Part VII – Technical Specifications

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Chapter 1 General Provisions

1.1 Introduction

1.1.1 This document (or "Technical Specifications" or "TS" or "Part VII") sets out the requirements of the Government in relation to one (1) Aluminium Alloy General Purpose Launch for use by the Water Supplies Department ("WSD") of the Hong Kong Special Administrative Region ("HKSAR") as the "user department". Reference to "Vessel" shall mean the vessel.

1.1.2 Unless otherwise specified in the Technical Specifications, all the specifications stated in this Part VII of the Tender Documents are classified and labelled as follows:

(a) Essential Requirements [E]; and

(b) Those specifications that are not labelled with [E] or [D] shall equally form part of the Contract like the specifications labelled as [E], but the Government will not conduct checks at the tendering stage whether the products offered comply with those specifications not labelled with [E]; and

(c) Desirable Specifications [D].

1.1.3 All Essential Requirements and Specifications without Label shall form part of the Contract. For Desirable Specifications, to the extent the Contractor has committed to comply with them in its tender, they shall also form part of the Contract. As part of the tender evaluation during the tendering stage (viz. Stage 1 of the evaluation – completeness check), the Tenderer shall submit all the information sufficiently detailed to substantiate that the product and the services offered meet the Essential Requirements as stipulated in this Part VII (viz., specifications with [E] label) and repeated in Annex C to Part II - Conditions of Tender, failing which its tender will not be considered further. For those Specifications without Label, where there is any proposal or evidence to show that the tender does not comply with these specifications, the Tenderer's tender will not be considered further. Commitment to comply with the Desirable Specifications will equally form part of the Contract.

1.1.4 Neither the Essential Requirements nor the Specifications without any Label may be counter-proposed by the Tenderer. Any contravening counter-proposal shall be dealt with in accordance with Clause 17 of Part II – Conditions of Tender.

1.1.5 All specifications forming part of the Contract in the aforesaid manner shall be of equal materiality and importance upon the award of the Contract. The non-compliance with any specifications set out in these Technical Specifications shall have the same consequences as specified in the Contract. Save during the tendering stage in the manner as mentioned above, no differentiation shall be made based on the classification unless otherwise expressly specified.

1.1.6 The Vessel shall be Ready for Use before the Delivery Date and delivered by the Delivery Date as per the schedule stipulated under Schedule 2 – Delivery Schedule of Part V - Schedules.

1.1.7 Unless otherwise expressly defined in the Contract, all technical terms and expressions used in this Part VII shall be interpreted in accordance with the professional or common usage in naval architecture, marine engineering, nautical navigation and the shipbuilding industry. Where design specifications of the Vessel or any Equipment are required to be approved by the specified Recognised Organisation ("RO"), they must be approved by the RO as well as by the Government New Construction Section

("GNC") of the Marine Department ("MD") prior to the construction of the Vessel or installation of that Equipment on the Vessel.

1.1.8 Where design specifications of the Vessel or any Equipment are not required to be approved by the RO, they must be approved by GNC prior to the construction of the Vessel and installation of that Equipment on the Vessel. This applies regardless of whether this is stated to be the case in the relevant individual provisions.

1.1.9 For the avoidance of doubt, references to "tests" throughout the Tender Documents and the Contract shall include all inspections, surveys, assessments, trials and experiments.

1.1.10 Without prejudice and in addition to the interpretation principles set out in Clause 1.2 of the Part IV – Conditions of Contract, the following interpretation principles shall apply when interpreting the Tender Documents and the Contract including this Part VII:

(a) references to "Chapter" or "Paragraph" or "Annex" refer to the chapter of or the paragraph of or the Annex to this Part VII;

(b) quotation marks may or may not be added for each defined term whether with or without brackets; a defined term may be identified with quotation marks and brackets, or just quotation marks, or just brackets;

(c) the use of article "the" may or may not appear before a defined term or an abbreviated term; there shall be no difference whether the term is preceded with or without the article;

(d) a defined term may have two or more versions (typically a longer version and an abbreviated version) (e.g. "Factory Acceptance Tests" or "FAT"); or may still be referred to by the original description of the subject matter based on which the term is defined; the original description, or the longer version of the defined term, or the shorter version of the defined term may be used interchangeably. For clarity sake, the original description, or the longer version may be used for more self-explanatory purpose; however, there shall be no difference;

(e) where a subject matter has been defined with two or more alternative terms of reference, any one of these terms of reference may be used interchangeably;

(f) a defined term may appear earlier than the provision in which it is defined; a term defined will have the same meaning throughout the document;

(g) there shall be no difference between a term with a hyphen and the same term without a hyphen (e.g., "sub-system" or "subsystem");

(h) titles and headings may appear in lower case or upper case throughout or only in upper case with the first word at the beginning; there shall be no difference in meaning;

(i) headings and titles do not affect the construction of the Tender Documents and the Contract;

(j) a sub-Section of this Part VII (at whichever sub-level and regardless of the numbering system adopted) may begin in upper or lower case and may be ended with semi-colon or full stop; these differences do not have any interpretation significance on their own;

(k) figures may be expressed in Arabic numerals or in words; or both; there shall be no difference; three zeros in a figure may or may not be separated by any space or comma; there shall be no difference;

(l) where more than one unit of a subject matter is to be supplied as part of the Work, all requirements stated to be applicable to that subject matter shall apply to each such unit of that subject matter. This is regardless of whether the term "each of" or other cognate expression is used preceding that subject matter.

1.2 Statement of Purposes of the Vessel

1.2.1 The Vessel shall be used by WSD for carrying staffs to perform water quality monitoring work in the reservoir, such as water sampling and site inspection, in the reservoir of WSD.

1.2.2 The Vessel shall be designed and constructed for a service life of at least **15** years under reasonable maintenance.

1.2.3 The Contractor acknowledges and agrees that the Government relies on the professional judgment and skill of the Contractor to ensure that the Vessel is compliant with all of the aforementioned requirements and warrants that it will alter, modify or otherwise change aspects of the Vessel's fittings, fixtures, user interface as required by the Government in order to ensure the ultimate fitness for purpose of the Vessel before the Acceptance Certificate is issued.

1.3 Authorities

1.3.1 GNC of MD is the section responsible for the procurement of the Vessel for the Government of the HKSAR of the People's Republic of China (hereinafter referred to as the Government).

1.3.2 GNC may delegate the site supervision work including plan reviewing work during the construction stage to private consultancy firms to act on behalf of the Government.

1.3.3 The Electrical and Mechanical Services Department ("EMSD") is the Department which will oversee the Communication Equipment and Electronic Navigational Equipment ("ENE") technical acceptance.

1.4 Shipyard

1.4.1 The Tenderer's nominated shipyard building the Vessel must have the essential shipbuilding and workshop facilities such as lifting gears, hull construction and calibration equipment, machinery installation and calibration equipment and vessel launching or slipping facilities.

1.4.2 The Contractor shall employ a team of professional staff to carry out the design of the Vessel and also carry out supervision and quality control work in the course of Vessel construction.

1.5 Design and Construction Responsibility

1.5.1 It is the SOLE responsibility of the Contractor to supply the Vessel which is safe, fit and suitable for the operation of the user department and which meets all the relevant regulations and the specifications in these TS including the desirable requirements (if and to the extent the Contractor has indicated compliance in its tender), which include without limitation requirements for safety, health, environmental protection, hull form design features, structure, method and materials for construction and fitting out, stability, sub-division and operational efficiency.

1.5.2 Unless otherwise expressly specified in this Part VII, references to "RO" in this Part VII shall mean, in the case of the Vessel, the Recognised Organisation as specified in Schedule 9 of Part V for the Vessel. References to "RO Requirements" (in upper or lower case) shall mean, in the case of the Vessel, the requirements of the rules and regulations of the aforesaid RO as specified in Schedule 9 of Part V. References to "RO" and "RO Requirements" shall mean, in the case of the Daughter Boat, the Recognised Organisation and the rules and regulation of such Recognised Organisations as specified in Schedule 9 of Part V for the Daughter Boat. References to "IMO requirements" shall mean the latest and as amended requirements published by the IMO and available on its website and applicable to the relevant subject matter in the relevant paragraph where it is required that IMO requirement shall be complied with provided that where the IMO requirements are of any convention or resolution or other multilateral treaty of the IMO (including any amendment thereto), Hong Kong has joined in as a party to such IMO requirements.

1.5.3 The Vessel is required to be issued with Type Approval Certificate or a certificate of classification with such class notations by the RO all as specified in Schedule 9 of Part V, as one of the conditions to be fulfilled before the Acceptance Certificate for the Vessel will be issued. All plans, particulars and documentations which are required for the classification of the Vessel by the RO, in addition to those listed in Annex 3 to this Part VII shall be approved by the RO before submission to MD for endorsement and final approval prior to commencement of vessel construction works. Any subsequent modifications or additions are to be treated in the same manner. Those drawings which are not required under ship classification approval shall be submitted to MD for approval before works is carried out.

1.5.4 Notwithstanding the submission of the preliminary plans and drawings by the Contractor then as part of its tender for the Contract, all plans and drawings of the Vessel except the design stresses and scantling, shall be submitted to GNC for approval before completion of the Vessel design. The design stresses and scantling including internal structural members shall be approved by the RO.

1.5.5 The Contractor shall design, build and supply the Vessel in full compliance with the requirements given in this Part VII which, to that extent, may be over and above what is normally required by any statutory and RO's rules and regulations. Should there be any contradiction between the rules and regulations of the RO and this Part VII, the Part VII shall prevail unless GNC stipulates or agrees otherwise.

1.5.6 Even if the Contractor may appoint a Sub-contractor to design the Vessel with the prior written consent of the Government, the Contractor shall not be relieved of its obligations under the Contract through such appointment, and the Contractor shall be responsible for all acts, defaults and omissions of the sub-contractor as if they were its own.

1.6 Survey and Inspection

1.6.1 Tenderers shall note that the unit price per Vessel quoted in Schedule 1 of Part V shall be deemed to have included the cost of surveys to be carried out by the relevant RO in respect of that Vessel (if required to be arranged by the Contractor under the Contract).

1.6.2 All electronic items and their installations shall be approved and inspected by EMSD or EMSD representatives as part of the Technical Acceptance.

1.6.3 Subject to Paragraph 1.6.7 of this Part VII, an advance written notice of not less than five (5) working days (if the Vessel is located in Asia), and ten (10) working days (if the Vessel is located other than Asia) must be given to GNC before the representatives of GNC and other Government officers are invited to conduct a survey visit of the Vessel. The Contractor shall be fully responsible for any delay if the Contractor fails to give adequate notice as aforesaid.

1.6.4 The Contactor shall provide

(a) an Implementation Timetable, in the form set out in Annex 2 to this Part VII, setting out the major milestones and their scheduled completion dates and incorporating the Delivery Dates specified in Schedule 2;

(b) the Drawing Submission Timetable in the form set out in Annex 3 to this Part VII; and

(c) the Main Items Inspection Timetable in the form set out in Annex 4 to this Part VII.

Each one of the above shall be submitted to GNC for approval by the respective deadlines specified in Clause 11 of Part IV.

The Delivery Date for the Vessel as stated in the Implementation Timetable shall be no later than those set out in Schedule 2 of Part V. Notwithstanding anything in the Contract to the contrary, the Government may suspend payment of any of the instalment specified in Schedule 3 of Part V if any of the timetables required herein has not been submitted for GNC's approval or GNC does not approve any of them or if the progress of work does not comply with any of them as approved by GNC.

1.6.5 A weekly work progress report with photos evidencing the progress and material/equipment procurement status shall be submitted to GNC during the construction of the Vessel. The weekly report shall be submitted before noon of every Monday.

1.6.6 GNC may designate consultant(s) from private sector who will be authorised to represent the GNC in all technical matters including site supervision and plan approval related to the construction of the Vessel. The Contractor shall cooperate with the consultant(s) and afford them unhindered access to the Vessel at all times during working hours, and shall furnish them with current copies of all approved drawings, sketches, correspondence, change notices, change orders, test agendas, schedules etc.

1.6.7 After arriving at the site for a survey visit, if MD officers consider it is unsafe to carry out the test or inspection, the test/inspection will not be carried out. The Contractor shall arrange another additional survey visit at the Contractor's expenses. The Government shall not be responsible for any delay arising from any postponement in conducting the survey visit due to any safety issue as specified in this Paragraph.

1.6.8 Where any fee charge and associated expense are payable for the services of an RO which are necessary in order to fulfil any obligation of the Contractor under the Contract, the Contractor is responsible to pay the RO all such fees, charges and associated expenses. Such fees shall include charges for drawing approval, surveys (if deemed necessary), issue of certificates, and any other expenses payable to the RO.

1.6.9 The Contractor shall provide office space for MD officers and consultants during their survey visits and construction progress visits to the Vessel at the shipyard where the Vessel is constructed. The office space shall include, but not be limited to, two (2) desks, six (6) chairs, one (1) telephone, one (1) conference table for 10 persons, drinking facilities, power supply and one (1) cupboard for storage of documents and working clothes. The space provided by the Contractor shall also be fitted with air conditioning, have Internet access, a copying and a printer machine. Cleaning of the space shall be carried out in each working day.

1.6.10 The hours of work of MD officers or consultants will be arranged to coincide with those of the shipyard, in so far as it is practicable to do so. It is intended that all reasonable steps be taken so that the duties of the MD officers and consultants can be carried out with a maximum of efficiency and a minimum of interference with the Contractor's work.

1.7 Official Sea Trial and Speed Requirements

1.7.1 The Contractor shall submit for GNC approval, an Official Sea Trial programme 14 working days in advance of the Official Sea Trial, which shall include details of proposed procedures for carrying out the Official Speed Trial, endurance test, manoeuvring test, crash stop test, astern running test, emergency steering test, anchoring tests and other tests as stated in the paragraph 1.7.7 below, bottom survey on the slipway and all other tests as stated in this Part VII, all of which shall be required to be performed as part of the Official Seal Trial and therefore part of the Technical Acceptance (if not earlier). This programme must be submitted to MD in not less than 14 working days before the trials commence. The notification for Official Sea Trial shall be included evidence that the Vessel is safe to go to sea for the intended tests and trials specified in the Contract (including the inclining experiment report as mentioned in Paragraph 3.6 of this Part VII and approved by the RO).

1.7.2 Like all other tests and trials to be conducted as part of the Technical Acceptance, the Contractor is required to carry out the full Official Sea Trial in Hong Kong at its own expense (including the expense of fuel, lubrication oil, crew and other necessary expenses), in the presence of MD officers, user department officers and the consultants. The Contractor shall observe the local requirements on navigation before the sea trial, including the third parties insurance in accordance with the laws of Hong Kong.

1.7.3 The Contractor shall provide to MD officers, the name, post, duty and experience of each one of the Contractor's staff on board the Vessel during the Official Sea Trial to ensure the safe operation of the trial. The number of persons on board during a particular test or trial has to be agreed by the MD officers. The location of each person on board (which can affect the centre of gravity of the Vessel under trial) will need to be first agreed by the MD officers.

1.7.4 The Contractor shall provide a trial report to GNC after completion of the above tests. The report shall contain information regarding the method of test, engine(s) running condition, sea condition, weather condition and wind condition, vessel loading condition, the heeling angles (steady or varying as the case may be) during each forward turning manoeuvre, and any other relevant information as required by GNC or

the GNC appointed consultant during the tests; and such information shall be prepared in a format agreed by GNC.

1.7.5 The Contractor shall provide a test report to GNC after completion of the above tests. The report shall contain information regarding the method of test, engine(s) running condition, sea, weather and wind conditions, the Vessel loading condition, the heeling angles (steady or varying as the case may be) during each forward turning manoeuvre, and any other relevant information as required by GNC or GNC appointed consultant during the tests; and such information shall be prepared in a format agreed by GNC.

1.7.6 Official Speed Trial

(a) The Official Speed Trial shall be carried out in the Hong Kong Waters under the conditions as specified in Paragraph 1 of Annex 5 to this Part VII.

(b) As part of the Technical Acceptance as specified in Paragraph 1.8.1 of this Part VII, the Contractor shall carry out the Official Speed Trial in the presence of MD officers or their appointed agents.

(c) The actual mean speed of the Vessel (i.e. NOT theoretical) shall be measured during the Official Speed Trial runs to determine if the Contract Speed can be achieved. The speed calculations must NOT be corrected by wind, wave, tidal current, shallow water effects and weather condition.

(d) The actual mean speed shall be calculated as the arithmetic mean of not less than FOUR continuous runs, i.e. TWO runs in each direction. The speed for each run shall be taken by measuring the time of the Vessel running for one nautical mile between two poles or other measuring method acceptable to MD.

(e) The Contract Speed is considered not achieved if the Contract Speed cannot be attained once during the Official Speed Trial after a total of two attempts each attempt to be measured in the manner specified in (d) above.

(f) The Contract Speed to be achieved by the Vessel in the Official Speed Trial shall be the minimum highest achievable speed of 10 knots as specified in Paragraph 2.4.1 of this Part VII, with the engine power at declared maximum (rated) power and the Vessel under Official Speed Trial Conditions as stated in Annex 5 to this Part VII. If the Vessel fails to achieve the minimum highest achievable speed under the aforesaid conditions, the Government will deem that the Vessel has failed to pass the Official Speed Trial and therefore Technical Acceptance.

(g) The instruments used in measuring the Contract Speed for the Official Speed Trial shall be provided either by:

(i) the Contractor provided that the speed measuring device has been calibrated by a certified body in Hong Kong acceptable to GNC; or

(ii) Global Positioning System ("GPS") supplied by the Government.

(h) The GPS or Differential Global Positioning System ("DGPS"), which is properly calibrated (with supporting calibration documents) and installed on board the Vessel, is acceptable to GNC; or other speed measuring methods that are acceptable to GNC.

(i) The instrument use in measuring the Propeller Shaft Power for the Official Speed Trial shall be provided by the Contractor and shall be able to measure both port and starboard Propeller Shaft Power simultaneously. The Propeller Shaft Power

measuring device shall have been calibrated by a certified body in Hong Kong acceptable to GNC.

(j) The Vessel must be in the trial conditions (see Paragraph 1 of Annex 5 to this Part VII for the conditions of the trials) during the Official Speed Trial. All Equipment shall also have passed the Technical Acceptance and which operation shall not be affected during the Official Sea Trial.

(k) The speed, time of the day, engine running conditions, sea condition, etc., shall be properly recorded by the Contractor, and signed as witnessed by GNC surveyor (or GNC representatives) during the Official Sea Trial. A copy of the Official Sea Trial Report as required in Paragraph 1.7.7 below shall be given to GNC before Delivery Acceptance.

(l) Upon successful completion of the Official Speed Trial in Hong Kong, the Contractor shall arrange GNC officers to carry out hull bottom inspection on the Vessel to check for any hull damage before delivery.

1.7.7 The following tests shall be conducted by the Contractor as part of the Technical Acceptance and the testing results shall be recorded and form part of the Official Sea Trial Report. The applicable conditions under which each of the tests specified below shall be conducted are further set out in the relevant paragraph of Annex 5 to this Part VII:

(a) Endurance Test

The Endurance Test shall be carried out for different engine loading and speeds to obtain the speed/fuel consumption curves (or data) for the Vessel, with the engine(s) operating within the manufacturer recommended engine operating conditions. The test results shall be recorded in accordance with the requirements stipulated in Annex 5 to this Part VII. The report submitted shall include a curve or curves showing ship speed versus propulsion engine(s) rpm and power, with particulars of the vessel loading and displacement in the test(s).

(b) Manoeuvrability Test

Forward turning circle tests to port and starboard sides shall be carried out with:

(i) Both main propulsion engines running; and

(ii) Single main propulsion engine running.

The minimum time for turning to both sides at 15°, 90°, 180°, 270° and 360°shall be recorded.

(c) Crash Stop Test

The minimum time and distance achievable by the Vessel when running from full ahead to stop, and then to full astern shall be determined at the Crash Stop Test.

(d) Astern Running Test/ Emergency Steering Test

The maximum astern running speed achievable by the Vessel shall be determined by the test. Also an emergency steering test shall be carried out to ascertain satisfactory emergency steering operations.

(e) Starting Tests for Main Engine and Electric Generator Engine.

(f) Anchoring Test according to the RO Requirements.

(g) Noise Level Test according to the requirement stipulated in Paragraph 3.9.1 (c) of this Part VII.

(h) Megger test as mentioned in Paragraph 6.3.8 of this Part VII.

1.8 Acceptance and Delivery

1.8.1 Acceptance of the Vessel (including all Equipment) shall be carried out in two (2) parts:

(a) Technical Acceptance

(b) Delivery Acceptance

1.8.2 Technical Acceptance

(a) This includes the satisfactory inspection of all items as listed in Annex 4 to this Part VII in the version as completed by the Contractor and approved by the Government in accordance with Paragraph 1.6.4(c) of this Part VII;

(b) This includes all the hull construction, mechanical and electrical tests and trials as required in this Part VII and those considered necessary by the Government (and all of which shall be conducted in Hong Kong waters unless otherwise specified) and the Contractor shall be responsible for all costs in keeping the Vessel in Hong Kong whilst the Technical Acceptance is conducted. These tests and trials shall include without limitation equipment tests, anchoring tests, inclining experiment, the bottom survey (in Hong Kong) on the slipway, the Official Speed Trial as mentioned in Paragraph 1.7.6 of this Part VII, all of those tests and trials as specified Paragraph 1.7.7 of this Part VII, the bench acceptance test and on-site commissioning test for ENE as mentioned in Chapter 8 of this Part VII and all other tests whether as specified in this Part VII or otherwise necessary to determine whether or not the Vessel including the Equipment has been supplied in accordance with all the specifications set out in these Technical Specifications;

(c) All units of all ENE items and their installations shall be approved and inspected by EMSD as part of the Technical Acceptance including the bench acceptance test and on-site commissioning test for all units of all ENE items as mentioned in Chapter 8 of this Part VII;

(d) all other tests whether as specified in this Part VII or otherwise necessary to determine whether or not the Vessel including all Equipment has been supplied in accordance with all the specifications set out in the Offered Specifications.

(e) The Contractor shall supply all necessary equipment and labour at its own cost for carrying out the tests and trials comprised in the Technical Acceptance.

(f) If the Vessel cannot pass all of the tests comprised in the Technical Acceptance by the Delivery Date specified in the Contract, the options available to the Government are set out in Clause 12 of Part IV and other applicable provisions of the Contract.

1.8.3 Delivery Acceptance

(a) The Vessel, after its successful completion of Technical Acceptance, shall be delivered at the Contractor's expense to the Government Dockyard. In accordance with the applicable Delivery Date as specified in Schedule 2 of Part V.

If the delivery of the Vessel in Ready to Use condition is 120 days later than the Delivery Date specified in Schedule 2 of Part V, at the discretion of Government, the Contract may be terminated according to the applicable terms stipulated in the Contract.

(b) Type Approval Certificate or a certificate of classification with such class notations by the RO all for the Vessel as specified in Schedule 9 of Part V shall be issued by the RO as specified in Schedule 9 of Part V before the Acceptance Certificate is issued by the Government.

(c) The Delivery Acceptance of the Vessel shall be carried out by GNC in accordance with the terms stipulated in the Contract. The Delivery Acceptance is only completed when the Acceptance Certificate is issued by the Director of Marine.

(d) The Contractor must demonstrate to MD officers that all hull construction, outfitting, vessel stability, machinery, electrical and electronic equipment are in good working order; and must hand over the Vessel, its fixtures and Equipment to GNC in good and complete condition.

(e) Not later than six weeks before the Delivery Acceptance of the Vessel, the Contractor is required to submit to GNC four copies of the Inventory List covering all items of or relating to the Vessel including all engines, on board equipment, manuals, documentation, spares, stores, and equipment for testing in respect of the entire Vessel. The Inventory List shall be approved by GNC before the day of Delivery Acceptance and covers everything which the Contractor is required to deliver under the Contract. At the Delivery Acceptance of the Vessel, the approved Inventory List will be used to check that all the items have been delivered to GNC in a satisfactory state. Details of each inventory item shall include item name, description, type, quantity, manufacturer’s name and contact details, part reference number and/or serial number, and the items’ locations in the Vessel.

(f) The items specified in Paragraph 9.2 of this Part VII, all items listed in Annex 7 to this Part VII, all items set out in the Inventory List in the form as approved or stipulated by the Government, and all other items which are required to be delivered under this Part VII as part of the Delivery Acceptance shall be delivered to GNC as part the Delivery Acceptance of the Vessel. The Contractor must provide 14 days advance notice in writing for Vessel delivery when the Vessel is considered to be completed in accordance with the Contract and Ready for Use and to be delivered for the Delivery Acceptance. The Government will not accept delivery if after undergoing the tests and trials in the Technical Acceptance, the Government does not consider that the Vessel is in Ready to Use condition.

(g) On delivery, the Vessel must be in a clean, tidy and fully fitted and operational condition.

1.9 Warranty Services During the Warranty Period

1.9.1 Notwithstanding and without prejudice to the Contractor's obligation to provide the Warranty Services for the Vessel under the Conditions of Contract, the original copy of the manufacturer's warranty certificates and all related manuals and documents in respect of all the Equipment valid for 12 months from the date of Acceptance Certificate of the Vessel, shall be delivered to MD upon Delivery Acceptance.

1.9.2 The full scope of the Warranty Services is set out in Annex 1 to this Part VII.

1.9.3 The Contractor is responsible for arranging the Vessel for Guarantee Slipping at the end of the 12-month Warranty Period. In addition to any defects which the Contractor may be required to fix under Clause 18 of Part IV, the Contractor shall also be responsible for the rectification of any defects found in the course of Guarantee Slipping. The full scope of the Services to be provided as part of the Guarantee Slipping is set out in Annex 1 to this Part VII.

1.10 Support Services

1.10.1 The Vessel must be designed for through life support and easy maintenance in the HKSAR based on an operation profile and minimum life expectancy as mentioned in this Part VII.

1.10.2 The above applies not only to main engine but also to all other equipment installed in the Vessel. Support and maintenance services must be available (i.e. serviceable) in Hong Kong in respect of all equipment installed in the Vessel and return of the whole or part of the Equipment to the original place of manufacturer or supplier shall not be necessary in order to carry out any repair work.

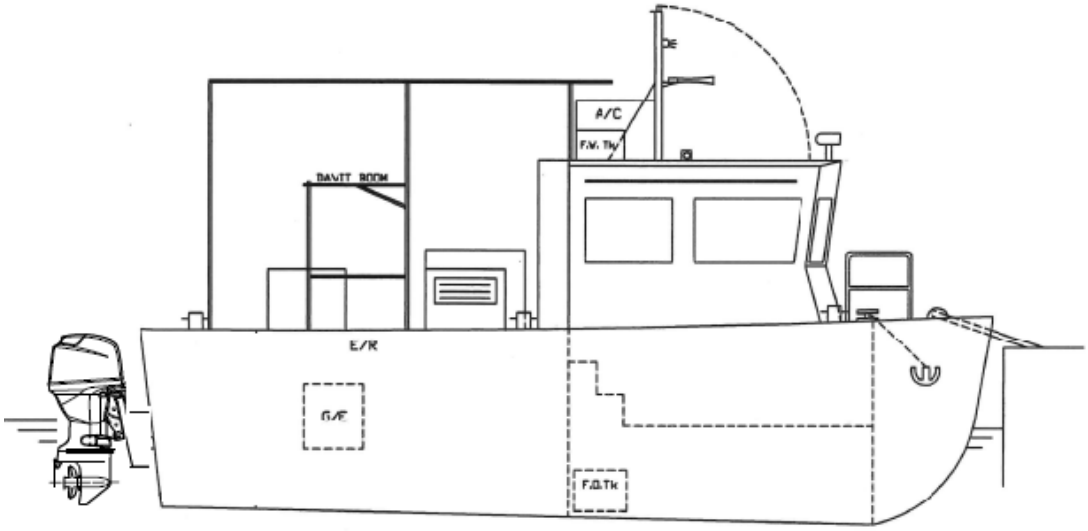
1.11 Asbestos Free

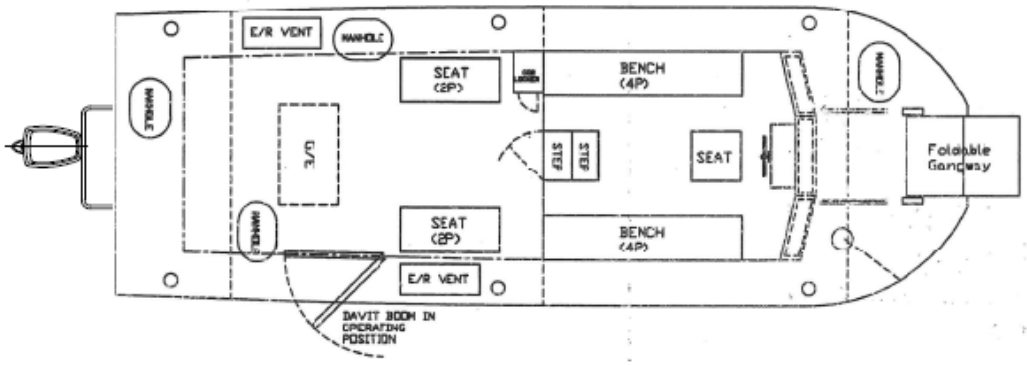
1.11.1 The Vessel must not contain any asbestos or asbestos containing materials. The Contractor must comply with the Hong Kong Air Pollution Control Ordinance (Cap. 311), Part X. The Contractor shall engage a service supplier approved by one of the RO or other entities acceptable by MD to verify that there is no asbestos on the Vessel. An asbestos free certificate or a statement of compliance issued by the service supplier to this effect shall be provided upon delivery of the Vessel.

Chapter 2 General Technical Requirements

2.1 Guidance General Arrangement Plan

Principal Dimensions	
Length Overall	8.5m to 9.0m
	(Not greater than 9m)
Extreme Breadth	Not greater than 3m
Freeboard at the aft	About 1m





2.2 General Provisions

2.2.1 Without prejudice to the generality of Chapter 1, this Chapter contains the more particular technical specifications for the Vessel. The significance of Essential Requirements is explained in Paragraph 1.1 of Chapter 1 above.

2.2.2 The work to be done under this contract consists of the design, construction, outfit, testing and delivery of **One Aluminium Alloy General Purpose Launch for the Water Supplies Department**. Workmanship, functions, characteristics and performance shall be in accordance with this Part VII, best marine construction practices, and the regulatory standards herein specified or otherwise applicable.

2.2.3 The Contractor is required to exercise its professional expertise and knowledge to come up with an appropriate design for the Vessel which can comply with all requirements of the Contract. The Guidance General Arrangement Plan shown above ("Guidance General Arrangement Plan") is a reference drawing to help to explain the tender requirements. The Contractor is required to submit its own design in details for MD's approval.

2.2.4 During the design and construction of the Vessel, the Contractor is required to submit a detailed General Arrangement Plan ("GA Plan") and all relevant construction drawings for GNC's approval and acceptance. As for the preliminary General Arrangement Plan which has to be submitted during the tendering stage in Schedule 7 ("Preliminary General Arrangement Plan"), unless the Government otherwise directs, the GA Plan to be submitted after the Contract award shall incorporate those features set out in the Preliminary General Arrangement Plan. Requirements in these Technical Specifications that the General Arrangement Plan shall follow the "Guidance General Arrangement Plan" in these Technical Specification shall be changed to follow the Preliminary General Arrangement Plan instead if in the opinion of the Government, the relevant aspect of the Preliminary General Arrangement Plan submitted by the Contractor is better than the Guidance General Arrangement Plan, but not otherwise.

2.2.5 All the machinery, equipment and facilities, furniture, fixtures and fittings, including outfitting of the Vessel that are described in this Part VII, together with their requirements for design and installation standards that are stipulated in this Chapter and in any other parts of this Part VII, are the items that must be included in the complete "As-built" Vessel delivered to the Government.

2.2.6 It is desirable that the Preliminary General Arrangement Plan to be submitted by the Tenderer shows improvements over the Guidance General Arrangement Plan over such operational aspects in Assessment Criterion in Part (A)(2)(a) of Annex D - Marking Scheme to Part II – Conditions of Tender. [D]

2.3 Rules and Regulations

2.3.1 The Vessel shall be designed and constructed in accordance with the latest edition of the rules and regulations of the Recognised Organisation as specified in Schedule 9 of Part V. By latest edition, it is meant the latest edition as at the keel laying date of the Vessel. The Tenderer shall state in Schedule 9 of Part V which RO (to be selected from the definition of "Recognised Organisation" in Clause 1.1 of Part IV) and its rules and regulations that shall be used in the design and construction of the Vessel.

2.3.2 The Vessel is required to be issued with certificate of classification (without conditions) or type approval certificate as in Schedule 9 by the RO. All plans, particulars and documentations which are required for the classification of the Vessel, in addition to those listed in Annex 3 to this Part VII shall be approved by the RO before submission to GNC for endorsement and final approval prior to commencement of work. Any subsequent modifications or additions are to be treated in the same manner

2.3.3 Without prejudice to the general requirements that the Contractor shall perform all Work in full compliance with all applicable laws and regulations, and in full compliance with the requirements of the Contract including this Part VII, the construction of the Vessel must comply with the rules, regulations, standards, and recommendations of the entities as specified below:

(a) International Electro-technical Commission ("IEC") Regulations for the Electrical and Electronic Equipment.

(b) International Telecommunications Union recommendations in the International Radio Regulations ("ITU-R").

(c) Quality and standards of the welding shall comply with the rules of an RO or American Welding Society ("AWS") or other applicable international standards or rules acceptable by MD.

(d) ISO 12215-4 "Small craft – Hull construction and scantlings – Part 4 Workshop and manufacturing" or other applicable international standards or rules acceptable by MD.

(e) All equipment/fittings shall be designed and manufactured to at least the standards as specified in these Technical Specifications. When none of the rules and regulations in Paragraphs 2.3.3 (a) to (d) above are applicable, then the applicable standards specified by the applicable organisations below shall be complied with:

BSI	British Standards Institute
GB	Standardization Administration of the People's Republic of China
IEEE	Institute of Electrical and Electronic Engineers
ISO	International Organization for Standardization
JIS	Japanese Industrial Standards

2.3.4 The Contractor shall design, build and supply the Vessel in full compliance with the requirements given in this Part VII which, to that extent, may be over and above what is normally required by any statutory and RO's rules and regulations. Should there be any contradiction between the rules and regulations of the RO and this Part VII, the Part VII shall prevail unless GNC stipulates or agrees otherwise.

2.4 Contract Speed

2.4.1 The Contract Speed of the Vessel shall not be less than 10 knots at WMO Sea State 2 when marine diesel engine as defined in Paragraph 4.2.1 of this Part VII, being adopted running at 100% MCR under Official Speed Trial Conditions as stated in Paragraph 1 of Annex 5 to Part VII and whilst observing the requirements further specified in Paragraph 2.4.2 of this Part VII. [E]

2.4.2 The Contract Speed prescribed above shall be achieved without chine walking, porpoising, or other dynamic instabilities. The propeller propulsion system selected shall match the engine profile and avoid cavitation as far as possible.

2.5 Principal Dimensions

2.5.1 The Principal Dimensions of the Vessel shall be:

Length Overall:	8.5 metres to 9.0 metres (both figures included)	[E]
Extreme Breadth:	Not greater than 3 metres	[E]
Extreme Draught:	Not greater than 1.5 metres	[E]
Freeboard at the aft	About 1 metre	
The height of Launch	Not more than 4.0 meters	

"Length Overall" means the distance between the foreside of the foremost fixed permanent structure (included fender) and the aftside of the aftermost fixed permanent structure of the Vessel, included waterjet propulsion system and out-fittings (if any). The Tenderer shall indicate the length overall of the Vessel in Dimension scale in General Arrangement Plan submitted according to Schedule 7 of Part V.

2.6 Material of the Construction

2.6.1 Material of hull structure shall be marine grade aluminium alloy. [E]

2.6.2 Plate material shall meet the requirement of EN AW 5083 or equivalent.

2.6.3 Profile material shall meet the requirement of EN AW 6082 or equivalent.

2.6.4 Console material shall be either marine grade aluminium alloy or composite material.

2.7 Propulsion System

2.7.1 Propeller propulsion unit shall be driven by one outboard marine diesel engine.

2.8 Vessel Operating Profile and Environment

2.8.1 The Vessel shall be designed to provide sufficient space for carrying three (3) crews and ten (10) other persons. Shock mitigating seats for one crew at steering console shall be provided. Detailed provisions regarding the mounting of shock mitigation seats are specified in Paragraph 3.7 of this Part VII.

2.8.2 The Vessel shall be designed for deployment by the WSD on at least 24 days per year. The Vessel shall be designed and built to operate in Hong Kong Waters. [E]

The Operational Hours/Range of the Vessel shall be:

Number of hours/day:	5 hours/day	[E]
Number of days/year:	24 days/year	[E]

Endurance for fuel capacity :	30 hours at the contract speed of the Vessel with full fuel oil tank(s) [E]

2.8.3 The Vessel shall have good manoeuvrability and quick response throughout its speed range and capable to operate in open water.

2.9 Markings and Colour Scheme

2.9.1 The Contractor shall provide the markings and colour scheme for the Vessel. All painting colour scheme for the Vessel and fittings shall be approved by GNC before application.

2.9.2 Draught marks, names, insignia and other colour markings shall be in a colour contrasting with the hull and consoles' colour.

2.9.3 All labelling shall be both in Chinese and English and as per applicable rules and regulations. The WSD logo shall also be displayed on both sides of the Vessel or elsewhere as directed by MD and WSD.

2.9.4 The Vessel's name shall be marked permanently on both sides and console of the Vessel. Details of the size and calligraphy shall be directed and agreed by the MD and WSD.

2.9.5 Draught marks shall be provided permanently at the port and starboard of stem and stern. Draught marks shall be in Arabic numerals 100 mm high and shall be measured from the underside of the keel to the underside of the number markings. A draught mark plan shall be produced by the Contractor and agreed by GNC before the draught marks are marked permanently onto the hull surface.

2.9.6 All labelling, stencilling and marking (not limited to the hull but including all aspects of the Vessel) shall be made on separate plaques, boards or labels attached to the structure. By default all displays, control actuators, electric switches, valves, and other equipment shall be labelled to indicate their type and function as appropriate.

2.9.7 Safety markings for the prevention of person tripping in the Vessel shall be provided where necessary.

2.10 Tally Plates

2.10.1 The following information shall be displayed on the builder's plate.

(a) Builder's name;

(b) Vessel's name;

(c) Year of build; and

(d) Maximum number of persons including the crew that the Vessel is designed to carry.

2.10.2 Tally plates in both English and traditional Chinese characters shall be fitted for all spaces and all equipment as required by MD including but not limited to:

(a) Equipment in the console;

(b) Electrical and communication equipment;

(c) Air vents and filling pipes for the fuel oil tank;

(d) All valves and equipment on deck;

(e) Control panels, switchboards, distribution boxes and electrical circuits; and

(f) Any other equipment and fitting as required.

Information engraved on the tally plates shall include: service, function, mode of operation, source of power, fuse rating, voltage and warning and other information as required by MD.

2.10.3 Tally plates exposed to weather shall be made of durable and weatherproof material and be securely fastened.

2.10.4 List of tally plates shall be provided as directed by MD.

2.10.5 All cable termination shall be identified clearly for disconnection and reconnection.

2.11 Other Design Features

2.11.1 Berthing requirement of the Vessel shall match with the designated point of berth at Government Dockyard and WSD.

2.11.2 Permanent list is not allowed, and where it is not practical to achieve this requirement, the maximum permanent list of the Vessel in its lightship condition must not be greater than 0.5 degree.

2.11.3 Permanent ballasts can only be used as agreed by GNC. The Contractor shall note that it shall be under a very exceptional case that GNC would agree for the Vessel to have ballast installed.

2.11.4 The Vessel shall be free of unacceptable structural vibrations and free of excessive porpoising at all speeds so that there is no loss of directional control.

2.11.5 All lifting appliances shall be properly certified and a Registry of Lifting Appliances and Lifting Gear is to be provided in accordance with the applicable laws and regulations.

Chapter 3 Hull

3.1 Structures of the Hull and Scantlings

3.1.1 The Vessel shall be designed and built with a mono hull form. The strength of the hull structure shall be approved by the RO while fulfilling the Contract Speed specified in Paragraph 2.4.1 of this Part VII and the hull structure shall be constructed of marine grade aluminium alloy.

3.1.2 The vessel's design stresses and load (wave height versus speed), maximum acceleration considered and scantlings calculation including internal structural members shall be approved by the RO.

3.1.3 Strength shall be maintained by ensuring hull structural continuity of main members including bottom and deck girders and transverse web frames. Where the strength of a main structural member is impaired by cuts or interruptions in continuity, efficient means of compensation shall be fitted. Special care shall be given to reinforcing the hull in way of the fenders and areas likely to experience slamming.

3.1.4 The keel structure shall be arranged to accommodate Vessel's dry docking and lifting requirements in the Government Dockyard and relevant dockyard in Hong Kong.

3.1.5 All materials and build processes for aluminium alloy construction shall comply with an approved standard. Their selection shall recognise the craft through life cycle and service conditions for ease of repair in the event of hull damage.

3.1.6 Major penetrations or access openings through the transverse hull bulkheads below the main weather deck level shall be avoided as far as possible. Cable penetrations shall be located as high and as far inboard as possible. Any and all penetrations through bulkheads below the main deck shall be fitted with RO approved devices and be so arranged to ensure the bulkhead to be entirely watertight and strength maintained.

3.1.7 The hull construction material shall be of a type which has been certificated by the RO appointed in accordance with the applicable rules and regulations of the RO. The Contractor shall carry out quality control throughout the construction of the Vessel by their quality control personnel.

3.1.8 These records of the structural materials used for vessel construction and up-to-date copies shall be provided to GNC before and/or during the construction stage of the Vessel.

3.1.9 Strength shall be maintained by ensuring hull structural continuity of main members including bottom and deck girders and transverse web frames. Where the strength of a main structural member is impaired by cuts or interruptions in continuity, efficient means of compensation shall be fitted. Special care shall be given to reinforcing the hull in way of the fenders and areas likely to experience slamming.

3.1.10 Weather-tight deckhouse located above the main deck shall, in their outside boundaries, have means of closing the openings, and such means shall be of sufficient strength and be of a design to maintain weather-tight integrity in all operational conditions.

3.1.11 Close attention shall be paid to the fabrication and installation of machinery foundations to insure rigidity of the foundations and their structural continuity with adjacent structure.

3.2 Weld and Fabrication

3.2.1 All welding and fabrication shall be implemented according to the applicable requirements stipulated in Paragraphs 2.3.3 and 1.5.4 of this Part VII.

3.2.2 Welding joints shall be carefully designed and constructed to conform to the latest established standards and shipbuilding practice to prevent fatigue failures. Cutting for edge preparation shall be performed by qualified persons to achieve the correct angle, shape and smooth finish of the edges. Only qualified welders shall perform the welding work. Certification of the qualifications of each individual welder shall be submitted to MD by the Contractor. Welds installed using unqualified procedures or welding performed by non-certified welders shall be subject to removal by the Contractor at its own expense.

3.2.3 The structure fabrication and quality control regime shall include but not be limited to the following:

(a) Inventory of incoming material, consumables components and machinery;

(b) Traceability procedures for materials together with traceability identification codes which shall be serial and indexed to the controlled manufacturing procedures;

(c) Lofting, cutting, fit up, welding, forming and dimensions of structural components;

(d) Welding and inspection procedures identifying clearly the type and extent of Non Destructive Test (NDT) inspection carried out on the Vessels' structure. NDT Plan is to be approved by the RO. Normally, not less than 10% of the structure shall be subjected to Ultrasonic Test (UT) and Radioactive Test (RT);

(e) Machining, measuring and inspection equipment maintenance and calibration;

(f) Finish surfaces and bolting;

(g) Procedures for non-conformance reporting and rectification of defects; and

(h) Design and manufacturing drawing control and procedures for revisions, updates and reissue of drawings.

3.3 Stability

3.3.1 The offered Vessel shall meet the Intact Stability Criteria and other requirements specified in Paragraphs 3.3.4 and 3.3.6 of this Part VII.

3.3.2 All calculations and drawings must be in metric units.

3.3.3 A final stability assessment of the sea trial loading condition using final lightship data shall be delivered to MD prior to the Official Speed Trial mentioned in Paragraph 1.7.6 of this Part VII.

3.3.4 Intact Stability Criteria

Stability shall only be considered satisfactory for the loading conditions set out in Paragraph 3.3.6 (h) if, the following criteria are complied with either:

(a) The Intact Stability Code as specified in MSC.267(85) as amended, with compliance of the conduct of Inclining Experiment as specified in Paragraph 3.3.5 of this Part VII, and requirements of Stability Information Booklet as specified in Paragraph 3.3.6 of this Part VII; or

(b) The criteria specified in ISO 12217-1 for Category B vessels, or

(c) As per stability requirements of the RO.

3.3.5 Inclining Experiment

(a) An inclining experiment shall be carried out with the attendance of MD officer(s)/appointed consultant.

(b) At least 10 working days in advance of the inclining experiment specified at Paragraph 3.3.5 (a), the "Scheme of Inclining Experiment" (“Scheme”) shall be approved by the RO and submit to MD for reference.

(c) The Scheme shall include:

(i) the Vessels’ intended condition during the inclining experiment with intact stability results, including surplus and missing weights, and their centre of gravity;

(ii) the proposed locations and movements of inclining weights;

(iii) the calculation of estimated metacentric height, heel and trim of the Vessel before and during the inclining experiment;

(iv) the proposed number, location and lengths of pendulum used or other methods of measuring heel angles;

(v) hydrostatic table, and tank capacity tables; and

(vi) the list of data to be measured (i.e. draughts, specific gravity of floating water).

(d) The inclining experiment shall only be conducted:

(i) after the "Scheme of Inclining Experiment" has been approved by the RO surveyors and the MD officers; and

(ii) in the presence of RO surveyors and MD officer(s) and/or appointed consultant.

The lightship weight and centres of gravity shall be calculated and presented in the inclining experiment report. The GM of the Vessel after each and every shift of inclining weight shall be preliminarily determined. Free surface effects of all liquids on board shall be taken into account in all calculations.

(e) The inclining experiment report shall be produced and has obtained the RO’s approval before submitting to MD for further comments. The report shall include a statement from the Contractor stating that the Vessel is safe to go to sea for the intended tests and trials specified in the Contract.

(f) The Vessel must not carry any operational limitations with respect to its stability capability within the operational requirements stipulated in this Part VII.

3.3.6 Stability Information Booklet

(a) The Contractor shall supply to MD four (4) copies of the Stability Information Booklet. The Stability Information Booklet must be given to MD at the time of Delivery Acceptance.

(b) The Vessel shall comply with the stability criteria mentioned in this Part VII or other applicable IMO regulations (International Code on Intact Stability, 2008 - 2008 IS Code) or 12217-1 for Category B vessels, as from time to time revised or amended by any revision or amendment that applies to Hong Kong) ("latest and as amended IMO Resolution").

(c) The stability due to wind and ship rolling shall be calculated for the operational sea and weather conditions stipulated in this Part VII. These calculations shall be submitted to GNC for approval.

(d) The Stability Information Booklet and the Inclining Experiment Report shall be approved by the RO before they are submitted to GNC for the final acceptance. These documents shall only be considered as acceptable when they are accepted in writing by GNC.

(e) A Preliminary Stability Information Booklet based on the estimated centre of gravity ("CG") positions of the Vessel shall be submitted to GNC during the design stage and within four months after the kick-off meeting, to show that the Vessel can fulfil this Part VII required Vessel stability as well as any other stability requirements required by GNC to be considered, during the design and construction stage.

(f) The FINAL Stability Information Booklet and the Inclining Experiment Report shall be delivered to GNC at least 14 days before the Delivery Acceptance.

(g) **For the avoidance of doubt, in addition to the above requirements**, the Stability Information Booklet in its final version shall include (but not limited to):

(i) The Vessel's particulars, sketch of general arrangement drawing showing different compartment and tank positions, hydrostatic curves, and cross curves of stability;

(ii) Tank calibration/sounding tables include but not limited to fuel oil tank and freshwater tank. These tables shall consist of the locations of tanks (in terms of frame numbers), levels from tank bottom, capacity, VCG/LCG/TCG and free surface moments, and the location of the sounding points. The trim and heel of the Vessel for which these tables are applicable shall be stated clearly;

(iii) Stability calculations for each loading condition shall include but not be limited to a profile drawing of the Vessel and items of deadweight, lightship, displacement, drafts, trim, VCG, GM (solid & fluid), LCG, down-flooding angle and maximum static stability - GZ curves;

(iv) Any other information as reasonably required by the RO and/or GNC; and

(v) The inclining experiment report shall be approved by the RO.

(h) In the preliminary stability information booklet and in the final stability calculations, the estimated and the final (obtained after conducting an inclining experiment) lightship data shall be used respectively. Both the preliminary and final Stability Information Booklet shall include the following loading conditions (and any other conditions as may be required by MD during the construction of the Vessel) and their stability results shall be presented as per the IMO Code on Intact Stability or other applicable standard as mentioned in Paragraph 3.3.4.

Loading Conditions		Fuel oil	Payload	Persons
1	Full Load Departure Condition	100%	230 kg	975 kg (13 persons)
2	Full Load Arrival Condition	10%	230 kg	975 kg (13 persons)
3	Light Load Departure Condition	50%	30 kg	255 kg (3 crews)
4	Light Load Arrival Condition	10%	30 kg	255 kg (3 crews)

(i) The weight of each person shall be assumed to be 75 kg, and effects per crew to be 10 kg.

(ii) The weight of additional payload shall be as stipulated in Paragraph 3.3.6 (h) of this Part VII to be evenly distributed along the deck and the VCG of the additional payload shall be assumed as 500 mm above deck.

(iii) The maximum free surface moments shall be used for calculating the stability of the Vessel in all the above conditions.

(iv) The VCG of each person shall be assumed to be 300 mm above the seat when seated, and 1000 mm above the deck when standing. The seated or standing position, and LCG of each person, shall be in their most likely position on board.

(v) The vessel shall be capable of operating safely at WMO Sea State 2.

(i) The Stability Information Booklet shall be approved by the RO before submitting to MD for comments.

3.4 Painting

3.4.1 Paints shall be of a fire-retardant marine quality and applied in accordance with the manufacturer's specification.

3.4.2 Volatile Organic Compounds ("VOC") content limits of the paints shall comply with the Controls and Requirements of the VOC Regulation (VOC content limits for regulated vessel paints and regulated pleasure craft paints) of the Regulation of Hong Kong Air Pollution Control Ordinance.

3.4.3 Painting schedule shall be submitted for MD approval before commencement of work. The proposal shall contain a list and the detailed specification of the paint intended to be used. Thickness of each coating shall be specified.

3.4.4 All painting work shall carry a one-year guarantee provided by the Contractor against defects in material and workmanship. The Contractor shall provide MD at Delivery Acceptance a letter of certification from the paint manufacturer to certify the application of the paint is under the paint manufacturer's quality control and in accordance with the manufacturer's requirements including but not limited to the surface preparation, control of the temperature of the metal surfaces, atmospheric conditions, paint thickness, and method of application.

3.4.5 Hull paint which could have prolonged contact with reservoir water shall meet BS6920-1:2014 'Suitability of non-metallic products for use in contact with water intended for human consumption with regard to their effect on the quality of the water'.

3.4.6 All deck areas shall be covered with hard wearing and anti-slip epoxy paint.

3.4.7 A painting report shall be submitted to MD upon completion of work.

3.4.8 Surfaces that require painting shall be fully prepared and pre drilled prior to painting.

3.4.9 All fastening preparation and other penetrations shall be complete before painting of any surface.

3.4.10 All surfaces and any parts of the hull, deck or machinery, fittings that may cause glare or reflection must be matte powder-coated.

3.5 General Arrangement

3.5.1 The Vessel shall be designed and built as a mono-hull vessel. The hull and superstructure are constructed of all welded marine grade aluminium alloy plates and specially designed extrusions.

3.5.2 Without prejudice to the requirements set out in this Part VII (whether it be essential or specifications without label or other Offered Specifications) ("Proviso"), to the extent that the arrangement as specified in the Conceptual General Arrangement Plan do not show indication concerning compliance with the aforesaid requirements, such arrangement shall be understood to serve as a guide and to help to explain the tender requirements. Without prejudice to the generality of the Proviso as aforementioned, all components of the Vessel as specified in the Offered Specifications including in this Part VII shall be included in the as-built Vessel.

3.5.3 Walkway and headroom dimensions of the Vessel shall be as follows:

Guidance		**Dimension**
Side deck walkway width	:	Minimum 0.40 metres Obstructions to this walkway shall be avoided
Clear headroom for accommodation space	:	Minimum 2.0 metres

3.5.4 During the design and construction of the Vessel, the Contractor is required to submit a detailed General Arrangement Plan for GNC's written approval and acceptance.

3.5.5 The superstructure cabin shall provide sufficient seating and space to accommodate for total three (3) crews and six (6) persons. The other four (4) persons shall be provided suitable seating at aft deck outside the superstructure cabin. [E]

3.5.6 The superstructure shall be designed and arranged so as to protect the crews and persons from weather and sea conditions, and aims to minimise risk of injury.

3.5.7 All controls, electrical equipment, high-temperature parts and pipelines, rotating assemblies or any other items in cabins and compartments shall be properly placed not to cause injury.

3.5.8 Equipment fixtures and fittings on board shall be fitted properly to avoid injury to persons at all times during bad weather and worst sea conditions.

3.5.9 Store space shall be arranged for storing the anchor chains, mooring ropes, spare fire extinguishers and other equipment.

3.5.10 All interior decks shall be covered with fire retarding vinyl composition sheet and colour to be selected by GNC.

3.5.11 A hinged type of foldable type gangway with size of 800mm width x 1200mm length to be provided at the fore deck. The design strength of the gangway is to be affordable of having two persons each carrying the equipment and water samples (20 kg for equipment and water sample).

3.5.12 The fore deck geometry of the Vessel shall be carefully designed to facilitate safe boarding/mooring to MD's satisfaction. Adequate geometry of the bow to be designed to achieve the above said function.

3.5.13 A hinged flush type watertight hatch cover shall be provided on the main deck for access to the Fore Peak. Access ladder shall be provided.

3.5.14 The crew space within the superstructure shall be installed with four (4) 220V AC wall mounted 300mm diameter fans and grab rails shall be provided where necessary.

3.5.15 Superstructure and Steering Console shall be as follows:

(a) The outside configuration of the superstructure shall be of a design that deflect rain and seawater during heavy weather; and to provide practically all-round visibility at the steering/helm position of the console area. Pillars are not allowed to be fitted inside the accommodation area.

(b) The steering console shall be fitted at the front end of the superstructure. The layout of the console shall be submitted for MD's approval before any construction work on the consoles commences. To facilitate the efficient visualisation and inspection of the design of the console, full size mock-up consoles complete with deck plate, seats, mounting systems and any other fixtures that may influence the final design of the console shall be manufactured for inspection, modification (if necessary) and confirmation by MD and WSD. The console of an existing craft may be used as the basis for initial discussions.

(c) The console's design shall be optimised ergonomically so that a coxswain of an Asian stature (approximately 1.75 metres in height) can operate the controls and displays for extended periods from both the seated and standing positions without incurring unnecessary physical strain.

(d) The layout of the controls and displays shall be designed to ensure that the coxswain's left-to-right viewing angle from both the seated and standing positions does not exceed 190 degrees.

(e) The controls or displays of the following equipment shall be installed in the console and located in front of the coxswain in natural positions, with the highest priority devices being located in prime positions. Control shall ideally be positioned between elbow and shoulder height. Instrument panels and display screens shall be located at or below sitting eye height. All controls and displays shall be operable when wearing normal uniform with foul weather gear and lifejacket.

(i) Helm;

(ii) Engine throttle control head;

(iii) Engine monitoring display panel;

(iv) Engine start control;

(v) A magnetic compass fitted with an independent dimmer switch, installed on the top of the console in line with the coxswain's line of sight dead ahead;

(vi) Navigation lights, and flood lights switch panel;

(vii) Fuel tank level gauge;

(viii) One set of open shelves for the stowage of log books and files;

(ix) One dial type inclinometer and one thermometer for marine use;

(x) One metal rubbish bin with cover shall be stored inside a cabinet/locker;

(xi) One metal box for keys shall be provided and fitted inside the superstructure;

(xii) One wooden box with locks for the storage of binoculars, and it shall be fitted within the vicinity of the forward high seats. One waterproof and fog proof 7x50 Marine binoculars for day time use shall be provided;

(xiii) One electric powered marine wall-mounted master clock;

(xiv) Three cup holders;

(xv) One framed safety plan of appropriate size;

(xvi) Ten coat-hooks;

(xvii) A number of storage lockers; and

(xviii) One approved type first aid box.

(f) The Controls, Displays and Equipment shall be as follows:

(i) All the controls, displays and equipment shall be waterproof, shockproof and suitable for external marine use;

(ii) The surfaces of console tops and instruments shall have dark glare-free colours. Surface finishing and interior linings of the steering console shall be of a matt non-reflecting finish to facilitate night operation.

(iii) The instruments and controls shall be provided with screen and dimming facilities to minimise glare and reflections and prevent them from being obscured by strong light.

(iv) Lockers shall be provided, if space permits, to allow for the watertight storage of items of officer's equipment. The console and locker(s) shall be designed to ensure easy access for the maintenance and repair of equipment mounted, installed or stored therein;

(v) The arrangement shall be designed to protect the crew and persons on board from injury inflicted by the console and the equipment installed on them;

(vi) Sufficient legroom shall be provided to obviate the risk of impact injury during rough weather or violent manoeuvres in both the seated and standing positions; and

(vii) The design of lockers or other storage acceptable to the WSD, or void spaces and their mounting facilities, shall be subject to the prior approval by MD and WSD. Upon request, the Contractor shall change and modify the design to the satisfaction of MD and WSD. Lockers or other storage shall be ready in the mock-up for inspection before finalisation.

(g) Throughout the vessel polarized and tinted windows shall not be fitted.

(h) All windows shall be manufactured from clear toughened safety glass, secured to the structure and shall be issued with the type approval certificate by the RO and is suitable and safe for marine use. Details of the all windows shall be submitted to GNC for approval and window glass thickness shall be verified in accordance with the submitted information before installation.

(i) Retractable transparent solar UV roller blinds shall be installed on all side windows throughout the Vessel. The blinds shall be capable of being retained in position either partially lowered or fully lowered, without swinging due to vessel motions at sea.

(j) All windows of the accommodation space shall be fitted with curtain.

(k) A basic layout of the windows is shown in the Conceptual General Arrangement Plan. Details of all windows shall be submitted to GNC for approval. Weather-tight test shall be carried out after windows installation.

(l) Retractable transparent solar blind (American Standard Window Film ASWF, Sunny-Kool or equivalent) shall be installed inside of all steering console front windows. All forward facing windows of superstructure shall be inclined forward and provide visibility free of any glare under all operating condition. The superstructure front windows shall be inclined from a vertical plane topside out to reduce unwanted reflection, at an angle of not less than 10° and not more than 25°.

(m) The height of the lower edge of the steering console front windows above the main weather-deck shall be, where practical, kept as low as possible for a better view forward. Care shall be given to ensure the lower edge will not present an obstruction to the forward view.

(n) One each large RO approved sliding window shall be fitted at port and starboard side to facilitate direct downward viewing to the side of the Vessel.

(o) Frames at the superstructure window separations shall be kept to a minimum, and they shall be of adequate structural strength and stiffness. They shall not be installed immediately in front of any navigation seats. The positions of window frames shall be agreed by GNC before installation.

(p) Heavy-duty marine type wide span and large area electric wiper(s) (covering not less than 60% of the window glass plane area) with fresh water window washing systems shall be fitted to all steering console front windows.

(q) Wipers shall have an interval operation and adjustment functions and be fitted with electrical fresh water window/wiper washing systems. These wipers shall be capable of operating independently of each other. The type and make of wiper must be submitted to GNC for acceptance before they are fitted.

(r) Two sets of spare wiper blades shall be provided for each window wiper installed for the Vessel. One spare unit of wiper for the coxswain front window shall also be provided.

3.5.16 Awning and open deck area of the Vessel shall be as follows:

(a) A removable awning structure with endurable canvas or equivalent material to cover the whole part of engine room and stern area to be provided at the aft of the superstructure. The contractor is required to submit the canvas or equivalent sample material and the colours sample of the material to GNC for approval prior to installation.

(b) A removable awning to be provided for the solar panel when the vessel is not in used. The choice of the material used for this awning will be same as said in Paragraph 3.5.16(a) of this Part VII.

(c) Arrangements shall provide sufficient air to the engines and shall give adequate protection against damage, as distinct from deterioration, due to ingress of foreign debris.

(d) The bow & aft deck area geometry of the vessel shall be carefully designed to facilitate safe mooring to GNC's satisfaction.

(e) Walk around deck which provides easy access to fore deck or aft deck.

(f) Components including but not limited to air vents and pipes are preferably recessed into the deckhouse side.

(g) All exterior deck areas shall be covered by an appropriate anti-slip surface for boarding / landing and deck covering requirements. The anti-slip paint shall not be made of a mix of paint and added grit material ("sand") and shall be to GNC's satisfaction.

(h) Hand rails shall be provided where necessary. Grab rails shall be positioned internally and externally throughout the Vessel to MD satisfaction. Hand rails and grab rails shall be made of high quality marine grade aluminium extrusions.

A davit boom with electric winch capable of lifting 10 kg to be installed at the starboard side aft of the stern area.

3.6 Hatches, Doors, Ladders and Access

3.6.1 Design of all outfitting including, but not limited to, doors, hatches, ladders, ventilation heads, etc. shall be of a type approved by the RO for this type of vessel, or other entities acceptable to MD.

3.6.2 Detailed specifications of these items shall be provided. They shall include the structural arrangement, scantlings, material and welding procedures. These shall be in accordance with the RO Requirements.

3.6.3 The design and the arrangement of the flushed type watertight manhole shall be submitted to GNC for approval.

3.6.4 Where the hatches are used for escape purpose, it shall be capable of operating from both sides.

3.6.5 Hatches for access to the watertight compartments below the main deck level shall be type approved by the RO. Watertight and weather-tight deck hatches shall be of hinged type as far as practical.

3.6.6 All hatches shall be fitted with a hold back device.

3.6.7 Doors shall be fitted with manual means of locking; and shall be able to be quick opened from both inside and outside of compartment.

3.6.8 Door to aft deck shall be RO approved outwardly opening weather-tight type.

3.6.9 All doors shall be fitted with hooks or other means to hold them in the fully open position if required.

3.6.10 All exterior doors shall be fitted with high quality commercial-grade marine lever-type locksets. Three sets of keys shall be provided. All keys shall be tagged for identification and all locks shall all be keyed alike.

3.6.11 If stairway fitted, slopes shall be acceptable to MD and shall be fitted with handrails on each side.

3.6.12 Vertical ladders, if provided, shall be constructed with non-slip purpose with suitable step space intervals including but not limited to adequate footsteps and handholds for safe access to the compartments and locations of equipment.

3.6.13 All stair/ladder shall be constructed with non-slip steps.

3.6.14 The engine room and all underdeck compartments shall be provided with two widely separated means of access/escape of minimum 400 mm x 600mm.

3.6.15 Engine removal hatch to be provided for electric generating set.

3.6.16 A pilot ladder with four steps to be provided for operation purpose.

3.7 Seating, Furniture and Fittings

3.7.1 One upholstery heavy duty pedestal seat shall be provided at aft of the centre of steering console. Requirements of the seats as follows:

(a) The seat shall have high density foam cushions;

(b) Seats shall be of a hydraulically damped, shock reducing type;

(c) Lumbar support;

(d) Adjustable height and direction (Turntable/Mounting pedestal 0°- 180°) with foot rest; and

(e) Safety belt to be provided.

3.7.2 One high-density black colour leather settees accommodate for four (4) persons shall be provided at each side of the cabin inside the superstructure. Additional seating to be fitted for other four (4) persons at the aft deck area.

3.7.3 Suitable handrails and grips, coated with appropriate anti-slip material, shall be provided in the superstructure.

3.7.4 The designs of the fixtures, fittings and finishing specified shall be discussed during the kick-off meeting and drawings shall be submitted to GNC and WSD within one month from the date of the kick-off meeting for approval.

3.7.5 Built-in furniture shall be adequately secured against vessel impacts in case of ship collision or in bad weather conditions.

3.7.6 All seats shall be strongly secured against 45 degrees inclination in all directions when all seats are occupied by sitting persons.

3.7.7 All tables and seats shall be lightweight, tough and robust.

3.7.8 Upholstery such as seat cushions back rests and settees shall be fire self-extinguishing, e.g. urethane foam to BS 3379 or equivalent, and be of thickness not less than 100mm and be covered with imitation leather.

3.7.9 Lockers if fitted shall be provided with built-in locks and keys. They shall be designed and fitted to the satisfaction of GNC officers.

3.7.10 All hardware including screws, hooks, hasps, hinges, handles, sliding bolts, etc. shall be made of brass with chrome plated finish, or in stainless steel.

3.7.11 All fittings and hardware fitted on board the Vessel such as coat hooks, ceiling lights, bulkhead mounted lights, etc. shall be of a high quality chrome finish. They shall be properly fitted in accommodation space and any other spaces directed by GNC officers.

3.7.12 Colour and decoration schemes (or a furnishing sample board showing materials and colour to be used) for furniture and fittings shall be submitted to MD for approval before installation/fitting.

3.7.13 All furniture shall be fitted as to allow easy removal of the under-deck machineries and tanks if required.

3.8 Fender System

3.8.1 Fixed heavy duty rubber/foam fender shall be fitted to cover the full length of the port and the starboard sides for hull protection purposes.

3.8.2 The fender shall be detachable but tightly affixed to the hull. The method of attachment may be by recessed belts, a track system, bolting or other non-adhesive mechanical means agreed by the Government Representative. The design shall ensure that the fender cannot become detached or slide aft as a result of wave action or other unintended external influences.

3.8.3 The fender shall be high resistant to impact, abrasion, outdoor temperature extremes, degradation caused by ultraviolet radiation, ozone and contact with seawater, oil, petrol, diesel, lubricating oil or chemicals.

3.9 Insulation and Lining

3.9.1 Insulation of the Vessel shall be as follows:

(a) Boundaries and ceilings inside the superstructure shall be properly insulated against weather heat and temperature, with not less than 50 mm thick glass-fibre wool; and be lined with protective/decorative panel linings of hard wearing surface and water sealing.

(b) Boundary of machinery space shall be effectively fire and sound insulated with asbestos-free materials of adequate thickness, pinned and wire-mesh secured, and lined with incombustible sheathing in accordance with the RO Requirements.

(c) The noise level in the superstructure shall not exceed **80** dB when the Vessel is operating at all speeds. The Contractor shall make all reasonable efforts to minimise noise and vibration in the Vessel.

3.9.2 Lining of the Vessel shall be as follows:

(a) Panels of wall, ceiling panels and their joint materials shall be readily removable. The joining method shall provide long-lasting firm and strong attachments between the adjoining members and parts against excessive vibration, and withstand temperature changes and wear and tear within the life expectancy of the Vessel.

(b) The panels shall be fitted to avoid noise generation due to its own vibration or in resonance response to the overall vibratory mode of the Vessel. This requirement applies to all operational speeds of the Vessel.

(c) Colour of the lining material shall also be agreed by GNC.

(d) The deck or floor of accommodation space shall be covered with non-skid, wear resistance and fire retardant vinyl PVC sheets that are acceptable to GNC officers. Colour of the floor covering shall be agreed by GNC.

3.10 Anchor, Chains and Strong Points

3.10.1 The Vessel shall be equipped with one hot dip galvanised or stainless steel anchor and suitable swivel, shackles and secured stowage shall be provided by the Contractor.

3.10.2 Two 30 m long 20 mm diameter braided nylon warps for mooring shall be provided by the Contractor in a suitable stowage. Anchoring equipment to be provided in accordance to RO requirements.

3.10.3 The strong points shall be designed and installed with sufficient safety factor to prevent material yield of the strong points or surrounding structures to which they are attached in a welded condition. Calculation of the horizontal load shall be in accordance with the requirements of ISO 15084 or other equivalent international standards. The following strong points shall be provided with:

(a) Anchoring/towing point forward (port and starboard);

(b) Towing points fore and aft capable of withstanding the forces involved when towing or being towed by a sister vessel or other craft of similar size. The forward towing point shall be located as agreed with WSD. Details of the design shall be discussed at the kick-off meeting and submitted to the MD for approval before the completion date stipulated in Annex 2 to this TS;

(c) Mooring point aft (port and starboard); and

(d) Lifting strong points for a four-point lift.

3.10.4 Devices for lifting the Vessel

(a) The Vessel shall be provided with following lifting device for docking, storage, inspection and maintenance purposes, designed for use with fixed jib cranes, telescopic cranes and truck mounted cranes:

(i) 4-Points Lifting Device

The Vessel shall be designed with strong point lifting attachments permanently fitted to the hull. Lifting slings shall also be provided. Any attachments of the lifting slings shall be constructed with stainless steel.

(b) The lifting points and locations shall be designed and installed with sufficient safety factor to prevent material yield of the strong point or surrounding structure in a welded condition. Detailed drawings of the lifting arrangements shall be approved by the RO or other entities acceptable by GNC.

3.10.5 All the lifting devices/accessories shall be designed to withstand at least six times the mass of the Vessel with all the equipment. All devices and accessories shall be in accordance with the laws of Hong Kong prior to delivery. The 4-point lifting designs shall be discussed at the kick off meeting and agreed by MD and the WSD. To avoid the need for costly and unnecessary alteration or modification of existing equipment, the Contractor shall, prior to any construction, submit detailed drawings of both methods so that the WSD can check dimensional compatibility with its existing lifting facilities.

3.11 Mast and Lightning Protection

3.11.1 The mast shall be constructed such that no vibration is experienced in any operating condition. The mast design shall be of appropriate size/strength to suit its purpose.

3.11.2 The mast is so designed to be fold-up type or detachable and could accommodate all the navigation lights and lights indicating types of operation.

3.11.3 The Vessel shall be fitted with a proven lightning protection system as per relevant appropriate requirements to protect the Vessel, persons on board and the electronic equipment installed.

3.11.4 Method and working principle of lightning protection shall be submitted to GNC for approval before the installation.

Chapter 4 Machinery

4.1 General Requirements

4.1.1 The Tenderer shall note that the Vessel is for use in Hong Kong and the main engine, electric generating set and any other machinery offered by the Tenderer are those at present commonly used by ships operating in Hong Kong Waters, and that they have good support for spare parts and after sale services locally in Hong Kong.

4.1.2 The supports of local agents should include supplying brand new proposed main engine, electric generating set and other machineries for five years after vessel delivery. [D]

4.1.3 The Vessel shall be equipped and fitted with all machineries described in this Chapter each complying with the specifications set out in this Chapter for such machinery. The spare parts to be provided shall be of the same model as supplied for the Vessel and shall equally comply with all specifications set out in this Chapter.

4.1.4 The engine room shall be an unmanned machinery space (UMS), designed for unmanned operation. Under normal operation, all controls are directed from the steering console shall be fitted with a full set of monitoring instrumentation and alarm indications. However, essential local manual controls shall also be provided for the main engine and steering system for emergency operation.

4.1.5 Two accesses with reasonable separation shall be provided for the engine room. The design of the engine room layout shall be approved by the RO and agreed by GNC. The machinery, associated piping systems and fittings relating to the main engine and electric generating set shall be of a design and construction adequate for the service for which they are intended and shall be so installed and protected as to reduce to a minimum any danger to persons on board, due regard being paid to moving parts, hot surfaces and other hazards. The design shall have regard to materials used in construction, the purpose for which the equipment is intended, the working conditions to which it will be subjected and the environmental conditions on board. Cushion/protection on the overhead cable trunk for preventing head injury of crew shall be provided.

4.1.6 Easy access and ample headroom around all machinery shall be provided for local operation, routine checking and ‘in-situ’ maintenance. Well-planned removal routes shall be provided for the major items such as the main engines, and the generating set, etc.

4.1.7 Sufficient space and headroom in the vicinity of the machinery for local operation, inspection and routine maintenance for all the machinery shall be provided. Procedures and sequences for complete removal of the major items such as the main engine, electric generating set, fuel oil tank etc. shall be carefully designed to enable their removal from ships for maintenance in a practicable manner so to avoid the need for the deck or shell plate to be cut.

4.1.8 All parts of machinery, hydraulic, control and other systems and their associated fittings which are under internal pressure shall be subjected to appropriate tests including a pressure test before being put into service for the first time.

4.1.9 Provision shall be made to facilitate cleaning, inspection and maintenance of main engine, electric generating set, fire pump etc. and their associated piping and equipment.

4.1.10 Lifting brackets for moving heavy equipment shall be mounted underneath the deck head of the engine room, the engine room entrance and other appropriate locations. The lifting capacity shall be marked on every of these lifting brackets after a load test to the RO Requirements. All lifting appliances shall be properly certified and a Registry of Lifting Appliances and Lifting Gear is to be provided in accordance with the applicable regulations.

4.1.11 All emergency stops shall be fitted with protective guards to prevent inadvertent use.

4.1.12 The machinery installation shall be suitable for operation as in an unmanned machinery space. The monitoring and control, including automatic fire detection system, bilge alarm system, remote machinery instrumentation and alarm system shall be centralised in the steering console.

4.2 Main Engine

4.2.1 The Vessel shall be powered by one (1) main engine of marine four-stroke outboard diesel engine of adequate power to deliver the Contract Speed as stated in Paragraph 2.4.1 of this Part VII. The engine shall drive stainless steel fixed pitch propeller through integral gearbox. [E]

4.2.2 The engine shall be required for the Vessel with annual operation of not less than 1,000 hours. When the engine with a power output of more than 130 kW installed on the Vessel, it shall be in compliance with IMO Tier II or U.S. EPA Tier III emission requirements, and a type approval certificate to be issued by any classification society listed in the definition of "Recognised Organisations" in the Clause 1.1 of Part IV certifying the emission standard shall be provided.

4.2.3 The Contractor shall be responsible for ensuring the correct installation and setting up of the engine including the choice of propellers in accordance with the manufacturer's recommendations, so as to avoid ventilation and cavitation, unless the propellers are designed to ventilate and/or cavitate.

4.2.4 The Vessel shall be capable of navigating at lower speeds. The engine shall be coupled to the propeller through a reversible gearbox. The gearbox shall be provided with alarms for low oil level and high oil temperature.

4.2.5 The main engine located at the transom shall be easily accessible for maintenance, routine checking and troubleshooting even when underway.

4.2.6 Engine-mounted charging alternator with built-in voltage regulator shall be provided on main engine for charging their respective starting batteries.

4.2.7 Engine Performance of the Vessel shall be as follows:

(a) The Tenderer is required to submit the estimated propulsive power requirements and characteristic curves of the proposed propulsion system for the Vessel to support its claim for the achievable 10 knots Contract Speed with marine diesel engine in whichever proposed propulsion system being adopted running at 100% MCR.

(b) Manufacturer's full power shop trial certificate for a continuous running test at full load for four hours for the engine must be submitted to MD before the acceptable trials.

(c) The governor control of the engine must be capable of proper control when the engine is suddenly unloaded.

(d) The engine shall always be in a standby mode and being pre-lubricated.

4.2.8 The engine system shall include the following accessories:

(a) Electrical alternator and remote starting control;

(b) Dead-man switch or emergency cut-off;

(c) Engine protection system as required by engine manufacturer, with audio and visual warnings at the console; and

(d) The engine shall incorporate one alternator for battery charging.

4.2.9 The Tenderer shall supply the Vessel with a comprehensive vessel information and display on the displays located at the console information including but not limited to the following:

(a) Engine rpm;

(b) Engine running hours;

(c) Oil temperature and pressure;

(d) Fuel tank level gauge;

(e) Battery voltage;

(f) Course and speed;

(g) Engine faults and notification alarms; and

(h) Bilge control display panel with alarm.

4.3 Propeller

4.3.1 The propeller shall be of stainless steel with fixed pitch that is able to minimize vibration to the hull.

4.3.2 Removable propeller guard shall be provided for the Vessel but shall not be fitted during the Official Speed Trial.

4.4 Steering System

4.4.1 The steering system shall be designed and approved by the engine manufacturer and the design approved by the RO. It shall be either a power assisted hydraulic, electronically controlled hydraulic system or electronic system and be capable of operation if at least one hydraulic power unit ("HPU"), or electronic actuator malfunctions. This is to be achieved through using a closed loop hydraulic system capable of operating the engine cylinders with no power, or through the provision of individual HPUs or electronic actuators for the engine and tie bars so that if one engine HPU fails the other will still function and steer the engine. The HPU size and capacity or electrical input shall be such to fulfil the steering requirements and the number of helm revolutions from lock to lock selected as per Paragraph 4.4.12 below. Under normal running conditions, all of the HPUs or electronic actuators shall operate. However, should one or more HPU(s) or electronic actuator(s) fail, even a single HPU or electronic actuator shall be capable of continuing to provide assisted steering for the Vessel.

4.4.2 A redundant system with independent power supply shall be provided to maintain the Vessel's steering capability in the case of main power supply failure. This power supply can be provided by the emergency battery bank so long as an automatic changeover is fitted.

4.4.3 The hydraulic fluid tank (if fitted) shall be easily accessible for routine level checking.

4.4.4 Connections, fittings, oil fill openings and air bleeders shall be accessible with the engine and systems fitted and installed.

4.4.5 Components in the system shall be protected externally against corrosion. The complete hydraulic steering system shall be designed to withstand, without failure or leakage, the conditions of pressure, vibration, shock and movement expected in a Vessel operations.

4.4.6 Materials used in the hydraulic steering systems shall be resistant to deterioration caused by contamination by liquids or compounds with which the material may come in contact under normal marine service, e.g. grease, lubricating oil, hydraulic fluid, petroleum, common bilge solvents, salt and fresh water.

4.4.7 The type of hydraulic fluid used in the hydraulic steering system shall be specified by the steering system's manufacturer and shall be stated in the owner's manual. The hydraulic fluid shall be non-flammable which means its flash point shall be higher than 150 degrees Celsius.

4.4.8 Hydraulic lines shall be supported by clips, straps or other means to prevent chafing or vibration damage. The clips, straps or other devices shall be corrosion resistant and shall be designed to prevent cutting, abrading or damage to the lines and shall be compatible with hydraulic line materials.

4.4.9 A flexible section shall be installed between rigid piping and the hydraulic cylinder(s).

4.4.10 The design strength of the hydraulic steering systems shall be tested in accordance with the requirements of the RO. All the fittings (hoses and piping) shall withstand the system test pressure without leakage.

4.4.11 The steering system shall ensure the helm is having 4 to 5 turns or revolutions from lock to lock.

4.5 Engine Room and Other Machinery Spaces Ventilation

4.5.1 There shall be two sets of marine axial type A.C. ventilating fans in the engine room. One set of supply fan and one set of exhaust fan. All air inlet and outlet shall be equipped with fire dampers.

4.5.2 Arrangements shall provide sufficient air to the engine and shall give adequate protection against damage, as distinct from deterioration, due to ingress of foreign debris.

4.5.3 The air supply inlet vents shall be connected to louvers of efficient design in preventing ingress of water during extreme weather conditions. All vents shall be provided with weather-tight covers, fire dampers and coaming of adequate height.

4.5.4 The engine room compartment shall be adequately ventilated so as to ensure that when machinery therein is operating at full power in all weather conditions, an adequate air supply is maintained to the compartment for the safety of personnel and the operation of the machinery.

4.5.5 All spaces containing machinery shall be provided with forced ventilation for combustion and ventilation air to meet the requirements of the prime movers and other heat sources with a minimum 50 air changes per hour for the machinery space. The ventilation design shall be such to avoid any hot spot or "dead air" area.

4.5.6 All ventilation ducts, intakes, and outlets shall be sized to minimise pressure drops and flow noise. For design purpose, air flow rates in ducting shall be kept at 10 m/s or less. Airflow rates at vents and louvres shall be as low as required to avoid flow noise (Typically 5 m/s depending on vent or louvre design).

4.5.7 Steering gear room and tank space shall be adequately mechanically ventilated for the purpose of those compartments. The ventilation arrangements shall be adequate to ensure that the safe operation of the Vessel is not put at risk.

4.5.8 The steering gear room and tank space shall be adequately ventilated for ensuring that the safe operation of the Vessel.

4.5.9 Automatic shut-off device shall be provided according to RO Requirements.

4.5.10 Calculation for the capacity of the fans to meet the minimum air changes requirements shall be submitted to the RO for approval.

4.5.11 For guidance, the ventilation air to the compartment as stated shall:

(a) limit the temperature rise in a machinery space to 10°C above ambient temperature;

(b) as the prime movers draw combustion air from within the compartment, the total ventilation air be based on ISO 7547 "Standard for Shipbuilding - Air-conditioning and ventilation of accommodation spaces" as a minimum but shall not be less than that required for combustion plus 50%.

(c) the instrument use in measuring the minimum 50 air changes per hour for the machinery space shall be provided by the Contractor and shall have been calibrated to the satisfaction to GNC during the yard trial.

4.6 Piping System

4.6.1 Pipes connection and bending shall be as follows:

(a) Piping connections and joints shall be constructed and designed in accordance with the rules and regulations of the RO.

(b) Pipe bends shall be kept to a minimum and have sufficient radius to facilitate smoothness of flow.

4.6.2 The piping material shall be copper chrome plated or stainless steel 316L. The thickness accords with the RO Requirements.

4.6.3 All pipes for essential services shall be secured in position to prevent chafing or lateral movement. Long or heavy lengths of pipe shall be supported by bearers so that no undue load is carried by pipe connections or pumps and fittings to which they are attached.

4.6.4 Suitable provision for expansion shall be made, where necessary, in each range of pipes.

4.6.5 Where expansion pieces are fitted, arrangements shall be provided to protect against over extension and compression. The adjoining pipes shall be suitably aligned, supported, guided and anchored, where necessary, expansion pieces of the bellows type shall be protected against mechanical damage.

4.6.6 As far as practicable, pipelines, including exhaust pipes from engines, are not to be routed in the vicinity of switchboards or other electrical appliances in positions where the drip or escape of fluids or gas from joints or fittings could cause damage to the electrical installation.

4.6.7 Watertight bulkheads, decks or structural members having pipeline penetration shall be designed and compensated in accordance with RO Requirements.

4.6.8 The material of the gaskets shall be capable of resisting chemical attack of the fluid being conveyed. Galvanic corrosion shall be avoided if different materials used in the system.

4.6.9 Machinery and piping designation and marking shall be as follows:

(a) All piping and equipment shall be labelled and colour-coded. And each pipe running through each compartment shall be colour coded, labelled, and have the direction of flow marked in at least two places.

(b) Colour coding of machinery and piping shall be in accordance with the following:

Fire main	Red
Sea Water	Dark green
Fuel Oil	Dark brown
Lube Oil	Striped black/yellow
Fresh Water	Blue
Hydraulic Oil	Orange

4.7 Fuel Oil System

4.7.1 The fuel oil for one (1) main engine and separately for the electric generating set shall be supplied from one fuel oil tank. Endurance for fuel capacity shall be as stated in paragraph 2.8.2 of this Part VII.

4.7.2 Quick closing valves (control from above the main deck) shall be fitted to the fuel oil tank outlets.

4.7.3 Boost pumps shall be arranged to lift fuel to the engines through coalescing filters.

4.7.4 Fuel filters shall be mounted near the fuel tank on the suction side of the fuel pump. The system design and filtration systems shall be approved by the engine and generator system manufacturer.

4.7.5 The tank shall be hydrostatically tested as required by an approved standard and connections shall be proven tight.

4.7.6 An electric motor-driven pump shall be provided for transferring the fuel.

4.7.7 The Contractor shall provide the initial fills of fuel oil, lube oil, coolant, and hydraulic fluids using fluids and additives prescribed by engine manufacturer. The Contractor shall provide a summary listing of all fluids and quantities used.

4.7.8 All materials used in fuel systems shall be resistant to deterioration by its designated fuel and to other liquids or compounds with which it may come into contact under normal operating conditions, e.g. grease, lubricating oil, bilge solvents and sea water.

4.7.9 The filling pipe shall be of metallic construction and a permanent fixture led from the deck and secured to the tank by an approved connection. A screwed cap and name plate inscribed ‘Fuel Oil’ shall be provided at the filling point. Flexible hoses are not permitted as filling pipes. A fuel oil filling gun shall be easily inserted into the fuel oil filling pipe.

4.7.10 An easily removable coarse strainer should be built into the filling line, if required. [D]

4.7.11 Two duplex filters shall be fitted in the oil fuel supply lines to the main and auxiliary engines, and the arrangements shall be such that any filter can be cleaned without interrupting the supply of filtered fuel oil to the engines.

4.7.12 Flexible pipes of approved type shall be used as short joining lengths to the engine where necessary.

4.7.13 Water separators shall be fitted to the fuel supply line, if required.

4.8 Fuel Oil Tank

4.8.1 The Vessel shall be built with independent stainless steel fuel tank(s) to service the Vessel's main engine and electric generating set, actual location to be designed and approved by the RO and accepted by GNC. Individual components of the system, and the system as a whole, shall be designed to withstand the combined conditions of pressure, vibration, shocks, corrosion and movement encountered under normal operating conditions and storage.

4.8.2 The tank(s), if more than one, shall be interconnected to permit fuel transfer between the tanks.

4.8.3 All materials used in fuel systems shall be resistant to deterioration by its designated fuel and to other liquids or compounds with which it may come into contact under normal operating conditions, e.g. grease, lubricating oil, bilge solvents and sea water. All seals such as gaskets, O-rings and joint-rings shall be of non-wicking, i.e. non-fuel absorbent material.

4.8.4 Earthing device shall be provided for fuel filling system. Grounding wires shall not be clamped between a hose and its pipe or spud.

4.8.5 Fuel filling systems shall be designed to avoid blowback of fuel through the fill fitting when filling at a rate of 30 litres/min at between 1/4 and 3/4 full of the tank capacity.

4.8.6 Quick closing valves (control from above the main deck) shall be fitted to the fuel oil tanks outlets.

4.8.7 Fuel filters shall be mounted near the fuel tank on the suction side of the fuel pump. The system design and filtration systems shall be approved by the engine manufacturer.

4.8.8 Provisions of the fuel oil tank

(a) A tank content gauge and low level alarm shall be fitted in the console. A level gauge in litres shall be provided for each tank;

(b) Rigid fuel suction pipes near the tank bottom shall be provided;

(c) An inspection hole, air vent with flame trap on deck and discharge valve with remote operated quick closing device shall be provided. Fuel tank inspection hatch shall be sized to allow proper inspection of the entire tank interior. The inspection hatch shall have gasket covers secured by stainless steel bolts and self-locking nuts;

(d) Suitable provision such as drip trap shall be made for collecting the oil discharge;

(e) Baffle openings shall be designed so that they do not prevent the fuel flow across the bottom or trap vapour across the top of the tank;

(f) The tanks shall be designed and installed to prevent water from being trapped on the exterior surface;

(g) Sounding pipes with chained cap shall be provided;

(h) Tank drain shall be provided; and

(i) The compartment or space containing the fuel oil tank shall be fitted with two ventilating pipes of arrangement acceptable to GNC.

4.8.9 Structures and Design

(a) The tanks shall be hydrostatically tested as required by an approved standard and connections shall be proven tight. Before test the internal surfaces of the diesel tank shall be left unpainted and shall be cleaned thoroughly to the satisfaction of MD.

(b) If two separate fuel oil tanks built in or integrated to the hull are provided, the fuel oil tanks shall be symmetrical (one at portside and the other at starboard) to minimize the tank beam and to reduce free surface effect.

(c) Diesel tank(s) shall be at the underdeck position. The tanks shall be installed so that the loads due to the mass of the full tank are safely induced into the structure, with due consideration given to upward and downward acceleration due to the Vessel's movements at maximum speed in the sea.

(d) Except the electric wires for the fuel oil tank level sensor(s), no other shall pass through any fuel tank. Ventilation for the fuel tank shall comply with national or other acceptable industrial standards.

(e) The total capacity of the diesel oil tank(s) shall be provided. Fuel supplied shall not be less than requirement of the Vessel's operation as Paragraph 2.8.2 of this Part VII with 10% margin in litres. The unpumpable capacity of each tank shall not be more than 10% of the capacity of that tank

4.9 Fresh Water System

4.9.1 Independent stainless steel fresh water tank(s) with a total capacity of not less than 300 litres shall be arranged in the Vessel to supply fresh water to the main deck, underdeck and crew space.

4.9.2 The fresh water tank(s) shall be installed in the compartment space as designed by the Contractor according to RO requirements. The fresh water system shall be supplied by a fresh water pump to achieve a pressure at the tap located at the main deck, underdeck and crew space to GNC's satisfaction. This system acts as the portable fresh water system and a hose which freely reaches all parts of the Vessel.

4.9.3 Marine grade stainless steel 316L shall be used for fresh water tank. The fresh water tank shall be flushed clean before installation and delivery of Vessel.

4.9.4 The fresh water tank shall be designed to easily accessible for maintenance. It shall also be arranged with its own fill and vent pipes with gauze to prevent ingress of material / bugs to the tank. The freshwater tank shall be fitted with the following:

(a) Inspection / cleaning access cover;

(b) Filling / sounding pipe;

(c) Air pipe; and

(d) A tank content level gauge in litres and low level alarm shall be fitted on the steering console station.

4.9.5 The tank shall not be integral with the hull and shall be installed so that the loads due to the mass of the full tank are safely induced into the structure.

4.9.6 The thickness shall sustain the loads due to the mass of the full tank with due consideration given to upward and downward acceleration due to the Vessel's movements at maximum speed in the sea without damaging the integrity of the tank and ship's structure.

4.9.7 The freshwater tank shall not be directly adjacent to any other tanks carrying liquid of any kind.

4.9.8 The freshwater tank shall be tested without leakage by a head of water equal to the maximum to which the tank may be subject, but not less than 2.5 m above the top of the tank. The static test pressure shall be applied for 5 minutes without pressure drop.

4.9.9 A capacity indicator calibrated in litres shall be provided.

4.9.10 The impressed unit shall be provided with a starter, pressure switch, pressure gauge, relief valve and suction valve. The freshwater pump shall maintain the pressure automatically.

4.9.11 Domestic freshwater piping shall be made of copper or stainless steel 316L. Certificate of piping material shall be submitted before the delivery of the Vessel. The welding joints of the domestic fresh water piping's shall be free from lead. The domestic fresh water from the fresh water tank shall be free from any substance harmful to health and shall comply with the Government requirements for domestic water.

4.10 Bilge System

4.10.1 The Vessel shall be fitted with a bilge system to the requirements of the RO.

4.10.2 A bilge audible and visual alarm panel shall be fitted in the steering console station for all subdivision compartment spaces.

4.10.3 When the Vessel is afloat and unmanned, the bilge audible and visual alarm system shall continue to function. When the audible and visual alarm is not acknowledged after a time period such as 5 minutes (can be adjusted), the audible and visual alarm shall be extended externally to an audible and visual alarm fitted on the top of the deckhouse to bring the attention of the persons ashore or the guard of the Government Dockyard. The additional protection shall be able to be turned on and off when required.

4.10.4 A bilge water holding tank of capacity according to the requirements of RO shall be provided.

4.10.5 The bilge of the engine room and steering gear room and the compartment with fuel oil tank shall lead to a bilge water holding tank. An electric motor-driven pump fitted in each machinery room with associated piping shall be provided in pumping out bilge water ashore or to the bilge water holding tank. A suitable electric motor-driven pump

shall be provided to pump out the dirty oil ashore. A direct overboard shall be provided in case of emergency affecting the safety of the Vessel.

4.10.6 Bilge piping shall be of stainless steel 316L.

4.11 Seawater System

4.11.1 All sea valves shall be compatible with the hull material, connected to the sea chests shall be tested according to RO Requirements.

4.11.2 Sea chests provided for the main and auxiliary machineries should be installed in the vicinity of their respective seawater pump suctions but with adequate distance between each other to avoid water flow disturbance. [D]

4.11.3 Seawater piping shall be constructed of 316L stainless steel pipe. A suitable strainer with isolation valves and air vent shall be fitted to each seawater system. Due consideration shall also be given for quick and easy access to the seawater strainers.

4.12 Electrical Generating Set, Instrumentation and Controls

4.12.1 One electrically started, fresh water cooled diesel engine shall be integrated with an alternating current alternator to be installed on the Vessel (collectively, "electric generating set" or "electric generator"). This electric generating set shall be of self-excited, brush-less, ventilated type. [E]

4.12.2 The capacity of this generating set shall be able to supply all electricity necessary to ensure that normal operational conditions of propulsion and safety can be achieved.

4.12.3 Each electric generating set at its continuous service rating, shall have sufficient capacity for:

(a) Supplying all full operational electrical load of the whole Vessel including air conditioning running at full capacity plus not less than a 15% reserve margin; and

(b) Permitting the starting of the largest motor without causing any motor to stall or any other device to fail due to excessive voltage drop of the system when the electric generating set is supplying full operational electrical load including air conditioning running at full capacity of the whole Vessel.

4.12.4 Electrical load analysis and calculations shall be approved by the RO before submission to GNC.

4.12.5 The exhaust of the electric generating set shall be arranged with a water-lock/lift-silencer with a view to reducing its noise levels. This shall be configured with a hose running from the gen-set (wet outlet) and a wet hose outlet.

(a) The exhaust outlet leading to stern side on the transom shall be positioned above the waterline and be as high as practicable to prevent standing waves sealing the outlet. Exhaust pipe outlets shall be at a minimum of 300 mm vertical distance above loaded waterline and can be arranged via goose-neck type expansion bellow to the exhaust outlet fitted to shell above waterline for discharge.

(b) The exhaust system shall be designed appropriately to comply with the gen-set and exhaust manufacturers' requirements. The electric generating set exhaust system shall be arranged to provide reasonable access to engine room machinery.

(c) RO approved expansion bellow (for example the goose-neck type in both dry and wet side) shall be used.

(d) All exhaust components shall be mounted or suspended using spring-type hangers which will not transmit heat, noise or vibration to the Vessel's structure.

(e) Lagging / Noise control requirements: Flexible sound reduction wrap for exhaust piping works to be based on manufacturer / appropriate industrial standard.

4.12.6 The design and installation of the electric generating set, switchboard and the associated wiring shall follow the RO Requirements. For the avoidance of doubt the following requirements shall also be met:

(a) The electric generating set shall be provided with a type approval certificate issued by the any classification society listed in the definition of "Recognised Organisation" in Clause 1.1 of Part IV but not necessarily the RO for the Vessel specified in Schedule 9 of Part V.

(b) The rating of each diesel engine shall be capable of developing for a short period (15 minutes) a power of not less than 110% of the alternator's continuous service rating.

(c) The Vessel's main electrical supply shall be generated and distributed at 220V, 50 Hertz, single phase system. A low voltage 24V DC supply shall be provided for the relevant equipment/apparatus.

(d) The resilient-mounted electric generating set designed for marine application shall be of a proprietary make. The arrangement of the electrical and piping systems shall enable the quick dismantling and easy replacement of the unit.

4.12.7 The controls and instrumentation of the electric generating set shall be designed for one-man operation in the steering console, the instrumentation and controls in the console shall be comprehensive and shall include:

(a) Remote start and stop.

(b) Tachometer with running hour meter.

(c) Cooling water temperature gauge.

(d) Exhaust gas temperature gauge.

(e) Lubricating oil pressure gauge.

(f) Battery charger ammeter.

(g) Fault indicating lights and alarms.

(h) Protective devices such as overspeed, low lubricating oil pressure trip etc. as recommended by the engine builder.

(i) A standard manufacturer's local control panel to be fitted in the engine room.

(j) Instrumentation and alarm panel for electric generating sets; and

(k) The local control panel in engine room shall contain the following devices:

(i) Start / stop push buttons to be fitted with guard cover and running / stop indication lamp for the electric generating set; and

(ii) Volt-metre, Watt-metre for the electric generating set.

4.12.8 One (1) fire detector panel shall be installed in the vicinity of the steering console station.

4.12.9 All the instruments such as temperature sensors, pressure sensors, level gauges etc. shall have obtained type approval certificates issued by the RO or the manufacturer's certificate complying with the national standards of the place of manufacture of the relevant instrument.

4.12.10 The Contractor shall provide copies of the type approval certificates or the manufacturer's certificate to GNC on or before the Delivery Acceptance. At least two independent means of stopping the main engine and electric generating set from the steering console under any operating conditions shall be available.

4.13 Air- Conditioning System

4.13.1 A Proprietary Make split-type marine air-conditioner system including indoor and outdoor units for inside the Superstructure shall be provided. The Contractor shall propose specific equipment for approval by GNC prior to purchasing.

4.13.2 The temperature inside the deckhouse shall be maintained at 22°C for 60% relative humidity when the external ambient air temperature is 38°C at 85% relative humidity with full crew and full carrying capacity on board. An acceptance test of the complete air-conditioning system of the Vessel shall be carried out by GNC to verify the system is effective and complying to the requirements given here. The Contractor shall provide GNC a copy of this test report upon completion of the test.

4.13.3 The design of the cooling air capacity shall be evenly distributed. An individual control shall be provided in each compartment.

4.13.4 The location of air-conditioning indoor and outdoor units shall not create obstructions to the removal of any hatch covers or direct maintenance of any major machinery and equipment.

4.13.5 The way of refrigerant copper tubes between indoor unit and outdoor unit shall not create obstructions to the removal of any hatch covers or direct maintenance of any major machinery and equipment.

4.13.6 The supporter rack for each outdoor unit shall be provided. Removable covers shall be provided for protection the external unit of air-conditioner from sunlight / rain.

4.13.7 The refrigerant shall be non-Ozone depletion substances and CFC and HCFC free. The use of refrigerants under Class 2 and Class 2L (such as R717, R32 and R1234yf) shall be avoided as far as possible. If it is unavoidable to use refrigerants under Class 2 and Class 2L, the refrigerants shall fulfil the relevant restrictions as specified by the manufacturers, agents or suppliers, such as requirements on minimum room area and minimum installation. Reference shall be made to the "Guidance Note on Household Air-Conditioners Using Mildly Flammable Refrigerant" issued by EMSD.).

4.13.8 Emergency stop switches of the air conditioning system in addition to the normal power 'on' and 'off' switches shall be installed in the steering console.

4.13.9 Sufficient fresh air induced to the air-conditioned area shall be based on ISO 7547 "Standard for Shipbuilding - Air-conditioning and ventilation of accommodation spaces", all compartment; and there shall be not less than 25 m3/hour per person so as to keep the CO2 level low enough for health reasons.

4.13.10 Bacteria resistant replaceable filters shall be fitted at air inlets.

4.13.11 The air-conditioning indoor units shall be located in the compartments for its efficient operation within the cabin environment, as recommended by the air-conditioner manufacturer, with due regards to air moisture at sea environment to avoid undue condensation formation. In view of design constraints with respect to the already compact cabin space and its other installed fixtures and fittings, the exact installation position of the indoor units shall be agreed by GNC before installing the indoor units in the cabin(s).

4.13.12 Sufficient ventilation shall be provided in case of air-conditioning breakdown.

Chapter 5 Fire Safety Equipment

5.1 General Provisions

5.1.1 The Vessel shall be enclosed by fire-resisting divisions complying with the requirements of the International Code for Application of Fire Test Procedures (FTP Code), as defined in Chapter II-2 of SOLAS.

5.1.2 Fire-resisting bulkheads and decks shall be constructed to resist exposure to the fire as per RO Requirements for that specific location. The main load-carrying structures shall be arranged to distribute load such that there will be no collapse of the construction of the hull and superstructure when it is exposed to fire.

5.1.3 The hull, structural stiffeners, bulkheads, decks, superstructure and pillars shall be constructed of approved non-combustible materials as required in the FTP Code and having adequate structural properties.

5.1.4 The arrangement of pipes, ducts, electrical cables etc., penetrating into fire-resisting divisions shall be made to ensure that the fire-resisting integrity of the division is not impaired, and necessary testing shall be carried out in accordance with the FTP Code.

5.1.5 All furniture shall be constructed entirely of approved non-combustible or fire-restricting materials, except that a combustible veneer with a calorific value not exceeding 45 MJ/m2 may be used on the exposed surface of such articles.

5.1.6 All upholstered furniture, draperies, curtains, suspended textile materials shall have the qualities of resistance to the propagation of flame in accordance with the FTP Code.

5.1.7 All deck finish materials shall comply with the FTP Code.

5.1.8 All the exposed surfaces and surfaces in concealed or inaccessible spaces in corridors and stairway enclosures, and of bulkheads (including windows), wall and ceiling linings in all compartments shall be constructed of materials having low flame-spread characteristics as required in FTP Code.

5.1.9 Any thermal and acoustic insulation shall be of non-combustible or of fire-restricting 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 or fire restricting, but they shall be kept to the minimum quantity practicable and their exposed surfaces shall have low flame spread characteristics.

5.1.10 Exposed surfaces in corridors and stairway enclosures, and of bulkheads (including windows), wall and ceiling linings, in all compartments shall be constructed of materials which, when exposed to fire, are not capable of producing excessive quantities of smoke or toxic products, this being determined in accordance with the FTP Code.

5.1.11 Hose reel with attached fire hose shall be installed in engine room(s) for ready-to-use purpose with a length to cover the whole ship length.

5.1.12 The fire control plan shall be permanently exhibited for the guidance of the ship's crew at main deck, using graphical symbols in accordance with IMO Resolution A.654 (16) as amended. The text of such plan shall be in the languages of English and traditional Chinese. The fire control plan must be approved by GNC before Vessel acceptance.

5.1.13 When the Vessel is afloat and unmanned, the fire detection system and the bilge alarm system shall continue to function. When the audible and visual alarm is not acknowledged after a time period of five minutes (can be adjusted), the audible and visual alarm shall be extended externally to an audible and visual alarm fitted on the top of the deckhouse to bring the attention of the persons ashore or the guard of the Government Dockyard. The signals of fire detection system and bilge alarm system shall be sent to the shore office or supervisor automatically. This additional protection shall be able to be turned on and off when required.

5.2 Fire Detection System

5.2.1 An approved automatic fire detection system shall be provided in the Vessel at appropriate locations in accordance with RO Requirements. The fire detection system shall comply with the rules of the RO or International Standard acceptable to GNC.

5.2.2 The fire detection panel shall be installed in the deckhouse.

5.2.3 The detection system shall initiate audible and visual alarms distinct in both respects from the alarms of any other system not indicating fire, in sufficient places to ensure that the alarms are heard and observed on the control station.

5.2.4 Fire detectors shall be installed in the engine room, steering gear room, deckhouse etc. in addition to meeting the RO Requirements. Detection system using only thermal detectors shall not be permitted unless in spaces of restricted height and where their use is especially appropriate

5.3 Portable Fire Extinguishers

5.3.1 Adequate number of portable fire extinguishers shall be provided to serve all compartments in the Vessel and so positioned, as to be readily available for immediate use. The quantity and position of portable fire extinguishers shall also comply with relevant requirements as said in the Code of Practice - Safety Standards for Class II Vessels as amended version issued by Local Vessels Safety Section of Hong Kong Marine Department.

5.3.2 Fire extinguishers shall be type-approved by the RO or other international standards acceptable to GNC. Certificates shall be submitted to GNC before Delivery Acceptance.

5.3.3 Fire extinguishers shall be ready for use and located in easily visible places such that they can be reached quickly and easily at any time in the event of a fire. Portable fire extinguishers shall be properly secured in place.

5.4 Fire Pump

5.4.1 One (1) fire pump shall be provided to have sufficient capacity to pump water from the sea-chest to deck hydrant with a jet throw of at least 12 metres.

5.4.2 A semi-rotary hand pump of brass casing shall be provided on deck for fire-fighting purpose. The pump shall be able to produce a flow jet of at least 6 metres distance. The suction sea-chest of the hand pump shall be fitted outside the engine room and the suction valve shall be operated by an extended spindle on main deck. Installation shall comply with relevant requirements as said in the Code of Practice - Safety Standards for Class II Vessels as amended version issued by Local Vessels Safety Section of Hong Kong Marine Department.

5.4.3 Isolating valves shall be fitted at appropriate locations and at hydrant outlets. The hydrant shall be supplied with a complete set of fire-fighting accessories including appropriate length of fire hose made of suitable material and spray/nozzle. The hose and nozzle shall be stowed inside a fire box located in the vicinity of the hydrant.

5.4.4 A deck washing pipe line shall be branched off from a fire main line. Fire water to be provided for anchor chain flushing.

Chapter 6 Electrical System

6.1 General Requirements

6.1.1 All the electrical equipment and installation shall comply with the requirements of the RO.

6.1.2 A 24 volts electrically started, fresh water cooled diesel engine shall be installed and integrated with an alternating current alternators, which shall be of self-excited, brushless and ventilated type.

6.1.3 All electrical equipment, fittings, instruments, switches, cables, insulation, sheathing, circuit breakers, rating standards and their installations shall comply with the latest Regulations of the International Electro-technical Commission ("IEC"), Electrical Installations in Ships.

6.1.4 Protective devices such as circuit-breakers or fuses shall be provided at the source of power, e.g. the switchboard, to interrupt any overload current in the circuit conductors before heat can damage the conductor insulation, connections or wiring-system terminals.

6.1.5 Switches and controls shall be marked to indicate their use, unless the purpose of the switch is obvious and its mistaken operation will not cause a hazardous condition. Each cable shall be clearly labelled and carry its own unique identification code.

6.1.6 The Contractor shall submit a layout plan showing the exact locations of the Equipment. All Equipment shall be accessed easily and safely for inspection and maintenance.

6.1.7 All Equipment installed shall be provided with manuals for operation and maintenance.

6.1.8 The standard of installation shall enhance the Equipment's safety features of not presenting any hazards to the operator, e.g. all metal panels exposed to the operator shall be grounded properly. Warnings of any potential hazards shall be displayed in both English and Chinese, or with universally recognised labels.

6.1.9 If electrical fittings, not of aluminium, are connected to aluminium, suitable means shall be taken to prevent electrolytic corrosion.

6.2 Electricity Distribution Network

6.2.1 The main electrical AC power supply shall be provided by one electric generator.

6.2.2 The generator shall be sized based on a 15% growth margin above the predicted maximum load condition. The Vessel's electrical load calculation shall include summer and winter, static and transient, loads on AC, DC and ship service systems. The Vessel's electrical load calculation shall be approved by the RO and accepted by GNC.

6.2.3 The generator set shall maintain an output voltage within ±5% over the entire load range and frequency within ±1.5 Hz.

6.2.4 The generator starting circuit shall be 24V DC. Starting and normal shutdown controls shall be mounted on the generator along with generator oil pressure and water temperature gauges; AC voltmeter and ammeter shall be directly connected to existing wiring systems with the use of a double-pole, double-throw (DPDT) transfer switch / centre-off switch for an ammeter to read both legs (AC Volts readings).

6.2.5 The generator shall be protected against short-circuits and overloads by multipole circuit-breakers (overload protector).

6.2.6 The distribution of the electricity to the equipment shall be through circuit breakers fitted on an electrical distribution board.

6.2.7 Circuit breakers shall be provided for each circuit. Circuit breakers shall be of the proper voltage rating, manual reset type, designed for inverse time delay, instantaneous short circuit protection, and capable of repeatedly opening the circuit in which it shall be used without damage to the circuit breaker. Circuit breakers shall indicate whether they are in the open or closed position. All circuit breakers shall be labelled to identify the circuit being protected.

6.2.8 Twenty (20) percent of spare circuit breakers or three spare circuit breakers, whichever is the greater, shall be provided in each distribution panel, both AC and DC. The Vessel's ENE shall be supplied from an independent distribution panel, which shall in turn be supplied from a single breaker in the main DC panel.

6.2.9 All supply panels shall be fitted with a miniature circuit breaker of double-pole type with over-current and short circuit trips. All junction boxes shall be readily accessible. A special arrangement is required for the navigation lights supplied from this prime panel.

6.3 Main Switchboard

6.3.1 One (1) main switchboard shall be installed in engine room. Bottom incoming line, front plate maintenance.

6.3.2 Switchboards for main power supplies shall be installed such that the control elements, indicating instruments, circuit-breakers and fuses are readily accessible. The terminal side shall be accessible.

6.3.3 Under all normal conditions of operation, power is distributed from the main switchboard and the distribution system shall be designed to keep cable costs to a minimum by distributing to power panels located close to the user services and in general located in the engine room. Connections and components on panel-boards shall be in locations protected from the expected conditions in conformity with IEC 60529:

(a) IP 67 as a minimum, if exposed to short-term immersion;

(b) IP 55 as a minimum, if exposed to splashing water; and

(c) IP 22 as a minimum, if located in protected locations inside the Vessel.

6.3.4 Switchboards shall be permanently marked with the nominal system voltage.

6.3.5 A self-standing dead front marine type main switchboard of aluminium construction with adequate ventilation louvres shall be fitted in an accessible and well ventilated position and shall contain the following:

(a) Sector for single phase supply 220-240V AC (designed by contractor)

(b) Sector for 24V DC supply

6.3.6 The solar panel system

The Tenderer shall propose a solar panel system complying with all of the specifications set out in below:

(a) The solar panel system shall be fitted on the top of the deckhouse. For a maximum solar collection, it shall maximize efficient use of the deck space in a manner as practical as possible. The solar battery systems must have the ability to be charged from the solar panels;

(b) The solar panel system converts solar energy sufficiently to power shipboard AC 220V lighting and others, such as cabin lighting, fans, the portable apparatus and the domestic equipment;

(c) A multipole switch locates in steering console which can send the solar power to charge all the 24V DC batteries, this multipole switch must interlock with other battery charger; and

(d) Rigid service walkway and platforms shall be provided for maintenance.

6.3.7 Due consideration shall be given in respect of the switchboard location to avoid any risk of damage resulting from oil and water spray or other mechanical hazards. Adequate guardrail(s) and insulated mat(s) shall also be provided.

6.3.8 Megger test and other relevant tests shall be carried out and witnessed by GNC. The results for these tests shall form part of Sea Trial Report that shall be submitted to GNC before Delivery Acceptance.

6.3.9 An appropriate laminated electrical diagram shall be attached on each switchboard.

6.3.10 All switchboard instruments, controls, and all circuit breakers, both on external panels and inside the switchboard, shall be provided with labels of durable flame-retardant material bearing clear and indelible indications. The appropriate ratings of fuses, the setting of adjustable protective devices and the full load current of electric generating set shall be indicated.

6.3.11 Apart from the spare feeder breakers, the switchboard shall contain but not limited to the following:

(a) Electric Generating Set Sector with the following:
  (i) Circuit breaker of adequate capacity with over-current trip and short circuit trip;
  (ii) Interlock device to ensure only one electric generator is connected to the bus bar;
  (iii) Voltmeter, ammeter, wattmeter and frequency meter;
  (iv) Indication lights for "Power Available", "Breaker Opened" & "Breaker Closed"; and
  (v) All necessary fittings and any other protective devices.

(b) 220V AC Single Phase Sector with the following:
  (i) Meters or earth lamps to indicate the state of insulation;
  (ii) Moulded case circuit breakers with over-current and short circuit trips for the distribution of 220V AC power supply to their components including but not limited to lighting services, fans and motors; and
  (iii) Any other necessary fittings and protective devices.

(c) 24V and 12V DC Feeders Sector:

(i) Transformer / rectifier of adequate capacity for converting AC power to D.C. power. The rectifier shall be of 1-phase full wave regulated type with voltage regulation ±5% and ripple factor 4% at 100 Hz;

(ii) Magnetic automatic relay switch for activating emergency 24V D.C. supply in event of AC power failure;

(iii) Supply source indicator lamp for transformer / rectifier;

(iv) Ammeter for charging unit;

(v) Voltmeter with selector switch (charging voltage and battery voltage);

(vi) Meters or earth lamps to indicate the state of insulation;

(vii) Moulded case circuit breakers with over-current and short circuit trips for 24V DC bus and feeder circuits; and

(viii) Any other necessary fittings and protective devices.

(d) Sector for shore power supply

6.4 DC Power Source

6.4.1 Batteries for Main Engine and Electric Generating Set Starting shall be as follows:

(a) Independent bank of 24V batteries shall be provided for starting of each of the main engine and the electric generating set.

(b) The capacity of the batteries shall be sufficient to provide at least six consecutive starts of the main engine, and at least three consecutive starts of the electric generating set from cold, without recharging.

(c) Electrical connections shall be arranged so that the batteries can be used to start either main engine or generator engine by operating a manual change-over switch in the engine room.

(d) The batteries shall be charged by engine driven alternator with backup service provided by an automatic battery charger. Interlock or protective devices shall be provided to prevent simultaneous charging from the charger and the alternator. The battery charger shall also be prevented from charging the batteries during main engine starting.

(e) Batteries shall be of maintenance-free type as follows:

(i) There will be three sets of 24V batteries charged directly from engine driven alternators, electric generating set. There shall be one battery set allocated to each engine.

(ii) Power supply batteries shall be portable, maintenance free, heavy duty, deep cycle and produced from environmentally friendly materials. They shall have a minimum life expectancy of five years, or 200 full discharge cycles at full load, rated in accordance with cognizant regulatory body requirements.

(f) Each engine driven alternator shall have its own built-in voltage regulators, automatic cut-off, and any other required protective devices.

(g) The batteries shall be located as close as practicable to the engines in order to minimise the voltage drop. The battery bank shall be housed in a separate GRP or GRP lined storage box. Each box shall be provided with a removable cover with locking clips for ease of maintenance.

6.4.2 Batteries for Routine and Emergency Supply shall be as follows:

(a) 24V battery shall be provided for routine and emergency supply, all emergency equipment shall operate from a dedicated 24V DC power supply.

(b) In event of main electrical AC power failure, 24V DC batteries shall act as an emergency supply for all communication equipment, navigation and emergency lighting, fire detection and control system, and other vital instrumentation and control systems for the Vessel to return to base.

(c) This emergency supply shall come into operation automatically in the event of main electrical power supply failure. The capacities of these sets of batteries shall be sufficient to maintain the emergency supply for a period according to the RO Requirements.

(d) The batteries shall be installed in a separate compartment located outside of the engine room above main deck. The compartment shall be well ventilated and prevent ingress of water.

6.4.3 Independent batteries for electronic equipment shall be as follows:

(a) Battery shall be provided solely for the echo sounder, DGPS and electronic chart.

(b) The battery bank shall be housed in a separate GRP or GRP lined storage box, that the box shall be located outside of the engine room above deck. The box shall be well ventilated and prevent stagnant of water.

(c) Provided an independent batteries charger for it in the steering console.

6.4.4 12/24V DC services shall be supplied from the switchboard in the steering console through a 2-wire insulated system to the following items:

(a) Navigation light control panel and navigation lights;

(b) Emergency lighting;

(c) Fire detecting system;

(d) Compass light;

(e) Instrument panel in control console;

(f) One hand-held searchlight and two fixed floodlights (for fore deck & aft deck);

(g) Unmanned duty alarm system; and

(h) Any other navigational and electronic equipment (if applicable).

6.4.5 The batteries as required in Paragraphs 6.4.1 and 6.4.2 of this Part VII shall be subjected to continuous trickle charge under normal operation of the Vessel by an automatic battery charger. Under the battery fully discharged condition, the charger shall be able to perform a quick charge function.

6.4.6 Apart from the charger, a provision shall also be made to allow the batteries to be charged by an engine driven alternator. The battery chargers shall provide automatic control between float and boost charges. Each charger shall also be provided with a voltmeter, voltage regulator, selector switch, blocking rectifier, and the required devices for protecting the chargers against short circuit, reverse connection, excessive temperature and overloading. The capacity of each battery charger shall be sufficient for charging one set of completely discharged starting batteries to fully charged condition within 10 hours.

6.4.7 Battery charger installations shall meet all cognizant regulatory body requirements including:

(a) One (1) set of charging and discharging board with one charger for Routine and Emergency battery, located in engine room. Charging method shall be float-charging type and boosting charge type with manual voltage adjuster.

(b) The charger is equipped with rectifying device. When the main power supply is normal, the rectifying device provides DC 24V power. When the main power failure, it automatically switches to battery for power supply. The character of battery charger shall be: Input (AC)220V, 2Ph, 50Hz. Output(DC) Maximum Voltage: about 28V.

(c) The chargers shall be sized such that a completely discharged battery bank can be recharged to 80% capacity within 8 hours (100% at 10 hours). At the end of the charge, the charge shall be tapered to a trickle value.

(d) The chargers shall be fitted with a pilot lamp, a charging adjustment, a voltmeter and an ammeter indicating charging current.

(e) Discharge protection shall be provided to prevent a failed charger component from discharging the battery bank.

(f) Battery charging facilities will be available via the main propulsion engines and the 220V AC generator. Battery chargers shall not be mounted directly over batteries.

(g) Battery selector/isolator switches shall be provided between battery chargers and the battery banks they serve.

(h) Provisions shall be made to allow either main engine to be started by the other engine's starting batteries.

(i) The charger has protection against overcharge.

6.4.8 An instruction plate with a schematic wiring diagram illustrating the operating procedures and precautions for the selection of battery banks and charging of batteries shall be provided in the vicinity of the charger, battery selection switchboard and charging distribution board. All charging control shall be conducted in the steering console.

6.4.9 Batteries shall be permanently installed in a dry, ventilated location above the anticipated bilge-water level :

(a) Battery rooms, boxes and lockers shall be ventilated to prevent the accumulation of flammable gases. Natural ventilation shall be employed if the required number of air changes is small and the duct shall be run directly from the top of the battery room, box or locker to the open air above, with no part of the duct more than 45° from the vertical.

For natural ventilation of the battery room, the cross-sectional area A of the inlet shall be equal to that of the outlet, not less than:

(i) for vented type batteries

$$A = \frac{50 \times U_n \times Q \times n}{1000} \text{ cm}^2$$

(ii) for valve-regulated sealed batteries

$$A = \frac{20 \times U_n \times Q \times n}{1000} \text{ cm}^2$$

where: Un — nominal voltage of the battery, in V;
Q — battery capacity, in Ah;
n — number of cells in series.

The quantity Q of air expelled from the rooms, boxes or lockers containing vented type batteries shall not be less than:

$Q=0.11In$ m³/h

where: I — the maximum charging current during the development of gas, but not less than 25% of the maximum charging current output by the charging device, in A;

n — number of battery cells.

The quantity of air expelled from the rooms, boxes or lockers containing valve-regulated sealed batteries may be reduced to 25% of that required in $Q=0.11In$ m³/h

(b) Batteries shall be located in areas so as to avoid heat soak. Emergency batteries shall be located in the area outside the engine room such as steering console.

(c) All battery storage boxes shall be provided with removable covers and locking clips for ease of maintenance.

(d) Drainage shall also be provided to avoid accumulation of moisture.

6.4.10 Batteries shall not be installed directly above or below a fuel tank or fuel filter.

6.4.11 Any metallic component of the fuel system within 300 mm above the battery top, as installed, shall be electrically insulated.

6.4.12 Battery cable terminals shall not depend on spring tension for mechanical connection to them.

6.4.13 A battery-disconnect switch shall be installed in the positive conductor from the battery, or group of batteries, connected to the supply system voltage in a readily accessible location, as close as practical to the battery or group of batteries except the circuits for engine starting and navigation lighting and electronic devices with protected memory and protective devices such as bilge-pumps and alarms, if individually protected by a circuit breaker or fuse as close as practical to the battery terminal.

6.4.14 Local information plates showing the voltage, ampere-hour rating, group number and application shall be provided for each battery set.

6.5 Circuit Breakers

6.5.1 All circuit breakers shall have time delay thermal overload trip and instantaneous short circuit current trip. The overload trip shall be set at 110% of the maximum circuit load current. The cable rating shall be in excess of the circuit breaker overload tripping current.

6.5.2 Circuit breaker shall act as a protective device only and shall not use for switching purposes. An individual On/Off switch shall be installed for each electrical fitting.

6.6 Motors and Starters

6.6.1 Where a starter is situated remotely from the motor, stop and start buttons shall be provided near the motor for local operation. All electric motors of essential services shall have separate start and stop push buttons plus running indication lights (with dimmer control) inside the steering console.

6.6.2 Motors installed in the engine room and other enclosed spaces shall be of semi-enclosed drip-proof type. Motors installed in locations exposed to weather or moisture shall be of waterproof construction. Insulation of motors shall not be less than Class B standard under IEC Regulations for the Electrical and Electronic Equipment.

6.6.3 A circuit diagram shall be placed in the local control box of each electrical installation.

6.6.4 In general, starters to be of magnetic control type except that small motors (0.5 kW or less) shall be manually operated by line switch with protective fuse on each pole.

6.7 Power Receptacles/Sockets

6.7.1 Receptacles/sockets installed in locations subjected to rain, spray or splashing shall have a minimum protection of IP 55, in accordance with IEC 60529 or equivalent when not in use, e.g. protected by a cover with an effective weatherproof seal.

6.7.2 A system of 220V AC, 13A and 24V DC 5A socket outlets shall be provided in the engine room, fore and aft ends of the Vessel on the main deck.

6.7.3 Socket outlets for 220V AC (with USB charging socket 5V 2A), 24V DC or 12V D.C shall be provided in the steering console.

6.7.4 Each socket outlet shall be integrated with an 'On/Off' switch to facilitate local switching of the electrical equipment. The 220V AC socket outlets shall be supplied with 13A 3-square-pin fused plugs. The 24V DC socket outlets shall be supplied with fused plugs.

6.7.5 Sockets for different voltage systems shall be clearly labelled and with different pin sizes so that one system cannot plug into the other.

6.7.6 Power sockets on the weather deck, in the engine room and other damp locations shall be watertight and be provided with watertight covers and switches. All power plugs provided for the portable equipment intended to be used in these areas shall also be of weatherproof marine type.

6.8 Engine Condition Monitoring System

6.8.1 The Contractor shall provide an Engine Condition Monitoring System ("ECMS") showing the information and functions specified below:

(a) All the main engine alarm and running parameters;

(b) All the generator alarm and running parameters;

(c) All the Gearbox alarm and running parameters;

(d) Fire detecting system;

(e) Level alarm and indicator data;

(f) Fans (under main deck) control;

(g) Bilge alarm & pump control; and

(h) Other relate alarm signal.

When an alarm signal occurs, the audible and visual alarm must be trigger, set mute and confirm button.

6.9 Lighting

6.9.1 All lighting, including the navigation lights, shall be equipped with LED bulbs and digital switching.

6.9.2 Independently controlled dimmable walkway lights shall be supplied to cover the fore and aft decks of the Vessel.

6.9.3 Independently controlled high-powered white floodlights shall be supplied to cover the fore and aft decks.

6.9.4 The arrangements and positioning of the lighting shall be discussed at the kick-off meeting and shall be agreed by the WSD.

6.10 Navigational Equipment

6.10.1 Navigation Lights and signalling

(a) Navigation lights and signalling equipment shall comply with the requirement specified in the International Regulations for Preventing Collisions at Sea 1972 as amended.

(b) The lights shall be controlled from the control and alarm panel at the primary console. Each navigation light circuit shall be provided with a switch, protection fuse, indicating lamp and alarm.

(c) A dimmer(s) for the panel indication lights, buzzer stop and lamp test buttons shall be fitted.

(d) Navigation light circuits shall be independent of any other electrical circuits. There shall be two separate power supply systems to the distribution board.

(e) The following navigation lights shall be provided together with double-pole circuit-breaker:

(i) Port side light;

(ii) Starboard side light;

(iii) Stern light;

(iv) Masthead light; and

(v) Anchor light.

6.10.2 Type Approval Certificates for all navigation lights shall be submitted prior to Delivery Acceptance.

6.11 Lightning Protection

6.11.1 The Vessel shall be fitted with a proven lightning protection system to protect the personnel on board and the electronic equipment installed. The method and working principle of protection shall be approved by the RO or other entities acceptable by GNC before submission to MD by the completion date stipulated in Annex 3 of this Part VII for endorsement.

6.12 Searchlight and Flood Lights

6.12.1 The Contractor shall supply a high-powered hand-held white searchlight. They shall be connected to sockets on board with coiled extension cables of appropriate lengths. Sockets shall be installed on both the port and starboard sides of the console. Facilities for storing the hand-held searchlights shall be provided. The type of searchlight, the length of the extension cables, the positioning of the sockets and the stowage shall be discussed at the kick-off meeting and shall be agreed by the WSD.

6.12.2 The flood lights shall be installed in the Vessel and each flood light shall be fitted at bow and aft deck area.

Chapter 7 Life-Saving Appliance Arrangements

7.1 General Provisions

7.1.1 Life-saving appliances and arrangements shall be provided as per Merchant Shipping (Local Vessels) (Safety and Survey) Regulation (Cap. 548G) and the Code of Practice issued by the Government of the HKSAR regarding the Vessel of this type.

7.1.2 Life-saving appliances ("LSA") shall be provided in the Vessel at appropriate locations in accordance with the RO Requirements. All the required Life jackets shall be Inflatable Life jackets.

7.1.3 Life-saving appliances shall be of approved types conforming to the latest International Life-Saving Appliance Code (LSA Code) adopted by the Maritime Safety Committee of the Organization and approved by the RO.

7.1.4 Life jackets shall be so placed as to be readily accessible and their positions shall be clearly indicated. Donning instructions shall be posted at suitable positions in the Vessel.

7.1.5 Adequate number of lifebuoys shall be provided, relevant requirements as said in the Code of Practice - Safety Standards for Class II Vessels as amended version issued by Local Vessels Safety Section of Hong Kong Marine Department. Lifebuoys shall be marked with ship names on both sides.

7.1.6 Approved LSA Plan by RO in frame shall be posted on the wall inside deckhouse.

Chapter 8 Electronic Navigational Equipment

8.1 Description of Electronic Equipment System

8.1.1 Contractor shall be responsible for the supply, delivery, testing, installation, commissioning and a 12-month warranty from the date of the Acceptance Certificate and provision of operational and maintenance service manual and training for the following equipment/systems to be fitted on board the Vessel:

(a) Echo sounder and depth indicator;

(b) GPS/DGPS receiver and electronic chart system; and

(c) Magnetic compass.

8.1.2 The Contractor shall provide all labour, material, transportation, installation calibration, testing and commissioning, Warranty Services in Warranty Period and test equipment etc. which are necessary to complete the work required in this chapter.

8.1.3 An integrated system shall be provided, so that information and also the display monitors of different systems, such as ECS, DGPS receiver, shall be shared in order to utilise the limited space available in coxswain operation area and to provide users a better displaying interface.

8.1.4 All equipment offered shall be designed for marine applications and shall allow effective operation under most arduous condition i.e. poor weather, strong winds and heavy rains, severe vibration etc. Exposed components shall be weather-proof and adequate protection against splash and water shall be provided for all electronic equipment fitted on board.

8.1.5 All components of the Equipment exposed to the weather shall be sea water resistance. Internal components shall be fully enclosed with heavy duty seals and sufficient heat dissipation mechanism (e.g. ventilation, conduction, etc.) to protect the Equipment.

8.1.6 The Contractor shall pay attention to the compass safe distance of the Equipment when designing and constructing the Vessel.

8.1.7 All siting, installation and cabling in respect of compass, etc. shall comply with the relevant rules and regulations of Hong Kong.

8.1.8 All electronic equipment and electrical appliances shall have Hong Kong warranty and their on-site maintenance shall be locally available.

8.1.9 When the generation/use of calendars are employed for logging of reports, activation of equipment, or as any essential part of logic for the proper functioning of the system, then the calendar generation shall function without any error or manual intervention for all leap years.

8.1.10 The circuit-breaker for the electronic equipment shall equip with lockout device to allow lockout-tagout procedure, so that the breaker can be locked and tagged during the equipment maintenance.

8.1.11 Lightning protection shall be provided and installed wherever applicable. The lightning arresters for all outdoor antennas shall be installed at the antenna ends.

8.1.12 Equipment supplied shall complete with all standard and/or maker recommended accessories as required for normal operation.

8.2 Echo Sounder and Depth Indicator

8.2.1 The equipment shall consist of a transducer and display on the multi-function display, which is recessed mounted at the steering console and capable of providing readout of sea depth in feet, fathoms and meters.

8.2.2 The measuring depth shall be from 3 feet to 250 feet or equivalent in fathom or metre with at least 3 selectable ranges to indicate shallow, mid and deep ranges. The unit of measurement shall be selected at the front panel of the equipment.

8.2.3 Shallow water audible alarms shall be provided. Setting of the alarm depth shall be at the front panel of the equipment.

8.2.4 The peak to peak transmitting pulse power of the transducer shall not be less than 100 watts and the nominal operating frequency shall be around 200 kHz.

8.3 GPS/DGPS Receiver

8.3.1 The information received by the GPS/DGPS receiver shall be input to the screen of the Electronic Chart System ("ECS"). The output of the receiver shall give the vessel position in a format compatible with the NMEA 0183 format or some other NMEA format acceptable to GNC.

8.3.2 The system shall be provided with "speed logs and electronic compass interface" or "gyro and its interface" to support the "dead reckoning" mode operation, if GPS satellite signal is absent for a period greater than 10 minutes.

8.3.3 The system shall be capable of storing not less than 20 user-definable routes, each of up to 100 user-definable waypoints, each waypoint with a user-editable label/comments that consists of up to 20 alphanumeric characters.

8.3.4 On-screen annotations / labels shall be in English and desirably with Chinese.

8.3.5 Performance requirements

(a) Display shall be as follows:

Display unit:	True sunlight readable 640 x 480 pixel (or better) back-lit LCD Display
Position indication:	Latitude/Longitude; Universal Transverse Mercator
Position resolution:	4 decimal places
Others:	Readout of navigation data; 3-D panorama display

(b) GPS Receiver shall be as follows:

GPS Receiver Type:	Equipped with 8 channel parallel receiver or better
Frequency Range:	1575.42 ± 1MHz (C/A code), L1
Sensitivity:	-130 dBm or better
Dynamic Range:	25 dB or better
Warm start fix time:	Less than 30 seconds
Cold start fix time:	Less than 3 minutes

Position Accuracy: 15 m or better

Tracking Velocity: 999 kt or better

(c) Differential Beacon Receiver shall be as follows:

Frequency range: 283.5-325 kHz

Frequency Step: 500 Hz

Position Accuracy: 5 m or better

(d) Environmental Requirements shall be as follows:

Operating temperature: -15℃ to +55℃ or better

8.4 Magnetic Compass

8.4.1 The Contractor shall provide one magnetic compass of at least 70 mm in diameter.

8.4.2 The magnetic compass shall be suitable for marine use and shall include the following:

(a) Heeling angle affordable shall be at least 30 ^{o} and pitch angle affordable at least 30 ^{o};

(b) Compensator adjuster; and

(c) Mounting bracket and mounting kit.

8.5 Electronic Chart System

8.5.1 The Electronic Chart System ("ECS") shall be a multi-function display system able to show on each of its displays the water depth data provided by the echo sounder, the GPS position of the Vessel and Electronic Navigation Chart ("ENC") information. The ECS shall be compatible with ENC for reservoirs provided by WSD, and the Contractor shall set up the ECS with these ENC before commissioning the system on-site as specified at Paragraph 8.7.1(b) of this Part VII. The console shall consist of two displays of ECS.

8.5.2 General Requirements

(a) One set of ECS shall be provided with the following function:

(i) Navigational calculation;

(ii) Navigation Chart updating;

(iii) Piloting; and

(iv) Voyage monitoring.

8.5.3 Performance Requirements

(a) Navigational Features shall be as follows:

Total Waypoints: 2,000 or more

Routes: 50 route plans or more

Alarms:	Including but not limited to, proximity alert, cross-track error and arrival/anchor watch

(b) Electrical and Physical shall be as follows:

Power Source:	12 or 24V DC (external)
Display (Screen Type):	9 inch or greater diagonal high resolution colour display, resolution 800x480 WVGA or better
Waterproof Rating:	IPX6 or better

(c) Environment shall be as follows:

Operating Temperature:	-10℃ to +50℃ or better
Storage Temperature:	-20℃ to +60℃ or better

8.6 Installation Requirements

8.6.1 General

(a) The control panel of all Equipment shall be installed and flush-mounted in the coxswain operation area unless otherwise specified. The mounting screw shall be detachable from the front of the Equipment and the Equipment shall be taken out at the front for further checking or replacement. The Contractor shall submit a layout plan showing the exact locations of the Equipment.

(b) Equipment supplied shall be completed with all standard and/or maker recommended accessories as required for normal operation.

(c) The Equipment supplied shall be completed with all the auxiliary items required for normal operation including connectors, circuit breakers, power sockets, interface device, plugs and cables with conduits. Additional power conditioners, filtering devices, power stabilizer or regulator shall be provided and installed at no extra cost if required.

(d) RF connectors of suitable impedance shall be provided and used for connections of the RF cables, antennae and other equipment. Connectors between the feeder cables and antennae shall be protected by weatherproof material to avoid water seepage.

(e) All wiring shall be finished in a neat and appropriate manner approved by the Government.

(f) Adequate measures to prevent interference between the electronic equipment shall be taken which include:

(i) Separate screened conduits or trunkings shall be provided;

(ii) Rules, regulations and recommended practices regarding screening of electric wiring shall be observed;

(iii) Receiving apparatus and other electronic equipment which may be affected by radio frequency induced voltages shall be effectively earthed, screened and protected against such voltages; and

(iv) Lightning protection devices shall be fitted.

(g) All siting, installation and cabling work shall be undertaken to the highest standard to ensure:

(i) Satisfactory performance of the Equipment;

(ii) Protection from mechanical and water damages;

(iii) Ease of accessibility for maintenance and repair; and

(iv) Manufacturers' recommendations shall be strictly observed.

(h) The power, signal and control cables connecting to the flush-mounted equipment shall be long enough to let the equipment wholly place on a safe place like on the panel, table, etc. with valid cable connections for fault finding and equipment testing. These extended cables shall be properly managed and resided inside the console.

(i) Electromagnetic Compatibility ("EMC") shall be achieved through careful design and layout of the equipment and installations and the proper application of EMC measures, including but not limited to shielding. Any mutual interference between equipment/cabling shall be within an acceptable level and shall not affect the intended operation and functionalities of the equipment.

(j) Installation location shall be as follows:

(i) Installation location of the Equipment shall be easily accessible for inspection and maintenance. Exact location shall be subject to the approval of the Government.

(ii) Installation location of the Equipment shall not cause interference to other Equipment by way of the emitted interference.

(k) Material and Workmanship shall be as follows:

(i) Material and Equipment shall be of high quality, and shall comply with, where applicable, the appropriate British Standards and Code of Practice, together with any amendments made thereto, suitable for installation in the Vessel.

(ii) All the designs shall be subject to the approval of the Government and the respective works shall be carried out in a first class workman-like manner.

(iii) The Government reserves the right to reject any part of the installation not comply to this Specification. The Contractor shall carry out the necessary remedial work or replacement at its own cost and expense and without delay.

(iv) The Contractor shall provide all installation materials including cables, casing, mounting accessories and etc. which are durable and fire retarding. Where it is impracticable for signal cables for data to be run inside conduits, PVC insulated and sheathed with armoured cable shall be used.

(l) Equipment Fixing and Interconnection shall be as follows:

(i) All switches, connectors, jacks and receptacles shall be clearly, logically and permanently marked during installation. All wires and cables shall be identified at every termination and connection point with permanent type markers suitable for installation in the Vessel.

(ii) Interconnection of various items of Equipment shall be mechanically and electrically connected by multi-pin connectors or terminals.

(iii) All cables shall be joined by properly designed connectors or inside joint boxes. Where terminal blocks are used for connection cables, the tip of each conductor shall be crimped with a suitable terminal pin before it is inserted into the terminal block.

(iv) The Contractor shall be responsible for providing and installing properly rated power cables from the power points to its own equipment.

(m) Electricity shall be as follows:

(i) The power supply shall be compatible with Vessel's DC electrical system.

(ii) The Equipment shall be protected by appropriately rated fuses. The fuses shall be contained in independent fuse holders which are easily accessible.

(n) Cable shall be as follows:

(i) All exposed cables and wiring shall be sheathed or protected by metal conduits.

(ii) Watertight cable glands shall be provided by way of watertight bulkhead or deck penetration.

(iii) Signal wiring shall be separated from power supply cables and housed in separate screened conduits or cable trunks.

(iv) Cables and wirings shall run behind the compartment lining. Where electric cables are necessary to be fitted on the decorative surface of bulkheads, they shall be enclosed in proper metal conduits.

(o) Labelling and Marking shall be as follows:

(i) Each cable shall be clearly labelled and carry its own unique identification code.

(ii) Polarity of power cables shall be labelled.

8.7 Acceptance Test

8.7.1 The acceptance tests shall comprise the following:

(a) A bench acceptance test which includes functional tests and detailed measurements of the performance of the Equipment to verify that each Equipment shall comply with all the required performance specification.

(b) On-site commissioning test shall be carried out by the Contractor in the presence of the EMSD representatives after completion of the installation of each system. The overall installation standard and operational features of each system shall be evaluated. The test shall be carried out during sea and basin trial.

8.7.2 The Contractor shall submit test reports on the performance of the Equipment and deliver the test reports to the EMSD representatives prior to the installation.

8.7.3 The Contractor shall submit schedule of commissioning test of the electronic equipment installed onboard at least one month prior to the on-site commissioning test date.

8.7.4 The Contractor shall provide all the necessary test equipment and tools for carrying out the acceptance tests at no extra cost to the Government.

8.7.5 At least one month before the end of the Warranty Period, the Contractor shall arrange and perform final acceptance test in the presence of the representatives from EMSD. Should any defects be found during the final acceptance test, the Contractor shall fix the defects as soon as possible, and in any event no later than the time prescribed by the EMSD representatives. The Warranty Period shall be extended if the defects are not cleared or fixed by the Contractor.

8.7.6 For significant defects (e.g., involving the replacement of Equipment etc.) found during the final acceptance test, the Warranty Period of the Equipment shall be properly extended as determined by EMSD.

8.8 Documentation for the Proposed Equipment

8.8.1 The Contractor shall supply the following documentation:

(a) Technical and proposed equipment information including integrated system equipment schematic diagram of all these general electronic equipment, in English and sufficiently detailed to enable a technical appraisal of the Equipment in this Chapter to be made.

(b) Lists of marine electronics equipment with unit price.

8.8.2 The Contractor shall within one month after delivery of the Vessel, supply three sets of Operation Manual, Service Manual and integrated system/equipment schematic diagram in English (at least two sets of which shall be original), giving full details on:

(a) Operations and working principals;

(b) Equipment functional description;

(c) Equipment specifications;

(d) Schematic block diagrams and circuit diagrams with sufficient information and details for Equipment maintenance and repairing;

(e) Calibration procedures;

(f) Equipment (adjustment/mounting procedure) and parameter settings;

(g) Part list with part numbers and locations (the adjustment/calibration tools/kit/program shall also be included);

(h) Maintenance and troubleshooting instructions;

(i) Equipment interfacing with wiring diagram with clear signal labelling;

(j) Software operation manual for Equipment driven by application software;

(k) As fitted conduit/trunking route diagrams for the electronic equipment installed onboard for the purpose of future maintenance; and

(l) The design conduit/trunking route diagrams submitted to MD and EMSD for approval during construction stage.

8.8.3 In addition, the Contractor shall submit a list to show the unit price and the installation cost for each proposed Equipment and the accessories and recommended maintenance spares for the first year following the Warranty Period. The name of the manufacturer and model/type shall also be included in the above list for MD and EMSD's consideration/evaluation.

Chapter 9 Services Support

9.1 General Requirements

9.1.1 In determining the appropriate design for the Vessel, all of the following factors shall equally be taken into account without one outweighing another.

(a) Vessel performance (e.g. engine rating, size, etc.).

(b) Initial cost.

(c) On-going cost (e.g. maintenance cost, petrol consumption, etc.).

(d) Reliability (frequency and time to repair breakdown).

(e) Time between maintenance periods.

(f) Time to undertake scheduled maintenance (downtime).

(g) All machineries and equipment installed in the Vessel shall be serviceable in the HKSAR.

9.1.2 Maintainability - the Vessel shall be easy to maintain by ensuring that there shall be:

(a) good access to all installed items for monitoring, service and overhaul.

(b) ease access to in-situ service and maintenance in the HKSAR.

9.2 Information to be Provided Prior to and at Delivery Acceptance

9.2.1 Information shall be provided prior to Delivery Acceptance:

(a) Detailed Inventory List for the whole Vessel to be submitted to the Government for approval.

(b) The Inventory List shall cover all discrete items down to major component/unit level.

(c) Full details of each item includes:

(i) Item number.

(ii) Description.

(iii) Type/model.

(iv) Quantity.

(v) Manufacturer.

(vi) Manufacturer's reference number.

(vii) Location in Vessel.

(viii) Local agent/supplier address, telephone and fax numbers.

(d) FOUR paper copies and ONE soft copy of the Inventory List shall be provided to GNC.

9.2.2 "As Fitted" drawings and other information shall be supplied.

The Contractor shall supply the following items upon Delivery Acceptance of the Vessel:

(a) FOUR complete sets of paper print drawings of the Vessel and ONE soft copy in Compact Disk (CD-ROM).

(b) FOUR complete sets of paper print as fitted electrical schematic, cabling, wiring and single line diagrams for electrical equipment installed on board and conduit/trunk route diagram and ONE soft copy in CD-ROM as per the Vessel delivered.

(c) FOUR copies of ship equipment list for all bought-in machineries and electrical equipment. The list shall include:

(i) Description.

(ii) Type/model.

(iii) Makers part no. or equivalent.

(iv) Location.

(v) Quantity.

(vi) Supplier or agents name and contact address.

(d) FOUR copies (at least one original) of maker operation, maintenance and workshop manuals for all machineries/equipment in English.

(e) FOUR paper copies and ONE soft copy in CD-ROM as per the Vessel delivered of "Docking Plan" which shall include the profile, plan and sections shall be prepared by the Contractor.

(f) FOUR copies of On board Operator's Manual (English and Chinese) covering:

(i) Daily user check and operation procedure.

(ii) Operating detail of each system.

(iii) Emergency operation procedure.

(The precise format and detail required will have to be subject to the GNC's approval when the configuration of the Vessel and outfitting is decided.)

(g) The first draft of the On board Operator's Manual (in both English and Chinese) shall be submitted to GNC for approval one month before documentation acceptance.

(h) The documentation for all Equipment, spares and stores, special tools and test equipment shall be provided at the Delivery Acceptance of the Vessel.

9.2.3 Tools & Test Equipment for Electronics shall be as follows:

(a) All test and tool equipment for the electronics equipment of the Vessel shall be delivered directly to EMSD.

(b) All items shall be properly documented, preserved and packed.

9.2.4 Photographs

The Contractor shall at Delivery Acceptance provide the following:

(a) As-Fitted Photographs

(i) Two sets of colour prints (130 mm x 90 mm) from different aspects to give an overall picture of the various parts/areas of the Vessel; and

(ii) Each print shall be enclosed in a suitable album and labelled showing the position of the content.

(b) Official Photographs

(i) Four framed colour photographs of picture size not less than 350 mm x 270 mm and frame size not less than 510 mm x 400 mm showing the profile of the Vessel in Hong Kong Waters;

(ii) Four 200 mm x 150 mm colour photographs with specifications of Vessel particulars showing the profile of the Vessel in HKSAR Waters; and

(iii) Four 150 mm x 100 mm colour photographs showing the profile of the Vessel in Hong Kong Waters.

(c) Softcopy of Photographs

All photographs as required in the sub-paragraphs (a) and (b) above shall be taken by way of digital camera in JPEG format at a resolution of not less than 5.0 Mega pixel. The photographs shall be stored in Compact Disk (CD-ROM) and forwarded to GNC.

9.2.5 Certificates and Reports

Copies of the following documents (one original with two copies and one softcopy stored in CD-ROM), filed in clear folders, shall be forwarded to GNC at the time of Delivery Acceptance:

(a) Associated test certificates;

(b) Test performance certificates of equipment (e.g. electronics, switchboards, etc.);

(c) Main engine performance test certificates;

(d) Complete record of the trial commissioning tests;

(e) Original copy of the warranty certificates of all machineries, equipment and apparatus of the Vessel (valid for 12 months from the date of Acceptance Certificate of the Vessel);

(f) Certificates of light and sound signalling equipment;

(g) Builder certificates;

(h) Certificates of building material;

(i) Deviation card for compass (after adjustment in the HKSAR);

(j) Hull construction material issued by RO;

(k) Undertaking duly signed and sealed by the Contractor's (or its sub-contractor's) shipyard for providing Warranty Services in relation to all aspects of the Vessel during the Warranty Period in the HKSAR as stipulated in Annex 1 of this Part VII - Technical Specifications; and

(l) Any other certificates as appropriate.

9.2.6 Ship Model

(a) Tenderer is required to quote a separate price in Schedule 1 for the supply of ship model(s) (scale 1:20) for display and training purpose. The ship model(s) shall be provided upon Delivery Acceptance.

(b) The ship model shall be provided with a reasonable realistic appreciation to the viewer (who cannot see the actual vessel) about the shape, scale, construction of the Vessel and the machinery installations and fittings therein. Hence the model shall include the position and look of the major external fittings, including but not limiting to the skeg, appendages, shafts, waterjet propulsion units, rudders, mast, mast fittings and navigation lights and any other external above and under water items; and the Vessel shall be made to an overall exact scale standard relevant to model making.

Chapter 10 Training

10.1 Training on Electronic Navigational Equipment

10.1.1 General requirements

(a) The Contractor shall provide classroom-based and vessel-based training as specified in Paragraphs 10.1.2, 10.1.3 and 10.2 of this Part VII as appropriate before Delivery Acceptance of the Vessel to the MD in Hong Kong, to the operational and technical staff to familiarise officers with the operation and maintenance of the Equipment being supplied and installed. The trainer shall be able to communicate with the local trainees effectively.

(b) Coronavirus Disease-2019 ("COVID-19") was declared as a pandemic by World Health Organisation on 11 March 2020. COVID-19 pandemic shall be regarded as a pre-existing condition, and shall not be considered as a reason for not to provide the mentioned training in person by the trainers in HKSAR.

(c) All training courses shall be held in the venue to be provided by GNC in HKSAR and delivered by qualified instructors. The training shall be conducted in Cantonese and/or English with relevant training manual in both Traditional Chinese and English supplied by the Contractor to each trainee in both paper and CD-ROM format before the start of each course.

(d) Any engineering/operational systems upgrade that have been implemented during the construction of the preceding Vessel shall be supplemented to and reflected in the training notes/ operator's manual.

(e) The Contractor shall submit a detailed course syllabus and a schedule for conducting the training course for acceptance one (1) month prior to Delivery Acceptance of the Vessel to the MD and EMSD as appropriate.

(f) Training manual in both Traditional Chinese and English shall be provided and submitted to MD and EMSD as appropriate for approval at least one (1) month prior to commencement of the Training on Electronic Navigational Equipment that include Operator Training and Equipment Maintenance Training, and the Training on Operation and Maintenance of the Vessel respectively.

(g) It is anticipated that two distinct types of training shall be required, namely:

(i) Operator Training

(ii) Equipment Maintenance Training

10.1.2 Operator Training Course

(a) This course shall provide training for trainers.

(b) The course shall provide a full knowledge and appreciation of the day-to-day operation of all Equipment. This shall include hands-on demonstrations and operation of all Equipment including the necessary routine cleansing requirement.

(c) The course shall be held immediately before the commissioning of the Equipment on the Vessel.

(d) A total of up to 10 trainees will attend the course. The training course shall accommodate the specified number of trainees.

10.1.3 Equipment Maintenance Training Course

(a) The equipment maintenance training course shall enable the maintenance staff to:

(i) acquire full knowledge and appreciation of all aspects of the design considerations, day-to-day operation, inter-connected system operation, fault breakdown, routine maintenance and fault finding/repairing procedures of the Electronic Navigational Equipment ("ENE") being offered; and

(ii) effectively maintain the ENE. This shall include practical demonstrations and tests.

(b) The maintenance training shall include, but not limited to the following items:

(i) Introduction of the Equipment locations;

(ii) Equipment operational, working principle and functional descriptions;

(iii) Equipment block and schematic functional descriptions;

(iv) Equipment adjustment/calibration procedure and parameter settings;

(v) Equipment construction and mounting;

(vi) Equipment interfacing and signal interfacing; and

(vii) Preventive maintenance and trouble-shooting.

(c) The course shall enable technical staff to effectively maintain the Equipment.

(d) The course shall be held immediately after the commissioning of the Equipment on the Vessel.

(e) A total of up to 15 trainees will attend the course. The training course shall accommodate the specified number of trainees.

10.2 Training on Operation and Maintenance of the Vessel

10.2.1 In addition to the training to be provided for the ENE, the Contractor shall provide training in relation to the operation of the Vessel for the operational staff of the user department, training in relation to maintenance of engine and equipment on board for the technical staff of the user department and for the Maintenance and Support Section of Government Dockyard.

10.2.2 In order to ensure the navigational work-up team of the MD acquires full knowledge and appreciation of all aspects of the manoeuvrability, vessel handling, turning characteristics, engines, etc., the Contractor shall provide an appropriate training course for 22 officers of the MD in the HKSAR upon the Delivery Acceptance of the Vessel. An operation training programme shall be proposed for consideration by GNC which shall include details of depth and duration of the training course. The training instructors must possess suitable qualifications acceptable to MD. A certificate shall also be issued to the trainees by the training instructor or his

organisation upon completion of the training course for proof of competence and satisfactory completion of the course.

10.2.3 In order to ensure the engineering work-up team and the front-line maintenance teams of the MD and the maintenance personnel of the Government Dockyard acquire full knowledge and appreciation of all aspects of the designs, day to day operation, breakdown, routine maintenance and fault diagnosis of the engine/electrical distribution system, hull structural repair, etc., the Contractor shall therefore provide appropriate train-the-trainer courses for a total of 10 engine operators and 15 maintenance personnel from the Government Dockyard in the HKSAR or overseas at the delivery of the Vessel. A certificate shall also be issued to the trainees by the training instructor or his organisation upon completion of the training course for proof of competence and satisfactory completion of the course.

10.2.4 All facilities, venue, and materials necessary for the above-mentioned training courses and otherwise required in these Technical Specifications shall be provided by the Contractor unless otherwise specified. The training shall also be conducted in Chinese and/or English with relevant training materials to be supplied by the Contractor. The training materials shall be provided before the training, in both paper and CD-ROM format. The training video and training manuals for the major operations shall be provided onboard.

Chapter 11 Abbreviations

AC	Alternating Current
AWS	American Welding Society
BS	British Standards
CD	compact disc
CD-ROM	Compact Disc Read-Only Memory
CH	Channel
cm	centimetre
CO_2	Carbon Dioxide
dB	Decibel
dBm	Decibel-milliwatts
DC	Direct Current
DGPS	Differential Global Positioning System
ECS	Electronic Chart System
ENC	Electronic Navigational Charts
ENE	Electronic Navigational Equipment
GM	Metacentric Height
GMDSS	Global Maritime Distress Safety System
GPS	Global Positioning System
GZ	Righting Lever
Hz	Hertz
IMO	International Maritime Organization
IEC	International Electro-technical Commission
IP	Ingress Protection
IPX	Internetwork Packet Exchange
IS	Intact Stability

ISO	International Organization for Standardization
ITU-R	International Telecommunication Union – Radiocommunication Sector
K	Kilo
kg	Kilogram
kHz	Kilohertz
km	Kilometer
kW	Kilowatt
LCD	Liquid Crystal Display
LCG	Longitudinal Centre of Gravity
LED	Light-emitting Diode
LSA	Life-Saving Appliance
LSA Code	International Life-Saving Appliance Code
m/s	Metre per Second
MCR	Maximum Continuous Rating
MHz	Megahertz
mm	Millimetre
MSC	Maritime Safety Committee
Nm	Nanometre
NMEA	National Marine Electronics Association
PVC	Polyvinyl Chloride
RF	Radio Frequency
ROT	rate of turn
rpm	revolutions per minute
RT	Radioactive Test
SOLAS	Safety of Life at Sea
TCG	Transverse Centre of Gravity
TS	Technical Specifications

VCG	Vertical Centre of Gravity
VDC	Voltage of Direct Current
W	Watt
WVGA	Wide Video Graphics Array

Part VII - Annex 1 - Warranty Services and Guarantee Slipping

1. Warranty Services

1.1 The Contractor shall provide Warranty Services in relation to all aspects of the Vessel during the Warranty Period, including Guarantee Slipping as stipulated in this Annex. Both the Warranty Services and Guarantee Slipping shall be carried out locally in Hong Kong. If the Contractor appoints an authorised agent to perform the Warranty Services, the Contractor shall ensure that the authorised agent appointed will perform the Warranty Services and Guarantee Slipping in full compliance with the requirements of the Contract including those as set out in this Annex 1.

1.2 The Government reserves all rights and claims against the Contractor in the event that any warranty claim has not been handled in accordance with the terms of the Contract.

1.3 For the Equipment in respect of which the manufacturer/supplier does not offer a one-year free warranty on such equipment, the Contractor shall provide the Warranty Services throughout the Warranty Period at the Contractor's own cost. For other loose equipment and installations, such as life-saving and firefighting equipment, etc., which are required to be serviced, inspected or renewed annually, the Contractor shall provide the servicing, inspection and renewal as per the manufacturer's requirements of that equipment or installation in the Warranty Period applicable to such items.

1.4 During the Warranty Period, when the Vessel is handed over for the Warranty Services and/or Guarantee Slipping, the Contractor shall be responsible for the due return of the Vessel in good order. Should there be any loss or damage of the Vessel or any Warranty Item (as defined in Paragraph 1.5 below) caused by any reason whatsoever while the Vessel is in the possession or control of the Contractor (including even when the Vessel is at the Government Dockyard or a maintenance base of the user department) or at the shipyard of the Contractor or an authorised agent appointed by it, the Contractor shall pay for the cost for the loss or damage plus 20% as and for liquidated damages but not as a penalty. Throughout the Warranty Period, notwithstanding anything to the contrary in the Contract, the Vessel and all Warranty Items are deemed to be at the Contractor's risks, and the Contractor shall insure and keep insured, at his own expense, a property insurance with the Government to be named as the sole payee, for an indemnity amount of not less than the purchase price of the Vessel plus 20% to protect the Government property against all risks. The Certificate of Insurance and evidence showing that the premium has been paid shall be available for inspection in advance. The Contractor shall provide this insurance policy before the commencement of the Warranty Services and/or Guarantee Slipping. Any excess payable under the insurance policy shall be borne by the Contractor.

1.5 Total Vessel Warranty

It is required that the Vessel is covered by free of charge Warranty Services for one year after the date of the issue of the Acceptance Certificate in respect of the Vessel. The Warranty Services shall cover the entire Vessel and all its Equipment (including all major Equipment specified in Schedules 6 and 7 in Part V and electronic navigational equipment), fittings and outfit (including spare parts, and documentation) (collectively, "Warranty Items") against defects of design, construction, workmanship or materials and against any non-compliance with any of the Product Warranties. The Warranty Services may be backed up by the Contractor using individual equipment suppliers/manufacturers' warranties but the Contractor shall remain solely liable to MD as a primary obligor to provide the Warranty Services. Notwithstanding and without prejudice to the Contract on warranty obligations for the total Vessel, any individual equipment supplier/manufacturer's warranty extending beyond the one year total Vessel warranty must be assigned to the Government as appropriate.

In order not to violate the warranty of main propulsion engine(s), gearbox(es) and diesel generator(s), the Contractor shall also provide the corresponding periodic maintenance services based on the manufacturer(s)' recommendation within the Warranty Period at no extra cost to the Government.

1.6 Procedures for Warranty Claim

Without prejudice to the provisions of the Contract, a detailed procedure for dealing with warranty claims must be proposed by the Contractor and agreed by MD before the issuance of the Acceptance Certificate of the Vessel. This shall be based on the following principles:

1.6.1 Any notification of claimed defect shall be sent from MD to the Contractor through a defined route.

1.6.2 There shall be a joint inspection to examine the defect and the Contractor shall propose the appropriate and necessary remedial action to the satisfaction of MD.

1.6.3 The Contractor shall undertake on-site Warranty Services (including provision of all replacement Warranty Items, spare parts, labour, materials, test equipment, and transportation) wherever, at the option of the Government, the Vessel is berthed in the Government Dockyard or maintenance bases of the user department. Taking the Vessel to the shipyard of the Contractor should be avoided unless absolutely necessary.

1.6.4 Rectification of defects must have a minimum effect on the operation of the Vessel by the provision of on loan equipment if the anticipated repair time exceeds the time frame as specified in Paragraph 1.7.1 below.

1.7 Throughout the Warranty Period, the Contractor shall be responsible for the provision of free of charge corrective maintenance and rectification of all defects in all and any of the Warranty Items including repair and replacement as necessary. This shall, at no cost to the Government, include Warranty Services to be performed by the Contractor described in the following sub-paragraphs:

1.7.1 To attend to the Vessel for inspection and repair within 24 hours (excluding Hong Kong public holidays) of receiving the report of a fault ("fault report") and to take immediate action to rectify the defect after inspection. Unless otherwise agreed by the Government, all corrective maintenance and rectification must be effected within 48 hours after the fault report is first issued. The MD must be informed of what corrective maintenance and rectification actions have been taken within 72 hours of receiving the relevant fault report.

1.7.2 To provide all necessary transport, replacement Equipment, spare parts, labour and materials, tools and testing instruments required for the corrective maintenance and rectification.

1.7.3 Any replacement item or part to be used shall originate from the manufacturer of the original Warranty Item to be repaired and must be able to be found in the latest spare parts list issued by such manufacturer. Alternative components shall not be used without the prior approval in writing of the MD.

If the Contractor fails to respond to any reported warranty claims within 48 hours, the MD may arrange corrective maintenance and rectification of the defect either on its own or by deploying a third party contractor as deemed appropriate with a view to minimising any downtime incurred. In such case, the Contractor shall compensate the Government for the full cost of such repairs plus 10% as and for liquidated damages but not as a penalty no later than 10 working days after a written demand has been served on the Contractor by MD.

1.8 Extension of Warranty

1.8.1 The Warranty Period for any Warranty Item shall be suspended whilst and if the Contractor fails to repair and correct satisfactorily the defects in such Warranty Item within seven working days counting from the date when the relevant fault report was first issued.

1.8.2 Warranty Items which are electronic equipment sub-assemblies, modules or components and which are replaced during the Warranty Period shall have a new warranty period of one year commencing from the date of replacement.

1.8.3 In relation to a Warranty Item, references to Warranty Period shall be construed to include such extended warranty period as mentioned in Paragraph 1.8.1 and/or 1.8.2 above, depending on whichever is applicable.

1.8.4 Equipment which is found to be defective during the trials at the Guarantee Slipping as mentioned in Paragraph 2.2.5 below shall have an extension of warranty of one year.

1.9 Recurrent Defects

During the Warranty Period, should a second and similar defect arise in relation to a Warranty Item, this shall be construed as conclusive evidence of the Warranty Item's unsuitability for the purpose intended, and the Contractor shall take immediate steps to conduct a thorough investigation jointly with MD at the Contractor's expense, to ascertain the reasons for any such defect and shall forthwith at the MD's option and the Contractor's expense, procure and deliver another replacement Warranty Item with a new design suitable for the purpose intended to replace the original defective Warranty Item.

1.10 In the event that the Contractor proposes to modify any Warranty Item or any part of the Vessel in order to repair or replace the same or another Warranty Item, the Contractor shall obtain the Government's advance written consent to the proposed modification.

1.11 Throughout the Warranty Period, the Contractor shall maintain an inventory of spare parts, which shall be the same items as listed in Schedules 6 and 7 in Part V and in the same quantity in the shipyard of the Contractor which the Contractor shall use for performing the Warranty Services. The Government will not provide its own inventory of the Spare Parts to the Contractor for the provision of the Warranty Services.

1.12 Updated/Upgraded Information

It is expected that during the Warranty Period certain Warranty Items may be modified or changed. All documentation affected by this change must be updated to reflect the new situation. All the support documentation such as the Vessel inventory list, job information and maintenance scheduling in relation to these modifications and changes shall be provided at the expiry of the Warranty Period.

1.13 Warranty of Electronic Navigational Equipment

Please refer to the Chapter 8 of the TS.

2. Guarantee Slipping

2.1 As stated in the section "Warranty" above, Guarantee Slipping shall be carried out at the end of the original Warranty Period regardless of any subsequent extension in relation to any Warranty Item under the terms of the Contract.

2.2 At the Guarantee Slipping, the Contractor shall carry out the following work and provide all necessary materials, spare parts, labour and equipment in order to carry out such work:

2.2.1 Pre-guarantee slipping inspection and trial

(a) Joint inspection with trial to confirm the list of guarantee slipping items; and

(b) Collect vessel performance information beforehand for comparing when guarantee slipping completion.

2.2.2 Engines and Gearboxes

(a) Renew the lubricating oil and replace the filters for the main engines and gearboxes and top up the engine coolant as per the manufacturer's recommendations;

(b) Clean all the engine air filters and change the filter elements;

(c) Change all fuel/water separators elements and fuel filters for all engines;

(d) Clean the coolers of the engines and gearboxes and renew all zinc anodes if provided;

(e) Check all the engines' belts and adjust or renew if necessary;

(f) Check tappet clearances for the inlet and exhaust valves, ignition timing and idle speed and adjust if necessary;

(g) Conduct function tests for the engines' protection system and their associated sensors, gauges and other measuring devices;

(h) Disconnect and remove all engines and gearboxes sea water pipes (suction & discharge) for inspection, and clear off marine growth and obstructive materials in all pipes and fittings;

(i) Repair all damages and leakages in the metal and fibreglass pipelines; and

(j) Any other work required or recommended by the engine manufacturer.

All of the work listed at Paragraphs 2.2.2(a) to (j) of Annex 1 to Part VII shall be carried out by the manufacturer's authorised agent/dealer. All the work procedures and the spare parts used shall comply with the manufacturer's specifications and requirements.

2.2.3 Hull and Deck Items (where applicable)

(a) Paint Under the Water Line

(i) Paint under the water line shall be checked by the paint manufacturer's representative for the effectiveness of one year's protection against marine growth;

(ii) The hull shall be cleaned and readily for inspection of paint damage;

(iii) Damaged paint shall be repaired according to the paint manufacturer's procedures;

(iv) After the repair of the damaged paint as specified at Paragraph 2.2.3(a)(iii) of Annex 1 to Part VII, two coats of touch up primer and one coat of touch up shall be applied; and

(v) One touch up anti-fouling paint of finishing coat shall be applied to the damaged paint as specified at Paragraph 2.2.3(a)(iii) of Annex 1 to Part VII.

(b) Paint Above the Water Line

(i) Damaged paint on the hull above the water line and deckhouse shall be repaired properly. After repair, two coats of touch up primer and one coat of touch up (finishing) shall be applied;

(ii) Two coats of paint shall be applied on the Vessel's name, draft marks and insignia; and

(iii) One full coat of anti-slip paint shall be applied to the open and side deck.

(c) Inspect and clean and polish propellers.

(d) Inspect, clean and remove obstructed object on the propeller shaft.

(e) Water jet tunnel and impeller(s) inspection and cleaning (if applicable).

(f) Free, clean, grease and recondition all moving parts of the deck fittings, i.e. WT (water tight) hatches, vent covers, rollers and fairleads and anchor chain stoppers, etc.

(g) Renew all zinc anodes on hull, rudder(s) and tail shaft(s).

(h) Life-saving appliances (LSA) and Fire-fighting appliances (FFA) must be serviced and re-certified as required. (Free, clean, grease and recondition all fire control valves, hydrants and bilge suction and control valves).

(i) Free, clean and repaint the anchor chain and swivel set.

2.2.4 Mechanical, Electrical & Air-conditioning

(a) Dismantle all overboard valves for inspection and renew the defective parts;

(b) Check and clean the sea water system (including the grating, sea chest internal, sea suction and strainers) complete with renew their zinc anodes;

(c) Each of the compartment bilge suction to be checked and free of rubbish;

(d) Generator megger test and electrical circuit earth leak test; and

(e) Batteries condition check and switch over test.

2.2.5 The following shall be tested at the dock trial / sea trials as part of the Guarantee Slipping:

(a) Engine control and steering system including emergency/alternative method;

(b) Engine alarm and shut down function (including emergency stopping of engines at wheelhouse);

(c) Hybrid System;

(d) Battery Generator;

(e) Navigational equipment, lights and sound signals;

(f) Ahead and astern running and crash stop test;

(g) Steering trial;

(h) Speed Measurement;

(i) Bilge system function (including high level bilge alarm system);

(j) Fire pump(s) function (including fire detection system, alarms, ventilation fans /fuel pump remote shutdown);

(k) The Dock Trial and Sea Trial Safety Checklist items, as listed below;

Dock Trial Check List

General items will be checked during dock trial	
1.	Engines start and stop testing
2.	Engines emergency stop check
3.	Engines speed and clutch unit testing
4.	Engines speed high and low idle speed testing
5.	Engines gauges and alarm check
6.	Propulsion system testing
7.	Anchor windlass testing
8.	Navigation lights testing
9.	Wheelhouse horn and windows screen wipers testing
10.	Fire protection system alarm check
11.	Portable fire extinguishers inspection
12.	Life-saving equipment inspection
13.	Engine room ventilation fans testing
14.	Air compressor and air conditioning system testing
15.	Cabin lights testing
16.	Bilge system in each compartment testing.
17.	Floor plate inspection
18.	Fuel tanks quick closing valves testing
19.	G.S. pumps testing
20.	Bilge pumps testing
21.	A/C cooling water pumps testing
22.	Tailshaft cooling water pumps testing
23.	Fire pumps testing
24.	Fuel oil pumps testing
25.	Sanitary pumps testing
26.	Sewage pumps testing
27.	Fresh water pumps testing
28.	Waste water pumps testing

29.	Steering system power assisted and manual operation testing
30.	Emergency rudder operation check
31.	Rudder indicator check

Sea Trial Safety Check List

General items will be checked during sea trial	
1.	Engines start and stop testing
2.	Engines emergency stop check
3.	Engines speed and clutch unit testing
4.	Wheelhouse horn and windows screen wipers testing
5.	Portable fire extinguishers are in place
6.	Life jackets and life buoys are in place
7.	Sea trial navigation flag hoisted
8.	Telecommunication system function check
9.	Approved coxswains are in control
10.	Sufficient fuel oil to perform the full course of sea trial
11.	Water tank is full

(l) Other trials or testing of equipment as required by the Government Representative; and

(m) Any item or component found defective shall be repaired or replaced.

2.3 After Guarantee Slipping, the Contractor shall submit the above works completion report (including engines trial/testing report completed with engines parameters) to the Government Representative.

Part VII - Annex 2 - Implementation Timetable

Milestones		Completion Dates
1	Issuance of "Notification of Conditional Acceptance"	To be advised after Tender Evaluation.
2	Contract Date (the date of the last party signing the Articles of Agreement)	The date when the last party signs the Articles of Agreement. The Government will not sign the Articles of Agreement until and unless the Contractor fulfils all of the conditions precedent as specified in Clause 25.2 of Part II - Conditions of Tender (save to the extent waived by the Government, if any).
3	Kick-Off Meeting	To be held within two (2) months after the Contract Date at the Government Dockyard or the Contractor's Shipyard.
4	Completion of hull and superstructure of the Vessel	The Contractor shall propose the completion dates of Milestones 4-8 for GNC's approval within two (2) months after the Contract Date.
5	Completion of installation of engine propulsion system, propellers and steering system	
6	Completion of design with GNC approval and installation of ENE Systems	
7	Launching of the Vessel	
8	Conduct of all tests, inspections and trials as part of the Technical Acceptance including the Yard Trial	
9	Shipment to Hong Kong	
10	Delivery Date	The Delivery Date for the Vessel shall be no later than the date set out in Schedule 2 (Delivery Schedule) of Part V.

Part VII - Annex 3 - Drawing Submission Timetable

Item No.	Drawings Approval	Completion Date
1	General Arrangement Plan	*All the drawings are required to be submitted in two months after Signing of Articles of Agreement for GNC's approval / reference.*
2	Lines Plan	
3	Stability Information	
4	Inclining Experiment Report	
5	Midship Section	
6	Stern Construction	
7	Frames and Bulkhead Sections	
8	Construction Profile and Deck Plan	
9	Shell Expansion Plan	
10	Bow Construction & Bow ramp Details	
11	Deckhouse Construction Plan	
12	Fuel Oil tank Construction	
13	Paint Schedule	
14	Tank Capacity Plan	
15	Main Engine & Gearbox Mounting Arrangement	
16	Power / Speed Estimation and Curve	
17	Cabin Arrangement & Details	
18	Engine Room Arrangement	
19	Shafting ~~line~~ Arrangement	
20	Propeller Drawing	
21	Steering Arrangement & Rudders & Rudder Stock	
22	Mast Structure	
23	Details of Diesel Generator Arrangement	
24	Details of ENE Equipment System	
25	Control Console Arrangement and Schematic Diagram	
26	Instrumentation and Control System	
27	Calculation of Fuel Oil Capacity	
28	Details of Main Engines /Generators Alarms & Sensors	
29	Crane Details	
30	Engine Room Piping Diagrams including sea water system, bilge system, fresh water system, black water system, HVAC	
31	Engine Room Ventilation and Exhaust & Calculation	
32	Details of the Air-Conditioning System & Calculation	
33	Ship's Ventilation Arrangement & Details	
34	Fire Detection System	

Item No.	Drawings Approval	Completion Date
35	Details of Electrical Equipment	
36	Electrical Load Calculations	
37	Schematic Layout of Electrical Circuits	
38	Lighting Arrangement	
39	Battery Arrangement & Details	
40	Navigation Light Arrangement	
41	Search Lights & Flood Lights Arrangement	
42	Lightning Protection Arrangement	
43	Details of Galvanic Corrosion Prevention	
44	Torsional Vibration Calculation	
45	Fire Fighting Arrangement	
46	Lifesaving Arrangement	
47	Tonnage Measurement Calculation	
48	Freeboard Calculation	
49	Anchoring & Mooring Arrangement	
50	Hatches & Manholes Arrangement & Details	
51	Ship's Railing Arrangement & Details	
52	Wheelhouse Windows & Visibility Diagram	
53	Windows Arrangement & Details	
54	Insulation & Lining Arrangement & Details	
55	Fender Arrangement & Details	
56	Painting Scheme	
57	Cathodic Protection Arrangement & Details	
58	Ship's Name & other Tally Plates Details	
59	Safety Plan	
60	Others as required	

Part VII – Annex 4 - Main Items Inspection Timetable

VESSEL NAME : "PUI LING "			Inspection date	Outstanding / Reinspection / Remarks
Item	Items to be inspected			
	Hull Structure, Layout and Outfitting Inspection			
H-1	Hull Lofting			
H-2	Construction materials –Aluminium plate mark checking for hull			
	a) Aluminium plate mark checking for hull			
	b) Material certification verification			
H-3	Construction materials – aluminium plate mark checking for deckhouse			
	a) Aluminium plate mark checking for deckhouse			
	b) Material certification verification			
H-4	Welding consumables and welders' certificates verification			
H-5	Keel lay inspection			
H-6	Fabrication of hull up to main deck in stages of work including			
	a) Alignment			
	b) Edge preparation			
	c) Welding			
	d) Workmanship			
	e) Compliance with approved plans			
	f) Non-destructive tests NDT (X rays) of welds			
	g) Hull internal work inspection			
	h) Plating thickness gauging			
H-7	Engine girder fabrication and welding			
H-8	Deckhouse scantling and welding check			
H-9	Inspection and weld check of connection between deckhouse and main deck			
H-10	Welding construction and pressure test of tanks			
	Fuel oil tank(s)			
	a) Tank construction (internal/external/fitting)			
	b) Tank pressure test			
	Fresh water tank(s)			
	a) Tank construction (internal/external/fitting)			
	b) Tank pressure test			

Part VII - Annex 4 - Main Items Inspection Timetable

VESSEL NAME : "PUI LING"			Inspection date	Outstanding / Reinspection / Remarks
Item	Items to be inspected			
	Hull Structure, Layout and Outfitting Inspection			
H-11	Hose test for hull and deckhouse			
H-12	Mock-up inspection for the wheelhouse			
H-13	Deckhouse console mock up			
H-14	Installation of the various outfitting items			
	a) Anchor and chain			
	b) Windlass			
	c) Hand pump			
	d) Hatches			
	e) Doors			
	f) Windows			
	g) Ventilators			
	h) Seating of heavy equipment and mast			
H-15	Function test of various outfitting items			
H-16	Water-tightness or weathertightness of openings			
	a) Manholes			
	b) Hatches			
	c) Doors			
	d) Windows			
	e) Ventilators and Air pipes			
	f) Cable glands			
H-17	Painting inspection of different layers			
H-18	Zinc anodes and lightning protection			
	a) Installation of zinc anodes			
H-19	Vessel dimension verification			
H-20	Draught marks verification			
H-21	Hull completion survey			
H-22	Arrangement of deckhouse, wheelhouse and accommodation			
H-23	Inspection of fire, heat and sound insulation			
	a) Fire Insulation			
	b) Heat Insulation			
	c) Sound Insulation			
	Cabin			

Part VII - Annex 4 - Main Items Inspection Timetable				
H-24	Lifesaving appliances and firefighting appliances			
	a) Lifesaving appliances			
	b) Firefighting appliances			
H-25	Inspection of sea chest and grating			
	a) Sea chest			
	b) Grating			
H-26	Inclining experiment			
H-27	Sea Trials including operation of outfitting			
H-28	Trial of anchor & mooring arrangement			
H-29	Cleanliness inspection before acceptance			
H-30	Inventory check in HKSAR			
H-31	Acceptance and delivery			
H-32	Acceptance of As-Fitted drawings and Engine/Equipment manuals and Documentation			

Part VII - Annex 4 - Main Items Inspection Timetable				
VESSEL NAME : "PUI LING"			Inspection date	Outstanding / Reinspection / Remarks
Item	Items to be inspected			
	Machinery and Electrical Installation			
EM-1	General inspection and function tests on installation of machinery:			
	a) General inspection of the main propulsion engine			
	b) General inspection of the generator set			
	c) General inspection of the shafting			
	i. Propeller taper bedding test			
	ii. Coupling taper bedding test			
	iii. Coupling and rudder bolts fitting			
	d) General inspection of propeller			
EM-2	Main Engine:			
	a) Test of engine safety devices and alarms			
	b) Test of emergency stop			
	c) Inspection of exhaust pipe before lagging			
EM-3	Hydraulic test of sea valve			
EM-4	Inspection of the sea water suction strainers			

Part VII - Annex 4 - Main Items Inspection Timetable

VESSEL NAME : "PUI LING"			Inspection date	Outstanding / Reinspection / Remarks
Item	Items to be inspected			
	Machinery and Electrical Installation			
EM-5	Fresh water system:			
	a) General inspection and dimension checking of the fresh water system			
	b) Fresh water tank low level alarm test			
	c) Fresh water tank final cleaning/internal inspection before filling			
	d) Fresh water tank high level alarm test			
	e) Fresh water tank content gauge calibration and test			
	f) Inspection of piping penetration of bulkhead and deck			
	g) Hydraulic test of fresh water system piping			
	h) Functional test of fresh water system			
EM-6	Fuel oil system:			
	a) General inspection and dimension checking of the fuel oil system			
	b) Fuel oil tank(s) low level alarm test			
	c) Fuel oil tank(s) final cleaning/internal inspection before filling			
	d) Fuel oil tank(s) high level alarm test			
	e) Fuel oil tank(s) content gauge calibration and test			
	f) Inspection of piping penetration of bulkhead and deck			
	g) Hydraulic test of oil fuel system piping			
	h) Functional test of oil fuel system			
EM-7	Bilge system:			
	a) General inspection and dimension checking of the bilge system			
	b) Bilge tank low level alarm test			
	c) Bilge tank high level alarm test			
	d) Bilge tank content gauge calibration and test			
	e) Inspection of piping penetration of bulkhead and deck			
	f) Hydraulic test of bilge system piping			
	g) Functional test of bilge system			
EM-8	a) Inspection of piping penetration of bulkhead and deck			
	b) Hydraulic test of black water/sanitary system piping			
	c) Functional test of black water/sanitary system			

Part VII - Annex 4 - Main Items Inspection Timetable

VESSEL NAME : "PUI LING"			Inspection date	Outstanding / Reinspection / Remarks
Item	Items to be inspected			
	Machinery and Electrical Installation			
EM-9	Firefighting system:			
	a) General inspection and dimension checking of the firefighting system			
	b) Inspection of piping penetration of bulkhead and deck			
	c) Hydraulic test of firefighting system piping			
	d) Functional test of firefighting system			
EM-10	Fire extinguishing systems:			
	a) General inspection and dimension checking of the fire extinguishing system			
	b) Inspection of piping penetration of bulkhead and deck			
	c) Hydraulic test of fire extinguishing system piping			
	d) Functional test of fire extinguishing system			
	e) Test of fixed fire extinguishing alarm system			
	f) Test of fire detection (smoke and heat detection) alarm system			
EM-12	Hydraulic system:			
	a) General inspection and dimension checking of the hydraulic system			
	b) Inspection of piping penetration of bulkhead and deck			
	c) Hydraulic test of hydraulic system piping			
	d) Functional test of hydraulic system			
EM-13	Engine room ventilation:			
	a) Inspection of E/R ventilation fan installation			
	b) Function test of start/stop at remote and local control for E/R ventilation fans			
EM-14	Air conditioning system:			
	a) General inspection and dimension checking of the air conditioning system			
	b) Inspection and hydraulic test of cooling water system			
	c) Functional test of air conditioning system			
	d) Full test of air conditioning during sea trial			
EM-15	Batteries:			
	a) Inspection and dimension checking of the batteries spaces including ventilation.			
	b) Inspection of battery connectors and battery boxes			
	c) Inspection of battery charger			
	d) Operational test of battery charger			
	e) Test of main engines and generators consecutive starting by each group of battery (start/stop at remote and local control)			

Part VII - Annex 4 - Main Items Inspection Timetable				
VESSEL NAME : "PUI LING"			Inspection date	Outstanding / Reinspection / Remarks
Item	Items to be inspected			
	Machinery and Electrical Installation			
EM-16	Electrical installation:			
	a) Inspection of lightening conductor			
	b) General inspection of cable layout and checking of cable sizes			
	c) Inspection of cable penetration of bulkhead and deck			
	d) Inspection of transformers			
	e) Inspection of tally plates			
EM-17	Main and emergency switchboard and panels:			
	a) Main switchboard and panels – high voltage primary injection test			
	b) Cable size checking of electrical switchboard installations			
	c) Inspection of AC distribution panel			
	d) Inspection of DC distribution panel			
	e) Megger test of the electrical system			
	f) Earth test of the electrical system			
EM-18	Control console(s):			
	a) Inspection of control console			
	b) Functional test of console controls			
	c) Inspection of navigation equipment control panel			
EM-19	Lighting:			
	a) Inspection and functional test of general lighting			
	b) Inspection and functional test of emergency lighting			
	c) Inspection and functional test of floodlight installation			
	d) Inspection and functional test of searchlight installation			
EM-20	Navigation Lights and Signals:			
	a) Inspection and functional test of navigation lights			
	b) Test of horn /whistle			
EM-21	Shafting (tailshaft and coupling) system:			
	a) Marking/Stamping and material check			
	b) Dimension check and taper bedding test			
	c) Shaft line checking of stern tube/shaft bracket and alignment of main engines and tail shaft			
EM-22	Steering system installation and testing:			
	a) Inspection and dimensional check of rudders			
	b) Inspection and dimensional check of steering gear system			
	c) Steering system functional test			

Part VII - Annex 4 - Main Items Inspection Timetable				
VESSEL NAME : "PUI LING"			Inspection date	Outstanding / Reinspection / Remarks
Item	Items to be inspected			
	Machinery and Electrical Installation			
EM-23	Electronic Navigational Equipment installation and testing by EMSD			
EM-24	Test of window wipers			
EM-25	Test of noise levels throughout the vessel during the sea trial			
EM-26	Inclining Experiment			
	a) Official Speed Trial			
	b) Other Official Sea Trials			
	Operational System			
OS-1	Installation inspection and functional test for ENE Systems			
OS-2	Inspection of tally plate and cable label			
OS-3	Inspection of main engine/genset safety alarms on W/H console table			
OS-4	Function and performance test during Sea Trial			

Note:

The inspection items are preliminary and not exhaustive, any items found necessary to be included at a later stage will be added to this list.

Part VII - Annex 5 – Vessel Condition During Respective Sea Trial

1) Official Speed Trial

Conditions at Speed-Trial		
1	Person on board	13 Persons (at 75 kg per person)
2	Fuel oil tanks	not less than 85% fuel tank capacity
3	Fresh water tank	not less than 85% tank capacity
4	Grey water tank	not less than 50% tank capacity
5	Store/Utilities	230 kg
6	Sea Conditions	Sea state 2 : wave height 0.1 - 0.5 metres

2) Endurance and Performance Test

Conditions at Endurance and Performance Test		
1	Person on board	13 Persons (at 75 kg per person)
2	Fuel oil tanks	not less than 85% fuel tank capacity
3	Fresh water tank	not less than 85% tank capacity
4	Grey water tank	not less than 10% tank capacity
5	Store/Utilities	230 kg
6	Sea Conditions	Sea state 2 : wave height 0.1 - 0.5 metres

3) Manoeuvrability Test

Conditions at Forward Turning Circle Test		
1	Person on board	13 Persons (at 75 kg per person)
2	Fuel oil tanks	not less than 80% fuel tank capacity
3	Fresh water tank	not less than 85% tank capacity
4	Grey water tank	not less than 85% tank capacity
5	Store/Utilities	230 kg
6	Sea Conditions	Sea state 2 : wave height 0.1 - 0.5 metres

4) Crash Stop Test / Astern Running Test / Emergency Steering Test

Conditions at Crash Stop Test / Astern Running Test / Emergency Steering Test		
1	Person on board	13 Persons (at 75 kg per person)
2	Fuel oil tanks	not less than 80% fuel tank capacity
3	Fresh water tank	not less than 85% tank capacity
4	Grey water tank	not less than 85% tank capacity
5	Store/Utilities	230 kg
6	Sea Conditions	Sea state 2 : wave height 0.1 - 0.5 metres

Part VII - Annex 6 – Endurance and Performance Tests

Date of Test:		Place of Test:	
Vessel's Identification:		Vessel's Name:	

Conditions at Endurance and Performance Tests

Person On board	**3 crews +10 other persons**	Dummy Weight	**75 kg per person**
Fuel (diesel oil)	**Refer to Annex 5**	Other Equipment	230 kg effects on board
Sea Conditions	**WMO Sea State 2** wave height ≤ 0.5 metres and water depth ≥5 metres		

Engines:	**Port Side**	**Starboard Side**	**Propellers:**	**Port Side**	**Starboard Side**
Maker			Maker		
Type			Type		
Serial Number			Diameter		
Rated Power			Pitch		
Rated Speed			Direction of Rotation		

Engine Load	**Engine Speed (rpm)**	**Vessel Speed (Knots)**	**Time (Start)**	**Time (Finish)**	Fuel Consumption (litres/minutes)	Engine Oil Pressure (Bar)	Engine (in) CW Temp. (ºC)	Others	Others
__% of rated Power	At Minimum Crushing Speed		>15 min						
50% of Rated Power/rpm			>15 min						
60% of Rated Power/rpm			>15 min						
70% of Rated Power/rpm			>15 min						
80% of Rated Power/rpm			>30 min						
90% of Rated Power/rpm			>30 min						
100% of Rated Power (Endurance Test)			>90 min						

Remarks:

Witness by:	MD Representative	Shipyard Representative

Course	0	45	90	135	180	225	270	315	360
Time Taken Ahead turning to starboard									
Course	0	45	90	135	180	225	270	315	360
Time Taken Ahead turning to port									

Turning diameter: Ahead turning to starboard	Ship length
Engine R.P.M.	rpm
Max heeling angle	degree

Turning diameter: Ahead turning to port	Ship length
Engine R.P.M.	rpm
Max heeling angle	degree

Witness by:	MD Representative	Shipyard Representative

Part VII - Annex 7 – As Fitted Drawings and Machinery/Equipment Documents and Information Literature to be Delivered to the Government at Delivery

1.1 Upon delivery of the Vessel, the Contractor shall deliver to the Government four (4) hard copies and two (2) soft-copies in .pdf and .dwg (where applicable) files of the following plans and drawings that contain the technical information of the Vessel and its machinery and equipment as they are when the Vessel is on the day accepted by GNC/MD. These are termed the final version of the "As-Fitted" Plans and Drawings, and they must consist of the following ones as well as any other additional ones that may be required by GNC/MD during the design and construction of the Vessel and before the Vessel is accepted by the Government.

1.2 The As–Fitted Plans and Drawings shall be prepared by professional ship draughtsmen and they shall be prepared in a professional manner, scale, size and style normally required of in the ship design and construction business sector. All plans and drawings shall show and be clearly marked for the profile, plan, and section views of the layout, arrangement details, and construction details in a manner required by GNC officer.

1.2.1 General Arrangement Plan.

1.2.2 Lines plan and offsets data and table.

1.2.3 Final stability information booklet and the final inclining experiment report.

1.2.4 Hydrostatics, cross curves and intact and damage stability calculations for all ship loading conditions specified in the Technical Specifications.

1.2.5 Vessel subdivision drawings and stability calculations.

1.2.6 Painting scheme of the whole Vessel.

1.2.7 Vessel draught marking diagram.

1.2.8 Detailed arrangement and layout plan of the deckhouse, accommodation, decks showing the disposition of all main equipment, fittings and fixtures, furniture, doors, windows, hatches, manholes and access openings. The down-flooding openings (points) shall be clearing indicated on the drawings.

1.2.9 Equipment layout diagram.

1.2.10 Hull structural construction and hull scantlings drawings.

1.2.11 Hull shell and frames and the framings arrangement and construction plan.

1.2.12 Hull shell expansion plan.

1.2.13 Bow ramp construction plan.

1.2.14 Steering gear system and steering arrangement diagrams.

1.2.15 Deckhouse and deck structural and construction plan.

1.2.16 Hull watertight bulkheads construction plan.

1.2.17 Deckhouse to deck connection detailed construction plan.

1.2.18 Deck edge details and construction plan, including detailed structural arrangement drawings of hull to deck connection.

1.2.19 Detailed cathodic corrosion prevention and arrangement plans and drawings for the Vessel throughout.

1.2.20 Mast structural and construction plan and mast equipment arrangement plan.

1.2.21 Anchoring & mooring arrangement plan.

1.2.22 Fender design and arrangement.

1.2.23 Piping diagrams for fuel oil, freshwater, lubrication oil, bilge, firefighting, scuppers and drains, sewage system.

1.2.24 Fire firefighting system drawings.

1.2.25 Drawings of the main switchboard and all other switchboards and the electrical system.

1.2.26 Electrical Load Calculation.

1.2.27 Electrical installation drawings.

1.2.28 Details of the Operational Systems.

1.2.29 Operational Systems equipment installation and location drawings, including ENE, communications and radio terminal.

1.2.30 Operational Systems connection drawings.

1.2.31 Engine Room arrangement.

1.2.32 Propeller details and drawings.

1.2.33 Main fuel oil tank drawing and its associated piping and manifold(s), and filling, overflow and ventilation system.

1.2.34 Freshwater tank construction plan and its associated piping arrangement.

1.2.35 Fuel oil tank(s) construction plan and its associated piping system.

1.2.36 Black water tank construction plan and its associated piping system.

1.2.37 Grey water tank construction plan and its associated piping system.

1.2.38 Drawings for anchor, windlass and the anchoring system.

1.2.39 Lifesaving appliance arrangement plan and fire safety plan.

1.2.40 Navigation lights, sound and signal diagrams.

1.2.41 Vessel overall lighting arrangement and light control plan.

1.2.42 Vessel alarm and signals, internal communication systems and public address systems plan.

1.2.43 General layout and arrangement drawing of the air-conditioning system.

1.2.44 Piping layout drawing of the air-conditioning system (if any).

1.2.45 Air-conditioning load calculation.

1.2.46 Solar panel system.

The lists are not exhaustive, additional as fitted drawings may be added if required.

1.3 Documents shall be provided by the Contractor:

1.3.1 In not less than one (1) month before the Delivery Acceptance of the Vessel, the Contractor shall provide for GNC acceptance a list of all documents to be provided.

1.3.2 When the Vessel is delivered to the Government Dockyard, the Contractor shall deliver to the Government all of the documents as listed above and those specified in Chapter 10 of this Part VII which required to be delivered upon delivery acceptance and all other technical information, leaflets, literature, manuals and booklets etc. and whatsoever items that are necessary for the operation, handling, services, maintenance, spare parts, repairs and the technical understanding of any one of all the engines, machinery, motors, pumps, equipment, fittings and outfitting items of the Vessel.

Part VII - Annex 8 – Definition of Waves and Sea

Beaufort scale number	Description	Wind speed	Wave height	Sea conditions	Land conditions
0	Calm	< 1 km/h (< 0.3 m/s) < 1 mph < 1 knot < 0.3 m/s	0 m 0 ft	Flat.	Calm. Smoke rises vertically.
1	Light air	1.1–5.5 km/h (0.3–2 m/s) 1–3 mph 1–3 knot 0.3–1.5 m/s	0–0.2 m 0–1 ft	Ripples without crests.	Smoke drift indicates wind direction. Leaves and wind vanes are stationary.
2	Light breeze	5.6–11 km/h (2–3 m/s) 4–7 mph 4–6 knot 1.6–3.4 m/s	0.2–0.5 m 1–2 ft	Small wavelets. Crests of glassy appearance, not breaking	Wind felt on exposed skin. Leaves rustle. Wind vanes begin to move.
3	Gentle breeze	12–19 km/h (3–5 m/s) 8–12 mph 7–10 knot 3.5–5.4 m/s	0.5–1 m 2–3.5 ft	Large wavelets. Crests begin to break; scattered whitecaps	Leaves and small twigs constantly moving, light flags extended.
4	Moderate breeze	20–28 km/h (6–8 m/s) 13–17 mph 11–16 knot 5.5–7.9 m/s	1–2 m 3.5–6 ft	Small waves with breaking crests. Fairly frequent whitecaps.	Dust and loose paper raised. Small branches begin to move.
5	Fresh breeze	29–38 km/h (8.1-10.6 m/s) 18–24 mph 17–21 knot 8.0–10.7 m/s	2–3 m 6–9 ft	Moderate waves of some length. Many whitecaps. Small amounts of spray.	Branches of a moderate size move. Small trees in leaf begin to sway.
6	Strong breeze	39–49 km/h (10.8-13.6 m/s) 25–30 mph 22–27 knot 10.8–13.8 m/s	3–4 m 9–13 ft	Long waves begin to form. White foam crests are very frequent. Some airborne spray is present.	Large branches in motion. Whistling heard in overhead wires. Umbrella use becomes difficult. Empty plastic bins tip over.
7	High wind, moderate gale, near gale	50–61 km/h (13.9-16.9 m/s) 31–38 mph 28–33 knot 13.9–17.1 m/s	4–5.5 m 13–19 ft	Sea heaps up. Some foam from breaking waves is blown into streaks along wind direction. Moderate amounts of airborne spray.	Whole trees in motion. Effort needed to walk against the wind.
8	Gale, fresh gale	62–74 km/h (17.2-20.6 m/s) 39–46 mph 34–40 knot 17.2–20.7 m/s	5.5–7.5 m 18–25 ft	Moderately high waves with breaking crests forming spindrift. Well-marked streaks of foam are blown along wind direction. Considerable airborne spray.	Some twigs broken from trees. Cars veer on road. Progress on foot is seriously impeded.
9	Strong gale	75–88 km/h (20.8-24.4 m/s) 47–54 mph 41–47 knot 20.8–24.4 m/s	7–10 m 23–32 ft	High waves whose crests sometimes roll over. Dense foam is blown along wind direction. Large amounts of airborne spray may begin to reduce visibility.	Some branches break off trees, and some small trees blow over. Construction/temporary signs and barricades blow over.

10	Storm, whole gale	89–102 km/h (24.7-28.3 m/s)	9–12.5 m	Very high waves with overhanging crests. Large patches of foam from wave crests give the sea a white appearance. Considerable tumbling of waves with heavy impact. Large amounts of airborne spray reduce visibility.	Trees are broken off or uprooted, saplings bent and deformed. Poorly attached asphalt shingles and shingles in poor condition peel off roofs.
		55–63 mph			
		48–55 knot	29–41 ft		
		24.5–28.4 m/s			
11	Violent storm	103–117 km/h (28.6-32.5 m/s)	11.5–16 m	Exceptionally high waves. Very large patches of foam, driven before the wind, cover much of the sea surface. Very large amounts of airborne spray severely reduce visibility.	Widespread damage to vegetation. Many roofing surfaces are damaged; asphalt tiles that have curled up and/or fractured due to age may break away completely.
		64–73 mph			
		56–63 knot	37–52 ft		
		28.5–32.6 m/s			
12	Hurricane	≥ 118 km/h (≥ 32.8 m/s)	≥ 14 m	Huge waves. Sea is completely white with foam and spray. Air is filled with driving spray, greatly reducing visibility.	Very widespread damage to vegetation. Some windows may break; mobile homes and poorly constructed sheds and barns are damaged. Debris and unsecured objects are hurled about.
		≥ 74 mph			
		≥ 64 knot	≥ 46 ft		
		≥ 32.7 m/s			

World Meteorological Organization (WMO) Sea State Code		
Sea State Code	Wave Height (meters)	Characteristics
0	0	Calm (glassy)
1	0 to 0.1	Calm (rippled)
2	0.1 to 0.5	Smooth (wavelets)
3	0.5 to 1.25	Slight
4	1.25 to 2.5	Moderate
5	2.5 to 4	Rough
6	4 to 6	Very rough
7	6 to 9	High
8	9 to 14	Very high
9	Over 14	Phenomenal
Character of the Sea Swell		
	0. None	
Low	1. Short or average 2. Long	
Moderate	3. Short 4. Average 5. Long	
Heavy	6. Short 7. Average 8. Long	
	9. Confused	