

OUTLINE TECHNICAL SPECIFICATION

100M ACCOMMODATION / CRANE WORK BARGE (300MEN)

CONTENTS

SECTION I.....	4
1.0 HULL SPECIFICATION	4
1.1 HULL GENERAL:.....	4
1.2 PRINCIPAL DIMENSIONS.....	4
1.3 CLASSIFICATION AND REGULATIONS.....	4
1.4 CERTIFICATES.....	5
1.5 MATERIALS.....	5
1.6 WORKMANSHIP.....	5
1.7 SCANTLINGS AND DECK LOADING.....	5
1.8 TRIM AND STABILITY.....	5
1.9 INCLINING EXPERIMENT.....	5
1.10 TANKS-GENERAL.....	6
1.11 ACCOMMODATION - GENERAL.....	6
1.12 CABINS AND FURNISHING.....	7
1.13 GALLEYS.....	9
1.14 MESS ROOMS.....	10
1.15 FREEZER/CHILLER & PROVISION STORE.....	12
1.16 STORES - GENERAL.....	12
1.17 LAUNDRY/DRYING ROOM.....	13
1.18 HOSPITAL ROOM.....	13
1.19 OFFICES.....	13
1.20 AFT CONTROL ROOM.....	14
1.21 RECREATION ROOM	15
1.22 CONFERENCE ROOM.....	15
1.24 FORWARD CONTROL ROOM.....	15
1.25 CHANGE ROOM.....	15
1.26 PRAY ROOM.....	15
1.27 RADIOGRAPHY ROOM.....	15
1.28 ISTOPE STORAGE CONTAINER.....	15
1.29 SCAFFOLDING AND GANGWAY RACKS.....	16
1.30 CLEAR DECK SPACE	16
1.31 HELIDECK	16
1.32 PAINTING & CATHODIC PROTECTION.....	16
1.33 FENDERS	18
1.34 INSULATION.....	18
1.35 PANELLING AND CEILING.....	18
1.36 DECK COVERING.....	18
1.37 WINDOWS AND SIDELIGHTS.....	19
1.38 DOORS.....	19
1.39 LOCKS.....	19
1.40 NAME PLATES (OUTFIT).....	19
1.41 ARTICULATED GANGWAY.....	20
1.42 STRUCTURAL FIRE INTEGRITY.....	20
1.43 MOORING SYSTEM.....	22
1.44 TOWING GEAR&CAPSTAN.....	24
1.45 PEDESTAL MOUNTED OFFSHORE CRANE	24
1.46 FIRE PROTECTION & DETECTION.....	24
1.47 LIFE SAVING APPLIANCE.....	27
1.48 AIR CONDITIONING.....	28
SECTION II.....	31
2.1 MACHINERY GENERAL.....	31
2.2 MAIN GENERATING SETS.....	31
2.3 EMERGENCY GENERATOR SET.....	32
2.4 PIPING AND VALVES - GENERAL.....	32
2.5 PIPING MATERIALS.....	33
2.6 BALLAST SYSTEM.....	33
2.7 BILGE SYSTEM.....	34
2.9 FUEL OIL SYSTEM.....	34

2.10	DOMESTIC POTABLE FRESH WATER SYSTEM (HOT AND COLD)	34
2.11	DOMESTIC SEA WATER SYSTEM	35
2.12	SEWAGE TREATMENT PLANT	35
2.13	OILY BILGE SYSTEM	35
2.14	FIRE MAIN SYSTEM	36
2.15	AIR COMPRESSORS	36
2.17	WORKSHOP EQUIPMENT	37
2.18	VENTILATION	37
SECTION III		38
3.1	ELECTRICAL	38
3.2	ELECTRICAL INSTALLATION STANDARDS	38
3.3	MATERIALS AND EQUIPMENTS, ENVIROMENTAL CONDITIONS	38
3.4	ELECTRICAL SYSTEM OF SUPPLY	40
3.5	ELECTRIC POWER SOURCE	40
3.6	ELECTRIC MOTORS & STARTERS	42
3.7	LIGHTING	43
3.8	NAVIGATIONAL AND OPERATIONAL LIGHTS	43
3.9	ALARM	44
3.10	24DC POWER SUPPLY (BATTERY CHARGER & DISCHARGE PANEL)	44
3.11	TRANSFORMER	44
3.12	COMPUTER NETWORK CABLING	45
3.13	INSPECTION AND TESTING	45

SECTION I

1.0 HULL SPECIFICATION

1.1 HULL GENERAL:

The vessel is to be an unmanned barge for unrestricted service. It is a purpose built Accommodation / Work Barge for use in supporting the offshore activities of companies engaged in oil and gas exploration and recovery.

The hull and superstructure is to be of all steel welded construction. Hull to have raked stem and transom stern. The vessel shall have a double skin at some machinery spaces, fuel oil tanks.

Above main deck, air-conditioned accommodation spaces complete with adequate messing and recreational facilities are provided for a complement of 300 persons.

On main deck, set a deck crane. The crane shall be capable of lifting with the main fall of a minimum of 100 metric tonnes to the top deck of a platform at least 20 metres above mean sea level at a radius of 23 metres.

Machinery, storage facilities and control rooms are provided, and the safety features incorporated in the vessel contribute to a safe and healthy working environment.

1.2 PRINCIPAL DIMENSIONS.

Length overall (mld hull)	100.00 m
Breath moulded	33.00 m
Depth moulded	7.60 m

Complement	300	men
Main deck:	12	men
Accommodation deck 1	136	men
Accommodation deck 2	120	men
Accommodation deck 3	32	men
Deck loading of cargo area	5 T/m ²	
Fuel oil capacity:	~1030	m ³
Fresh water capacity:	~1900	m ³

1.3 CLASSIFICATION AND REGULATIONS

The vessel shall be designed and constructed to the latest Requirements, Rules and Regulations of Bureau Veritas (BV),

Notation + Hull +mach special service – accommodation /work barge- no propulsion
Unrestricted navigation, ALM

Ship flag shall be malaysia.

In addition it should comply with the following international Regulations and Recommendations.

- BV. Rule for the Classification of Steel Ships.
- International Load line Convention 1966.
- International Rules of Tonnage Measurement (both 1967 and 1969 Convention)
- MARPOL 73/78 and latest amendments
- International Regulations for Preventing Collisions at Sea 1981 with subsequent amendments
- MODU requirement 2009 and latest amendments.

1.4 CERTIFICATES

All necessary certification issued by Classification Society and Regulatory Bodies in accordance with the proceeding paragraph, together with the following certificates supplied by the Builder, are to be handed over to the Owner in a timely manner during the delivery of the vessel.

- a) Builders Certificate.
- b) Certificates for all materials and equipment surveyed or inspected for Classification and Regulatory Authority compliance.
- c) Safety Construction Certificate.
- d) Safety Equipment Certificate.
- e) Radio Telephony Certificate (OFE).
- f) Protocol of Tests and Trials.

1.5 MATERIALS

The vessel is to be constructed throughout of mild steel plates and sections tested and approved by the Classification Society.

All cables, fastenings, shackles, rigging, winch cables, sheave blocks and light fittings to be made of materials which have been tested, approved and certified where applicable.

1.6 WORKMANSHIP

Workmanship is to be of good quality, and in every respect to the satisfaction of the Owner, his Representative, and the attending Surveyor. The shipyards standard for building tolerances are to be reviewed before work commences.

1.7 SCANTLINGS AND DECK LOADING

Scantlings are to be in accordance with the Classification Societies requirements except where specifically strengthened for the loading specified.

The main deck and supporting structure in way of the wooden sheathed clear deck area is to be designed to 5 tonnes/m² uniform load.

1.8 TRIM AND STABILITY

The vessel is to have sufficient positive stability in all reasonable operating and loaded conditions.

The trim is to be such that with fuel and water tanks in various configurations, the vessel can be trimmed level to provide a stable working platform at all times.

Stability standards are to comply with the intact and damage stability requirements as laid down by the International bodies and relevant authorities for the intended type and area of service of the vessel.

1.9 INCLINING EXPERIMENT

When the vessel has reached a sufficiently advanced stage of construction, and only minor work remains to be completed, the lightweight and vertical and horizontal centres of gravity of the vessel are to be determined by means of an inclining experiment. The inclining experiment is to be attended by the Owner or his representative and also the regulatory authorities. During the inclining experiment, the vessel shall be in a suitable condition approved by the Owner or his representative.

No loose water or oil is to be on board and all shipyard equipment, rubbish, etc is to be removed.

1.10 TANKS-GENERAL

The water ballast, oil fuel and fresh water tanks are to be subdivided as shown on the General Arrangement Plan.

1.11 ACCOMMODATION - GENERAL

The barge accommodation and main deck layout are as follows:

a) Inner Bottom / Tank Top

S.W Ballast Tanks	:	Eleven	(11)
Portable Water Tanks	:	One	(1)
Fresh Water Tanks	:	One	(1)
F.W Cooling TK	:	Four	(4)
Fuel Oil Tanks	:	Two	(2)
Fuel Oil Day Tanks	:	Two	(2)
Fuel Oil Overflow Tank	:	One	(1)
Lube Oil Tank	:	One	(1)
Void Tanks	:	One	(1)
Winch Compartments/Stores	:	Four	(4)
Switchboard Room	:	One	(1)
.Machinery Rm	:	One	(1)
Bilge Holding tank (under)	:	One	(1)
Sewage Tank (under)	:	One	(1)
Dirty oil Tanks (under)	:	One	(1)
Mechanical Workshop	:	One	(1)

b) Main Deck

CO2 Room	:	One	(1)
Galley	:	One	(1)
Welding Workshop	:	One	(1)
Provision Room	:	One	(1)
Chiller Room	:	One	(1)
Freezer Room	:	One	(1)
Change Room	:	One	(1)
Central Laundry	:	One	(1)
Gymnasium room	:	One	(1)
Hospital with Wash Room	:	One	(1)
Paint Store	:	One	(1)
Mess room	:	One	(1)
Common Toilet	:	One	(1)
Electrical Workshop	:	One	(1)
Emergency Generator Room	:	One	(1)
Officer Mess Room	:	One	(1)
Deck store	:	One	(1)
A.H.U Room	:	One	(1)
Four Man Cabins	:	Three	(3)
Stairway	:	One	(1)

c) Accommodation Deck 1

Four Man Cabins	:	Thirty-four (34)
Officer	:	One (1)
Pray Room	:	One (1)
Store	:	Two (2)
Stairway	:	One (1)

d) Accommodation Deck 2

Four Man Cabins	:	Thirty (30)
Common Toilet	:	One (1)
A.H.U Room	:	One (1)
Store	:	Two (2)
Stairway	:	One (1)

e) Accommodation Deck 3

One Man Cabins	:	Eight (8)
Two Man Cabins	:	Six (6)
Four Man Cabin	:	Three (3)
Client Office	:	One (1)
Barge Office	:	One (1)
Conference Room	:	One (1)
Linen Locker	:	One (1)
Store	:	One (1)
Common Toilet	:	One (1)
Forward Control Room	:	One (1)
Winch Control Room	:	One (1)
Recreation Room	:	One (1)
Stairway	:	One (1)

1.12 CABINS AND FURNISHING

Cabins located as per the General Arrangement drawing are to be fitted out in accordance with the following details, and arranged to provide ample room for easy occupancy.

Fire retardant material shall be used in all accommodation areas and crew spaces according to ILO 92 Requirement.

Berth/Bunk size shall be a minimum 2.00m x 0.90 c/w thick spring mattress.

Noise levels shall be in accordance with IMO Resolution

1.12.1 FOUR BERTH CABINS

Each 4- berth cabin is to be fitted out with the following:

- 4 bunks, in double tier of hard smooth material with two drawers under each lower berth, minimum 200cm x 90cm with berth ladders and fire retardant berth curtains.
- Four thick spring mattresses of non-rot material such that it will not harbour vermin.
- Berth light for each bunk.
- 4 built-in full height lockers of hard smooth material, each with shelves, hanging rail and hooks.
- One upholstered chair.
- One table with drawers on one side.

- Settee
- One desk lamp
- One book rack.
- Mirror.
- Four hat hooks.
- Tumbler holder for each person.
- Four towel hooks.
- Shared attached modular toilet
- Wash basin
- Window curtain as required

1.12.2 TWO BERTH CABINS

Each 2- berth cabin is to be fitted out with the following:

- Two (2) berth bunk of hard smooth material with two drawers under lower berth minimum size 200cm x 90cm with berth ladders and fire retardant berth curtains.
- Two (2) thick spring mattresses of non-rot material such that it will not harbour vermin.
- Berth light for each bunk.
- Two built-in full height lockers of hard smooth material, with shelves hanging rail and hooks.
- One desk with drawers on one side.
- One upholstered chair with arm rests.
- Settee.
- Mirror.
- Tumbler holder for each person.
- Book rack.
- Ashtray, four hat and four coat hooks.
- Desk lamp.
- Attached modular toilet
- Window curtain as required

1.12.3 SINGLE BERTH CABIN

Each single berth cabin is to be fitted out with the following:

- Single berth bunk of hard smooth material with two (2) drawers under, minimum size of 200cm x 120cm.
- One thick spring mattress min size 200cm x 120cm of non-rot material such that it will not harbour vermin.
- Berth light.
- Built-in full height locker of hard smooth material, with shelves hanging rail and hooks.
- One desk with drawers on one side.
- One upholstered settee.
- One coffee table
- Upholstered chair with arm rests.
- Book shelf.
- Mirror, desk lamp.
- Ashtray, two hat and coat hooks.
- Attached modular toilet.
- Curtain rail and fire retardant curtains over window and bunk.
- Flooring to be carpeted of chemical fiber type.

1.12.4 TOILETS AND WASHPLACES (ATTACHED TO CABINS)

Each 1-berth and 2-berth and 4 men cabin is to be provided with an attached modular/shared toilet as shown on the General Arrangement drawing.

Each toilet/wash place is to be fitted out as follows:

- One vitreous China washbasin with hot and cold fresh water supply and spring mixing taps.
- One European type vitreous China W.C. pedestal, flushing valve and seat.
- One toilet cabinet over washbasin, with mirror front light over, and shaving socket.
- One soap holder near wash basin.
- Individual tumbler holder and tooth brush rack for each person.
- One toilet roll holder.
- One shower recess with hot and cold fresh water supply through mixing valve, soap receptacle, hand-grip.
- One shower curtain and rail.
- One towel rail and one towel hook for each person.

1.12.5 COMMON TOILET ON MAIN DECK

- Five (5) European type water closets with toilet roll holder and S.W Tap.
- Five (5) urinal with toilet S.W Tap
- Four (4) Wash basin c/w cold & hot water tap
- One (1) Wall mounted urinal bowl c/w flush valve.
- Two (2) Mirrors with rack.

1.12.6 COMMON TOILET ON ACCOMMODATION DECK 2

- Four (4) European type water closets with toilet roll holder and S.W Tap.
- Twelve (12) urinal with toilet S.W Tap
- One (1) Wash basin c/w cold & hot water tap
- One (1) Mirrors with rack.

1.12.7 COMMON TOILET ON ACCOMMODATION DECK 3

- Four (4) European type water closets with toilet roll holder and S.W Tap.
- Twelve (12) urinal with toilet S.W Tap
- One (1) Wash basin c/w cold & hot water tap
- One (1) Mirrors with rack.

1.13 GALLEYS

Galley is arranged on service deck level and is to be well equipped to a modern standard.

An Bakery room of size approx. 6 ft x 10ft inside corner of Galley with partition & door and 1 no stainless steel sideboard 3ft 'W' x 3ft 'H' x 8ft 'L' c/w marble top to be provided.

The galley is to be equipped with adequate equipment to cater for all on board and at least half compliment being served at a time.

The equipment generally be included for the galley;

- Two (2) Electric range with 6 hot plates (300x300mm each) and oven below (415V/3ph/50Hz).
- One (1) Electric range with 4 hot plates (300x300mm each) and oven below (415V/3ph/50Hz).
- One (1) Combi boiler steamer oven, Cap: 10 x 1 pan size (415V/3ph/50Hz)

- Two (2) Deep fryers (twin tank) floor standing Class approved type (c/w working & safety thermostat & alarm buzzer), Cap: 20+20L (415V/3ph/50Hz).
- One (1) Electric griddle floor standing, size approx 800x950mm (415V/3ph/50Hz).
- One (1) Tilting Pan Cap. 50L/approx 800x700mm (415V/3ph/50Hz).
- One (1) Rice cooker 3 deck type, Cap:27 kg (415V/3ph/50Hz).
- One (1) Stainless steel hot cabinet c/w Swing door (220V/1ph/50Hz).
- Two (2) Dish washing machine hood type, Cap: 50L (415V/3ph/50Hz).
- One (1) Electric meat mincer, Cap: 200kg/hr (220V/1ph/50Hz).
- One (1) Stainless steel upright chiller 1000 litres (220V/1ph/50Hz).
- One (1) Stainless steel bain marie c/w 7 full size deep pans & covers (220V/1ph/50Hz).
- One (1) Universal mixer c/w accessories, Cap: 40 Qt (415V/3ph/50Hz).
- One (1) Waste Food Disposal Unit
A waste food grinder with epoxy lined outlet chute with water flush system shall be installed for the disposal of galley wastes in accordance with Annex V of Marpol 73/78
-
- One (1) Stainless steel exhaust hood above electric ranges, deep fryers, electric griddle & tilting pan.
- One (1) Stainless steel stand c/w 50mm thk nylon chopping board.
- Three (3) Hand through hatches with stainless steel shutters.
- Three (3) Stainless steel serving tray along each serving hatches.
- Two (2) Working table c/w under shelves/sliding doors.
- Two (2) Stainless steel double bowls sink c/w sliding door cabinet (one unit c/w pre-rinse spray).
- One lot Stainless steel sideboards along walls c/w door cabinets/shelves, etc.
- One lot Freezer room with stainless steel slotted storage rack 4 tiers.
- One lot Chiller room with stainless steel slotted storage rack 4 tiers.

The layout is to be developed in conjunction with a recognized supplier of such equipment so that a balanced and workable layout is obtained. This is to be submitted for approval before the equipment is ordered.

1.14

MESS ROOMS

The total seating capacity to be such that the mess rooms be capable of accommodating half the total number of 300 persons on board.

Both mess rooms are to be fitted out with good quality furniture and fittings and with all modern amenities.

Adequate number of Formica topped dining tables with receptacles for condiment and sauce bottles at their centre line. In addition an adequate number of solid polished wooden upholstered chairs to be provided to give ample "elbow" room in the officers mess, whilst solid polished wooden benches are to be provided in the crews mess.

Out-fitting to include the following items in each mess room:

OFFICERS MESS ROOM (1 NO)

- Threer(3) Tables.
- Two (2) Each chairs for 10p.
- One (1) Stainless steel sideboard c/w door cabinets/shelves.
- One (1) Drinking fountain c/w filter, Cap: 35L/hr (220V/1ph/50Hz).
- One (1) Refrigerator two door non frost, Cap: 240L (220V/1ph/50Hz).
- One (1) Juice dispenser (twin tank), Cap: 2x12L (220V/1ph/50Hz).
- One (1) Hot water urn, Cap: 20L (220V/1ph/50Hz).
- One (1) Coffee urn, Cap: 2x3 gallons (220V/1ph/50Hz).
- One (1) Ice machine, Cap: 53kg/day (220V/1ph/50Hz).
- One (1) Cutlery counter.
- One (1) Battery wall clock
- One (1) Wash basin

MESS ROOM (1 NO)

Tables c/w solid wooden benches shall be arranged to accommodate at least One hundred and fifty (150) people.

- One (1) Drinking fountain c/w filter, Cap: 35L/hr (220V/1ph/50Hz).
- One (1) Refrigerator two door non frost, Cap: 516L (220V/1ph/50Hz).
- One (1) Juice dispenser (three tank), Cap: 3x12L (220V/1ph/50Hz).
- One (1) Hot water urn, Cap: 30L (220V/1ph/50Hz).
- Two (2) Coffee urn, Cap: 2x3 gallons (220V/1ph/50Hz).
- One (1) Ice machine, Cap: 130kg/day (220V/1ph/50Hz).
- One (1) Ice cream maker, Cap: 20 Qt (220V/1ph/50Hz).

- One (1) Upright display chiller, Cap: 650L (220V/1ph/50Hz).
- One (1) Bread conveyor toaster, Cap: 6 slices/min (220V/1ph/50Hz).
- One (1) Sandwich toaster - 4 pieces (220V/1ph/50Hz).
- One (1) Refrigerated salad bar c/w sneezer guard, Cap: 4 full size & covers (220V/3ph/50Hz).
- One (1) Cutlery counter.
- One (1) Battery wall clock.
- Two (2) Wash basins.
- One lot Sideboards c/w drawers & swinging door, etc.

1.15 **FREEZER/CHILLER & PROVISION STORE**

The cool and freezer rooms shall be situated as shown on General arrangement.

Two (2) refrigeration compressors & condensers to be provided with one unit acting as stand by.

Refrigerant shall be R407C gas.

One (1) refrigeration unit shall have enough capacity to maintain specified temperature within 18 hours of running.

Two off cooler unit fan coils are to be provided in the cold rooms, one for each compartment.

The insulation panels to be injected with 100mm polyurethane sandwich between internal & external lining of 0.5mm stainless steel sheets.

Floor to have 100mm foamed polyurethane, cement & non-slip ceramic tiles.

Door to be stainless steeled & framed with polyurethane complete with electric heating & packing.

Light switcher on each side of the room.

Freezer room self defroster tray and drain line shall have line heater.

Temperature range	:	-20°C for freezer room
	:	+1°C for chiller room

DRY PROVISION STORE

The floor shall be fitted with non-skid ceramic tiles. Wooden 4 tier slotted storage racks with side battens to be provided.

1.16 **STORES - GENERAL**

General stores are shown on the various levels of the accommodation, for the storage of linen and cleaning equipment.

Each store is to be fitted with four tier shelves and storm battens.

1.17 LAUNDRY/DRYING ROOM

One laundry/drying room is to be arranged on main deck. The laundry/drying room is to be equipped with:

- 2 off Tumble Dryer, each 20 kg of capacity (415V/3ph/50Hz).
- 3 off washing machine, each 20 kg of capacity (415V/3ph/50Hz).
- 1 ironing machine, Cap: 35kg/hr (415V/3ph/50Hz).
- 2 double stainless steel deep sink with hot and cold water supply.
- 1 stainless steel long sorting table.
- 1 off locker for detergent and washing.
- 1 ironing board
- 1 iron

1.18 HOSPITAL ROOM

One hospital complete with sufficient berths and examination space to be located on main deck.

A complete inventory of medical equipment and supplies is to be provided by the owner.

The hospital is to be equipped with the following:

- Two berths of tubular metal construction with side rails.
- Two 15cm thick mattresses.
- Small side table locker with side batten top and reading light for each berth.
- Consultation/Examination couch with angle poise light.
- Medical locker-fitted with poisons locker, restricted drugs locker, shelves, slotted gratings, drawers with lock.
- One revolving chair with arm rests.
- Table with drawer at side.
- One upholstered chair.
- Foot operated cover-lid dustbin.
- Strong lighting and Emergency lighting, and minimum four electric socket points.
- One (1) attached toilet /shower c/w long-bath & Drench Shower and washbasin
- One (1) battery wall clock.
- Two built-in full height lockers of hard smooth materials with shelves hanging rail and hooks.
- Book racks.

1.19 OFFICES

They are to be arranged as shown on the general arrangement plan, and fitted as follows:

The offices each is to be outfitted as follows:

Each office equipped with the followings:

- Two (2) Desks with table lamps.
- Two (2) Swivel chairs.
- One (1) Sideboard with cupboard below.
- One (1) Sideboard with open shelves.
- Two (2) Wall mounted open shelves.

- Two (2) Steel filing cabinet –4 tiers.
- One (1) Small refrigerator.
- One (1) Coffee maker with cupboard for crockery utensil.
- One (1) Single door small refrigerator.

1.20 AFT CONTROL ROOM

This room is located on the accommodation deck 3, and is to be fitted with sufficient desk top space to accommodate all the equipment listed below. Two chairs for the operators, one work table with drawers, sideboard, one 4-tiers steel filling cabinet.

The equipment supplied is to be as follows:

- a) Marine radar of 48NM, (220VAC) - 1 set
- b) Echo Sounder IMO approved type, (24VDC or 220VAC) - 1 set
- c) GPS IMO approved type, (220VAC) - 1 set
- d) Marine VHF transceiver 25W, (220VAC) - 1 set
- e) CCTV displays for 8 mooring winches.
- f) Satellite compass remote display, (24VDC) - 1 set
- g) Remote control, tension readout, line indication & Instrumentation consoles of mooring winches.
- h) Window wiper - 2 sets
- i) Binocular - 1 unit
- j) Search light with under deck control lever - 1 unit
- k) Navigation Lighting panel
 - Navigation Light Indicator Board
 - Mast Head Lights
 - Sidelights
 - Stern Lights
 - Anchor Lights
 - Immigration Lights
 - NUC Lights
 - Custom Lights
 - Towing Light/Operational Lights
- l) Sound Powered Telephone
Eight (8) station of sound powered telephone system shall be located as follows:
 - Winch control room - 1 unit
 - Forward control room - 1 unit
 - Auxiliary Machinery Area - 1 unit
 - Switchboard Area - 1 unit
 - Winch Compartment - 4 units (Headset with 10m cable)
- m) Fire and general alarm panel.
- n) 24VDC Emergency Switchboard panel.
- o) Fog horn per SOLAS requirements.

- p) Battery wall clock - 1 unit

1.21 RECREATION ROOM

Recreation room on Deck 3 is to be provided with upholstered settees & coffee tables, chairs for minimum 30 persons.

Recreation room shall have table shelve cupboard and drawer space for books, magazines newspapers, notice board & white board.

Coffee/tea maker to be provided together with wash basin fixed with hot and cold water tap

One 200L refrigerator to be provided.

One battery wall clock.

1.22 CONFERENCE ROOM

The Meeting rooms on accomodation 3 to be fitted with a meeting table and fill with upholstered armchairs all around, whiteboard, sideboard with drawers & lockers.

One battery wall clock

1.24 FORWARD CONTROL ROOM

This room is located at the forward end of the Accommodation Deck 3 and to be used when vessel is under tow and to be fixed with sufficient deck top space to accommodate the equipment provided, sideboard, work desk, chair, drawers/shelves.

- a) Marine VHF transceiver 25W, (220VAC) - 1 set
- b) Satellite compass unit, (24VDC) - 1 set
- c) Window wiper – 1 set
- d) Battery wall clock – 1 no.

1.25 CHANGE ROOM

The flooring to be provided with non-skid ceramic tiles and depressed gutter ways all round to facilitate drainage to the scupper.

The changing room is to be fixed with the following:

- Steel Lockers for 300men
- Wood benches.
- Four (4) Wash basin c/w cold & hot water tap.

1.26 PRAY ROOM

One room are to be fully carpeted type of chemical fibre and to be fitted out according to religion's requirement.

1.27 RADIOGRAPHY ROOM

One radiography darkroom shall be provided on the WORKBARGE. The radiography darkroom shall be air-conditioned but the air shall not return to the main Air Handling Unit

1.28 ISTOPE STORAGE CONTANINER

The builder shall provide a radioactive isotope storage box complete with warning signs and locking arrangement. Location of this storage box shall be subject to the prior approval of the COMPANY

1.29 SCAFFOLDING AND GANGWAY RACKS

Racks are to be provided to store 15 sets of scaffolding materials and 1 set of Gangway on board at all times. Location of the racks shall be such that the WORKBARGE crane can access to the scaffolding materials

1.30 CLEAR DECK SPACE

The working area of the deck from frame no. 1 to frame no. 19 is to be sheathed with hard wood, and is to be fully coated with Epoxy paint before laying down the wood.

1.31 HELIDECK

This shall be designed to suit for landing of either a Sikorsky S92 or Eurocopter EC225 and shall be designed to meet IMO Rules for adverse weather conditions. The helideck shall include all necessary landing and navigation lights.

The helideck shall comply to the latest edition of CAP 437, SES 10.1 and Shell Group Requirement for Aircraft Operations (SGRAO) - Part 5 Standards to Helideck Management.

The helideck shall be fitted with a Helideck Motion System that complies with CAP437. The system shall be Kongsberg HMS 100 or equivalent.

The Contractor shall ensure helideck perimeter safety net has manufacturer determine as expected net life span for net or documented procedure to assess the net integrity on an annual basis. Ensure any testing is conducted in line with OGUK Joint Industry Guidance for Helideck Perimeter Safety Nets – Issue 2, March 2008.

1.32 PAINTING & CATHODIC PROTECTION

1.32.1 GENERAL

All steel surfaces are to be shot-blasted and primed prior to fabrication. Steel surfaces free of grease, dust, etc prior to painting. The welding seams and butt, scars, etc are to be spot blasted or power brushed and primed prior to application of finished coatings.

1.32.2 Pre-Treatment Primer

All blast-clean steels are to be coated with:

- 1 full coat of Zinc Rich Shop Primer 25 mic

1.32.3 External Hull below Deep Waterline

- 1 full coat of coal Tar Epoxy 82 (Brown) 125 mic
- 1 full coat of Coal Tar Epoxy 82 (Black) 125 mic
- 1 full coat of SeaQuantum Anti-Foulings on Flat Bottom 150 mic
- 2 full coat of SeaQuantum Anti-Foulings on Vertical Bottom 100 mic each

1.32.4 External Hull Above Waterline

- 1 full coat of Coal Tar Epoxy 82 (Brown)	125 mic
- 1 full coat of Coal Tar Epoxy 82 (Black)	125 mic
1.32.5 External Main Deck (In way of Wood Sheathing)	
- 1 full coat of Coal Tar Epoxy (Brown)	125 mic
- 1 full coat of Coal Tar Epoxy (Black)	125 mic
1.32.6 External Main Deck (Outside of Wood Sheathing)	
- 1 full coat of Vinyguard Silvergrey 88	80 mic
- 1 full coat of Vinyguard Silvergrey 88 R/T	80 mic
- 1 full coat Deck paint Green 137	50 mic
1.32.7 Superstructure (Interior & Exterior)	
- 1 full coat of Alkyd Primer	80 mic
- 1 full coat of Pilot I (Grey)	40 mic
- 1 full coat of Pilot II (White)	40 mic
1.32.8 Superstructure Decks (External)	
- 1 full coat of Prismatic Aluminium	125 mic
- 1 full coat of Pioner Top Coat Green 137	50 mic
1.32.9 Exposed Internal Steelwork in Accommodation, Engine Room and Others.	
- 1 full coat of Alkyd Primer	40 mic
- 1 full coat of Alkyd Primer	40 mic
- 1 full coat of Pilot I (white)	40 mic
- 1 full coat of Pilot II (white)	40 mic
1.32.10 Steelwork in Machinery Space up to Floor Level	
- 1 full coat of Prismatic Off White	125 mic
1.32.11 Steelwork Behind Linings	
- 1 full coat of Bituminous Paint (Black)	150 mic
1.32.12 Steelwork Ballast, Sewage & Bilge holding tanks	
- 1 full coat of Coal Jotacote 575	125 mic
- 1 full coat of Coal Jotacote 575	125 mic
1.32.13 Steelwork in Fuel Oil Tanks	
- 1 full coat of Mineral Oil	
1.32.14 Steelwork in F.W. Tank, Drill Water Tank	
- 1 full coat of Penguard HB	150 mic
- 1 full coat of Penguard HB	150 mic
1. 32.15 Helideck	
- 1 full coat of Prismatic Aluminium	200 mic
- 1 full coat of Prismatic Aluminium R/T Anti-skid	200 mic

1.32.16 Under Helideck & Support

- | | |
|------------------------------|--------|
| - 1 full coat Alkyd Primer | 80 mic |
| - 1 full coat Pilot I Grey | 40 mic |
| - 1 full coat Pilot II White | 40 mic |

1.32.17 CATHODIC PROTECTION

The external steel hull below the waterline and the are to be protected against corrosion by means of sacrificial anodes. The number and weight of the anodes to be such that protection for the vessel for a minimum of three (3) years.

1.33**FENDERS**

All fenders arrangement will refer to the finalized GA plan.

Each side of the vessel and the transom is to be protected by wooden patch fenders (good quality hard wood suitable for marine usaged) of 2m depth and 4.0m wide as indicated on the General Arrangement drawing.

They shall be constructed of square wood suitably treated, and be secured by angle.

Pad eye for truck fender shall be installed on each side of barge.

Eight (8) nos of pad eye for tyre fender shall be installed on each side of boat landing.

1.34**INSULATION**

The type of bulkhead between adjacent spaces in a vertical or horizontal direction is to follow the guidelines for structural fire integrity detailed elsewhere in this specification, but in no instance to fall below the standards laid out in the latest SOLAS requirements and any amendments thereof. And all insulation generally described below is to be in accordance with the 1974 SOLAS Convention and the amendments.

1.35**PANELLING AND CEILING**

All material to comply with the SOLAS 1974 requirements and the amendments, and the structural fire integrity requirements as detailed elsewhere.

No screws must be visible for the finished paneling and ceiling.

For toilets/shower spaces, paneling and ceiling are to be suitably designed/sealed so that water does not enter behind the panels.

Ceiling is to be extended over the complete accommodation area. The ceiling height below main deck is to be such that the clear headroom is obtained as at least 2.20M. Adequate hinged service hatches are to be provided wherever necessary for access to the junction boxes and other instruments for maintenance.

Jointing of panel and ceiling boards are to be by aluminium sections or similar. Aluminium skirting (4" high) are to be provided all round at floor level except in way of washplace and warehouse.

1.36**DECK COVERING**

External deck is to be painted as specified in relevant sections.

All wash places, galleys and other relevant areas are to be laid with ceramic tiles (100 x 200mm) embedded on cement reinforced with chicken wire mesh. Tiles are to be well-covered up at side (at least 200mm) and coving to be covered with matching small tiles. Proper sealing arrangement is to be provided so that no water drips behind the paneling. With proper flexibility to avoid cracking.

Depress gutter way to be provided to allow for proper drainage of water from floor to scupper.

Before the deck covering is laid in the wash places, all pipe connections are to be completed and the steel deck tested for water tightness by flooding to coaming height.

Two man & Four man cabins, lobby to be laid with latex deck composition with 2mm Vinyl tiles.

Switchboard room to be laid with rubber sheet on steel floor.

1.37 WINDOWS AND SIDELIGHTS

All windows are to have weldable steel frames. The windows are to be glazed clear toughened glass provision is to be made for the collection and drainage of water leaking through the window frames.

Necessary walkway outside to be fitted for cleaning of windows, where applicable. All sidelights are to have weldable steel frames, and to be glazed in toughened glass, and are to be fitted with deadlights. All sidelights are to be of the hinged type, arranged to hinge upward with securing hooks fitted over. Provision is to be made for the collection and disposal of any water leaking through the sidelights.

1.38 DOORS

All external doors are to be watertight or weathertight type steel doors. All doors fittings are to be of solid construction. Door stopper, ajar hooks, means for securing in open position, lugs for padlock are to be fitted for all doors.

Fires rated internal doors are to be fitted for all areas facing passageway, in way of cabins, offices, etc.

Fire retarding doors laminated with low flame spread formica sheet s on both sides are to be fitted in toilet areas.

Doors in way of galleys and fire zones are to have fire rating.

1.39 LOCKS

All doors, cupboards, lockers, drawers, etc are to be fitted with locks of good quality and duplicate keys for each lock are to be supplied.

Three (3) master keys to be provided for all cabins, passageways and all external doors.

1.40 NAME PLATES (OUTFIT)

In way of accommodation, all cabins and compartments are to be fitted with plastic engraved name plates (screwed type).

All external name plates to fittings and compartments are to be of stainless steel or brass.

All necessary signs, arrows, notices etc are to be provided.

A full list complete with locations are to be submitted to Owner's representative for approval.

1.41 ARTICULATED GANGWAY

An articulated gangway of primary section of 16m long x 1.2m wide with secondary section of 5m long x 1.2m wide and removable section of 4m long x 1.2m wide to be provided.

1.42 STRUCTURAL FIRE INTEGRITY

The fire integrity of bulkheads and decks should comply with the minimum fire integrity of bulkheads and decks

The number in parenthesis preceding each category refers to the applicable column or row in the tables

- (1) 'Control stations' are spaces containing emergency sources of power and lighting.
 - Spaces containing barge radio equipment.
 - Fire control and recording stations.
 - Spaces containing centralised fire alarm equipment.
 - Spaces containing centralised emergency public address system stations and equipment.
- (2) Corridors' means corridors and lobbies.
- (3) Accommodation spaces' are those used for public spaces, corridors, lavatories, cabins, offices, hospitals, games and hobbies rooms, pantries containing non cooking appliances and similar permanently enclosed spaces.
- (4) Stairways' are interior stairways, lifts and escalators (other than those wholly contained within the machinery spaces) and enclosures thereto. In this connection a stairway which is enclosed only at one level should be regarded as part of the space from which it is not separated by a fire door.
- (5) Service spaces (low risk)' are lockers and storerooms having areas of less than 2 square meters, drying rooms and laundries.
- (6) Machinery spaces of category A' are all spaces which contain internal type machinery which has in the aggregate a total power of not less than 373 kW or which contain oil fuel unit; and trunks to such spaces.
- (7) Other machinery spaces' are all machinery spaces other than machinery of category A described in (6).
- (8) Hazardous areas' are all those areas where due to possible presence of flammable atmosphere due to operations, the use without proper

consideration of machinery or electrical equipment may lead to a fire hazard or explosion.

- (9) Service spaces (high risk)' are galleys, pantries containing cooking appliances, paint and lamp rooms, lockers and store-rooms having areas of 2 square meters or more and workshops other than those forming part of the machinery spaces.
- (10) Open decks' are open deck spaces, excluding hazardous areas.
- (11) Windows and side scuttles, with the exception of navigating bridge windows, should be of the non-opening type. Navigating bridge windows may be of the opening type provided the design of such windows would permit rapid closure.

The Classification Society permit windows and sidecuttles outside hazardous areas to be of the opening type.
- (12) External doors in superstructures and deck houses should be constructed to "A-0"b Class divisions and be self-closing, where practicable.
- (13) Protection of accommodation spaces, service spaces and control stations.
- (14) Corridor bulkheads, including doors, should be "A" or "B" Class divisions extending from deck to deck. Where continuous "B" Class ceiling and/or linings are fitted on both sides of the bulkhead, the bulkhead may terminate at the continuous ceiling or lining. Doors of cabins and public spaces in such bulkheads may have a louvre in the lower half. Such openings should not be provided in a door in an "A" or "B" Class division forming a stairway enclosure.
- (15) Stairs should be constructed of steel or other equivalent material.
- (16) Stairways which penetrate only a single deck should be protected at least at one level by "A" or "B" Class divisions and self-closing doors so as to limit the rapid spread of fire from one deck to another. Personnel lift trunks should be protected by "A" Class divisions. Stairways and lift trunks which penetrate more than a single deck should be surrounded by "A" Class divisions and protected by self-closing doors at all levels.

Self-closing doors should not be fitted with hold-back hooks. However, hold-back arrangements incorporating remote release fittings of the fail-safe type may be utilized.
- (17) Air spaces enclosed behind ceilings, paneling or linings should be divided by close fitting draught stops spaced not more than 14 meters apart.
- (18) Ceilings, linings, bulkheads and insulation except for insulation in refrigerated compartments should be of non-combustible material. Vapour barriers and adhesives used in conjunction with insulation, as well as insulation of pipe fittings for cold service systems need not be non-combustible, but they should be kept to a minimum and their exposed surfaces should have resistance to propagation of flame to the satisfaction of the Classification Society.
- (19) The framing, including grounds and the joint pieces of bulkheads, linings ceilings and draught stops should be of non-combustible materials.
- (20) All exposed surfaces in corridors and stairways enclosure and surfaces in concealed or inaccessible spaces should have low flame-spread characteristics.

- (21) Bulkheads, linings and ceilings may have combustible veneers provided that the thickness of such veneers should not exceed 2 millimeters within any space other than corridors, stairway enclosures and control stations where the thickness should not exceed 1.5 millimeters.
- (22) Primary deck coverings, if applied, should be of approved materials which will not readily ignite.
- (23) Paints, varnishes and other finishes used on exposed interior surfaces should not be of a nature to offer an undue fire hazard and should not be capable of producing excessive quantities of smoke or toxic fumes.
- (24) Ducts provided for ventilation of machinery spaces of Category A and hazardous areas should not pass through accommodation and service spaces or control stations.
However, the Classification Society may permit relaxation from this requirement provided that:
- The ducts are constructed of steel and insulated to "A" standard; or
 - The ducts are constructed of steel and fitted with an automatic fire damper close to the boundary penetrated and insulated to "A" standard from the machinery space of Category A to a point at least 5 meters beyond the fire damper.
- (25) Ducts provided for ventilation of accommodation and service spaces or control stations should not pass through machinery spaces of Category A or hazardous areas.

However, the Classification Society may permit relaxation from this requirement provided the ducts are constructed of steel and an automatic fire damper is fitted close to the boundaries penetrated.

1.43 MOORING SYSTEM

The vessel shall be fitted out with a complete mooring system including anchor winches, anchor lines, sheaves, fairleads, tension meters, pennant lines, buoys and all necessary associated equipment.

It will have a minimum of eight (8) point mooring with mooring system winches below main deck in an enclosed area.

1.43.1 ANCHORS

Mooring anchors to be supplied by the shipbuilder

Eight (8) units of 7 Tonnes.

Eight anchors for mooring purposes and One (1) spare anchor each is to be provided.

The high holding power anchors are to be fitted with shackles, and swivels, All with BV Certificate's.

Total Ten (10) unit of steel pennant buoys 1.83M dia. x 2.45M length each with filled foam to be supplied by shipbuilder.

The anchors are to be arranged as shown on the general arrangement plan, and anchor racks are to be fitted.

1.43.2 MOORING WINCHES

Eight units skid mounted single drum winches **electrical type**

All winches to be remote control operated from control panels in the central control room, and are to be fitted with CCTV monitoring system.

The **Electro-hydraulic power pack for the mooring winches** shall be able to start and stop from the local and remote control panels. Local control for winches to be provided.

The winch drums are to be of heavy duty fabricated steel construction and mounted on anti-friction type roller bearings.

The spooling capacity is to be 1500m of 52mm diameter wire with capacity as follow:
(to be finalized with designer and winch maker)

Drum pull (1 st layer)	: 70T x 12m/min (1 st speed)
	: 50T x 19m/min (2 nd speed)
	: 29T x 32m/min (3 rd speed)
	: 15T x 48m/min (4 th speed)
Drum pull (Mid layer)	: 59T x 17m/min (1 st speed)
	: 34.5T x 27m/min (2 nd speed)
	: 19.5T x 43m/min (3 rd speed)
	: 10.4T x 69m/min (4 th speed)
Drum pull (Top layer)	: 45T x 22.5m/min (1 st speed)
	: 26.5T x 35.5m/min (2 nd speed)
	: 15T x 50m/min (3 rd speed)
	: 8T x 90m/min (4 th speed)
Drum brake holding (1 st layer)	: 160T (static)

1.43.3 TENSIONER AND SHEAVES

For the mooring winches, 8 off tension sensor are to be provided together with wire length counter.

1.43.4 FAIRLEADS (UNIVERSAL)

8 off universal fairleaders are to be supplied and installed by the Builder.

The fairleaders are to be deck mounted type and to be designed withstand breaking strength of 52mm wire rope with 90 degrees wrap on sheave.

Builder is to fabricate base frame (blasted and painted) and to install after proper line up.

1.43.5 WIRE ROPES

Shipbuilder to provide 8 coils steel anchor wires EIPS, IWRC, RHRL of 1500m length x 52mm diameter each.

One end of the wire is to be fitted with Crosby socket.

Shipbuilder to provide Tensioner of not less than 8% of wire rope breaking strength for coiling wire ropes onto individual Mooring winches.

All anchor wire ropes come with certificates.

One spare anchor wires, same specification as above, are to be supplied on steel reels (Owner's option).

1.43.6 MOORING FITTING

The following fitting are to be installed:

- a. Twelve two (12) Double bollards.
- b. Two (2) Closed panama chocks.
- c. Two (2) sets of Smit towing Pad on Forward & Aft Deck with closed panama chocks.

1.44 TOWING GEAR&CAPSTAN

Tugger Winch of single drum & warping end of 15Tx15m/min capacity for 200M x 30mm dia. Wire rope and "A" frame for bridle recovery. Final dimension of towing gear is to the satisfaction of the approving authority.

Emergency towing bridle to be provided in accordance with classification society requirements

Set four capstan at aft and fore of barge, its capacity is about 10t.

1.45 PEDESTAL MOUNTED OFFSHORE CRANE

Capacity of crane shall be approx. 100mt@23m.

Builder will provide the under deck stiffening / reinforcement and pedestal to proper height above deck.

1.46 FIRE PROTECTION & DETECTION

The design and selection of all materials/equipment to be such that an efficient fire and safety philosophy in accordance with good offshore fire engineering practices is maintained. All equipment used are to be well proven in service, and are to be compliance with the Rules of SOLAS 1974, all subsequent amendments, and other such Regulations indicated in this specification.

Full system is to be designed, installed and commissioned by reputable supplier. The fixed system is to comprise of the following:

1.46.1 FIRE DETECTION SYSTEM

- (a) This Specification covers the supply, installation and commissioning of an Automatic Addressable Fire Detection System.

This system is to comprise of smoke/heat detectors and manual break-glass call points wired to the main control panel located in the Winch Control Room on the Accommodation deck 3. Each of these components is to be wired back to its own group indicator in the control unit and to be fitted with a

monitored resistor at the last detector to enable the continuity of the group wiring to be monitored.

- (b) The detectors shall include means for giving a visual and audible alarm signal automatically at one or more indicating units whenever any detector comes into operation. Such units shall give an indication of any fire and its location in any space served by the system and shall be centralised in the main fire control station which shall be so manned or equipped as to ensure that any alarm from the system is immediately received by a responsible member of the crew. Such alarm system shall be constructed so as to indicate if any fault occurs in the system.
- (c) The system shall be operated by an abnormal air temperature, by an abnormal concentration of smoke or by other factors that are an indication of incipient fire in any one of the spaces to be protected. The detection system shall not be used for any purpose other than fire detection.
- (d) The detectors may be arranged to operate the alarm by the opening or closing of contacts or by other appropriate methods.
- (e) At least one detector shall be installed in each enclosed space and there shall be not less than one detector for each 37 sq m (400 sq ft) of enclosed area. In large spaces the detectors shall be arranged in a regular pattern so that no detector is more than 9 meters (30 ft) from another detector or more than 4.5 m (15 ft) from a bulkhead.
- (f) There shall be not less than two sources of power supply for the electrical equipment in the operation of the fire alarm and fire detection system, one of which shall be an emergency source. The supply shall be provided by separate feeders reserved solely for that purpose. Such feeders shall run to a change-over switch situated in the control station for the fire detection system.
- (g) A list or plan shall be displayed adjacent to each indicating unit showing the spaces covered.
- (h) Provision shall be made for testing the correct operation of the detectors and the indicating units by supply means for applying hot air or smoke at detector positions.
- (i) All detectors of suitable type shall be allocated at locations comply & to the satisfactory of Classification notation, IMO, SOLAS or any other marine regulating body requirement.

1.46.2 CO₂ SYSTEM

The generator room & paint store shall be provided with a permanently installed automatic CO₂ fire protection system, to Class and Regulating body requirements.

At least 2 rotate lights and audio alarms to be installed in generator room for warning of CO₂ release.

1.46.3 GENERAL ALARM SYSTEM

All general alarm outputs are to be derived from the fire and gas control unit. The devices/sounders are to be 120mm 24V DC polarised bells.

In the event of a fire detection, or activation of manual call points the general alarm bells are to sound intermittently.

A continuous alarm bell sound is to indicate CO2 'system discharged', or activation of the sprinkler system. For CO2 'system discharged' an Electronic Sounder and a rotating beacon is also to be operated inside the protected space.

Additional dry contacts are also to be provided within the fire control unit to operate all required shutdown circuits, such as air handling units, ventilation fans, etc.

Manual breakable glass call points are to be fitted in all escape routes and corridors, in all machinery rooms and winch rooms, in office and control room. Access staircase to helideck, and stores.

1.46.4 FIRE FIGHTING APPLIANCES (PORTABLE)

The following items, in addition to those covered elsewhere in this specification, are required to be placed on board in a proper location, and to satisfy the requirements of SOLAS and any amendments thereof.

- (a) All fire extinguishers shall be colour coded to International Standards and shall have valid inspection tags.
- (b) Sufficient number of portable fire extinguishers to ensure that at least one such extinguisher will be readily available for use in any part of the accommodation or service spaces.
- (c) At least three (3) sets of firemen's outfits stored so as to be easily accessible and ready for use. The firemen's outfit shall consist of:
 - Protective clothing of material to protect the skin from the heat radiating from the fire and from burns and scalding by steam. The outer surface shall be water-resistant.
 - Boots and gloves of rubber or other electrically non-conducting material.
 - A rigid helmet (with protective mask) providing effective protection against impact.
 - An electric safety lamp (battery operated) of an approved type with a minimum burning period of three hours.
 - An axe.
 - A self-contained breathing apparatus of an approved type.
- (d) **At least one fire control plans on each deck permanently exhibited for guidance of the crew. It should consist of general arrangement plan showing clearly for each deck the control stations, particulars of the fire alarms, detecting systems, the fire extinguishing appliances, means of escape from different compartments etc. etc.**
- (e) The fire fighting equipment to be supplied generally of the follow:
 - **Thirty six (36) Fire hydrants.**
 - Thirteen (13) 40mm dia. x 23m hoses with dual purpose nozzle.
 - Thirteen (13) 50.8mm dia x 15m hose with dual purpose nozzle.
 - Six (6) 50mm dia. x 30m hose with dual purpose nozzle.
 - Three (3) Aircraft crash rescue sets.
 - One (1) 45L Portable foam applicator.
 - Fire extinguishers
 - Two (2) 9kg CO2.
 - Fourty Eight (48) 4.5kg dry chemical.
 - **Four (4) 5kg dry chemical.**
 - Five (5) 9L foam fire.

- Two (2) International shore connections.
- Three (3) Fire blankets.
- One (1) Fire alarm and central control panel located in the control room.
- Forty six (43) Manual call points.
- One (1) Set F.O. day and cargo tanks quick closing device.
- Three (3) Man overboard signals.
- Six (3) Fire axe.
- Three (3) Siren and rotating light for Co2 release.
- Four (4) Siren and rotating light for fire alarm.
- Four (4) Helideck Foam monitors.
- Three (3) Fireman outfits.
- Six (6) Air breathing apparatus.
- Six (6) Emergency escape breathing devices.

The quantity of fire fighting equipments will be confirmed by detail design.

- (f) Fixed automatic water sprinkler system to be installed in the whole accommodation spaces including store, workshop, ware house & etc. Alarm system to be provided on activation of the system.
- (g) Comprehensive active and passive fire and emergency alarm system must be fitted.
- (h) Means of raising alarm in emergencies shall be in accordance with SOLAS
- (i) Break glass or signal shall be provided with such system in accordance with SOLAS.
- (j) In high noise level area, flashing or revolving lights for raising alarm shall be provided.
- (k) Abandon and All Clear signals shall be operable from central controls only.

1.47

LIFE SAVING APPLIANCE

Life saving equipment to be installed according to SOLAS 1974, 1983 amendment international laws and classification society requirement for accommodation Barge.

The barge must be provided with liferafts 12 x 25 men to be placed on each side of the barge (total 24 in number).

Life jackets shall be 200% coverage of the total maximum onboard. Each lifejacket is to be fitted with a whistle and a light powered by a water activated battery. Each person shall be provided with a life jacket stowed in his accommodation. Additional life jackets should be stowed at or near the normal embarkation positions, in a suitable dry stowage position, unlocked and clearly marked.

At least 12 lifebuoys, stow so that they can be quickly thrown overboard in an emergency. Lifebuoys are to have self-igniting lights and smoke signals attached at least one on each side with buoyant lifeline not less than 27.5m in length.

A muster list showing special duties to be undertaken in the event of an emergency shall be allocated to each member of the crew. It shall also specify definite signals for calling all the crew to their lifeboat/liferaft and fire stations and shall give full particulars of those signals. The muster list shall be posted on doors in each of the cabins and at other strategic locations of the accommodation.

The Safety and Control plans are to be posted at all prominent parts of the barge, including all alleyways.

Sufficient numbers of life vests shall be provided for personnel working near or over water.

All liferafts, lifejackets and lifebuoys shall be fitted with retro-reflective material.

Life saving equipment appliance to be supplied generally of the following:

- **Twenty five 25 men liferafts.**
- Twelve (12) Lifebuoys.
- **600 Lifejackets marked with barge name and fitted with whistle..**
- Fourteen (14) Work vests fitted with retro reflective material.
- Twelve (12) Parachute distress signals.
- Four (4) Line throwing apparatus.
- One (1) Oxygen rescucitator with spare cylinder.
- One (1) Aldis Signal light c/w battery.
- Two (2) Stretchers capable of helicopter evacuation.
- Two (2) Radar transponders.
- One (1) EPIRB Radio beacons.

Means of Escape

- Means of Escape via Emergency exits and escape routes clearly indicated by notices of reflective nature, approximately 150 mm from floor.
- Escape exits painted red.
- Emergency lighting 430mm above floor level.

Medical

- First Aid Kits in control, mess room and machinery room.
- One (1) Eye wash and drench shower station c/w stainless steel pull rod on main deck, One (1) Portable Eye wash station in machinery room.

Rescue Boat

- One (1) SOLAS approved rescue boat capable of carrying 6 persons. SOLAS approved combined rescue boat and proper Davit shall be provided.

1.48

AIR CONDITIONING

For air conditioning of the barge, the plant has been split to serve accommodation and living spaces, service spaces and control room.

The design of the plant is to suit the layout as shown on the General Arrangement drawings and supplied by a reputable contractor with experience of designing such systems.

The system complies with the requirements of SOLAS (latest amendments), and is designed to suit the conditions stated.

1.48.1 DESIGN CONDITIONS

The capacity of the cooling installation for the air conditioning system is based on the following conditions.

Summer season

Outside	+42° C and 90% RH
Inside	+22° C and 50% RH

Winter season

Outside	0° C
Inside	+22° C and 50% RH

Fresh Air Circulation	35% - 40%
Raw Cooling water temp.	+35° C
Power supply	415V/3PH/50 Hz

1.48.2 CAPACITY OF COOLING LOAD

The air conditioning plant for accommodation spaces is designed for 65% return air to be used under the most extreme conditions & allows for a minimum of 30m³/hr fresh air per person.

The number of air changes per hour for other air conditioned spaces are based on the transmission load in summer time.

The galley is provided with spot cooling.

Compressor and condenser shall have 100% redundancy c/w auto-unloading.

Switch board room to be provided with independent air conditioning system.

1.48.3 SYSTEM

- (a) Chiller water cool Air Handling Units supplying the accommodation.
The units consist of the following components all situated in a double wall casing with minimum 30mm insulation complete with plenum & mixing box.
- (i) Filter section - with cleanable filters
 - (ii) Cooling section with cooling coil of copper tubes & aluminium fins.
 - (iii) Heating coil of stainless steel tubular type.
 - (iv) Water eliminator section with eliminator and water trap drain.
 - (v) Fan section with medium/high pressure backward curve double inlet double wheel centrifugal fan complete with drive mechanism & c/w flexible mount.
 - (vi) Distribution section for outgoing distribution pipes
- (b) Sea water cool Chiller Plant suitable for R407C comprising of two units each having 100% capacity with one as stand-by.
- (i) Each chiller plant having 2 electric driven compressors, 1 condenser (90/10 cupro-nickel tubes with zinc anode protection at end plates), 1 evaporator (copper shell & tube), etc.
 - (ii) 2 chiller pumps of each 100% capacity having cast iron casing, bronze propeller, stainless steel shaft & mechanical shaft seal construction.
 - (iii) Chemical tank & closed type expansion tank for replenishment of chiller water.
 - (iv) PLC control panel.

The following controls and as associated equipment is to be included:

- Pressure gauges
- Low pressure sensors
- High pressure sensors
- Service valves
- Pressure relief valves
- Safety valves
- Liquid level indicators/sight glasses
- Solenoid/control valves
- Thermostatic expansion valves
- Temperature gauges
- Heating and humidity control
- Filter-drier
- Water pressure controller

1.48.4 DUCTING AND DISTRIBUTION

All ducts are to be fabricated using galvanised sheet steel / spiral duct and to be suitably stiffened and supported.

Ducts to have 25mm rock/glass wool applied externally and lagged.

Air supply and return air grilles and diffusers are to be standard aluminium type. All air grilles are to have volume dampers and individual control of the air supply in each cabin.

All other fittings, control panels, etc which are required for the system are to be provided and fitted.

In each cabin and compartment, adjustable diffusers with open/close lever are to be fitted to the ceiling. Necessary return air grills are to be provided.

Fusible fire dampers and fire dampers with indicators are to be provided as necessary.

Dampers are to close automatically in the event of fan failure, fire or shut down.

Dampers are to be fitted with manual over-ride facilities.

Adjustable dampers are to be installed to duct work as necessary for balancing.

All penetration pieces required for the installation work are to be provided, and to be of an approved type so as not to effect the integrity of the fire divisions of the barge. After completion of the installation and construction, the system is to be tested and air balanced.

SECTION II

2.1 MACHINERY GENERAL

All machinery and equipment is to be manufactured and fitted in accordance with Classification and Regulatory body requirements, and where relevant Certificates are to be provided.

Pumps motors and similar equipment are to be standardized as far as possible with regards to make and type.

The builder shall provide all components and auxiliary equipment necessary to make the barge function in a safe and competent manner.

Care is to be taken that codes and standards relating to the barge's area of operation be adopted, and always in consultation with the Owners.

All items not conforming will be rejected and replaced with suitable and approved components.

2.2 MAIN GENERATING SETS.

2.2.1 OPERATING PHILOSOPHY.

The operational philosophy for the generating sets is that a multiple set of generators will be installed with one (1) set available as (non running) backup to the running sets. This "backup" set to have a capacity of mark up of the 100 percent of the expected load. For example, three (3) sets operating, with the four set acting as standby.

The running sets shall have sufficient capacity to start any electric motor drive whilst supplying the normal expected demand, without depressing the normal voltage level by more than fifteen (15) percent.

In addition a suitably rated standby set to supply emergency lighting and essential loads shall be provided and arranged to automatically start-up in the event of loss of the main power.

Interlocking shall be provided to prevent the parallel operation of the main and "standby" generating set.

2.2.2 MAIN GENERATING SETS

Four (4) sets of diesel engines coupled to alternators which able to generate up to 630kW/415V/3PH/50Hz each.(Final power of Gen. sets to be decided according to electrical loading calculations.)

- Four stroke marine diesel engine, sea water cooled, complete with electric starting system.
- 415V/3Ph/50Hz, 3wire. A.C. drip proof, self-ventilating self exciting Alternator. Minimum of Class 'F' insulation, c/w Single phase space heater.

The equipment shall be complete with all auxiliary components to form a complete generating packing, skid mounted and shall include, but not limited to the following:

- Synchronising Equipment (automatic and manual)
- Voltage regulator
- Speed regulator
- Short circuit sustain equipment (see note below)
- Load sharing governor

Proper insulation shall be used for the rotor and stator and both shall be further protected with 100% epoxy impregnation and an overall coating of resilient insulation on the end coils. The generator shall incorporate reactive drop compensation for parallel operation and shall also include a resettable protective device for the exciter/regulator to provide against extended low power factor loads.

The alternator sets shall be identical (pole pitch), to minimize circulating currents and the percentage of circulating currents shall be stated.

For further details of switchboard and related equipment, refer to the electrical specification (Section III).

2.3 EMERGENCY GENERATOR SET

One diesel generating set is to be provided and to be installed in the emergency generator room on the main deck level. Final power of Emergency Gen. set to be decided according to electrical loading calculations.

It is to be started automatically in case of failure of the main generators, and is to be used strictly for supplying power to essential services during an emergency.

The set is to be battery started and radiator cooled.

The details of the technical specification relating to the main generator/alternator relate to this unit also where applicable.

The details of switchboard and related equipment, refer to the electrical specification

2.4 PIPING AND VALVES - GENERAL

All piping systems to be installed in accordance with good marine practice and to the satisfaction of Classification, equipment suppliers and Owner.

Sea-main to be sized for maximum water speed of 2-3m/s with main machinery and pumps working. Elsewhere water speed to maximum 3.0m/s.

Piping shall be led as directly as possible with minimum number of bends and with sufficient flanged joints to provide for removal, inspection, servicing and replacement of piping and adjacent equipment without structural disturbance. Cutting of ship's structure is to be avoided if possible but if found necessary compensation is to be provided.

Pipe penetration through W.T./O.T. bulkhead, shell, decks, and tank tops to be of an approved type.

Expansion bellows (to withstand vacuum) of approved make is to be fitted where necessary to prevent damage due to thermal expansion for working of the structure.

Pipe connections to reciprocating machinery to be effected by an approved type flexible connection located as close to the machine as possible. Pipe is to be supported adjacent to the flexible connection.

Pipe routes to be clear of walkways, access routes, withdrawal spaces, doors, manhole and hatches. Routes to be chosen to avoid places where mechanical damage may be sustained. Where this cannot be avoided pipes are to be suitably protected. Where condensation is likely to form on pipe exterior, pipes are not to run over unprotected electrical equipment.

All pipes are to be cleaned and to be free of welding slag before installation. System shall be flushed after installation. All fuel oil, Lube oil and hydraulic oil piping to be cleaned by pickling prior to installation. All lubricating oil piping is to be flushed with system oil after installation.

All valves are to be of an approved type.

2.5 PIPING MATERIALS.

The materials for the various piping systems are to be in accordance with the following tables:

Pipe System	Materials
Sea main Auxiliary/Generator S.W. lines	Galvanised mild steel Sch. 80
Bilge Lines	Galvanised mild steel Sch. 60
Ballast Lines	Galvanised mild steel Sch. 40
Domestic F.W. lines (cold) accommodation	Galvanised mild steel Sch. 60
Domestic F.W. lines (hot) accommodation	Galvanised mild steel Sch. 40 / P.E / BV for
Domestic S.W. lines accommodation	Galvanised mild steel Sch. 60 P.E / BV for
Fuel oil piping	Black mild steel Sch. 40
Exhaust gas piping	Black mild steel Sch. 40
Compressed Air	Galvanised mild steel Sch. 80

All pipes are seamless.

All hot water pipes and compressor discharge pipes are to be efficiently lagged with insulation (asbestos free).

For galvanized pipes, hot dip galvanization is to be carried out only after fabrication of pipes complete with flanges, elbows etc.

2.6 BALLAST SYSTEM

Ballast system is to be served by two (2) self-priming centrifugal ballast pump having capacity of 500m³/hr@25m head. Pumps to be direct coupled to 415V/3ph/50Hz electric motors.

Pump is to be fitted with compound and pressure gauges.

Individual filling/suction valve for each tank to be located in auxiliary machinery room. Suitable spectacle flanges to be provided in system for changing over from ballast

Ballast piping to schedule 60 with welded flanges. Piping to be hot deep galvanised complete with flanges etc.

2.7 BILGE SYSTEM

The bilge system is to be designed to Class and Regulatory body requirements and is to be served by one (1) bilge pump of 100m³/hr@50M head.

Pump is to be fitted with compound and pressure gauges.

Individual suctions are to be arranged from each compartment and void space. Adequate number of bilge wells is to be arranged in way of tank top and other relevant areas for efficient bilge suctions.

Pipes are to be schedule 60 hot deep galvanised seamless.

2.8 GENERAL SERVICE SYSTEM.

The general service of pump one (1) of capacity 100m³/hr@110m to be made available as bilge, wash deck, and fire pump with cross- connected so that one acts as a stand by to the other.

Pump is to be fitted with compound and pressure gauges.

Pipes are to be schedule 60 hot deep galvanised seamless.

2.9 FUEL OIL SYSTEM

Two (2) fuel oil transfer horizontal gear pump of 5m³/hr@25m head capacity.

The pump is to have cast iron body, alloy steel shaft and motor/gears adjustable relief valve and compound pressure gauges.

Adequate number of daily service tanks to be provided for all prime movers, and to be in the compartment containing the diesel engine.

All daily service tanks are to be provided with low level alarms, overflow pipes back to storage tanks and other additional instrumentation as stated elsewhere.

Oil fuel filling/discharge connections of 100mm bore to be fitted port and starboard on main deck. Each connection is to be fitted with valve and quick coupling. The transfer pump is to draw from storage tanks and to deliver to check connections.

Fuel oil pipes are to be black Schedule 40 seamless pipes.

One (1) fitted to fuel return line and one (1) fitted to loading / discharge manifold.

2.10 DOMESTIC POTABLE FRESH WATER SYSTEM (HOT AND COLD)

For cold fresh water system, Two (2) automatic domestic fresh water pressure sets are to be provided, each comprise of:

- One (1) pressure tank, capacity 2000 litres, complete with relief valve, pressure switch, pressure gauge etc.
- One (1) electric F.W. pump, 25m³/hr@40m head.

For hot fresh water system, Four (4) electrically heated vertical storage calorifiers of 2 x 1000 litres and 2 x 500 litres capacity are to be fitted. For circulation of hot water, one hot water circulating pump, having a capacity of 4m³/hr@24m head to be provided for each heaters.

Domestic fresh water to be drawn from storage tanks and discharged to system by hydrophore.

Cold fresh water to be supplied to wash basins, showers, galley, calorifier, engine room, dark room etc.

Hot fresh water is to be supplied to galley, showers and wash basins.

Cold fresh water piping to be Schedule 40 steel tube with welded slip-on flanges.

Piping to be hot dip galvanised after fabrication.

System to be tested to 1.5 times working pressure when completed.

2.11 DOMESTIC SEA WATER SYSTEM

For domestic salt water system, One (1) automatic sanitary saltwater pressure sets are to be provided, comprise of:

- One (1) pressure tank, capacity 1000 litres,
- One (1) electric S.W. pump, 25m³/hr@40m head, one (1) as standby for F.W domestic system..

Pump is to have cast bronze body, bronze impeller and stainless steel shaft, and is to be fitted with compound and pressure gauges.

Sanitary hydrophore set is to draw salt water from sea main and supply sanitary water to water closets and galley.

Sanitary salt water piping to be Schedule 60 steel tube with slip-on flanges. Piping to be hot dip galvanised.

System to be tested to 1.5 times working pressure when complete.

2.12 SEWAGE TREATMENT PLANT

2 x 150 men sewage treatment plant comply to IMO, standard.

One (1) sewage transfer gear pump of 15m³@20m head capacity for sewage tank.

2.13 OILY BILGE SYSTEM

One oily bilge water separator is to be provided to remove oil from the bilge water of machinery spaces before discharging such water overboard. Capacity of the separator is to be approximately 1m³/hr.

The separator is to meet the requirements of IMO and relevant Authority and to have 15 ppm alarms and auto shutdowns fitted to the clean water overboard discharge to prevent the accidental discharge of oily water.

The oil-removed from the water is to be stored in a dirty oil tank of approximately 40 tons capacity. Sump drains from the main generators is also to be led to this tank for storage prior to discharge. **One (1) electric gear pump of 5m³/hr@20m head is to be provided to discharge the oil from this holding tank to a suitable outlet on the main deck.**

2.14 FIRE MAIN SYSTEM

The barge shall be provided with the following:

- (a) One (1) electrical driven fire pump of minimum 150m³/hr@110m head capacity
One (1) electrical driven emergency fire pump of 50m³/hr@80m head capacity.
One G.S pump is used the standby pump for fire system.
Pump is to be fitted with compound and pressure gauges.
- (b) The pumps should be far enough apart in separate compartments to ensure that a fire in any one compartment cannot put all two pumps out of action at one time.
- (c) A fire main, the diameter of which shall be sufficient for the effective distribution of the maximum required discharge from all fire pumps operating simultaneously.
- (d) The number of fire hoses to be provided on deck each complete with couplings and nozzles shall be one for each 30m (100 ft) length of the barge and one spare. In no case shall the number be less than five in all on deck at any time.

Machinery spaces shall also be provided with fire hoses.

- (e) The number and position of hydrants shall be such that at least two jets of water not emanating from the same hydrant, one of which shall be from a single length of hose, may reach any part of the barge normally accessible to the crew.
- (f) At least two (2) international shore connection- Facilities shall be available enabling such a connection to be used on either side of the barge.

The emergency fire pumps is to draw directly from a separate fire pump sea-chest and deliver to the hydrants on board via fire ring main having suitable isolation and branch/root valves.

The fire fighting capability is to be in accordance with SOLAS 1974 with all subsequent amendments, and is to be read in conjunction with the section relating to fire protection in Section I of these specifications.

2.15 AIR COMPRESSORS

One(1) electric motor driven air compressors 10m³/min@10bar

One (1) unit 2m³ air receiver to be supplied by Shipbuilder.

2.16 FRESH WATER MAKER

The WORKBARGE shall be provided with two units of water makers. One water maker should be sufficient to support full personnel onboard. and the other unit of same capacity to be on stand by.

2.17 WORKSHOP EQUIPMENT

- 1X Lathe machine
- 1X 200mmØ Bench grinder
- 2X Electric saw
- 1X Bench drill

2.18 VENTILATION

Ventilation shall be provided and installed to areas below deck with fans c/w necessary ducts.

Exhaust fans shall be provided for hospital (independent) galleys, laundry, changing rooms, locker room, toilets, paint store, CO2 room and where required.

Supply fans shall be provided for the machinery room, 4 winch compartments and where required.

SECTION III

3.1 ELECTRICAL

This part of the specification covers the electrical requirements of the barge, and is to be read in conjunction with the machinery specifications.

This specification outlines the general requirement for the design, construction, installation, and testing of electrical equipment and electrical systems, and is to be used with approved drawings and equipment pertinent to the barge being constructed.

The drawings and details in the plans should indicate in schematic form the layout of the electrical system. This includes the arrangement of feeders, control circuits, socket outlets, control panels, terminal cubicles, lighting, and all other relevant works.

Data presented on the drawings will be as accurate as possible. However, the Builder is to satisfy himself by necessary verification that the construction data is correct. All installation is the responsibility of the Builder.

All electrical machines, equipment and apparatus delivered to the shipyard and awaiting installation will be kept in a suitably ventilated store until required.

Before installation work is commenced, detailed drawings of wiring, and details of the equipment are to be submitted for approval.

All electric motors are to be standardised as far as possible for make and type.

3.2 ELECTRICAL INSTALLATION STANDARDS

These are to be the Rules and Regulations of the Classification Society and Regulatory bodies, including but not limited to SOLAS with all subsequent amendments.

Standards of the following institutes and professional bodies are to be used as guidelines in the choice and sizing of cables materials and components.

Other European standards or other recognised international codes or standards, may be used in lieu of the above, subject to approval and such that standards do not fall below those stated.

3.3 MATERIALS AND EQUIPMENTS, ENVIROMENTAL CONDITIONS

All materials and equipment shall be fully suitable for and fully in accordance with, the standards and codes referred to.

Material and construction must be suitable for exposure to the climatic conditions of offshore.

The atmosphere is highly salt laden, and this should be taken into consideration with regard to a high corrosive risk factor. Temperature range is 18 degrees C and 34 degrees C maximum with 100% relative humidity.

3.3.1 CABLES

In spaces where cables may be subjected to mechanical damage these cables are to be armoured or suitably protected by trunking or conduit. At gas tight, oil tight and watertight deck/bulkhead penetrations, glands or multi-cable transits are to be used.

Welding cables are to be multi-stranded, tough rubber sheathed. Cables are to be conformed to the standards indicated, or to an equivalent approved standard.

In general cables shall have flame retardant outer sheath, with oxygen index of not less than 30 and be type tested and certified for reduced propagation in accordance with IEC 332.

All power and control cable conductors shall be stranded copper conforming and with minimum cross-sectional area of 2.5mm sq.

Where armouring/screening of single core cables is required or specified it shall be non magnetic.

Colour coding shall be in accordance with IEE Regulations

3.3.2 CABLE SPECIFICATIONS

Whilst the following list dedicates cable types to their general service requirements, due consideration of the cables route should be taken with respect to smoke emission versus flame resistance / retardant for manned areas and vital services etc. and the utilisation of cable types shall be approved by the Class before any purchase action is initiated.

3.3.3 JUNCTION BOXES

Fixation of the labels shall in no way affect the certification of the junction boxes for use in a hazardous area.

Large terminal boxes located outside and exposed to the elements shall be fitted with suitably rated anti-condensation heater. The complete unit shall be suitable for the appropriate hazardous location and protected against driving rain by the installation of a full rain canopy above the box.

Cables shall enter junction boxes via their bottom and sides only. Top entry cables will not be allowed in outside locations.

Steel wire braided cables, types 5 and 6 defined in this specification, shall be terminated into poly carbonate enclosures, via suitable glands.

The earth tracer conductor shall be taken into the box and securely terminated. Earth continuity shall be ensured between the earth stud in the junction box, the cable braid and the main earth system.

3.3.4 CABLE TRAYS.

Cables on ladders and trays shall be grouped by voltage class and signal/service type.

Separate cable ladders/trays shall be installed for circuits within each of the following cable groups.

(i) Power cables with associated control

(ii) Intrinsically safe circuits. Instrument cables up to 220VAC order.

Analogue signals and control loops. Vital circuits fire, gas, telecoms, shutdown.

The number of cables installed in cable tray or ladder shall be such that the space factor does not exceed 70%.

3.4 ELECTRICAL SYSTEM OF SUPPLY

- (a) 415V 3 phase 50 cycle for power requirements and equipment considered permanent fixtures.
- (b) 220V single phase 50 cycle supply via three 3 phase transformers for supplying power to navigational lights and aids, general lighting and domestic appliances.
- (c) 415/220 volts emergency power supply, to be used for supplying power during emergency conditions to navigation aids, lights, emergency lighting, alarms and other essential users.
- (d) 24V D.C. navigational aids, radio and instrumentation.

3.4.1 SHORT CIRCUIT CALCULATION

The Builder shall ensure, by appropriate calculations, that all switchboards, switchgear, motor control centres and cables are adequately rated for the maximum anticipated fault current conditions.

The calculations shall be based upon the maximum number of generators and motors that can simultaneously contribute to the system fault level, that is, the "worst case" conditions.

These calculations, together with switchboard test certificates and switchgear rating data shall be submitted to the class for approval prior to switchboard construction.

3.5 ELECTRIC POWER SOURCE

Normal A.C. power supply is to be by four (4) in number main generating sets as detailed in the Machinery Specification (Section II). Each main alternator to be 415 volts, 3 ph, 50 cycles.

Alternators to be salient pole synchronous brushless type and are to be of enclosed ventilated drip proof construction with Class H insulation and shall be further protected with 100% epoxy impregnation and generally to Classification requirements fitted with anti condensing heaters.

Two alternators are to be operated in parallel normally, third and fourth set is to act as standby.

However, all four (4) main alternators are to be able to operate in parallel.

Emergency supply is to be by means of one emergency generator as stated in Machinery Specification.

3.5.1 EXCITATION AND VOLTAGE REGULATION

Regulation	:	+/- 0.5% Steady state less than 25 millisecond response time +/- 20% for full load Step Change, recovery to +/- 5% within one second with no more than two over shoots.
Exciter	:	Solid state, silicon rectifier brushless shaft mounted, of a "Volts per characteristic".
Overload	:	The generator shall be capable of withstanding 10% overload (0.8 P.F.) for one hour and 50% over load for 5 minutes without injurious damage.
Efficiency	:	The Combined Alternator, exciter and regulator efficiency at rated load shall be 94% minimum.

3.5.2 MAIN SWITCHBOARD

Main switchboard to be dead front type install in air conditioning Switch Board Room (at generator room level).

To be of steel construction with removable cover plates standard enamel finish, flush mounted instruments. Insulated handrails to be arranged along front side.

Following instruments to be fitted on each generator and mounted in the control panel.

Synchronising Equipment
 Frequency meter
 Voltmeter
 Kilowatt meter
 Ammeter
 Synchroscope
 Voltage Regulator
 Adjusting Rheostats
 Short Circuit Sustaining Equipment
 Load Sharing Governor (Woodward Type 2301 or equal)
 Start/Stop Buttons

Earth testing facility to be provided for both the 415 and 220 volt busbars which shall be split (divided) into at least two sections.

Each generator is to be protected by moulded case circuit breaker suitable rated for overload, short circuit protection and selectivity.

Synchroscope, dark lamps and necessary switches to be fitted for paralleling of generators.

The switchboard is to be arranged automatic synchronising with manual over-ride.

All outgoing circuits to be fed by approved moulded case circuit breakers.

All terminations on the switchboards are to be of the approved type.

Construction of the switch board to be such that it is well ventilated, care being taken to avoid hot spots.

All necessary safety features, such as reverse power relays, over and under frequency protection, over and under voltage protection, over current protection etc. are to be provided.

SWITCHGEAR

Switchgear shall be fully in accordance with the requirements of the Class shall be as follows:

- (a) Generator switchgear, with one (1) cubicle for each generator set, which shall contain all the necessary protection and instrumentation relevant to the generator.
- (b) Protection systems for the generating system shall be fully in accordance with the specifications.
- (c) Means of isolation shall be provided at both the incoming and outgoing ends of feeders and at the point of equipment utilisation.
- (d) Distribution switchgear fed from the main generator switchgear comprising, incoming and outgoing circuits to Motor circuits and sub-distribution.
- (e) Sub-distribution panels, supply lighting and small power supplies as described later in this specification.
- (f) Where three phase and neutral supplies are being fed to an area classified as hazardous, four pole or double pole switchgear shall be utilised to effectively isolate all power to the hazardous area.

3.5.3 ELECTRIC SHORE SUPPLY

Shore supply facility is to be incorporated in the main switchboard approximately 500 KW capacity 415 volts 3 ph 50 Hz supply. The shore supply terminals at the main switchboard are to be directly connected to the shore supply connection box mounted in a suitable position and of a weather proof construction. Facilities at the connection box are to be provided for checking the phase sequence of the incoming shore supply.

3.6 ELECTRIC MOTORS & STARTERS

Motors to be of squirrel cage type and all electric motors shall be designed, fabricated, and fully tested in accordance with the standards listed and additionally shall conform to IEC 92 (Electrical installations in ships), with degree of protection at least IP55.

All motors shall normally be standard marine type except where installed in hazardous locations.

All motors shall be rated to operate on a 415V, 3 -phase 3 wire, 50Hz electrical supply, or 220V single phase. 50Hz as defined by motor size as stated below.

All fractional horsepower motors shall either be spot wound for a 415V, 3- phase, 50Hz supply or 230V single phase 50Hz.

All electric motors of 100KW and above shall be fitted with anti-condensation heaters. The supply voltage will be specified on the motor data sheet. Where the motor is located in a hazardous area the anti condensation heater shall be of the same temperature class as the motor as defined in BS 5345 Part 1, Section 12.2.

The motor enclosure, including the terminal box shall be one of the following types to suit the hazardous zone location as specified on the Data Sheet.

All motors shall have metric frame sizes in accordance with IEC 72.

All motors and associated terminal boxes shall have degree of protection in accordance with IEC 144.

Generally where motors have local control, the stop switch/button should be of the stay put/locking type.

3.7 LIGHTING

All lighting throughout the barge, unless otherwise stated is to be fluorescent type standardising on twin tube fittings wherever possible. Fittings to comply with Classification. The type and enclosures for light fittings and switches to be determined by the location of the installation. Lighting inside accommodation to be flush mounted.

Light fittings in engine room and in areas subject to vibration to be resiliently mounted.

Accommodation fittings to be suitable for the decor. Decor/bulkhead, cold room, store and emergency lighting is to be incandescent.

Generally minimum illumination levels to be as per IES codes of practise and not to be less than the following:

Machinery space, stores	: 150 Lux
Gallery	: 110 Lux
Cabins, mess and wash places	: 75 Lux
Passage ways	: 50 Lux

Throughout the vessel in machinery areas and inner walkway of accommodation, fluorescent emergency lights with built-in chargers are to be provided. The charger is to be able to supply power for at least 3 hours in case of main power failure.

Emergency lights are generally to be located in all passage ways, stairways, galley, mess, recreation room, control tower, office and other common spaces in all strategic machinery areas.

Emergency lighting shall comprise a proportion of normal fittings, supplied from the Standby generator set. In addition, separate battery powered rechargeable fittings which illuminate on loss of normal mains supply, shall be provided at all exits.

Adequate number of flood lights 500 – 1000 watts are to be supplied and installed in work deck, winch areas, etc. As guidance, floodlights are to be fitted in the following areas:

Fwd Winch Compartments	: 4 off
Aft Winch Compartments	: 4 off
Control Tower (To illuminate Aft Main Deck)	: 8 off x 1000W each

The numbers of floodlights in other areas to be sufficient to maintain 200 LUX over the working deck.

3.8 NAVIGATIONAL AND OPERATIONAL LIGHTS

Navigational lights to comply with International Regulation for Preventing Collision at Sea (latest edition). Navigation lights to be controlled from the navigation panel in control room.

Indicator lamps and buzzer are to be fitted. Lights are to be two tier type 220V A.C. Main 220V supply to be taken from two sources via change over switch.

All operational lights as stated elsewhere are to be controlled from control tower from control panel. All operation lights are to be operated by 220V AC supply.

3.9 ALARM

All alarms as necessary in hull and machinery sections are to be fitted.

General alarm system to be installed with push buttons in control room and engine room alarm panel connected to audible alarms in control room, accommodation lobbies, machinery compartments and winch compartments. System to be energised from 24V D.C. supply.

Reset switch for the alarm is to be arranged in the control room.

3.10 24DC POWER SUPPLY (BATTERY CHARGER & DISCHARGE PANEL)

The system is to supply power to the navigational lights and aids, radio equipment, alarms instrumentation, etc.

Details of Radio equipment see 1.21.

Details of Navigation equipment, see 1.20.

Two (2) Dead front, wall mounted drip proof float type charges, to be located in the control room.

The rectifier to be Silicon type three phase full wave rectifying method with Surge current protector.

Necessary quantity of moulded case circuit breakers and fuses for radio, emergency lighting, alarm systems, general and fire alarms, telephones, etc.

The batteries, sufficient in number of the lead acid type, to be stored in a well ventilated room on the control deck. Racks to be made of steel with wooden grating on floor.

Batteries to be protected from accidental spillage and movement.

Separate vent fan to be provided, with exhaust to a safe / protected area.

3.11 TRANSFORMER

One (1) unit of 70Kva 3Ph 415/220V transformer to be provided, together with one (1) spare phase coil, to be supplied from main switchboard for main lighting and domestic load.

One (1) unit of 15Kva 3 Ph 415/220V transformer to be provided, together with one (1) spare phase coil to be supplied from emergency switchboard for emergency lighting and navigational load.

3.12 COMPUTER NETWORK CABLING

To be installed for all meeting/conference rooms, control rooms, offices, one-man cabins, radio rooms, hospital.

3.13 INSPECTION AND TESTING

All equipment and installation shall be fully tested and "meggered" before putting into service and a record shall be provided to the Owner of all circuit and equipment readings.

The inspection and testing shall conform to the guidelines of the Institute of Electrical Engineer recommendations for the Electronic and electrical equipment of mobile and fixed offshore installations.

All fuel oil, lubricant, hydraulic oil, grease, working oil and other consumable liquid for test/trials including of "OFE" to be provided by builder at Builder cost.