine Room	Engine Room Main Engine Room Port Exhaust Fans Status
Engine Room	Engine Room Main Engine Room Stbd Exhaust Fans Status
Engine	Engine Starboard Exhaust Left Temperature
Engine	Engine Starboard Exhaust Right Temperature
Engine	Engine Starboard Gear Box Oil Pressure
Engine	Engine Starboard Gear Box Oil Temperature
Engine	Engine Stbd Shaft Gland Bearing Temperature
Generator	Generator Port Coolant Temperature
Generator	Generator Port Exhaust Temperature
Generator	Generator Port Oil Pressure
Generator	Generator Port RPM
Generator	Generator Stbd Coolant Temperature
Generator	Generator Stbd Exhaust Temperature
Generator	Generator Stbd Oil Pressure
Generator	Generator Stbd RPM
HVAC	HVAC Engine Room Chilled Water In
HVAC	HVAC Engine Room Chilled Water Out #1
HVAC	HVAC Engine Room Chilled Water Out #2
HVAC	HVAC Engine Room Chilled Water Out #3

HVAC	HVAC Engine Room Compressor #1 Run
HVAC	HVAC Engine Room Compressor #2 Run
HVAC	HVAC Engine Room Compressor #3 Run
Hydraulic	Hydraulic Main #1 Oil Pressure
Hydraulic	Hydraulic Main #1 Oil Temperature
Hydraulic	Hydraulic Main #1 Tank Low Level
Monitoring	Monitoring Port Anchor System - Starboard
Monitoring	Monitoring Stbd Anchor System - Starboard
Navigation	Navigation Anchor Light Bulb Status
Navigation	Navigation Anchor Light Control On/Off
Navigation	Navigation Anchor Light Status
Navigation	Navigation Head Lower Light Status
Navigation	Navigation Head Top Light Bulb Status _ Not Under Cmd
Navigation	Navigation Head Top Light Status _ Not Under Command
Navigation	Navigation Head Top Light Control On/Off _ Not Under Cmd
Navigation	Navigation Masthead Light Bulb Status
Navigation	Navigation Masthead Light Control On/Off
Navigation	Navigation Masthead Light Status
Navigation	Navigation Port Light Bulb Status
Navigation	Navigation Port Light Status
Navigation	Navigation Port Light Control On/Off
Navigation	Navigation Starboard Light Status
Navigation	Navigation Starboard Light Bulb Status
Navigation	Navigation Starboard Light Control On/Off
Navigation	Navigation Stern Light Bulb Status
Navigation	Navigation Stern Light Status
Navigation	Navigation Stern Light Control On/Off
Port Lights	Port Lights Port Aft Guest Head Portlight Status
Port Lights	Port Lights Port Aft Guest Portlight Status
Port Lights	Port Lights Port Aft Head Portlight Status
Port Lights	Port Lights Port Aft Laundry Portlight Status
Port Lights	Port Lights Port Fwd Guest Head Portlight Status
Port Lights	Port Lights Port Fwd Guest Portlight Status
Port Lights	Port Lights Stbd Aft Guest Head Portlight Status
Port Lights	Port Lights Stbd Aft Guest State Room Portlight Status
Port Lights	Port Lights Stbd Aft Head Portlight Status
Port Lights	Port Lights Stbd Aft Head Portlight Status
Port Lights	Port Lights Stbd Engineers Room Portlight Status
Port Lights	Port Lights Stbd Fwd Guest State Room Portlight Status
Port Lights	Port Lights Stbd Guest Head Portlight Status
Refrigeration	Refrigeration Cold Storage Door Status
Refrigeration	Refrigeration Cold Storage Middle (50% level) Temperature
Refrigeration	Refrigeration Freezer Door Status
Refrigeration	Refrigeration Freezer Middle (50% level) Temperature
Refrigeration	Refrigeration Fridge Door Status
Refrigeration	Refrigeration Fridge Middle (50% level) Temperature
Safety	Safety Captains Stateroom Fire and Smoke
Safety	Safety Chain Locker Fire and Smoke
Safety	Safety Crew Galley Fire and Smoke
Safety	Safety Crew Lobby Fire and Smoke
Safety	Safety Engine Control Room Fire and Smoke
Safety	Safety Engine Room Port Fire and Smoke
Safety	Safety Engine Room Stbd Fire and Smoke
Safety	Safety Engineers State Room Fire and Smoke
Safety	Safety Exercise Room Fire and Smoke
Safety	Safety Foredeck Storage Fire and Smoke
Safety	Safety Guest Lobby Fire and Smoke
Safety	Safety Laundry Fire and Smoke
Safety	Safety Master Stateroom Aft Fire and Smoke
Safety	Safety Master Stateroom Port Head Fire and Smoke
Safety	Safety Master Stateroom Stbd Head Fire and Smoke
Safety	Safety Media Strm Fire and Smoke
Safety	Safety Pantry Fire and Smoke
Safety	Safety Pilot House Port Fire and Smoke
Safety	Safety Pilot House Stbd Fire and Smoke
Safety	Safety Port Aft Guest Stateroom Fire and Smoke

Safety	Safety Port Crew Cabin 3 Fire and Smoke
Safety	Safety Port Formal Dinning Fire and Smoke
Safety	Safety Port Fwd Guest Stateroom Fire and Smoke
Safety	Safety Port Main Salon Fire and Smoke
Safety	Safety Stbd Aft Guest Stateroom Fire and Smoke
Safety	Safety Stbd Crew Cabin 1 Fire and Smoke
Safety	Safety Stbd Crew Cabin 2 Fire and Smoke
Safety	Safety Stbd Formal Dinning Fire and Smoke
Safety	Safety Stbd Fwd Guest Stateroom Fire and Smoke
Safety	Safety Stbd Main Lobby Fire and Smoke
Safety	Safety Stbd Main Salon Fire and Smoke
Safety	Safety Study Fire and Smoke
Security	Security Center Swim Platform Deck Sensor
Security	Security Main Deck Aft of Main Doors Deck Sensor
Security	Security Main Deck Aft Stairs Deck Sensor
Security	Security Main Deck Port Companion Way Access Deck Sensor
Security	Security Main Deck Stbd Companion Way Access Deck Sensor
Security	Security Port Swim Platform Deck Sensor
Security	Security Starboard Swim Platform Deck Sensor
Tank	Tank Main Fresh Water #1 Level
Tank	Tank Main Fresh Water #2 Level
Tank	Tank Main Fuel Level #1
Tank	Tank Main Fuel Level #2
Tank	Tank Main Fuel Level #3
Tank	Tank Main Fuel Level #4
Tank	Tank Main Fuel Level #5
Tank	Tank Main Fuel Overflow #1
Tank	Tank Main Fuel Overflow #2
Tank	Tank Main Gray #1 Level
Tank	Tank Main Gray #2 Level
Tank	Tank Main Lube Oil - New Oil Level
Tank	Tank Main Lube Oil - Waste Oil Level
Tank	Tank Port Main Day Fuel Level
Tank	Tank Port Main Day Fuel Level
**THIS IS ONLY A PRELIMINARY SENSOR LIST	THE FINAL LIST WILL BE DEVELOPED DURING THE BUILD PROCESS WITH INPUTS FROM THE MCA, DNV, OWNER, NAVAL ARCHITECT AND METALNAVE

9.9.2 SiMON Controller

The system will include the following SiMON controllers:

- 2 SiMON Smart Controllers
- 1 SiMON Electronic Engine Controller
- 1 SiMON Atlas Interface Controller

9.9.3 SiMON Management Software

Complete SiMON Monitoring and Alarming System for 258 Sensor points, including mimic plan and profile views of the yacht with overlaid Icon indicators. A completely configured system will be provided to support the 258 sensor points, along with alarm setpoints.

9.9.4 SiMON Computers

There will be three (3) stations for this SiMON system, as follows:

- Helm/Bridge – 19” rack mounted computer running Windows XP Professional, 2.4Ghz, 512mb 40GB hard drive and a Nauticomp 18” Daylight Viewable LCD with low light dimming. Includes a 700 VA UPS backup power system.
- Engine/Machinery Control Room – 19” rack mounted computer running Widows XP Professional, 2.4 GHz, 512mb, 40GB hard drive and a 15” LCD. Includes a 700 VA UPS backup power system.
- Crews Quarters – Small footprint computer running Widows XP Professional, 2.4 GHz, 512mb, 40GB hard drive and a 15” LCD. Includes a 700 VA UPS backup power system.

9.9.5 NMEA Data Management

SiMON gathers NMEA streams and illustrates history on multiple pages. Also, allowing location tracking along with performance data logging

9.9.6 SiMON – Alarm Controller

This SiMON Controller provides for the control of external alarm devices such as horns, strobes, etc. Up to 6 amps are controlled via relays, which are triggered, by SiMON's Critical and Cautionary alarms at four levels per sensor point.

9.9.7 Software License

An unlimited site license for the vessel is granted to each purchaser of the SiMON system. This allows the purchaser to use SiMON at as many locations on the vessel as they desire without purchasing additional licenses for each location. The license is transferable upon resale of the vessel.

10. OUTFIT

10.1 Domestic Appliances

In general, the yacht shall be outfitted with 120 volt and 208 volt, 60 Hz appliances as available. For cooking, electricity will be used. All equipment installed shall be easily accessible and/or removable for cleaning, maintenance, and servicing. Care shall be taken that sufficient ventilation is provided for all equipment requiring it. The appliances listed below are to be updated and revised based on space requirements of the general arrangement plan. As models and model numbers are likely to change, the shipyard shall supply the latest comparable model available at the time of ordering of the appliances. Appliance list to be confirmed by Evan Marshall for both selection and compatibility with the general arrangement plans.

10.1.1 Cold Storage

The yacht shall be fitted with built in cold storage with temperature zones for both cold and frozen foods as shown on the general arrangement plans. The compressors shall be electrically powered, 3-phase, Cu/Ni 90/10, saltwater heat exchanger and fan cooled, and shall be located under the cold storage room. System shall have local sea suction and dedicated seawater system. Cospolich Refrigerator Company shall manufacture the mechanical components as well as the custom stainless steel insulated box. Unit shall feature:

- 4" foam-in-place polyurethane wall panels, incorporating perimeter male-female handrail system, encased in type 304, 0.035 stainless steel
- Floor manufactured using 0.060 in stainless steel, with underlayment.
- Heavy duty door and steel-reinforced door frame, with a positive lockable latch and inside safety release
- Modular construction, for ease of transportation and installation in hard to access spaces
- Exterior lighted rocker switch for interior lights
- LED temperature read-out display

10.2 Lifesaving Equipment

The yacht shall be outfitted as required by all regulatory requirements pertaining to a yacht of this type and size. In general the equipment shall include:

- Two (2) Switlik SOLAS-A equipment package 20 man Liferrafts, with canisters.
- Life rafts to be located as shown in the general arrangement plans
- Twenty-five (25) approved, Adult Personal Flotation Devices each with a whistle, dye marker, reflective tape, and light
- Three (3) approved, Child Personal Flotation Devices each with a whistle, dye marker, reflective tape, and light
- Six (6), inflatable lifejackets for use of the crew of any rescue boat or inflatable boat.
- Twenty-five (25) approved immersion suits
- Four (4) 30" Diameter approved, Life Buoys, painted with yacht name and port, with combined light and smoke signals, with 30 meters floating line, located main deck port and starboard and bridge deck port and starboard in recessed mounting locations.
- Visual Distress Signal Flares
 - Twelve (12) red parachute flares
 - Six (6) white parachute flares
 - Four (4) red hand flares
 - Four (4) white hand flares
 - Three (3) orange smoke day signals
- One (1) ACR Category I EPIRB w/hydrostatic release
- One (1) Radar Transponder (SART)
- One (1) Complete First Aid Kit
- One (1) Offshore Pharmacy Kit for Ocean Service

10.3 Portable Fire Fighting Equipment

The yacht when delivered shall be equipped with the following portable 5 lb. dry chemical fire extinguishers, Type B-1.

- Owner's Cabin
- Navigation Bridge
- Each Guest Cabin (4)
- Captain's Cabin
- Crew Lower Deck Passage Way
- Flybridge

The yacht shall also have the following 10 lb. dry chemical fire extinguishers, Type B-2:

- Main Galley
- Crew Galley and Lounge
- Main Salon
- Formal Dining Area
- Skylounge
- Engine Room (4)
- Lazarette
- Aft Main Deck (tender area) (2)

The yacht shall also have the following 10 lb. CO₂ fire extinguishers, type B and C:

- Main Galley
- Crew Galley
- Engine room

The yacht shall be equipped with five (5) spare 5 lb. dry chemical fire extinguishers, and six (6) spare 10 lb. dry chemical fire extinguishers per MCA. The yacht shall also be equipped with three (3) fire axes, one located on each deck mounted in brackets. The yacht shall be equipped with fire blankets in the main galley and crew galley. The yacht shall also be equipped with two (2) full fireman's outfits. Suitable storage shall be provided in the interior of the yacht.

10.4 Navigation and Communication Equipment

There shall be an allotment of \$300,000 for the purchase of electronic equipment such as satellite and cellular telephones, chart plotters, radio equipment, GPS equipment, and onboard telephone system. The Owner Representative shall make detailed equipment selections in a timely manner in accordance to requirements of the construction schedule. Locations for landline telephone connections shall be determined. Shipyards to run all wiring and build in all equipment to the Interior Designers specifications and the foot prints provided by the electronics vendors/suppliers. Standard cables and wire shall be the shipyards expense as well as all labor to run all wiring. The shipyard is to fabricate all equipment platforms and associated joinery for the installation of all navigation and communication equipment.

10.5 Electronic Entertainment Equipment

There shall be an allotment of \$250,000 for the purchase and installation of electronic entertainment equipment such as receivers, tuners, televisions, and stereo equipment. Owner shall make detailed equipment selections in a timely manner in accordance to requirements of the construction schedule. For example, sizes for television units that are to be mounted in cabinets will be required before fabrication of the cabinets per the Interior Designers design and specifications. Standard cables and wire shall be the shipyards expense as well as all labor to run the wiring. The shipyard is to fabricate all equipment platforms and associated joinery for the installation of all electronic entertainment equipment.

10.6 Plumbing Fixtures

10.6.1 General

Miscellaneous fittings such as towel bars, toilet paper dispensers, and soap dishes are to be determined by the interior decorator. All faucet, shower and galley pressure water units to have shut off valves in close proximity of respective unit. All drains to be fitted with water traps including air conditioning unit drains.

10.6.2 Bath and Shower Fittings

Bath and shower fittings shall feature a cast brass valve body. All brass components in contact with water supply shall contain no more than 3% lead content by weight. The fittings shall also feature ceramic disc valve cartridge, which allows users to control both water temperature and volume. Fittings shall be equipped with pressure balancing cartridge engineered to eliminate cross flow and avoid failure due to mineral deposits. Fittings shall also feature a hot limit safety stop and large "comfort zone" 20 degrees temperature range for at least 45-degree handle rotation.

10.6.3 Head Vanity Fittings

All heads shall be fitted with sinks and faucets per designer specifications. Sinks shall be feature under counter installation.

10.6.4 Tubs, Shower Pans, and Shower Doors

The yacht shall be fitted with whirlpool tub in all guest staterooms and in the Owner's stateroom. Additionally the Owner's stateroom shall be fitted with two showers. Captain and each crew stateroom shall be fitted with showers. The shower or tub doors shall be 10 mm tempered glass.

10.6.5 Miscellaneous Sinks and Faucets

Galley sinks shall be stainless steel double sinks per designer specification both the crew and main galley. All sinks and faucets shall be per designer specification. Faucets models shall be determined by the decorator. All sink and bath fixtures to be by Serdanelli models to be specified by designer.

The yacht shall be fitted with stainless steel utility sinks in the engine room, laundry room, and stewardess service areas, as well as other locations per designer.

10.6.6 Toilets

Toilets throughout the yacht shall be Headhunter™ Royal Flush Superbowl Toilets. Colors determined from Headhunter's standard selection, per the interior designer.

10.6.7 Spa

The yacht shall be fitted with the plumbing and wiring for the future installation of a spa on the flybridge. Plumbing shall include both supply piping and drain piping

10.6.8 Flybridge

The yacht shall be fitted with a flybridge day head including sink and toilet and hand shower as shown on the general arrangement plan. The bolt down flybridge bar shall include sink, icemaker, and BBQ.

10.6.9 Exterior Hand Showers

- A mixer-controlled deck shower is to be built in at the transom in a shower locker on aft deck.
- A mixer-controlled deck shower is to be built in on the flybridge per designer/naval architect specifications.

10.7 Security Systems and Devices

10.7.1 Electronic Intrusion Detection System

The yacht shall be fitted with a state of the art intrusion detection system. There shall be an allotment of \$60,000 for the purchase and installation of the system.

10.7.2 Locks

The yacht shall be fitted with a master key system. There shall be keyed locks on each stateroom door and on all exterior doors and lockers. The system shall be design with a sub-master key for all crew access area and a sub-master key for all guest access areas. There shall be privacy locks on all heads.

10.7.3 Safes

The yacht shall be fitted with six (2) 1.0 ft³ safes, Sentry Model 6250. One safe shall be in the Owner's stateroom, one shall be in the captain's stateroom, and there shall be one in each of the four guest staterooms.

10.8 Miscellaneous Deck Gear

The yacht shall come equipped with the following equipment

- Two (2) telescopic boat hooks
- One (1) handheld searchlight
- Two (2) appropriate sized flags of the country of registration
- One (1) ensign staff, with blocks, halyard, and cleat
- One (1) jack staff
- One (1) set of signal flags, 18" x 24", stored on the bridge
- Two (2), anchoring black balls
- Ship's Bell, chrome plated, 8" diameter
- 50 foot hose and plastic nozzle for each exterior hose wash down bib
- Eight (8) Fenders - Polyform™ F-11 with black Fenda-Sox™
- Twelve (12) Fender Hooks, custom for Yacht caprail cross-section
- 4 x 50' Black Mega-Braid™ docklines with 3' spliced eyes and leather chafe protection
- 4 x 100' Black Mega-Braid™ docklines with 3' spliced eyes and leather chafe protection
- One (1) Fortress™ anchor, model FX-125, with 5 meters chain, shackles, storage bag, and 300 feet of 1-1/4" 3-strand nylon line for stern anchor. Stowage arrangement in lazarette to be provided.

- Harken Sail track above house windows (frame 33 to frame 45) to facilitate crew access to this area.
- Harken Sail track above house windows (owner stateroom frame 19 to frame 27) to facilitate crew access to this area.

10.9 Boarding Equipment

10.9.1 Passerelle

The yacht shall be fitted with one hydraulic passerelle. The unit shall be type Ocean, manufactured by Cramm, per Cramm drawing 3086-00. The passerelle shall be controlled by a PLC control box and powered by the ship's integrated central hydraulic system. The unit's general specifications shall be:

- Overall Storage Dimension: 5112 mm
- Reach Outside Hull: 4850 mm
- Telescopic Part: 1000 mm
- Upward Angle: 20 degrees
- Downward Angle: 20 degrees
- Starboard Angle: 20 degrees
- Port Angle: 20 degrees
- Wheel set: SS removable
- Operation/handling: Infra red distance controller with push-button panel (IP65)
- Frame Material: Stainless steel, AISI 304
- Gangway Material: Aluminum ALMg 4.6 Mn.
- Gangway Finish: Painted ()

The unit shall also have teak grating, two (2) door rams 25/50 x 250, one (1) locking ram 25/50 x 60, two (2) removable stanchions for one side (stainless steel), and integrated Tivoli lighting (24 Volt).

10.9.2 Boarding Stairs

The yacht shall be fitted with a hydraulic accommodation ladder on the starboard side and a manual ladder on the port side.

10.9.2.1 Hydraulic Boarding Ladder

The yacht shall be fitted with one Cramm Hydraulic Operated Accommodation Ladder, Type CAL10T. The unit shall be powered by the ship's integrated central hydraulic system. The unit's general specification shall be:

- Drawing #: 3508-07-00/3508-08-00
- Dimension upper to lower platform: 2375 mm
- Angular Displacement: 50 degrees
- Steps operating: self pivoting
- Stanchions: removable
- Operating: push button panel
- Ladder Material: Stainless steel, AISI 304
- Cylinder Material: Steel with Stainless steel rod
- Stanchion Material: High Polished Stainless Steel

The unit shall have teak grating, two (2) cylinders for locking completely with locking pin, one (1) cylinder for extension.

10.9.2.2 Manual Boarding Ladder

The yacht shall be fitted with one Marquipt Tide-Ride™ boarding stair complete with all required mounting hardware and fittings. Stair shall be standard 21" wide providing 19" walkway with 9 steps, with teak treads and yacht name in bottom step. The boarding stair when not in use shall be stored on the bulwark. The yacht

shall be fitted with mounting brackets port and starboard and include two varnished teak handrails. The yacht shall also be equipped with one Marquipt™ vertical boarding ladder, six-step model, to fit the same mounting brackets as the Tide-Ride™ stairs. Ladder to be stored in the bulwark when not in use.

10.9.3 Bulwark Doors/Step Plates

There shall be five (5) bulwark doors for boarding the yacht each with a step plate bearing the yacht's name. They shall be located as follows:

- Port, near Frame 24 (for use with Tide-Ride stair)
- Port, near Frame 14 (for use with Tide-Ride stair)
- Starboard, near Frame 24 (for use with Tide-Ride stair)
- Starboard, near Frame 22 (for use with Hydraulic Side Boarding Ladder)
- Starboard, aft, near Frame 2 (for use with Passerelle)

10.9.4 Doorbell/Doorphone System

The passerelle and all bulwarks doors shall be fitted with a doorphone/doorbell system interfaced to the ship's phone system using watertight plugs at the bulwarks and a remote mounted unit containing a call button and speakerphone for visitors to contact the crew. Alternatively a wireless system may be used if suitable.

10.10 Tenders and Davit

The yacht shall be fitted with one 18' Novurania Equator™ and one 15' Novurania inflatable tender and two waverunner PWC's, all capable of being located on the aft main deck or on the flybridge. The yacht shall be fitted with overhead sliding davits for the tenders on the main deck, and a hydraulic deck crane on the flybridge. In addition, the main deck bulwarks shall be folding to allow for launch of the tender. The equipment shall be powered by the ship's integrated central hydraulic system. Details of the launching equipment are as follows:

10.10.1 Overhead Sliding Davit

Cramm shall manufacture the overhead-sliding davit, type CSD1500DW. The general specification for crane is as follows:

- Drawing #: CSD1500DW
- Overall length inside: 89000 mm (approx)
- Extended length outside: 3000 mm
- Controlling: portable controller
- Lifting speed: 6 meter/min
- Lifting height: 8 m
- Lifting capacity: 1500 kg per boom (two booms shall be fitted)
- Test load: 150%
- Construction Material: steel
- Extended Boom Material: galvanized steel
- Cable Material: spectron 16 mm diameter
- Lifting Hook: AISI 316, max. capacity 2500 kg

10.10.2 Folding Bulwarks

The yacht shall be fit with folding bulwarks manufactured by the shipyard to match and fit the yacht. The hydraulic hardware shall be manufactured by Cramm. The hardware shall include:

- Four (4) Hydraulic rams with stainless steel rods
- Four (4) Locking rams with plastic blind hole and stainless steel rod
- Set of electric parts for locking/unlocking indication
- Set of counter-balance valves
- Set of distance control valves

10.10.3 Hydraulic Deck Cranes

The yacht shall be fit with a hydraulic deck crane on the flybridge deck manufactured by Cramm, type and model to be determined. This crane shall be capable of reaching the water on either side of the yacht and rated to lift the Novurania Equator™ tenders. It will be powered from the ship's hydraulic system or a stand-alone power pack.

10.10.4 Removable Tender Cradles

The yacht shall be fitted with removable cradles for the Novurania™ tenders, capable of being fitted either on the main deck or the flybridge. The cradles shall be made of aluminum, painted white, and fitted with rubber protective padding at all areas to protect the hull of the tenders from damage. A second pair of cradles will be supplied to support the waverunners, also capable of being fitted on either the main deck or flybridge, constructed of aluminum painted white and fitted with protective rubber padding.

10.11 Dive Compressor

The yacht shall be fit with a dive compressor, Bauer™, Capitano, C-E1/DV, 3-Stage, 3-cylinder, single acting, reciprocating piston high-pressure air compressor/purification system. The compressor shall be located in the lazarette. The unit is to be powered by a 5-HP, 230 VAC/60 Hz, single-phase electric motor. The unit shall include the following standard equipment:

- Scuba Fill Hose Assembly (5 ft. Length)
- Bauer Breathing Air Purification System
- Final Pressure Relief Valve
- Belt Guard Designed to Meet OSHA Guidelines
- Motor Starter with NEMA 1 Enclosure

With the compressor shall be storage to SCUBA tanks, and a cooling box for proper filling of the tanks. The cooling box shall be plumbed with freshwater, and shall be pumped to gravity drain overboard.

10.12 Bedding

The yacht shall be fitted with custom innerspring mattresses in the Owner's stateroom, the guest staterooms, the captain's stateroom, the engineer's stateroom, and the crew staterooms.

10.13 Tools

The yacht shall be equipped with a 10-drawer roller tool cabinet, Proto Model # 9997ASHD. The yacht shall also have a 6-drawer drop front tool chest complete with a 92- piece Caterpillar Tool Set, Proto Model # 98312.

11. PAINT SYSTEM

11.1 General

This paragraph provides a comprehensive schedule of recommended coatings for all relevant parts of the yacht, both interior and exterior.

All preparation of surfaces and application of coating materials shall be done in accordance with supplier's instructions and recommendations in this specification and supplier's datasheets and application instructions.

All surface preparation and application work is to be carried out in accordance with relevant and applicable local and international safety standards and good working practices.

The coating materials specified for a specific surface shall be from one supplier, with exception for the shop primer.

Shipyard is to arrange ample storage space with sufficient space for safe and separate storage of all coating materials.

All materials will be stored indoors at a minimum temperature of 15° Celsius.

All materials are to be used within the applicable shelf life. The coating supplier shall test materials that are within one month from the expiry of the shelf life. Materials that have an expired shelf life shall not be used.

The yard will ensure that surface preparation and application of coating materials can take place without interference of other activities.

All fixtures are to be left off until the final coats have been approved and accepted.

Changes in the coating systems will only be allowed after a proposal by the yard, in writing, has been received, supported by the paint supplier(s) and approved by the owner's representative.

Shipyard is to arrange the presence of technical representative of the coating supplier during critical phases of the application process. The technical representative is to be equipped with the suitable equipment for inspection of surface preparation, application details and recording of environmental data.

Neither the appointment nor presence of a technical paint representative nor the provision of technical advice will relieve the shipyard or the paint contractor from their respective responsibilities for surface preparation and paint application work and the proper quality assurance and quality control.

Mixing of two component materials only with complete and undamaged units or by special hydraulic mixing units for the filler.

Small quantities of material may be mixed provided both components are measured by weight or volume according to a mixing schedule approved by the coating supplier. Separate units shall be identified and kept separate for mixing small quantities to avoid mixing with complete sets.

11.1.1 Shop primer

All steel and profiles used in the construction of the yacht will be shot/grit blasted and primed with a suitable zinc silicate shop primer of sufficient dry film thickness for proper corrosion protection.

Aluminium plates and profiles used in the construction of the yacht shall be used without any primer.

11.2 Surface Preparation

11.2.1 Steel

After cutting and welding, all steel surfaces to be checked for evidence of weld spatter and scarring which occurred during the welding process. Weld spatter to be removed and other steel surface defects to be corrected. In exposed area all welds to be fully welded. Stitch welding only allowed in non exposed area, after acceptance by owner or owners representative.

Prior to paint application shop primed steel surfaces shall be cleaned from dust and other loose foreign material prior to removal of grease, fat and similar foreign matter incompatible with paint application.

Removal of grease and fat to be done solvent cleaning or, in case of heavy contamination, with an industrial mix of detergent and water soluble solvent, followed by rinsing and washing with sweet water.

The steel surface shall be tested for soluble salt contamination and rinsed with 200 bar fresh sweet water to remove salt deposits that are present.

Welds and areas with mechanical damage/corrosion shall be spot blasted and primed with a suitable epoxy primer, approved by coating supplier.

Areas with intact approved shop primer, applied on accepted steel surface preparation, may be sweep blasted with approved grit prior to application of specified primer system.

11.2.2 Aluminium

All aluminium once fabricated will be heat straightened and faired to eliminate distortion and thermal stress originating from the welding process.

After completion of the fabrication and de-stressing the aluminium surface shall be cleaned to remove all dust and other loose foreign material.

Grease and fat shall be removed by a suitable method like solvent cleaning or washing/rinsing with a solvent/detergent mixture.

The aluminium surface shall be blasted with a metal-free grit to provide a suitable surface profile for primer application.

Alternatively the aluminium surface may be treated by grinding with P 24 or P 36. Black welding deposits on welds and in slot welds shall be ground out with small grinding tools. The aluminium surface may be primed with a suitable primer immediately (=same day) after grinding, or, alternatively, in a later stage treated with Deoxidine/Alodine 4830/4831 or another approved treatment, acceptable to the owner's representative and the paint supplier.

11.2.3 Other Metal Substrates

For surface preparation of metal substrates other than steel and aluminium recommended practices and products shall be provided by the yard as recommended by the coating supplier.

11.3 Coating Systems

All paint and coating material for use on exterior surfaces shall be Awl-Grip products.

11.3.1 Hull-Under Water

Under water surfaces, including rudders, skegs, seawater inlet chests, etc.:

1st coat: Epoxy Primer at 75 microns dft.

2nd coat: High Build Epoxy Coating at 150-200 microns dft.
3rd coat: High Build Epoxy Coating at 150-200 microns dft.
4th coat: Tin Free Anti Fouling, Self Polishing at 300 microns dft.

11.3.2 Hull-Above Water

Boot top, topsides, bulwarks:

1st coat: Epoxy Primer at 75 microns dft.
2nd coat: Epoxy Filler at required thickness.
3rd coat: Epoxy Filler (skim coat)
4th coat: Epoxy Primer at 50-75 microns dft
5th coat: Epoxy Primer at 50-75 microns dft.
6th coat: LPU Topcoat at 60-80 microns dft (excluding dft of show coat)

Alternative specifications may be proposed by the yard, subject to acceptance by the owners representative.

11.3.3 Superstructure-Exterior Surfaces

1st coat: Epoxy Primer at 75 microns dft.
2nd coat: Epoxy Filler at required thickness.
3rd coat: Epoxy Primer at 50-75 microns dft.
4th coat: Epoxy Primer at 50-75 microns dft.
5th coat: LPU Topcoat at 60-80 microns dft.

Alternative specifications may be proposed by the yard, subject to approval by the owners representative. Areas with non-skid surface to be decided in cooperation with the owners representative and yard.

11.3.4 Exterior Decks-Exterior, under wood deck covering

1st coat: Epoxy Primer at 75 microns dft.
Deck covering/wood cover as specified

11.3.5 Exterior Decks-Underside of decks, behind ceiling panels

1st coat: Epoxy Primer at 30-50 microns dft.
2nd coat: Epoxy Coating at 30-50 microns dft

11.3.6 Exterior Decks-Cranes, Gantry Overhead Cranes, Passerelle

1st coat: Epoxy Primer at 75 microns dft.
2nd coat: Epoxy Primer at 50-75 microns dft.
3rd coat: Epoxy Primer at 50-75 microns dft.
4th coat: LPU Topcoat at 50-80 microns dft.

11.3.7 Hull-Interior

Behind linings
1st coat: Epoxy Primer at 30-50 microns dft
2nd coat: Epoxy Coating at 30-50 microns dft.
Note: Manual surface preparation acceptable (St 3)

11.3.8 Bilges And Other Moisture Exposed Areas

1st coat: Epoxy Primer at 50-100 microns dft.
2nd coat: Epoxy High Build at 100-150 microns dft.
3rd coat: High gloss or semi gloss PU topcoat at 50-80 microns dft.

11.3.9 Technical Spaces, Forepeak, Cofferdams, Engine-Aux. Rooms, Lazarette, Store Rooms

1st coat: Epoxy primer at 50-100 microns dft.
2nd coat: Epoxy High Build at 100-150 microns dft.
3rd coat: LPU Topcoat at 50-80 microns dft.

11.3.10 Engines, Equipment in Engine Room

1st coat: Epoxy Primer at 30-50 microns dft.
2nd coat: PU Topcoat at 30-50 microns dft.

Note: Compatibility of Epoxy Primer with OE coating shall be tested and/or verified with Supplier of Epoxy and/or supplier of OE.

Note: No paint to be applied over hoses, electrical wiring, nameplates, generators, glass parts, stainless steel parts, copper, plastic, handles, levers, safety indicators and other surfaces where the original appearance needs to be preserved..

11.3.11 Chain Locker

1st coat: Heavy Duty High Solids Epoxy Coating at 300 microns dft.

11.3.12 Exterior Wood-Bulwark linings, Ceiling panels

1st coat: Epoxy Undercoat/Wood Primer
2nd coat: Fine filler to fill the grain.
3rd coat: Epoxy topcoat, semi-flat, at 120 microns dft.

11.3.13 Interior Wood

Interior wood will be painted or varnished in a professional way with state of the art coatings in accordance with owner's requirements.

11.4 Tank Coatings

11.4.1 Fresh Water Tanks

Steel to be inspected and corrected prior to surface preparation (weld spatter, blow holes, steel defects, rough edges, sharp edges, etc)

Fat, grease and similar foreign matter to be removed.

Steel surface to be grit blasted to SA 3 and with an angular surface profile of Rz 50-80. microns.

All residual grit, dust etc to be removed.

Surface to be coated with a Food Grade, solvent free epoxy coating system with an Internationally accepted recognised paint manufacturer. Coating system to be applied at a dry film thickness of min. 300 microns dft Manufacturers recommendations for application conditions, equipment, ventilation and curing/washing procedures to be followed to the letter.

11.4.2 Black/Grey water

Steel preparation and surface preparation as specified for Fresh Water Tanks

Surface to be coated with a two or three coat epoxy phenolic coating system from an Internationally recognised paint manufacturer. Manufacturers recommendations for application conditions, equipment, ventilation and curing/washing procedures to be followed to the letter.

Prime coat, subsequent coats and stripe coats in alternating colors.

11.4.3 Lube Oil/Fuel Tanks

Thorough steel cleaning and washing with fuel oil
No coating specified.

11.5 Quality Control

The yard shall-prior to start of the application of paint and coatings-produce a paint manual

This paint manual shall contain full specifications, application details and application instructions for all coating systems proposed by the yard in accordance with this paint paragraph.

The paint manual shall contain an inspection schedule for all surface preparations, applications, curing/washing procedures and final inspections/approvals.

The inspection schedule shall contain inspection points, hold points and acceptance points and be specific in required attendance and inspection records.

The paint manual shall contain acceptance criteria for all paintwork

11.6 Acceptance Criteria

All paintwork shall comply with following acceptance criteria:

11.6.1 Non Faired Paint Work

After application of the complete system in accordance with the relevant recommendations and instructions the average thickness shall be not less than 80 % of the recommended thickness and not above 150 % of the recommended thickness.

The paint appearance must be proof of a professional application, i.e. without any major defects like sags, runs, holidays, dirt and dust inclusions, surface effects, etc.

11.6.2 Faired Paint Work

The cosmetically quality of the faired paintwork shall be in compliance with following criteria:

11.6.3 Gloss

Min. average of 90% at 60 degr. angle for vertical surfaces.

Min. average of 87% at 60 degr. angle for horizontal surfaces.

Gloss level to be measured with a standard gloss meter at an angle of 60 degrees.

On representative areas per section of the yachts surface the average gloss level shall be measured as follows:

On areas of one sq. meter, the gloss level is measured at five spots at least 500 mm apart. The measurement of each spot consists of three readings within 5 cm of each other. Thus 15 readings are taken. The three readings at each spot shall be averaged.

Standard to be met:

- Only one of the three readings for a spot average may be less than 85 %. None of the three readings for a spot average shall be less than 80 % unless this is clearly caused by a very localised contamination.
- None of the five spot averages shall be lower than 85 %.
- The average of the five spot averages shall meet the criteria applicable for the subject surface.

11.6.4 Dust

Max. 5 particles dust inclusion of 300 microns diam. max per sq. dm for high visibility areas

Max.10 particles dust inclusion of 300 microns diam. max per sq.dm for low visibility areas

High/Low visibility areas to be indicated by owner's representative.

11.6.5 Orange Peel

Orange peel comparable with a sample panel to be provided by the yard prior to start of the painting work.

11.6.6 Fairness

Owners representative to be invited/present when the yard is doing the quality control checks on the fairness of the filler and subsequent coats. Surface for all areas of the yacht above the waterline to be smooth and fair. There shall be no unevenness greater than 1/16th of an inch measured over a 52" length. The measurement shall be taken using an aluminium bar, 1 " wide and 52 " long.

The ends of the bar shall be held against the surface with the 1" wide section normal to the surface. No measurement shall be taken within 6" of the end of the bar.

The unevenness shall be measured with a metal feeler gauge. This standard shall be met prior to the application of the final topcoat or show coat.

Fairness criteria shall also be applicable after launching of the yacht.

11.6.7 Sags/Runs

Major sags and runs not acceptable. Small sags and runs at "low visibility areas" may be accepted by the owners representative, depending on size and location.

11.6.8 Buffing

Buffing only acceptable for very small spots after consultation with owners representative.

11.7 Exterior Coating System

The yard shall provide a two-year performance guarantee on the performance of the exterior coatings.

The terms of the guarantee shall be:

No cracking, flaking, blisters, loss of adhesion or other defects

No loss of gloss exceeding 30 % compared with the value at the date of acceptance.

No color change of more than 5 CIE units.

No rust and other forms of corrosion.

No excessive amount of fouling.

11.7.1 Tank Coatings

The yard shall provide a three-year guarantee on the performance of the tank coating systems.

The terms of the guarantee shall be:

No corrosion, flaking, detachment or other defects.

12. TEST AND TRIALS

12.1 General

The builder shall develop a complete schedule of all test and trials and shall be responsible for scheduling the involvement of any of the equipment suppliers and vendors. The builder shall develop the schedule and protocol for these tests within 8 weeks after the commencement of construction. The Owner's Representative shall be notified at least 3 weeks in advance of scheduling of tests. The Naval Architect shall review the schedule.

During trials, the yacht shall be at all times in the care, custody and control of the Builder. Attendance of the Owner and /or Representative at the time of the trials, or the carrying out of a request to make certain runs or maneuvers, or any other actions, whether informally arranged or according to an established agenda, shall not serve to place the yacht in the care or control of the Owner at any time, and the Builder agrees to hold the Owner harmless in the event of loss or damages arising out of operation of the yacht during trials. However, the Builder shall have the right to refuse any request made by the Owner or the Owner's Representative if in their opinion such request could place the yacht in danger of loss or damage.

Builder is to install such apparatus as the Naval Architect, Owner, Engine Manufacturer, or other equipment suppliers may provide or require for the purposes of taking measurements to obtain the required data during all shop test and trials.

It is the purpose of the test and trials to demonstrate that the yacht complies with these specifications, that the yacht is suitable for the intended purpose, and the workmanship is satisfactory.

12.2 Shop Test

The yacht and its various system shall be subject to shop test during the construction of the yacht. In addition to all test required by DNV, the following test shall be conducted:

- Shop tests shall be performed of all equipment as applicable
- Onboard testing after installation as considered necessary
- Monthly progress reports detailing status of all activity and estimated adherence to overall schedule goals
- All piping and tanks shall be pressure tested at earliest opportunity after installation to determine integrity of system/tank and absence of leakage.
- The fuel tanks shall be tested to 3 psi or fill pipe head pressure whichever is greater
- Water tanks tested to fill or vent head pressure whichever is higher.
- All piping systems designed to carry fluids or gasses under pressure shall be pressure tested to 150% of system design working pressure
- All pressure tests to be for 24 hrs, zero pressure loss at steady temperature.
- Watertight bulkheads to be leak tested by air or ultrasonic means at all penetrations, and watertight doors
- Fresh Water tanks and piping to be flushed and sanitized/decontaminated after successful testing
- Fuel tanks to be cleaned and piping to be flushed with clean fuel oil bypassing all machinery after successful testing
- All other systems to be flushed with appropriate fluid or gas and decontaminated before being put into service
- All hatches, doors, windows to be subject to fire hose testing before relevant interior structures are commenced
- Builder shall develop and provide Fire and Safety Plan, Tank Capacity Plan and Sounding Tables to the Owner's representative before trials commence.

12.3 Commissioning Engineers

As part of the various equipment vendors' scope of supply they shall be required to send a commissioning engineer(s), as required, to the scheduled dockside and sea trials. These engineers will work in conjunction with the yard's own personnel, as appropriate, to approve the installation and approve the relevant warranty. A representative of the main engine manufacturer shall be present for all trials.

12.4 Dockside Trials

The builder shall conduct dock trials of all the yacht's systems prior sea trials, and shall ensure the involvement of any relevant equipment suppliers. The builder shall make detailed reports of the status of the various systems and keep complete records of all trials. The dock trials are to include the following:

- Verification of operational tests of all machinery and systems, including main engines and generators, and back-pressure and exhaust structures for a minimum 2 hrs at maximum practical RPM
- Compass Calibration and other equipment calibrations as necessary
- Verification of Principal Dimensions
- Verification of Tank Capacities
- Verification of acceptable radio suppression levels and megger test
- Verification of Water-Tightness or Weather tightness as appropriate of hatches, doors, and windows
- Test of Safety Equipment
- Test of Life Saving Equipment
- Test of Lifting Appliances
- Test of Steering Gear, Bow Thruster and Engine Controls
- Test of Ventilation, Air Conditioning and Heating Systems
- Test of Electrical Systems, Generators, and Full Load Test
- Test of Generator Automatic Switching, Seamless Transfer, and Load Shedding
- Test of Shorepower System
- Test of Anchor Handling and Mooring Equipment
- Test of Deck Equipment, Passerelle, Gangway, and all Hydraulic systems
- Test of Bilge/Ballast and Fire Fighting Systems
- Test of Sanitary Systems (Grey and Black Water Systems)
- Test of Bridge and Navigation Equipment
- Test of Freshwater System
- Test of all Domestic Appliances including Cold Storage Refrigeration Equipment
- Test of Entertainment Systems
- Test of Central Vacuum System
- Test of Fuel Oil Transfer and Service Systems
- Test of Lubrication Oil Systems
- Test of all other pumps and associated systems

A report of the various dock trials including all relevant measurements and data obtained shall be supplied to the Owner's Representative on satisfactory completion of the various trials. The Owner Representative be notified of all dock trials and shall be invited to attend.

12.5 Stability Test/Inclining Experiment

The Naval Architect shall conduct an inclining experiment on the yacht when the yacht is complete. The determination of the suitability of the conditions (weather or otherwise) for the test shall rest with the Naval Architect, class Surveyor, MCA, or Flag State surveyor. The builder shall be required to re-schedule the test if the conditions are deemed unsuitable. The builder shall supply all equipment including but not limited to certified test weights, and equipment for their handling. The test shall be conducted in accordance to DNV rules, and the requirements of the MCA or Flag State. The Owner's representative shall witness the test. The results shall be used to develop the required stability information booklet for the yacht's master.

12.6 Sea Trials

12.6.1 Trial Conditions

Sea trials shall be conducted on the yacht to insure that the yacht is operating properly. The trials shall be conducted in general accordance with the Sea Trial Code C-2 (SNAME, 1973) and shall be performed under the following parameters:

- The trials shall not be conducted if the true wind exceeds 15 knots or the significant wave height, $H_{1/3}$, exceeds 5 feet. The main engine manufacturer's guide for sea trials shall also be consulted.
- Speed trials shall be conducted for a range of engine speeds from low to full power, in at least three well-documented loading conditions of the yacht, one of which shall be full load. The documentation of the loading conditions shall include:
 - Draft at the forward perpendicular
 - Draft at the after perpendicular
 - Draft at amidships
 - Trim angle
 - Number and weight of persons aboard
 - Summary of test equipment aboard
 - Summary of any missing equipment
 - Summary of the tank loading conditions
- Trials shall consist of a minimum of four (4) runs each direction over a measured mile course at each speed and condition of loading to average out wind and sea effects. (If a measured mile is not available, Global Position System (GPS) may be used to help establish a measured mile, provided appropriate corrections are made)
- Duration of sea trials shall be for a minimum of twelve (12) hours with minimum of eight (8) hours at MCR.

If during the sea trial any breakdowns occur entailing interruption or irregular performance, which can be made good by the normal means available on board, the trial shall be continued after repairs and be valid in all respects. However, should it be required to returned to port to enable the repairs to be made, a further sea trials shall be undertaken to demonstrate the stipulated performance has been properly corrected.

After sea trials, the oil filters for the generators and main engines are to be changed. Lubrication oil samples shall be taken and submitted to the engine manufacturer for examination at the builder's expense.

All expenses for the sea trials and adjustments of all the yachts equipment shall be born by the builder, who, during the dock and sea trial's will provide the necessary crew and inspectors for Class, MCA and manufacturers representatives.

12.6.2 Trials and Test to be conducted

The following trials and test shall be performed:

- Compass calibration
- Turning circles Port and Starboard, (full speed)
- Ahead Steering Test
- Astern Steering Test
- Crash Astern from Ahead
- Crash Ahead from Astern
- Crash Stop Distance Measurement
- Full Astern Run
- Full Ahead Run

- Z Maneuver
- Emergency Steering Test
- Stabilizer System (Underway and Zero-Speed modes)
- Autopilot Test
- Shaft Cooling Systems Test
- Slow Ahead Both Engines Test
- Slow Ahead One Engine at a time Test
- Full Ahead one at a time to determine rudder angles and correct fuel/speed curves at various speeds to determine single engine operation efficiency
- Noise and Vibration Measurements to determine compliance with specification
- Alarm and on-board communication systems Test
- Fire and Safety Equipment Drills
- Electronics, Communication, and Navigation Equipment Test as requested by Owner's Representative
- Engine Room Ventilation and Exhaust Systems Test (measurement to include inlet depression, exhaust back-pressure, engine room temperature, per engine manufacturer's requirements)
- Air conditioning and fresh air makeup operational Test (at various loadings and speeds)
- Sanitary and Drainage systems Test (at various loadings and speeds)
- Anchor handling system test (including full-drop test with all chain hanging free)
- Carbon monoxide testing (to insure that at all operating speeds no exhaust fumes enter any living spaces through closed doors, windows, sink drains, or other openings)
- Any other trials required by Flag State, Class Society, Naval Architect, Equipment Suppliers, or Owner

12.6.3 Report of Sea Trial Results

A report of the sea trials including all measurements and data obtained shall be submitted to the Owner on satisfactory completion of the sea trials. The report shall include the following curves and diagram for the final set of propellers fit:

- Diagram of turning circles
- Crash stop diagram
- Main engine RPM vs. fuel consumption
- Main engine RPM vs. speed
- Range vs. fuel onboard (as a percentage of the total capacity) for various speeds over the normal operating range.

12.6.4 Acceptance of Sea Trial Results

Within ten (10) days from receipt of the report the Owner shall give the Builder notice in writing acceptance of the trials advising whether the Owner considers the results of the sea trials to indicate conformity of the yacht to the contract, the specifications, and contract plans. In the event the Owner rejects the results of the sea trials as not conforming to the contract or the specifications and plans, the Owner shall indicate in this notice of rejection in what respect the Yacht or any part thereof, does not conform to the contract and/or the specifications or plans.