



Ministry of Ports,
Shipping and Waterways
Government of India



GREEN TUG TRANSITION PROGRAMME

PHASE 1



GENERAL SPECIFICATION

This specification has been developed for the Indian Ports Association as a part of the Green Tug Transition Programme. The specification does not make any representation or warranties, express or implied as to the completeness, accuracy, suitability of the design and it shall be the responsibility of the respective end-user of the specification to make their own assessment/evaluation of any such completeness, accuracy, suitability of the design before construction and any consequence thereof.

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BACKGROUND

Over the years, the Government of India has announced several initiatives to support the shipping and ports industry, with a strong emphasis on reducing emissions and promoting sustainability. In 2015, the government announced the Sagarmala Program, aimed at holistic port infrastructure development through modernization, mechanization and computerization. Further in 2020, the Hon'ble Prime Minister released the Maritime India Vision - 2030 (**MIV 2030**), which is a 10-year blueprint for India's vision of a sustainable Maritime sector and vibrant blue economy.

MIV 2030 identifies key interventions to bolster India towards leading the world in the Safe, Sustainable and Green Maritime Sector. These include targets for increasing the share of renewable energy to 60% of the total power demand of each of its major ports, through solar and wind-generated power. It also envisages a 30% reduction in Carbon emissions per ton of cargo handled by 2030. Further, the vision also urges all the ports to switch 50% of their vehicles to greener fuels by 2030. "Harith Sagar" -Green Port guidelines also give out targets to make port crafts use cleaner and greener fuels for propulsion.

GTTP TIMELINES

As a first step towards implementation of GTTP, the Ministry of Ports, Shipping & Waterways (MoPSW) has mandated that four Major Ports (Jawaharlal Nehru Port Authority (JNPA), Deendayal Port Authority (DPA), V. O. Chidambaranar Port Authority (VOCPA) and Paradip Port Authority (PPA) shall operationalize a minimum of two Green Tugs each. While the remaining eight major ports shall operationalize at least one Green Tug each during the initial phase. This re-affirms the government's commitment to greener shipping operations and will help encourage the private sector to participate in the green transition programme.

GTTP is envisaged to be implemented in a phased manner to facilitate a smooth transition from existing diesel-driven tugs to fully green tugs.

INTENT

The intent of this specification along with the accompanying documents is to describe the guideline requirements and the standards of workmanship of a Battery electric Tug that is to be implemented in the First phase of GTTP.

TUG CONFIGURATION FOR THE FIRST PHASE OF GTTP

The GTTP program will utilize Battery Electric Tugs in the first phase. These electric tugs will have batteries capable of powering all tug operations, including Full bollard pull. However, a diesel generator will also be on board for Fire Fighting (FiFi) operations, and emergencies, and for extending the operational range of the tug. The propulsion considered for this vessel constitutes two steerable L-drives/Z-drives located in the aft driven by electrical motors.



Vessels shall be classed with any of the classification societies recognised by SSC in line with DGS-recognised organisations and they should have offices in India. A list of recognised classification societies is placed in Annexure 1. Classification societies shall review designs and provide ASTDS-GTTP-compliant certificates.

NEW DESIGNS

In cases where the Buyer requires any of the following

1. New technology other than battery electric tug
2. Any other alternate propulsion

A separate design conforming to the buyer's requirement may be developed by the respective builder/designer. The workmanship and quality of the vessel set out by this specification shall be complied with in such cases also if the vessel is intended to be operated in Indian ports. These new designs must be presented to the SSC committee for evaluation and GTTP compliance before being classified as ASTDS-GTTP Designs.

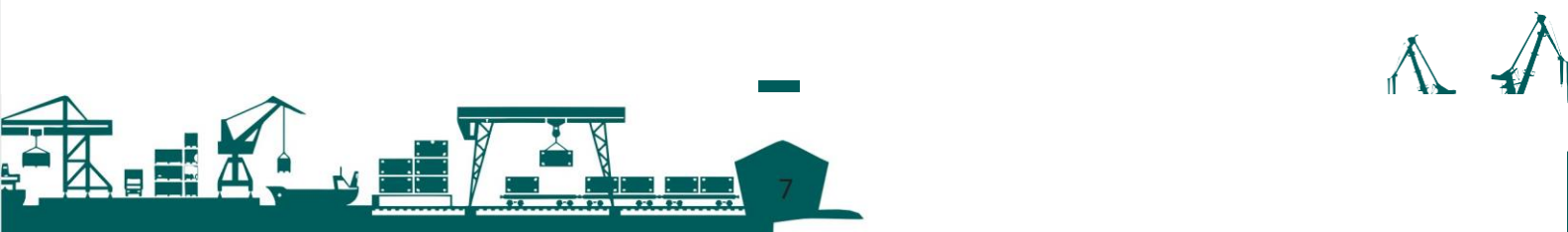
OVERVIEW OF TECHNICAL SPECIFICATION

This technical specification covers

1. Generalised specification for a Battery Electric Tug which can be adopted for any BP and port requirements.
2. Format for GTTP compliance declaration and GTTP compliant certificate. GTTP compliance declaration shall be submitted during the tendering process of the port by the bidder. However, a GTTP compliance certificate from the classification society shall be submitted to the port when the tug is inducted for port operations.

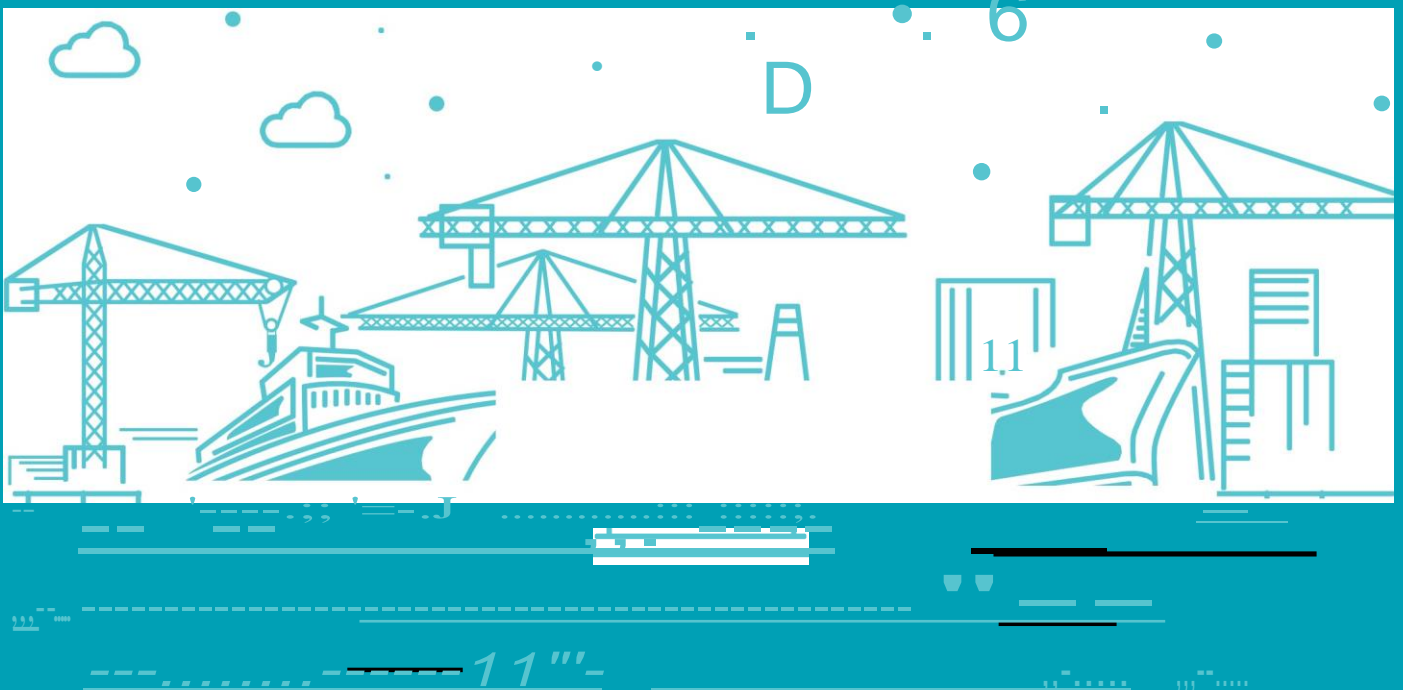
Additional Requirements by Buyer

Any requirements over and above the specifications from the buyer of the vessel can be considered in the design.



SECTION 2

GENERAL SPECIFICATION
FOR GREEN TUGS



MAIN GROUP 0

GENERAL



GENERAL

A DESCRIPTIONS

Interpretation

Buyer: is port or an organisation making a formal proposal against port's Tender, complying with all the requirements of tender; who own and operate vessels in the ports on a charter basis.

Builder: The shipyard who constructs the vessel as per the requirement of the Buyer.

Primary Functions

The vessel shall be primarily tasked with ship handling and towing operations within the harbour.

The tug shall be able to perform the following operations:

Primary Roles:

- Berthing/ Unberthing
- Ship assist operation
- Pushing/Pulling

Secondary Roles:

- Fire-fighting (Optional)
- Oil Spill operation (Optional)
- Personnel/Material Transfer

Operating Profile

The ship shall be designed for the operating profile as provided by the Port as part of the tender document.

Service Life

Generally, the vessel shall have an expected service life of 20-25 years. However, the vessel should comply with statutory & class regulations if any.

B MAIN PARTICULARS

The principal design characteristics of the vessel shall be as follows:

Length overall (excl. fender)	not greater than 36.0 m
Breadth moulded	not greater than 13.0 m
Navigational draught	not greater than 5.4 m
Gross tonnage (GT)	<500GT

The above-stated main particulars are subject to change as per port requirements & operation limitations and the design of the vessel shall meet all regulatory norms for the port-specified requirements.

Note: Hull draft is the distance from the baseline to the waterline of the vessel. However Navigational draft is the summation of the hull draft and distance below the baseline to the



bottom most point of the hull appendages/propeller in the vessel.

C COMPLEMENT

As per statutory rules applicable in clause F.

D CAPACITIES

The capacity of fuel oil, lube oil and fresh water shall be designed commensurate with the endurance requirements of the vessel.

The minimum capacities to be provided are as given below:

Battery capacity	- To be Sized according to the criteria specified in section 869
Fuel Oil	- Approx. 75m ³
Fresh Water	- approx. 25 m ³

E PERFORMANCE

The vessel shall have a static ahead bollard pull as per buyer's requirement at 100 % RPM of thruster during the Bollard pull test.

The vessel shall achieve a speed of approx. 10 knots at design draught with a clean hull at 100% RPM of the thruster in calm water and calm weather.

Environmental Conditions

The ship and its equipment and machinery should be capable of continuously operating under the following environmental conditions mentioned below: -

Ambient air temperature	: 10°C to 45°C.
Machinery room air temperature	: up to 55°C.
Sea water temperature	: 32°C.
Relative humidity	: 90% at 35°C.
Atmospheric pressure	: 750 mm Hg. {1000 m. bar}
The salinity of water	: up to 36000 PPM

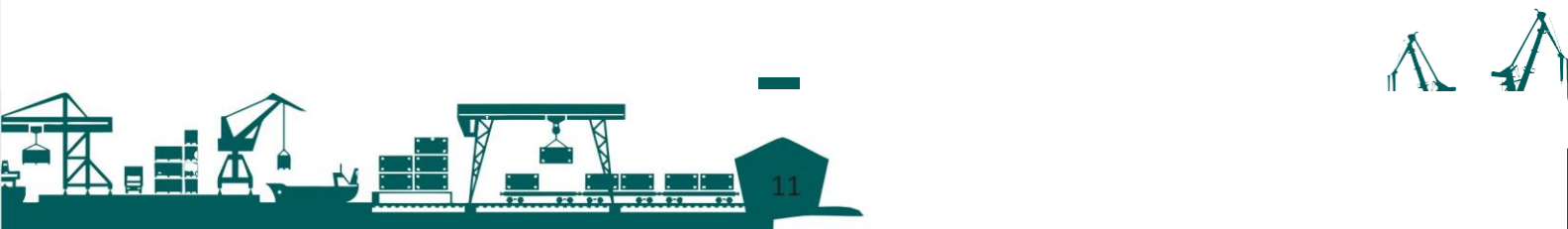
F CLASSIFICATION, REGULATIONS, CERTIFICATES

Classification

The Tug shall be built in accordance with the rules and regulations of the Indian Register of Shipping (IRS) or any other IACS member and according to the following notations:

If, SUL, If, IV, TUG, IN-WATER SURVEY, BATTERY PROP

Or equivalent notations of any other IACS member society. For any optional notations in



addition to the above, including AGNI 1 etc., necessary changes in accordance with the respective class notations shall be made by the builder/designer.

Statutory

The vessel shall sail under the Indian Flag.

The tug shall be designed and built as a river sea vessel or coastal vessel or sea-going vessel as per requirement specified by the Port as part of the tender document.

In case the vessel is to be designed and built as a River Sea Vessel, then DGS Order 18 of 2013 or its latest amendment as applicable at the time of vessel construction shall be considered.

In case the vessel is to be designed and built as a Coastal Vessel, then DGS Order 01 of 2014 or its latest amendment as applicable at the time of vessel construction shall be considered.

In case the Vessel is to be designed as a sea-going vessel, then Indian MS Rules for sea-going ships or its latest amendment as applicable at the time of vessel construction shall be considered.

Rules and Regulations

Tug shall comply with all relevant International Standards as applicable at the time of construction, including (but not limited to) the following:

- COLREGS- International Regulations for Preventing Collisions at Sea
- Load Lines, 1966/1988- International Convention on Load Lines, 1966, as Amended by the Protocol of 1988
- MARPOL- International Convention for the Prevention of Pollution from Ships
- Tonnage- International Convention on Tonnage Measurement of Ships, 1969
- 2008 IS Code-International Code on Intact Stability, 2008
- International Labour Conference-Maritime Labour Convention, 2006
- IMO regulations A 468 (Noise levels) and ILO Recommendation R141 as far as practicable for tugs.
- International Convention on the Control of Harmful Anti-Fouling Systems on Ships, 2001
- IACS Rules & Regulation on Battery powered vessels applicable as per class notation

Certificates

The Builder shall obtain the following certificates/ equivalent and deliver them to the Buyer at the delivery of the vessel.

- a. Certificate of Classification for Hull and Machinery Survey
- b. Bollard Pull Certificate
- c. International Tonnage Certificate



- d. Load Line Certificate
- e. Ship Safety Construction Certificate
- f. Ship Safety Equipment Certificate
- g. Radio Telephone Certificate
- h. Certificate of Anchors, Chains, Life-Saving equipment and Fire Fighting equipment
- i. International Oil Pollution Prevention Certificate
- j. Builder's Certificate
- k. Certificates of anchoring and mooring equipment
- l. Certificates for Compass adjustment
- m. Trim and Stability Booklet
- n. MARPOL Annex IV Sewage Pollution Prevention Certificate
- o. Certificate for towing hook with attachment, towline and towing reel
- p. Letter of Compliance for TBT-free, anti-fouling paint issued by the paint manufacturer
- q. Statement of compliance for EIAPP for generator engines issued by the Classification Society.
- r. Adjustment certificates for magnetic compass issued by the Builder.
- s. Lifting gear certificate
- t. GTTP Compliant Certificate
- u. All other certificates as required by Class.

G BUILD METHOD AND WORKMANSHIP

Generally, all works shall comply with the requirements of the Classification Society and other Authorities governing this specification.

Steelwork is to be carried out in compliance with IACS Rec. 047 Part A "Shipbuilding and Remedial Quality Standard for New Construction".

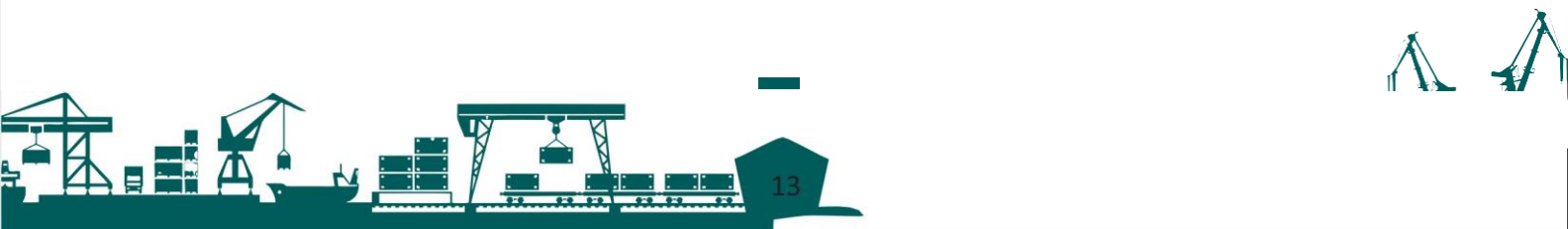
All works shall be carried out by the approved drawings.

The electrical installation is to be according to IEC norms.

All equipment and machinery are to be installed according to the manufacturer's instructions.

Due care and diligence shall be ensured in the protection and cleanliness of all items and equipment being installed in the vessel.

- All materials intended for, or allocated for the construction of the vessel, shall be properly stored or protected from the weather immediately upon arrival at the Builder's yard.
- Electrical, electronic, and interior communication equipment shall be protected against dampness and condensation. Sensitive electronics shall be protected from extreme temperatures as recommended by the OEM.
- Heater elements of electric motors higher than 90 kW should be energized after



installation onboard.

- Battery systems shall be stored as per the manufacturer's recommendation.

All workmanship for the vessel shall comply with global best shipbuilding practices followed for similar vessels, including the following:

Pre-treatment of materials

Flame cutting, bending, welding, welding sequence

Assembling

Use of tools

Alignment, fairness, tolerances

Launching, testing & fitting-out practice

Temporary access openings

Building sequence, application of modules, pre-outfitting, painting etc.

MATERIALS

Materials used for building and construction of the vessel shall be as described below:

- All materials, machinery, equipment, appurtenances, and outfits which are supplied by the Builder shall be new, good commercial quality, and carefully selected for the purpose they are intended to serve.
- Material and equipment shall be procured from recognized manufacturers and shall satisfy the requirements of the Rules and regulations in force.
- Neither asbestos nor asbestos-containing material shall be used in the construction of the vessel.
- Wherever stainless steel is mentioned, seawater-resistant stainless steel such as 316L is to be used.

J NOISE & VIBRATION CONTROL

Special consideration shall be given to limiting the noise levels within the vessel to a level as prescribed in MSC 337(91) (Noise levels) and ILO Recommendation R141 as far as practicable for tugs, by means of suitable sound insulation and isolation. Special attention shall be paid to keeping the noise levels within the prescribed levels for crew cabins adjacent/close to machinery spaces.

Vibration limits in accommodation spaces and other work areas shall conform to ISO 21984:2018 at free running speed, as applicable for this type of vessel. However, the requirements from the Buyer regarding vibration levels shall also be taken into consideration.

Special attention shall be taken to limit the local vibrations from the main machinery and other equipment such that these vibrations do not cause any malfunction or damage to the



equipment when the vessel is in service.

K DRAWINGS

General

Required documentation to Regulatory Authorities, Classification Society and Buyer shall be handled by the Builder.

All documentation shall be in English language. Method of drawing including the scales to suit Builder's standard practice.

Buyer Approval

Builder shall submit, to the Buyer a set of Classification Documents for their approval. The method of submission and schedule for the approval of the drawings shall be decided by the Buyer and Builder separately before commencing the project.

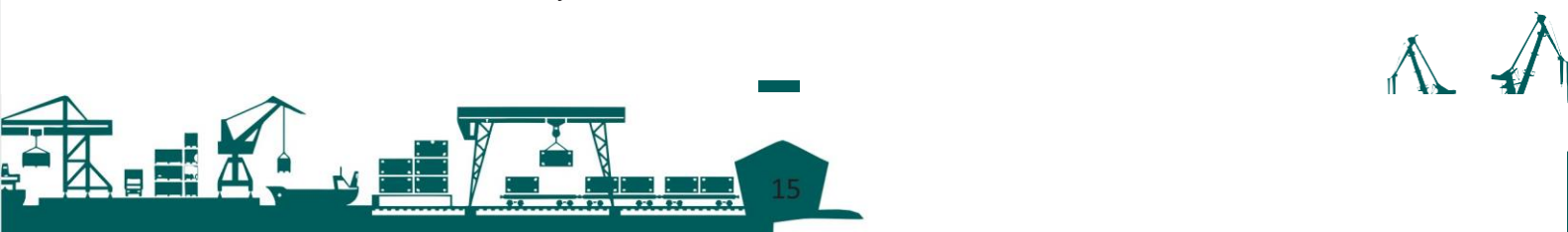
Classification Documents

Builder shall prepare and submit for approval to the Classification Society all documents that mandate Class approvals. Builder is obligated to incorporate all comments and remarks made by Classification Society.

Documents to be provided at delivery of the vessel

The Builder shall hand over at least the following drawings and manuals to the Buyer at the time of delivery of the vessel.

- General Arrangement Plan
- Final Stability Booklet
- Midship Section
- Transverse Sections including bulkheads
- Shell Expansion Plan
- Profiles & Deck Plan
- Superstructures/ Deck Houses
- Skeg Structure
- Docking Plan
- Machinery and Propulsion Arrangement
- Piping diagram schematic
- Navigation Lights and Sound Signals Plan
- Life-Saving Appliances Plan
- Fire Fighting Plan
- Electrical Single Line Diagram
- Electrical Wiring Diagram
- Electrical Equipment Arrangement
- General Service and Radio Service Battery Load Analysis
- Electrical Load Analysis



Wheelhouse Arrangement
Accommodation Plan
Sounding Tables
Towing Arrangement
Aft end structures
HVAC and E/R ventilation
Arrangement of Sea chest
Propeller drawing
Arrangement of Battery room
Battery Management System
Power/Energy Management System
Hazardous Area Plan
Operation & Maintenance Manual for the battery system
Risk Assessment documents as reviewed by Class.
List of Machinery, Equipment and Plants of Third Parties' Supply, with the following details: name of the manufacturer, address, telephone no.

The list, however, is non-exhaustive and at the time of signing the Shipbuilding Contract, any additional documents, if found necessary by the Buyer may be included to firm up the final list of Delivery documentation.

In addition, any drawing that needs to be displayed on the vessel as per Class or Regulatory Authority guidelines shall be properly framed and placed onboard the vessel by the Builder.

Instruction Books

Instruction books of the vessel's major machinery, i.e., Main Battery system, Azimuth Thrusters, Generators and other major equipment and systems shall be furnished to the Buyer. (The number of copies that need to be furnished shall be finalized by the Buyer and the Builder at the time of signing the Ship Building Contract)

The builder shall also prepare data booklets for Hull, Machinery and electric equipment giving the name/address of makers and references to such information as maintenance instruction books and/or spare parts list.

A spare part booklet for the main engine & other equipment shall be submitted at the time of delivery along with the delivery documents.

L EQUIPMENT AND SPARES

Spare parts shall be supplied by the Builder according to the OEM Specifications, which are mandated by the Classification Society and Regulatory Authority for the intended operation.

The list of inventories that need to be supplied along with the ship shall be as finalized between the Buyer and the Builder.



MAIN GROUP 1

SHIP GENERAL



SHIP GENERAL

10 SPECIFICATION, GEN. DESIGN, etc.

Measurements, calculations, etc. shall be by metric or decimal systems.

SI unit system shall be generally used throughout the vessel for drawings, scales etc.

The Builder is entitled to apply the following standards:

Standards issued by the International Organisation for Standardization (ISO)/Norsk Standard(NS), Japanese Standards Association (JIS)/German Institute for Standardization (DIN) /BIS (Bureau of Indian Standards) or other renowned standards.

International Electrotechnical Commission (IEC) Publication No.60092 -" Electrical Installations in Ships"

101 MODEL TESTING & ANALYSIS

The model test may be conducted if deemed necessary by the Buyer.

The model test, if required, shall be performed in a reputed and recognized model testing facility conforming to ITTC standards of tank testing and extrapolation. The test shall be conducted in the presence of Buyer's authorised representative to confirm the propulsive power, speed, bollard pull, etc. The scope of the model test shall be finalized by the Buyer and the Builder. The test shall include the following:

- a. Resistance test at a designed draught
- b. Self-propulsion test at designed draught
- c. Propeller open water test for designed propeller
- d. Bollard pull test at designed draught

15 QUALITY CONTROL, INSPECTION, TESTS & TRIALS

All hull structures, machinery, electrical equipment and outfits shall be inspected and approved by the Buyer or their authorized representative according to normal shipbuilding practice during the construction of the vessel. The completed vessel with all machinery, outfit and equipment shall be tested by the Builder to demonstrate their efficient working and to confirm that all requirements of the specifications and plans are fully complied with.

The Buyer shall be intimated in advance on the dates of all major tests and trials including Sea Trials, FAT of major equipment, Inclining Experiments etc.

151 MACHINERY TESTING

All tests and trials shall be carried out according to OEM recommendations, Class &



authorities' requirements and as per the Builder's standard practices. OEM-recommended test & trial protocols shall be approved by Buyer, and Class wherever applicable.

Dock Trial

Builder shall demonstrate the complete workability and correct functioning of the vessel, Propulsion systems, auxiliaries, generators, systems, equipment, etc. and notify/issue trial schedule to the Buyer. These dock trials shall be conducted in the presence of representatives of Class, Buyer's representative(s) and other Regulatory Authorities wherever applicable.

152 INCLINING EXPERIMENT

The inclining experiment shall be conducted when the vessel is as nearly complete as possible, under the supervision of the Classification Society, Regulatory Authority and the Buyer, to ascertain the lightship weight and vertical centre of gravity as per Classification Society requirements.

The inclining experiment report shall be submitted to the Buyer and Classification Society, showing the calculation of metacentric height and other related characteristics as required.

The final Stability Booklet, incorporating the results of the inclining experiment shall be submitted for approval to the Classification Society and Regulatory Authority.

In the case of series vessels, an inclining experiment shall be conducted on the first vessel of the series only. For other vessels, lightship assessment shall be conducted as per Classification Society guidelines for completing the stability booklet.

154 SEA TRIALS

A sea trial shall be carried out when the vessel is substantially completed. Auxiliary machinery, deck machinery, life-saving equipment, electric system, communication system, piping system, etc. are tested, as to confirm their operation. All trials are to be carried out as per Class Guidelines, OEM recommendations and Builder's standards/practices. The trial protocol shall be approved by the Class and Buyer.

- Speed trials are to be carried out at 50%, 75%, 90% and 100% RPM of the thruster at the design draught of the vessel. The vessel's speed shall be measured using an electronic measurement system (DGPS) for one double run. One double run shall consist of one (1) run in a direction on the course and one (1) run in the opposite direction.
- The following manoeuvring tests shall be performed.
 - i. Turning Circle Test
 - ii. Zig-Zag Tests
 - iii. Crash Stop Test -Ahead
 - iv. Crash Stop Test -Astern



- Endurance trial is to be carried out at 100% **RPM** of the thrusters with both DG and Battery supplying power to the motor. Throughout the period, readings of pressures and temperatures are to be recorded as per the Diesel generator & thruster manufacturers' recommendation. Fuel oil consumption for diesel generators and Soc of batteries to be recorded during endurance trial. Duration of endurance trial shall be determined by the time taken for depletion of battery Soc from maximum Soc to Minimum Soc as suggested by the Battery Manufacturer.
- Steering gear trials are to be carried out, as per Classification Society requirements. The time taken to move the thruster and the thruster angle is to be recorded.
- Anchor trials are to be carried out by Classification Society requirements.
- Bollard Pull test: The Bollard pull of the vessel has to be assessed during performance trials. During the bollard pull trials, adequate propeller immersion is to be ensured. The depth of water below the keel is not to be less than 2 times the maximum draught of the vessel. The length of the tow ropes, measured between the stern of the vessel and the test bollard, shall be at least two times the length of the vessel. Bollard pull shall be measured by a calibrated Load cell. The test shall be carried out for 15 minutes with the vessel in a stable position, heading & line fluctuations are constant. During this time towline force, power and thruster speed shall be recorded. The highest consecutive 5-minute period shall be considered for determining the bollard pull using the arithmetic average during the period. The vessel is required to demonstrate bollard pull for the below operational configuration in the ahead condition with the vessel loaded to design draught.
 - i. Battery Only - Should meet bollard pull requirements as per the port tender requirements.
 - ii. Diesel Generator Only-Achieved bollard pull shall be noted and included in the bollard pull certificate

16 GUARANTEE

The vessel shall be guaranteed for a minimum period of twelve (12) months after the official delivery date. This guarantee shall include all workmanship, material, machinery, equipment, outfitting, painting and other items.

However, damages resulting from mishandling of equipment installation, or operation contrary to the instruction of the maker are excluded from the scope of this guarantee.



MAIN GROUP 2

HULL



HULL

20 HULL MATERIALS, GENERAL HULL WORK etc.

201 HULL MATERIALS

Structural Steel

The main hull shall be all welded steel construction conforming to classification society rules. The steel for hull construction shall be in general of Grade A. High tensile steel may be used as appropriate, as per the design & class approved drawings.

The materials used shall be of good international shipbuilding standards. Steel plates, forgings and castings shall be delivered with a certificate according to the Classification Societies and Regulatory Authorities' requirements. Test marks and the maker's name shall be clearly stamped thereon.

204 TESTING OF TANKS, BULKHEADS

Air pressure tests shall be done for all tanks as required by Classification rules.

Hose testing of doors, hatches and other shell side and deck openings shall be done according to Classification Society requirements. Hose testing shall be carried out on all watertight structures, which are not tested by water or air pressure.

Structural Testing

Structural testing (hydro-test) for tanks (except voids) shall be done as per class requirements.

The tests shall be performed in the presence of the Class Surveyor and Buyer's Representative. Also, the Buyer shall be intimated about the test schedule in advance.

Test reports shall be submitted to the Buyer.

205 NON-DESTRUCTIVE TESTING (NDT)

NDT shall be carried out as per Class requirements.

X-ray testing shall be carried out as per Classification Society requirements and class approved NDT Plan.

Ultrasonic or dye-penetration test of the weld shall be carried out to the satisfaction of the Classification Society where it is not possible to undertake X-ray testing.



207 WELDING

Welding shall be carried out in accordance with the classification society.

Welding of the hull and all main structural elements shall be carried out only by welders qualified through standard welding procedures approved by the Class.

21 AFTBODY

The thickness of the shell plating shall be by class requirements. Increased thickness may be considered if required i.e. Thruster units, based on structural analysis and recommendations from suppliers, if any.

A double plate skeg of adequate size shall be fitted on the centre line. Skeg depth shall be finalized based on the navigational draught restrictions and dimensions of the selected thruster.

22 MIDSHIP AREA

226 BULKHEADS AND TANKS BELOW MAIN DECK

Bulkheads

Bulkheads shall be suitably stiffened in accordance with Class requirements.

Hull Tanks

Hull integrated tanks shall be arranged according to the general arrangement drawing.

Separate Service/Day tanks shall be provided for DG. The capacity of the day tanks shall be decided as per class/statutory requirements.

23 CARGO AREA

Deck loading in the aft working deck shall be as per class rules or as agreed between the builder and the buyer.

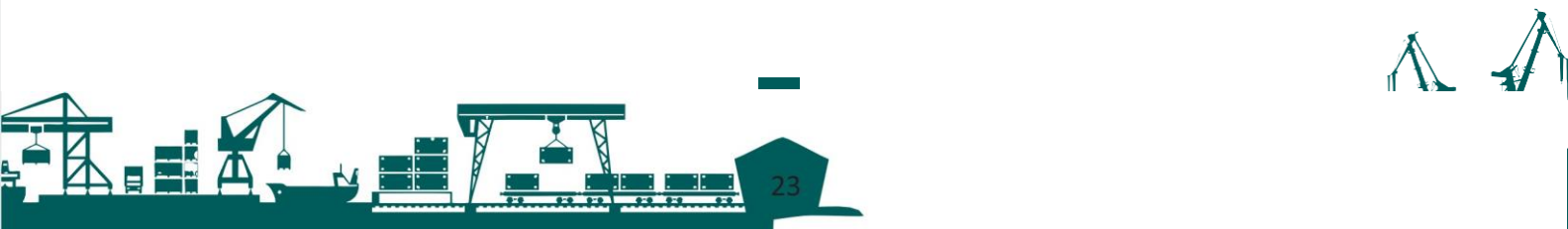
The vessel shall have a working deck area of at least 65 m².

24 FOREBODY

General

plating thickness to be as per class rule requirements.

Collision bulkhead shall be provided in accordance with class rules.



247 CHAIN LOCKERS

A chain locker for anchor chain cable shall be provided. The size of the chain lockers shall be sufficient to accommodate the full length of the chain.

25 DECKHOUSEANDSUPERSTRUCTURE

251 SUPERSTRUCTURE

The structural scantling shall be in accordance with class requirements.

253 MAST

A steel mast for navigation lights and antennae shall be fitted at the suitable location on the wheelhouse top deck at the centreline.

Mast height and mast fittings including Navigation lights, signal flag yard, radar, antennae etc. shall be determined by relevant Class/Statutory Rules.

Adequate stays shall be fitted, if necessary, to reduce vibration.

The hull structure under the mast shall be stiffened suitably.

Masts shall have rungs carried on top, arranged for access to light trays and necessary fittings. Safety cage shall be fitted if necessary.

254 BRIDGE

The wheelhouse shall be designed and built with as near as possible 360° unobstructed visibility.

The bridge shall be provided with clear, wide and large size windows wherein each bridge window shall be fitted with a pull-down/roll-up sunscreen shade and wipers. A suitable arrangement shall be provided for washing the wheelhouse front windows.

Tinted sky windows shall be installed slantwise in the wheelhouse top deck, fitted in metal frames.

26 HULLOUTFITTING

261 HULL MARKINGS

All markings shall be as per best global standards.



The ship's name shall be marked with suitable materials and mounted on the superstructure port and starboard (P&S).

Other hull markings like Port of Registry, IMO number, Owner's logo etc. shall be provided at appropriate locations, as agreed between the Builder and the Buyer, as per global best shipbuilding practice.

Draught marks shall be marked using weld beads/steel plates and shall be painted in white on bow and stern on P&S sides. Horizontal marks at every 100mm distance, metrical scale shall be followed.

The vertical extent of the draught marks shall be adequate to cover the draught of the vessel under all probable conditions of loading and corresponding trims with the vessel undamaged.

All machinery equipment, valves, hand wheels, levers, doors, ventilation etc. shall be indicated by nameplates of plastic/suitable non-corrosive metal with black letters in English. Bottom plugs and manhole covers shall be marked with tank number and content using weld beads.

Water-tight bulkheads, tank boundaries, numbers and contents shall be marked on the hull and deck.

Loaded waterline shall be marked using appropriate paint as per global best shipbuilding practice.

262 BOTTOM PLUGS, BILGE WELLS ETC.

One (1) bottom plug each shall be supplied and fitted in the hull tank, cofferdam, etc. where considered necessary.

The size and design shall be as per global best shipbuilding practices.

Water tanks shall have square and oil tanks shall have hexagonal sockets respectively.

Special attention shall be given to locating the bottom plugs as close as possible to the lowest point of each tank. The bottom plugs shall be kept clear of points designated for keel blocks as per the docking plan.

Bilge wells and sea tubes shall be arranged as necessary at suitable places in the double bottom.

263 FOUNDATIONS

All auxiliary, deck machinery, electrical equipment etc. shall be erected on foundations.



As far as practicable, all deck machinery foundations shall be open-type with accessibility for cleaning and painting works. Suitable reinforcements and insert plating shall be provided under the machinery, wherever necessary. Proper draining arrangements shall be provided to avoid accumulation of water.

264 FENDER, BILGE KEEL

Fender

Bow	-Cylindrical Fender& W Fender
Stern	-Cylindrical Fender
All around the vessel	-Dfender

Tyre fenders are to be fitted around the vessel

The final arrangement including the selection of fender types and size shall be decided based on Buyer's preference and design requirement on fender type and fender pressure.

Bilge Keel

Bilge keels shall be provided on the vessel.

Welding of the bilge keel shall be performed as per class-approved design drawings. Preferably, notch welding shall be applied to bilge keels and the bilge keel has to be welded on a doubler plate against shell plating.

266 HAWSE PIPES

The hawse pipe with anchor pocket shall be fitted in such a way that free anchor fall is obtained. The anchor pocket shall be designed for accommodating stockless anchors

The hawse pipe shall have adequate diameter and length to easily house the anchor shank and shackle.

The chafing ring of the steel bar shall be fitted at the lower edge of the chain pipe for protection and smooth running of chains.

267 BULWARKS

Strong bulwarks of steel plate, suitably stiffened shall be fitted all around the vessel at the main deck and forecastle deck.

The bulwark shall have a tumblehome and access doors shall be provided on both the port and starboard sides at the main deck level. Additionally, access may be provided on the forecastle level for pilot boarding.



The top of the bulwark shall be reinforced with a flat bar/steel pipe of suitable dimension/ thickness.

27 MATERIAL PROTECTION

271 PAINT SPECIFICATION

The paint system shall be of good quality marine grade. The final paint specification shall be mutually agreed between the Builder and the Buyer, as per the recommendations from the paint maker.

The final colour and decals are to be confirmed by the Buyer.

Paint in underwater hulls, water ballast tanks, and freshwater tanks, is to be guaranteed for five (5) years. All dry film thicknesses shall be as recommended by the supplier for a five (5) year system.

Paint specification and surface preparation shall be of high standard, wherein before fabrication, all steelwork shall be shot-blasted to SA 2.5 and shop-primed. The surface preparation and paint specification shall be in compliance with SOLAS concerning toxic and environmental requirements. Surface treatment shall be given to all welds, sharp edges, undercuts, slag, etc.

Decks are to be coated with high-friction anti-skid paints, in alignment with the paint scheme.

All edges, corners, logs, weld seams etc. to be stripe-coated with a brush or roller, between each layer according to the paint maker's instructions.

Descaling, shop priming, de-rusting and painting works shall be carried out by the paint maker's recommendation and yard practice.

In general, if in-water time before delivery exceeds 180 days (number of days shall be mutually decided between the Buyer and the Builder), a diver inspection shall be carried out and attended by a qualified paint maker.

All necessary remedial works as per the recommendations of the paint maker shall be carried out based on the observations during such inspections, including re-docking if necessary.

Paint Scheme

The painting scheme in general shall be as given below A detailed paint scheme covering all areas of the vessel shall be prepared in consultation with the the paint manufacturer for a 5-year system.



Underwater Hull	2 epoxy 1 coat of sealer 2 coats of tin free anti-fouling	DFT as per paint maker's recommendation for a 5-year life
Topsides	3 coats of Re-coatable epoxy	DFT as per paint maker's recommendation for a 5-year life
Inside machinery spaces/ Accommodation/ Thruster Room/stores etc.	2 coats of alkyd paints/as agreed between builder and buyer	DFT as per paint maker recommendation
Ballast Water& FWTanks	As per paint maker recommendation for 5-year life	As per paint maker's recommendation for a 5-year life
Main deck/Raised Main Deck	As agreed between builder and buyer	As per paint maker's recommendation
Superstructure	As agreed between builder and buyer	As per paint maker's recommendation
Funnel	As agreed between builder and buyer	As per paint maker's recommendation
Void spaces	As agreed between builder and buyer	As per paint maker's recommendation

278 EXTERNAL CATHODIC PROTECTION

Sacrificial Anodes

The ship's external hull shall have cathodic protection against corrosion for 5 years.

MGPS/ICAF System for Sea Chests/Box Coolers

Marine Growth Prevention System (MGPS)/Impressed Current Anti-Fouling System (ICAF) may be installed for sea chests (designed for a 5-year life), based on the Buyer's requirement.



MAIN GROUP 3

MISCELLANEOUS EQUIPMENT



MISCELLANEOUS EQUIPMENT

30 SMALL HATCHES & MANHOLES

Manholes

Bolted manholes shall be provided, in number and location as necessary, as per class requirement for access to all compartments, tanks, cofferdams, voids and pockets not provided with other means of access.

Hatches

Hatches shall have steel covers.

Single wheel/lever and multiple clip action type weather-tight access hatches shall be provided on the weather deck.

For the removal of the main machinery during overhaul/ maintenance, flush-type bolted hatches are to be installed on the main deck atop the Machinery room.

33 DECK CRANES FOR CARGO (Optional)

Type	- Knuckle boom
Safe working load	- min I.ST at 8m working radius (or as per the requirement of the Buyer)
Power	- Dedicated electro-hydraulic power pack as per makers' standard

Requisite calculations, as mandated by the class for ensuring the stability of the vessels shall be performed and demonstrated by the Builder to the Class.

Note: The rescue boat launching crane if provided can be utilized as a deck cargo crane provided both the specifications stipulated in this specification are met and acceptable to statutory body(ies) & class.



MAIN GROUP 4

SHIP EQUIPMENT



SHIP EQUIPMENT

41 NAVIGATION EQUIPMENT

Navigation equipment is to comply with the requirements specified in the rules & regulations in para 0. F as applicable at the time of vessel construction. Any additional equipment as required by the buyer shall also be considered if any.

42 COMMUNICATION EQUIPMENT

External communication equipment to comply with the requirements specified in the rules & regulations in para 0. F as applicable at the time of vessel construction. Any additional equipment as required by the buyer shall also be considered if any.

425 CALLING, COMMAND AND TELEPHONE SYSTEM

Separate systems shall be provided for talk-back and loudhailer systems

Telephone System/PA System

Telephones are to be provided in the wheelhouse, MSB rooms, and Cabins several telephones and their locations are to be finalized during the contract stage.

Loudspeakers for PA function to be mounted in areas such as corridors, mess/cabins, etc

Public Address & General Alarm System can be integrated system.

427 LIGHT AND SIGNAL EQUIPMENT

Light & Signal equipment is to comply with the requirements specified in the rules & regulations in Para 0. F.

43 ANCHORING, MOORING & TOWING EQUIPMENT

General

Anchoring, mooring equipment and towing arrangement shall be provided as per Classification Society requirements.

431 ANCHORS WITH CHAIN & EQUIPMENT

Anchor and Chain Cable

Anchors and chains

- Two HHP stockless type anchors in pockets
- Grade 2, stud link

Windlass

- Arranged in the forecastle
- Anchor windlass shall be combined with forward towing winch
- For details, ref. SFI No. 435.



434 MOORING EQUIPMENT

Mooring Capstan

Mooring equipment shall be provided as per class requirements

Mooring rope, towing rope, heaving lines, and hawser lines as per applicable class rules shall be provided.

One (1) off Electric/hydraulic Mooring capstan shall be provided with 5 tonne line pull & controls near the capstan.

Bollards & bitts shall be as shown in the General Arrangement. Arrangement of mooring equipment to be finalized during the ing contract stage.

435 TOWING EQUIPMENT

Forward Towing System

The towing system shall be equipped for ship assist operation with winch and staple. In general towing system shall have a load rating as per buyer's requirement.

Winch Type	-Anchor Towing Winch
Drive Type	- Electro-hydraulic/ Electric
Drum configuration	-Single drum
Towline force (first layer)	-As per OEM Recommendation
Brake holding load	-As per class requirement
Safety features	- emergency quick release and other safety features by Class requirements
Hauling speed of anchor	-As per class requirement

Forward Staple shall be provided and rated for the bollard pull of the vessel.

Controls shall be provided both locally and from wheelhouse.

Winch shall be capable of using synthetic rope if required as the per buyer's requirement.

Aft Towing Hook (OPTIONAL)

A Towing Hook with a quick-release system, which can be operated from the wheelhouse and from the main deck near the hook, may be provided for aft towing based on the Buyers' requirements.

Safe working load Minimum capacity shall be equal to the bollard pull

Sufficient rope guiding arrangements such as tow pin/gob eye may be provided on the aft deck, based on the Buyer's requirements.



Aft Towing Winch (OPTIONAL)

A towing winch shall be installed at the aft complete with drum, brakes, clutch etc. In general, towing systems have a load rating per buyer's requirement.

Winch Type	- Towing Winch
Drive Type	- Electro-hydraulic/ Electric
Drum configuration	-Single drum
Towline force (first layer)	-As per OEM recommendation
Brake holding load	-As per class requirement
Safety features	- emergency quick release and other safety features by Class requirements
Hauling speed of anchor	-As per class requirement

Aft staple shall be provided and rated the for bollard pull of the vessel.

Controls shall be provided both locally and from the wheelhouse.

Winch shall be capable of using synthetic rope if required as the per buyer's requirement.

438 HYDRAULIC SYSTEM FOR ANCHORING/MOORING/TOWING EQUIPMENT

If Hydraulic winches are fitted, one set of electro-hydraulic power units consisting of hydraulic oil pumps and other necessary accessories shall be provided. This hydraulic power unit drives the towing and mooring equipment shall be provided as applicable. Hydraulic oil tanks of sufficient capacity shall be provided.

44 REPAIR/MAINTENANCE EQUIPMENT

Suitable lifting arrangements including lifting eyes shall be provided inside machinery spaces to enable removal of engine/DG Set parts and other auxiliaries.

48 OIL SPILL RESPONSE EQUIPMENT (OPTIONAL)

Oil Spill Dispersant Arm (OPTIONAL)

Oil Spill dispersant spraying arms were installed on the main deck on the sides.

Oil Spill Dispersant storage tank(s) with a total capacity of at least 5 m³ shall be provided.

Oil Spill Containment Boom (OPTIONAL)

The vessel shall be capable of handling near-shore booms of a total length of 1000m, stowed on an adequate number of boom reels as per the OEM standards.

Out of this, one boom reel shall be carried on the aft deck of the vessel. Additional reels may be carried on the aft main deck based on operational demands.



MAIN GROUP 5

SHIP EQUIPMENT FOR CREW



SHIP EQUIPMENT FOR CREW

50 LIFESAVING EQUIPMENT

Lifesaving equipment like Rescue Boat, Life Rafts etc. shall be provided in compliance with the requirements specified in the rules & regulations in para 0. F.

505 FIREFIGHTING EQUIPMENT

Firefighting equipment shall be provided on the vessel in compliance with the requirements specified in the rules & regulations in para 0. F.

FRP cabinet shall be provided for securing fire hoses and nozzles.

FIFI 1 requirements of the selected class (Optional)

A sufficient number of firemen's outfits, breathing air compressors, etc. in compliance with FIFI 1 requirements of the selected class shall be provided on the vessel.

51 ACCOMMODATION-INSULATION, PANELS, DOORS, WINDOWS, LOCKERS

General

Class-approved materials shall be used for the vessel as applicable, including fire retardant paints, curtains, linings, etc.

510 ACCOMMODATION

In general accommodation arrangements shall be provided as per the General Arrangement Plan. However, alternate arrangements may be adopted as agreed between the Buyer and the Builder.

The vessel shall be arranged with the following facilities in cabins:

Master/Chief Engineer Cabin

- Wooden berth with drawers
- Wooden Wardrobe with mirror
- Writing table with locker
- Upholstered armchair
- One settee
- Document Locker/Shelf
- Coat hooks
- Flask & glass holder
- Book rack
- Wall mounted fans
- Attached Toilet



Other Cabins

- Wooden berth with drawers
- Wooden Wardrobe with mirror
- Writing table with locker
- Armchair
- Coat hooks
- Flask & glass holder
- Book rack
- Wall mounted fans
- Attached Toilet (optional)

511 PARTITION BULKHEADS, PANELLING

In general, the thickness of linings shall be 25 mm and that of partitions shall be 50 mm. The partitions shall be of non-combustible panels having good quality surface finish.

Low flame spread sandwich panels shall be provided for ceilings.

Ceiling and partition panels in galleys shall be provided with stainless steel cladding sheets.

512 DOORS

In general, accommodation spaces shall be fitted with joiner doors and fire-rated doors as applicable.

Weather-tight doors are to be provided for exterior access to the wheelhouse and lower deckhouse.

Watertight doors shall be provided on the main watertight bulkheads. All watertight doors are to be fitted with hinges and toggles in compliance with class requirements.

The wheelhouse doors shall be hinged and provided with glasses for good visibility.

Sill height to be in accordance with the relevant Rules and Regulations.

515 WINDOWS

All accommodation areas shall be provided with windows/scuttles/skylights as per the requirements of Regulatory Authorities and Classification Societies.

All windows shall be made of toughened glass and fitted in metal frames.

518 INSULATION

Insulation for fire, heat & sound shall be provided in accordance with class/statutory requirements, conforming to global best practices in tug construction.



52 DECK COVERING, LADDERS, STEPS, RAILINGS GANGWAYETC.

In general, floorings, ladders and other fittings shall be provided as described below:

- a. Flooring in cabins, public spaces, corridors, stairways etc. shall be provided with a suitable deck composition and laid with vinyl covering.
- b. Flooring in the engine control room, alleyways, mess room and wheelhouse shall be preferably of composite synthetic type.
- c. Sanitary spaces and galley shall be laid with non-slip type tiles over cement.
- d. Suitable flooring arrangement (Aluminium or Steel chequered floors) shall be provided in machinery spaces as agreed between the Builder and the Buyer.
- e. Ladders, stairs and handrails shall be provided as required.
- f. Steel handrails of suitable diameter shall be welded along the sides and front of the deckhouse.
- g. One (1) set of aluminium alloy gangway (optional) of 4m length, and 600mm clear breadth may be provided. Dimensions of the gangway to be as agreed between the Buyer and the Builder.

54 WHEELHOUSE

The wheelhouse shall be arranged with all necessary equipment as per the requirements specified in the rules & regulations in para 0.F. which includes but is not limited to the below.

Consoles
Chart table
Flag locker
Binocular holder
Revolving Arm Chair
GMDSS Table

Special attention shall be given to the overall ergonomics while arranging wheelhouse items.

55 GALLEY/PANTRY EQUIPMENT, PROVISION PLANTS, LAUNDRY/IRONING EQUIPMENT

551 GALLEY

Galley shall be provided with the following equipment:

Electric marine range with oven	- Full-size refrigerator with freezer
Stainless steel sideboard	- Stainless Steel Sink
Stainless steel worktable	- Canopy with electrically-driven exhaust fans

554 PROVISION STORE AND REFRIGERATION SYSTEMS

A provision store shall be provided in the main deck.



Deep freezers of adequate capacity shall be installed in the provision store for carriage of meat, fish, vegetables, dairy products, etc.

558 LAUNDRY

One marine heavy-duty washing machine cum dryer shall be provided on the lower accommodation deck.

Separate washing machine and drier units may also be considered based on Buyers' preference.

57 VENTILATION, AIR CONDITIONING & HEATING SYSTEMS

General

The AC plant and system should be designed for the following parameters: -

External Temperature: Maximum 41° C Dry Bulb (DB) and), Minimum 10° C Dry Bulb (DB).

Internal Temperature: All air-conditioned compartments (except the Galley) are to be 24°C Effective (27 °C DB/20 °C WB, Relative humidity 40 to 60%) Galley is to be 29 °C Effective (35°C DB/26°CWB).

Design temperatures may be modified suitably based on the area of operation & buyers' requirements.

571 VENTILATION/AIR-CONDITIONING SYSTEMS FOR ACCOMMODATION, CONTROL SPACES ETC.

The entire accommodation area, wheelhouse and switchboard room shall be air-conditioned.

Standalone centralized unit (direct expansion) shall be considered for accommodation. Water-cooled independent A/C shall be provided in the MSB room and air-cooled split A/C to be provided in Wheel House.

Other options such as a chilled water system with fan-coil and fresh air handlers etc. may be considered as agreed between the Builder and the Buyer.

574 VENTILATION/AIR-CONDITIONING SYSTEM FOR MACHINERY SPACE

The machinery space shall be ventilated by a mechanical ventilating system.

The ventilating fans shall supply fresh air to the operating station and other necessary places in the engine room through air ducts. One off-supply fan in the engine room shall be of reversible type.



The exhaust air from the engine room shall be led to the atmosphere through openings provided on the funnel.

The exhaust air opening and fresh air intakes for the engine room shall be provided with emergency shut-off fire dampers operated from the outside of the engine room.

Mechanical ventilation shall be provided for service/machinery spaces including the thruster room, CO2 room, workshop etc.

Battery room ventilation arrangement shall be independent of other ventilation systems or as applicable by the class rules.

In addition, galleys and toilets shall also be provided with suitable arrangements for forced ventilation.

Battery room shall be Air conditioned to maintain temperature as per manufacturer recommendation.

58 DRINKING AND SANITARY SERVICE SYSTEM FOR ACCOMMODATION

581 SANITARY SUPPLY SYSTEM

Fresh Water Service System

The system shall supply fresh water for sanitary services in accommodation, equipment in machinery spaces, galley and laundry.

FW Pressure set

- Primary and standby electrically driven pumps
- Diaphragm type hydrophore

Fresh Water Calorifier

Hot water requirements for accommodation and other consumers, if required, shall be supplied from one (1) electrical hot water calorifier. One (1) electric circulating pump shall be fitted at the return line of the calorifier, capable of circulating hot water at 65 degrees C.

Sea Water Service System

A separate seawater system shall be provided for toilet flushing.

SW Pressure set

- Primary and standby electrically driven pumps
- Diaphragm type hydrophore

An alternate system for sanitary supply may be considered based on the Buyer's preference.



582 SANITARY DISCHARGE SYSTEM

In general, the sanitary discharge system shall consist of the sewage treatment plant, sewage holding tank and shore discharge pump.

Sewage treatment plant shall be considered as mentioned in Para. 585.

Shore Discharge flange to conform to MARPOL 73/78, Annexure 4, Regulation 10.

583 SHOWERSANDTOILETS

Toilets shall have gravity-type discharge.

Alternate arrangements for toilets shall be considered based on the Buyer's preference.

584 DRINKINGWATERSYSTEM

Fresh water system for drinking shall be provided as per Para 581, Fresh Water Service System.

The drinking water system shall consist of a filter, UV Sterilizer and Coolers.

585 SEWAGE TREATMENT PLANT (STP)

One (01) off-sewage treatment plant meeting the statutory regulations with adequate capacity shall be provided.

In general, STP shall be of electrolytic type. Other types may also be considered based on Buyer's preference.



MAIN GROUP 6

MACHINERY MAIN COMPONENTS



MACHINE RY MAIN COMPONENTS

General

The propulsion system shall consist of 2 Nos of azimuth stern thrusters each driven by independent electric motors.

Equipment

2 x electric Motors, as per section 625

2 x azimuth stern thruster units, as per section 634

62 OTHER TYPES OF PROPULSION MACHINERY

625 PERMANENT MAGNET/SYNCHRONOUS/INDUCTION PROPULSION MOTORS

Two numbers of permanent magnet/Synchronous/Induction propulsion motors shall be provided.

The operating voltage shall be suitably selected based on the system voltage. The system shall be water-cooled. All motor data is subject to tolerance by the IEC. The motor RPM is to be selected to suit the L-Drive/Z-Drive requirement.

The Standards to be followed are as below:

Standard : IEC core equivalent

Insulation Class : min Class H

Temp rise : min Class F

IP Rating : min IP44

Duty cycle : Continuous Duty

The safety parameters of propulsion motors shall be provided as recommended by OEM and rules.

63 THRUSTERS AND TRANSMISSIONS

634 FIXED PITCH Z/L-DRIVE PROPULSION UNIT

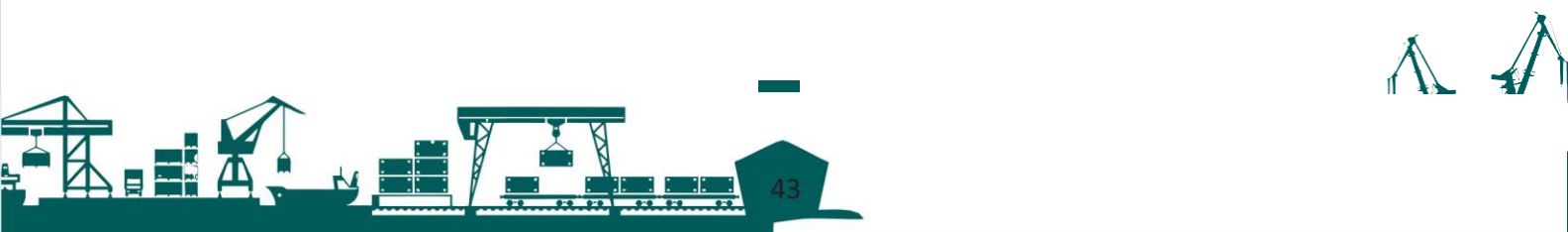
Two numbers of fixed pitch steerable rudder propeller units shall be provided:

Rated input power : Shall be capable of meeting the bollard pull requirements

Rated RPM : To suite Z/L-Drive.

Propeller Diameter - : to meet minimum Bollard Pull requirement

Thrusters shall be designed to deliver adequate power to meet the intended operations as per Ch. 0, para-E.



Emergency steering of the vessel shall be as per statutory/class rules. The steering system shall comply with the class requirements.

The steering system can be a hydraulic/electric system.

If the steering system is hydraulic, then the hydraulic unit for thruster units shall be as per the maker's standard. The units along with hydraulic oil tanks of sufficient capacity shall be provided in the thruster room.

637 MAIN REDUCTION GEAR

Gearbox having an appropriate gear ratio shall be integrated with the thruster unit, as per thruster OEM design.

65 GENERATOR SET FOR MAIN ELECTRIC POWER

At least 2 Nos. Diesel generators as per section 861 shall be provided. The final rating shall be as per the electrical load calculation carried out during the contract stage. DGs shall be resiliently mounted if required, to reduce vibration.

66 OTHER AGGREGATES FOR MAIN AND EMERGENCY ELECTRIC POWER

664 RECTIFIER CUM BATTERY CHARGER

The emergency source of electrical power is an accumulator 24V battery.

One (1) off rectifier cum battery charger of appropriate rating shall be installed. During normal conditions, it will be used for both charging batteries and feeding power supply to emergency consumers. Upon failure of the main source of electric power, the accumulator battery shall feed the power supply to emergency consumers through the emergency switchboard.



GROUP 7

SYSTEMS FOR MACHINERY MAIN COMPONENTS



SYSTEMS FOR MACHINERY MAIN COMPONENTS

General

All machinery systems and components shall be of good marine quality as per international standards and arranged according to class requirements and/or OEM recommendations.

Piping- General

Piping shall be designed as per best global standards and classification guidelines.

Piping shall be adequately supported.

Routing of pipes shall be done in such a way that it permits free passage in walking areas, and does not affect the performance of the crew. Special attention shall be taken to provide space for maintenance of the ship's structure as far as practicable.

Piping Material Specification

Material for the piping, valves, flanges and fasteners for piping and other system-related materials shall be selected as per relevant class requirements.

Treatment of these pipes shall be done according to the relevant class requirements.

In general, the materials for various systems shall be as follows:

- Bilge & Ballast - Galvanized Steel
- Sea Water - Galvanized Steel
- Fresh Water System - Copper or class-approved plastic
- Exhaust - Tailpipes above the funnel shall be of polished stainless steel material. Mild steel is to be used elsewhere.
- Fuel Oil System - MS Black Steel
- Lube oil system - MS Black Steel

70 FUEL SYSTEM

The fuel oil system shall consist of a Fuel Oil Service System and a Fuel Oil Transfer System.

Suitable bunkering arrangements as agreed between the Buyer and the Builder shall be provided on the main deck, with suitable connections for filling the bunker tanks. Class approved sampling system shall be provided at the bunkering station.

A flow monitoring system shall be provided for the Diesel Generators.

701 FUEL OIL TRANSFER AND DRAIN SYSTEM

Storage tanks, service tanks, overflow tanks and sludge tanks shall be provided.



FO Transfer Pump

Fuel oil shall be transferred from the fuel oil storage tank to each fuel oil service tank using two (one working and one standby) electrically driven transfer pumps, installed in the DG room.

702 FUELOILPURIFIERS/FILTERS

One no. fuel oil purifier/Filter rated at full power DG fuel consumption shall be provided by the OEM recommendation.

703 FUEL OIL SERVICE SYSTEM

Fuel Oil Service System

Fuel oil shall be transferred from the fuel oil storage tank through the F.O. purifier/Filter (as applicable) to each fuel service tank. From the service tanks, overflow lines shall be led to FO Overflow tanks.

Fuel oil shall be transferred from service tanks to diesel generators with the help of integrated fuel oil service pumps.

71 LUBE OIL SYSTEM

Self-contained lubricating oil systems shall be installed for the DG's, gears and drives. The lube oil system shall be as per OEM recommendations of main and auxiliary machinery.

Closed circuit lubricating oil system engine driven pump shall be provided with standby electric motor driven pump. Automatic changeover to be provided for Lube oil standby Engine-driven pumps with suitable alarms.

Dirty oil in the sludge tank shall be discharged using the dirty oil/sludge pump or via direct suction from the shore. The tank shall be provided with a high-level alarm.

A suitable number of lube oil tanks shall be provided by the Builder as hull tanks/loose tanks at appropriate locations based on the recommendations of OEMs of major machinery.

711 LUBE OIL TRANSFER & DRAIN SYSTEMS

LO Transfer pump

One-off Lube oil transfer pumps conforming to class and OEM requirements shall be provided for DGs.

A separate rotary hand-driven LO transfer pump shall be provided for DGs.



713 LUBE OIL SYSTEMS FOR TRANSMISSIONS

The gearbox lube oil system, if required, shall be as per OEM recommendations and comply with class requirements.

72 COOLING SYSTEM

Cooling system shall be provided for each propulsion machinery, D.G. sets, auxiliary machinery, HVAC and hydraulics. In general, the propulsion and auxiliary equipment cooling system are to be based on shell and tube/plate heat exchangers. Any other type of cooling system including box coolers shall be specially considered based on Buyer's requirement.

In case box coolers are fitted, the sizing of Box coolers shall be finalized by the builder based on the requirements of the engine and other machinery.

A fouling factor of 15% is to be considered for plate/tube-type heat exchangers and in the case of box coolers fouling factor shall be 30%.

73 COMPRESSED AIR SYSTEM

A compressed air system of 8 bar pressure and having sufficient capacity shall be provided for ship service air requirements. Air receivers of sufficient capacity shall be provided.

Service lines shall be provided for sea chest blow-downs, controls, and various equipment. A main deck service line shall also be provided.

74 EXHAUST SYSTEMS

The exhaust gas system for each generator shall contain the following equipment:

- Exhaust silencer (approx. 35 dBA and 125 Hz-for Diesel Generators)
- Integral exhaust gas spark arrestor

The exhaust system shall be designed such that it provides maximum isolation of machinery vibration and exhaust noise. Removable blanket-type insulations are provided for the exhaust gas lines. The entire system shall be resiliently mounted if required.

79 AUTOMATION SYSTEMS FOR MACHINERY

Vessel's central control station shall be located in the wheelhouse. Monitoring screens shall be provided in the switchboard room and wheelhouse to select the functionalities or requirements to be monitored.

The PMS/EMS system along with BMS should be able to keep the battery operation smoother and within the designed DoD.



Alarms should be given to the switchboard/Wheelhouse on reduction in the Soc of the battery.

As the battery approaches low Soc level there shall be provision to change from Battery to Hybrid mode in case the operator requires to have long endurance for the Tug.

The system shall be designed such that the DG's can also be used to charge the batteries based on the load on the vessel.

The Soc level alarms can be set according to the operating profile requirements as per design.

VESSEL MONITORING SYSTEM

This system shall be independent of all automation & control systems onboard the vessel. This system will be used to collect all the vessel operational parameters for monitoring the vessel's performance and operations. This system shall interface with the following equipment but not limited to:

1. GPS-Position & Time details
2. Speed Log-speed parameter
3. Battery Management System-Discharge power, State of Charge for the batteries
4. Diesel Generator- Running Status, power, Fuel consumption details
5. Propulsion System-power

The above parameters can be obtained from individual equipment or integrated automation systems existing onboard the vessel. All the parameters need to be recorded with a common time stamp preferably the GPS time for analysis. The system shall be capable of storing at least one month's data. Also, the system shall transmit the data continuously to offshore systems like cloud-based systems, and port operation systems.

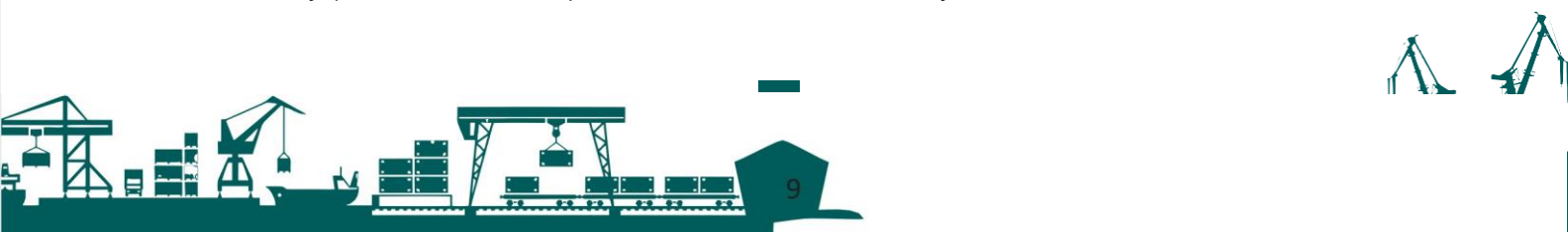
792 ALARM SYSTEM

Comprehensive alarm with monitoring system shall be provided as per class and OEM's requirement for major machinery including Battery systems, Propulsion systems, auxiliary engines, critical ship systems etc. Temperature monitoring & alarm for the battery room shall be provided as per class requirements.

793 PROPULSION CONTROLS

Remote operation shall be so designed that the propulsion plant can be operated from the wheelhouse. Instrumentation/alarms shall be as per class rules/maker standards.

Emergency control shall be provided, with which the propulsion motors can be controlled locally (switchboard room) in case the remote-control system fails.



UPS/24V power supply shall be provided for the Automation System.

795 DIESEL GENERATOR CONTROLS

The generator engine shall be speed-controlled remotely by the governor control switch on the main switchboard and also controlled at the engine side. Instrumentation/alarms as per class rules and OEM standards shall be provided.

Control power supply for the DGs shall be taken from the 24V power supply provided onboard.

A local engine control panel with necessary alarms, indication lamps and control switches shall be provided.



MAIN GROUP 8

SHIP COMMON SYSTEMS



SHIP COMMON SYSTEMS

80 BALLAST, BILGE & DRAIN SYSTEMS

801 BALLAST SYSTEM

Ballast is not considered in the standard design. However, if required, the same may be included adhering to relevant statutory/class requirements.

803 BILGE SYSTEM

The bilge system shall comprise of One (1) Bilge pump and One (1) Bilge/GS/Fire, both of capacity as per the requirements specified in the rules & regulations in para 0. F. The pumps are vertical centrifugal electric driven type. One (1) oily water tank of sufficient capacity shall be provided.

Bilge main system to be complete with suction from all watertight compartments. Engine room shall be provided with two nos. direct bilge suctions. Bilge alarms are to be installed in each watertight compartment.

Dedicated oily water and sludge tanks are provided. An electric-driven oily water pump and sludge pump shall be provided for pumping out oily water and sludge respectively.

Oily Water Separator

One (1) Oily water separator of approx. Capacity as per the requirements specified in the rules & regulations in para 0. F meeting relevant regulatory requirements shall be provided.

81 FIRE FIGHTING AND EMERGENCY SYSTEMS

811 FIRE DETECTION SYSTEM

In general, a fire detection system shall be provided adhering to relevant Class/Statutory Regulations.

This shall consist of an addressable fire & smoke detection system in all compartments, including the battery room, machinery room and all stairways, corridors, escape routes within accommodation spaces, etc. The detectors shall be of smoke/heat or thermal type dependent on the location of installation.

The gas detection system is to be installed in the battery room as per class requirements. Arrangements are to be provided for the automatic exhaust of the developed gases when detected. Battery chemistry including manufacturer recommendations is to be considered, whilst selecting the system.



813 ON BOARD FIRE FIGHTING AND DECK WASH SYSTEM

The firefighting and deck wash system shall be supplied by a dedicated fire pump and a Bilge/GS/Fire pump. The fire pumps shall be provided as below:

- a. At least two fire pumps have a total capacity as per the requirements specified in the rules & regulations in para 0. F. This may be met by a combination of a fire pump and a bilge/GS/fire pump.
- b. There shall be an independently driven emergency fire pump having a minimum capacity as per the requirements specified in the rules & regulations in para 0. F.

In addition, other firefighting equipment as per the requirements of the class and regulatory bodies shall be provided.

815 ENGINE ROOM FIRE FIGHTING SYSTEM

A fixed gas-smothering type fire suppression or "CO/ gas flooding fire extinguishing system shall be installed in the engine room, by the requirements of the Regulatory Bodies. Other compact and environment-friendly options such as FM 200 or NOVEC 1230 may be considered based on Buyer's preference.

Battery Room Fire Fighting

Fire fighting system for battery shall be as per the requirements specified in the rules & regulations in para 0. F

816 EXTERNAL FIRE FIGHTING SYSTEM (OPTIONAL)

An external fire-fighting system shall be fitted, comprising of Diesel generator PTO pumps, fire monitors and a water spray system, meeting FIFI 1 requirements of the selected class.

One no. fire pump connected to Diesel Generator PTO. The fire pump shall have a dedicated sea chest.

Any other configuration may also be considered as mutually agreed between the Buyer and the Builder.

Fi-Fi Pumps

The FiFi pump shall provide sufficient water to two fire monitors and a water spray system.

- Type Centrifugal
- Drive Engine PTO
- Total Capacity appx. 2800 m³/hr (meeting FIFI 1 requirements of the selected class)



Foam System

Foam tank(s) of a total capacity of 10,000 litres, complete with necessary fittings shall be provided. The system shall be provided with a line proportioner for foam mixing. The foam type shall be AF.

Fi-Fi Monitors

Two (2) single barrel dual purpose monitors each having capacity as per FIFI 1 requirements of the selected class.

Water Spray System

The vessel shall be provided with self-protection measures as required by FIFI 1 requirements of the selected class.

Fi-Fi Control System

Fire monitors shall have controls for both wheelhouse and local operations. Wherein, a fixed control panel shall be mounted in the wheelhouse with the operator having an unrestricted view of the Fi-Fi monitors.

82 OVERFLOW, AIR & SOUNDING SYSTEM

General

Air vents shall be installed for all tanks having filling or suction connections.

Air vents in fuel oil tanks and sludge/oily water/sewage tanks (as applicable) having flammable hydrocarbon shall be provided with the flame screen. Foam and dispersant tanks are to be given with a P/V (Pressure/Vacuum) vent.

Diesel Oil bunker stations shall be arranged on both the port and starboard sides. Connectors for fuel oil filling shall be of camlock type. For freshwater filling, threaded-type connectors shall be provided.

822 MANUALSOUNDING

Sounding provisions shall be provided for all tanks as far as practicable. The manual Sounding system shall be in general of sounding pipe type. Sight glasses are to be provided for small tanks, if possible.

823 AUTOMATIC/REMOTE SOUNDING SYSTEM

A Remote Tank Level Indications system shall be provided for FO Service tanks, in addition to the local tank level gauge.



All other hull tanks may be provided with remote tank level indication as per the buyer's requirement.

85 COMMON ELECTRONIC & ELECTRICAL SYSTEM

General

Electrical work in the ship shall be carried out by this specification, the Builder's standard and in compliance with classification rules. The type and construction of the electrical equipment shall be by the manufacturer's standard unless specifically stated.

The design of the electric plant including generators, motors and controllers shall be coordinated to ensure that the voltage dip, when starting the motor with the highest inrush current shall not exceed 15% of the rated voltage.

Power Generation and Distribution

Sufficient Batteries shall be provided for completing the operating profile of the Tug in the operating ports. Batteries shall be able to work with onboard DGs in case of an increase in the endurance period. 2 Nos. main generators each catering for vessel load as per section 861 shall be provided

Generators are to be provided with Floating neutral.

Electric power supplies available onboard: -

- a) 1000V DC or any other suitable voltage
- b) 415V, 50 Hz, 3phase, 3 wire
- c) 230V, 50 Hz, 1 phase, 2 wire
- d) 24V DC

86 ELECTRIC POWER SUPPLY

861 GENERATORS

Main Generators

Power Rating	: Capacity shall be derived based on the criteria as given below
Voltage	: Low Voltage & can be 50/60 Hz, 3Ph, 3 wire
Insulation	: Class-F/F
IP	: as per class rule
AVR	: Solid state design or as per maker standard
Excitation	: Self-excited, self-regulating type with brushless excitation system
Type of cooling	: The engine shall be FW/SW cooled
	: Alternator shall be air-cooled or water cooled as per OEM Standard.



Starting: ElectricStart

At least 2 nos. of generators shall be provided. Generators shall be as per the norms of classification society rules. The builder shall carry out load calculations at the time of construction based on the actual electrical rating of equipment to arrive at the final load rating of the generators.

Voltage and frequency tolerances shall be within the limits specified by the Class rules. Generator space heaters shall also be provided for each generator.

Total Generator capacity shall be sized based on the largest of the below criteria

- The generator shall be capable of driving an External Fi-Fi pump (if available) through the shaft and sufficient power for manoeuvring during firefighting operations.
- Total generating capacity equal to average power demand over one complete operation as per the operating profile (Based on Port data) to allow sufficient capability to perform continuous operations.
- Total generating capacity shall cater for at least 8 knots speed of the vessel.

865 TRANSFORMERS

All Transformers shall conform to class rules.

One (1) off Transformer (415V/230V) as per requirements of lighting/services of sufficient capacity shall be connected main switchboard for catering to the vessel's power supply requirements.

One additional transformer shall be provided for redundancy.

The final quantity & capacity of transformers shall conform to class requirements.

866 DC SYSTEM

24V Battery Charger & Distribution Board

At least one (1) battery charger with a distribution board shall be provided for charging and discharging of the battery. The battery charger shall be of dead front and self-supporting type and of such arrangement that the battery may be float charged. The necessary number of feeder circuits for consumers with fuses/MCB shall be provided.

General use batteries

At least One (01) set of storage batteries shall be installed in case of electric-started engines.



One (01) set of storage batteries for navigation & communication equipment shall be installed either in a battery room or inside dedicated battery boxes placed at a suitable location.

The batteries shall be maintenance-free, Lead acid type, 24V DC.

868 ELECTRIC SHORE SUPPLY

AC SHORE SUPPLY

The vessel shall be provided with an AC shore supply arrangement to cater for hotel load & Battery Charging.

The electrical interlocking of the main generator breaker and shore connection breakers shall be provided in such a way that the shore connection breaker cannot be switched 'on' if any of main generator breakers is 'on' and vice versa. The shore supply cable shall be a separate strand type and of adequate capacity to meet the harbour load and battery charging capacity. The shore supply cable shall be flexible.

A shore supply cable of 50 meters in length shall be supplied by the builder for use in the dry dock.

The Available shore power from the port shall be at least 2000kVA, 690V, 50Hz, 3 ph.

The vessel shall be designed with necessary charging arrangements to charge the tug for one full harbour operation within 2 hours for the given operating profiles as per Para 869.

869 ENERGY STORAGE SYSTEM(ESS)

Energy Storage Systems, consisting of battery banks shall be provided for harbour operations/ peak shaving/standby operations of the vessel. Battery banks shall be split between two separate compartments with equal capacity.

The battery can be air-cooled or water-cooled as per the battery Manufacturer.

ESS Shall be sized considering the below criteria for the vessel

- ESS to cater for One full harbour operation of the vessel for a given operating profile without the use of DG or to cater to energy requirement for 30min of Full Bollard Pull of the Tug without the use of DG whichever is higher.
- ESS to be able to discharge 110% propulsion power to accommodate bollard pull and house loads
- ESS to be able to charge at a rate to suit Port's operating profile and shore charging facilities



- Design life shall be at least 10 years.
- End of Life (EOL) usable State of Health (SoH) shall be at least 70%.

An emergency shutdown system to disconnect the battery system in case of emergency as per class requirements shall be provided.

87 COMMON ELECTRIC DISTRIBUTION SYSTEM

871 DC&ACSWITCHBOARDS

DC SWITCHBOARD

The DC switchboard shall be connected through a bus tie /fuse with precharge circuit & contactor wherever necessary such that failure in one bus shall not be propagated to the other bus leading to complete shutdown. The voltage of the switchboard shall be as per 85. The switchboard be complete with indications, protections etc required as per the class rules. DC switchboard to be provided with suitable fuse /breaker after DC selectivity studies. The switchboard shall be constructed according to IP 23.

The drives shall be part of the DC switchboard to reduce the footprint area.

AC Main Switch Board

The main switchboard shall be self-supported, steel-plated and dead front type. The construction of the panel board shall be of IP 23. The panel boards shall be manufactured from 14 SWG primed steel plates. The front shall be provided with hinged door locks and insulated handrails. Oil resistant type mat shall be provided in the front of the switchboard.

The bus bar shall be of hard-drawn conductivity copper.

The entire bus bar system including supports and insulation shall be designed to withstand the thermal and magnetic stresses due to short circuits, up to the maximum estimated fault level on the main bus bar.

Provision for manual and semi-auto synchronizing and paralleling of generators shall be arranged.

Breakers - MCCB/MCB's
 - bus tiebreaker

The instrumentation on MSB shall conform to class rules.

874 EMERGENCY STOP

Emergency stop system complying with Classification Rules shall be provided.



875 DISTRIBUTION PANELS

All distribution panels shall be made of primed steel with a painted surface. Cabinets shall have a hinged door with a catch and lock arrangement. The panels shall be provided with approx. 10% spare capacity of breakers.

Distribution panels for 415V

Distribution panels for motors, fans, galley-laundry equipment, heating fans etc. MCB/MCCB shall be used.

Distribution panels for 230V

Distribution panels for general lighting, heating and other 230V equipment. MCB shall be used.

Distribution panels for 24V

Distribution panels for electronic equipment, remote control etc. MCB shall be used.

88 ELECTRIC CABLE

All cables shall be approved by the classification society (except special cables).

All cables are to be of Halogen-free type.

The voltage rating of the cables shall not be lower than the nominal voltage of the circuit for which they are used.

0.6/1.0kV grade cables shall be used for all 415V installation and min 250V grade cables shall be used for all 230V and 24V power installations. Armoured Cables may be considered as per buyer/class requirements.

Cable in general shall have a copper conductor and XPLE or EPR conductor insulation.

The sizing of the cables shall be as per the Classification Rule requirement.

89 ELECTRIC CONSUMER SYSTEMS

891 GENERAL LIGHTING IN ER, ACCOMMODATION ETC.

All engineering machinery compartments shall be illuminated in accordance with Class Rules. All lighting fixtures shall be provided with enclosures having IP ratings indicated below:

Light fixture in dry accommodation	: IP20
Light fixture in galley, laundry etc	: IP44



Light fixture in engine room etc	: IP44
Light fixtures on open deck	: IP 56

Suitable number of sockets outlets, 230V, 15 A to be installed in engine room and workshop.

Non-water-tight 230V, SA sockets to be installed in cabins, public spaces, lockers etc.
Two sockets shall be fitted in each cabin.

Two off three phase sockets of suitable rating for welding machines are to be provided at suitable locations as agreed between the Buyer and the Builder.

Lighting

The following may be catered as per Class Rules in general:

- LED-based light fittings for entire ship.
- Provision for emergency lighting.

Navigation lights shall be provided as per Class Rules/COLREGs.

Machinery room

Machinery room lighting shall be arranged to provide proper illumination as applicable as per Class Rules.

Suitable lighting shall be provided in workshops & outside of the ship

Emergency Lighting

24V DC-operated Emergency light fittings shall be fitted to provide illumination to accessways and passageways. The emergency lighting system shall be as per class rules. In the event of failure of the ship's AC normal lighting 24V DC emergency lights to be switched on automatically.



SECTION 3

**COMPLIANCE CERTIFICATE
TEMPLATE FOR GREEN TUGS**



Vessel Requirements

Bollard Pull	<input type="text"/>
Length Overall	<input type="text"/>
Breadth moulded	<input type="text"/>
Navigational Draught	<input type="text"/>
Gross tonnage	<input type="text"/>

Operation Profile

Operation	Duration per cycle (mins)
Standby	<input type="text"/>
Steaming (Max speed)	<input type="text"/>
Transit Low< 6 KNOTS	<input type="text"/>
Transit High> 6 KNOTS	<input type="text"/>
High Bollard Pull >90%	<input type="text"/>
Medium Bollard Pull {50-90%}	<input type="text"/>
Low bollard Push/Pull< 50%	<input type="text"/>

Total Operation Duration per cycle mins

Number of Cycles per Day Nos

Shore power for charging kW

Technical Parameters

Estimated Energy Demand for one operation kWhr

Estimated Fi-Fi Power Consumption kW

Estimated Hotel Load kW

Estimated Propulsion power to achieve 100% of Bollard Pull kW



1. Generator Capacity:

Sl. No	Parameters	Vessel Detail	Remarks
a)	Fi-Fi Power Consumption+ Hotel Load	kW	
b)	Average power demand over one complete operation as per the operating profile (Based on Port data)	kW	
c)	Power Required for at least 8 knots speed of the vessel.	kW	
d)	Largest of (a), (b), (c)-Required generating capacity	kW	

The above indicated values are based on preliminary estimation for the project. The above is subjected to change based on Final Vessel design & specification.

2. Energy Storage Capacity:

Sl. No	Parameters	Vessel Detail	Remarks
a)	Energy Demand for One full harbour operation of the vessel as per the given operating profile.	kWhr	
b)	Energy requirement for 30min of Full Bollard Pull of the Tug	kWhr	
c)	Largest of (a), (b)-Required energy	kWhr	
d)	Estimated battery capacity considering 10yrs & EOLSoH of 70%	kWhr	

The above indicated values are based on preliminary estimation for the project. The above is subjected to change based on Final Vessel design & specification.

3. Guideline Specification:

The vessel will be built as per Guideline Specification issued by IPA.

No

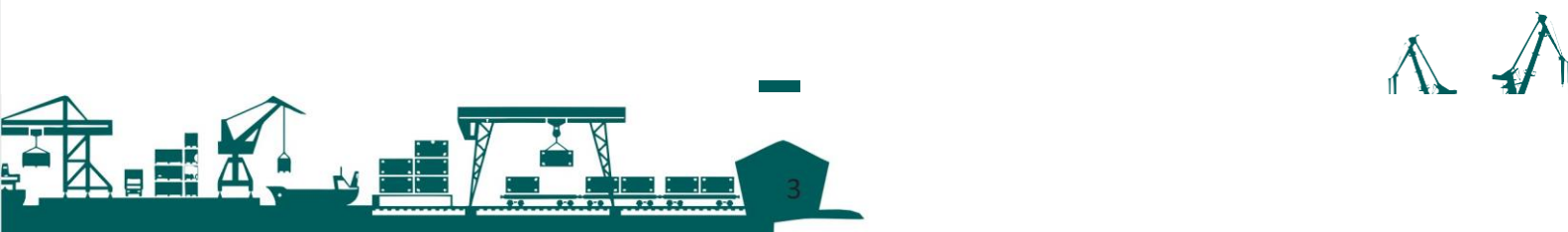
4. Declaration:

It is declared that vessel shall be designed & built as per the requirements specified in the guideline specification published by IPA and the GTTP compliance certificate issued by recognised classification society will be submitted during the induction of Tug into port operations.

Authorised Representative of the Tenderer

Supporting Documents for Certification:

1. Estimated Energy Calculation with respect to operating profile



Vessel Information

Tug Name	<input type="text"/>
Owner	<input type="text"/>
Bollard Pull	<input type="text"/>
Hull Number	<input type="text"/>
IMO Number	<input type="text"/>
Classification Society	<input type="text"/>
Length Overall	<input type="text"/>
Breadth moulded	<input type="text"/>
Navigational Draught	<input type="text"/>
Gross tonnage	<input type="text"/>
Compliments	<input type="text"/>
Built By	<input type="text"/>

Operation Profile

Operation	Duration per cycle (mins)
Standby	<input type="text"/>
Steaming (Max speed)	<input type="text"/>
Transit Low< 6 KNOTS	<input type="text"/>
Transit High> 6 KNOTS	<input type="text"/>
High Bollard Pull >90%	<input type="text"/>
Medium Bollard Pull {50-90%}	<input type="text"/>
Low bollard Push/Pull< 50%	<input type="text"/>

Total Operation Duration per cycle mins

Number of Cycles per Day Nos

Shore power for charging kW



Technical Parameters

Energy Demand for one operation	kWhr
Total Duration of one operation	mins
Fi-Fi Power Consumption	kW
Hotel Load	kW
Propulsion power to achieve 100% of Bollard Pull	kW

1. Generator Capacity:

Sl. No	Parameters	Vessel Detail	Remarks
a)	Fi-Fi Power Consumption+ Hotel Load	kW	
b)	Average power demand over one complete operation as per the operating profile (Based on Port data)	kW	
c)	Power Required for at least 8 knots speed of the vessel.	kW	
d)	Largest of (a), (b), (c)	kW	
e)	Number of Generators installed onboard	Nos	2
f)	Total Generator capacity installed onboard	kW	
g)	Generator Size acceptable (f > d)	Yes D	No 0

2. Energy Storage Capacity:

Sl. No	Parameters	Vessel Detail	Remarks
a)	Energy Demand for One full harbour operation of the vessel of given operating profile.	kWhr	
b)	110% propulsion power to accommodate bollard pull and house loads	kW	
c)	Energy requirement for 30 min of Full Bollard Pull of the Tug	kWhr	
d)	Design Life of Battery	yrs	10
e)	End of Life State of Health		70%
f)	Largest of (a), (c)	kWhr	
g)	Total Battery capacity installed onboard	kWhr	
h)	Number of battery banks installed onboard	Nos	2



l)	OEM declaration on battery sizing for design life mentioned in (d) and End of Life Depth of Discharge (e)	Yes <input type="checkbox"/>	No <input type="checkbox"/>
j)	Allowable Charge Rate of the installed battery to meet d) & e)		
k)	Allowable Discharge Rate of the installed battery to meet d) & e)		<input type="checkbox"/>
l)	Does discharge rate in k) meets the condition in b)	Yes <input type="checkbox"/>	No <input type="checkbox"/>
m)	Does charge rate in j) meets the operating profile and shore charging facilities	Yes <input type="checkbox"/>	No <input type="checkbox"/>
n)	Is the ESS Capacity acceptable	Yes <input type="checkbox"/>	No <input type="checkbox"/>

3. Guideline Specification:

The vessel is built as per Guideline Specification issued by IPA. Yes No

The Tug meets all the requirements as per para 1, 2 & 3.

Based on the above data, it is certified as the tug is GTTP Compliant.

Authorised Representative of the Classification society

Supporting Documents for Certification:

1. Classification Certificate
2. Bollard Pull Certificate
3. Energy Calculation with respect to operating profile
4. Battery OEM declaration on Battery Sizing
5. Thruster Performance curves

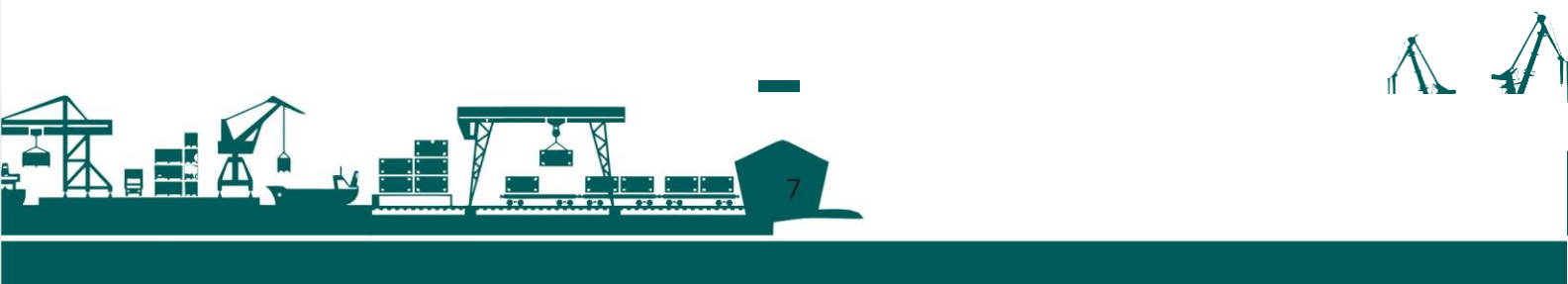


Annexure 1- Recognised classification Societies

List of recognised classification societies are as follows.

- IRS-Indian Register of Shipping
- ABS-American Bureau of Shipping
- Bureau Veritas
- **DNV-GL**
- LR- Lloyd's Register
- ClassNK-Nippon Kaiji Kyokai
- RINA

Note: The above list shall be amended as and when DGS issues recognized organisations circular.



DECLARATION BY STANDING SPECIFICATION COMMITTEE

The Technical Specification Document for Phase 1 of the Green Tug Transition Program of Ministry of Ports, Shipping and Waterways has been prepared, vetted and endorsed by all the members of the Standing Specification Committee.

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Shri Raja Soris

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Vice President, IRS

Shri Sivaram Narayana Swamy

GM (BD - Shipbuilding), CSL

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**Ministry of Ports, Shipping and Waterways
Government of India**