Part VII – Technical Specifications

Table of Contents

Annex 6 List of Recognized Organisations

Annex 7 As-fitted Drawings and Machinery/Equipment documents and information literature to be delivered to the Government at Delivery Acceptance

Annex 8 Definitions of Waves and Sea

Chapter 1 General Provisions

1.1 Introduction

1.1.1 This document (or "Technical Specifications" (TS)) sets out the requirements of the Government of the Hong Kong Special Administrative Region (HKSAR) of the People's Republic of China (hereinafter referred to as the Government) in relation to **eight (8) Speedboats** (**"Vessel"**) for use by the **Fire Services Department** (**"FSD"** or the **"user department"**).

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];

(b) Those specifications that are not labelled with [E] or [D] shall equally form part of the Contract like the specifications labelled as [E] ("Specifications without Label"), 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 TS (viz., specifications with [E] label) and repeated in Annex C to the 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 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.

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.

1.1.8 Where design specifications of the Vessel or any Equipment are required to be approved by the specified RO, they must be approved by the RO as well as by GNC prior to the construction of the Vessel or installation of that Equipment on the Vessel. Where design specifications of the Vessel or 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 the

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 – Technical Specifications:

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

(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 (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. This principle shall apply including without limitation where the subject matter is the Vessel, the Daughter Boat, and the Equipment on each Vessel.

(m) unless otherwise expressly stated where the requirement shall apply to both or just the Daughter Boat, all requirements in this TS are for the Vessel.

1.2 Statement of Purposes of the Vessel

1.2.1 The Vessel shall be used by FSD (i) mainly to provide fire cover to the Port Shelter and Rocky Harbour in Sai Kung Waters; and (ii) to perform fire-fighting, searching and rescue operations within Hong Kong Waters. This role involves considerably more than mere navigation and will include swift manoeuvring in high speed.

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

1.3 Authorities

1.3.1 The Government New Construction Section (GNC) of the Marine Department (MD) is the section responsible for the procurement of the Vessel for the Government of the Hong Kong Special Administrative Region (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 shipyard 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 a Vessel which is safe, fit and suitable for the operation of the FSD as set out in Paragraph 1.2.1 above and which meets all the relevant regulations and the specifications in this Part VII, 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 TS 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 Organisation 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 shall be issued with a Type Approval Certificate by the RO specified in paragraph 2.3.3 of this Part VII.

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.

1.5.5 The Contractor shall design, build and supply the Vessel in full compliance with the requirements given in these TS 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 the TS, the TS 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 – Price Schedule in 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 Chapter, 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 MD/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 -the TS, setting out the major milestones and their scheduled completion dates and incorporating the Delivery Dates specified in Schedule 2;

(b) the Drawing Submissions Timetable in the form set out in Annex 3 to the TS; and

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

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

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 of the Contract 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 and other necessary documents where applicable.

1.6.7 After arriving at the site for a survey visit, if MD/GNC 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 a 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/GNC officers and FSD officers 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/GNC officers or FSD officers 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, ship handling at sea and performance tests, manoeuvring test, crash stop test, astern running test, emergency steering test, anchoring tests and other tests as stated in this paragraph. 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 3.3.5 of this Part and approved by the RO).

1.7.2 As in 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/GNC officer(s), user department officers and the consultants. The Contractor shall observe the local requirements on navigation before the sea trial, including the third party insurance in accordance with the laws of Hong Kong.

1.7.3 The Contractor shall provide to MD/GNC 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/GNC 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/GNC.

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 Loading Conditions

	Operational Load Condition	
	Light	Full
Fuel (minimum)	90%	90%
Crew	3	3
Boarding Officers	nil	13
Kit	20 kg	210 kg
Equipment	20 kg	150 kg
Crew seats	3	3

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.

(b) As part of the Technical Acceptance as specified in Paragraph 1.8.2 of this Chapter 1, the Contractor shall carry out the Official Speed Trial in the presence of GNC 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 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 35 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. 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.

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.

(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 Vessel must be in the trial conditions (see paragraph 1 of Annex 5 to this Part 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.

(j) 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.

(k) 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:

(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. 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 engines running;

(ii) Single 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 Engines and Electric Generator Engines.

(f) Anchoring Test according to the RO Requirements.

1.8 Acceptance and Delivery

1.8.1 Acceptance of the Vessel (including all Equipment) shall be carried out in two 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 in the version as completed by the Contractor and approved by the Government in accordance with paragraph 1.6.4(c) of this Part;

(b) This includes all the hull construction, mechanical and electrical tests and trials as required in this part and those considered necessary by the Government, including equipment tests, anchoring tests, inclining experiment and bottom survey on the slipway in Hong Kong, the Official Speed Trial as mentioned in Paragraph 1.7.6 of this Chapter shall be conducted in Hong Kong Waters, the Endurance Test, Manoeuvrability Test, Crash Stop Test and Astern Running Test as mentioned in the Paragraphs 1.7.7 of this Part, the bench acceptance test and on-site commissioning test for ENE and on-site commissioning test for as mentioned in Chapter 8 of this Part and all other verification tests 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;

(d) All other tests whether as specified in this Part 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 the Conditions of Contract and other applicable provisions of the Contract.

1.8.3 Delivery Acceptance

(a) The Vessel, after its successful completion of Technical Acceptance, and the

Spare Parts as specified in Schedule 1 of Part V, shall be delivered at the Contractor's expense to the Government Dockyard. In accordance with the applicable Delivery Date specified in Schedule 2 of Part V.

(b) Type Approval Certificate for the Vessel shall be issued by the relevant RO as specified in Paragraph 2.3.3 of this Part VII 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 GNC/MD 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 MD 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 MD 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 MD 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 8.1 of Chapter 8, and all items set out in the Inventory List in the form as approved or stipulated by the Government shall be delivered to MD at 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.

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 the Part IV (Conditions of Contract), 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.

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 the TS.

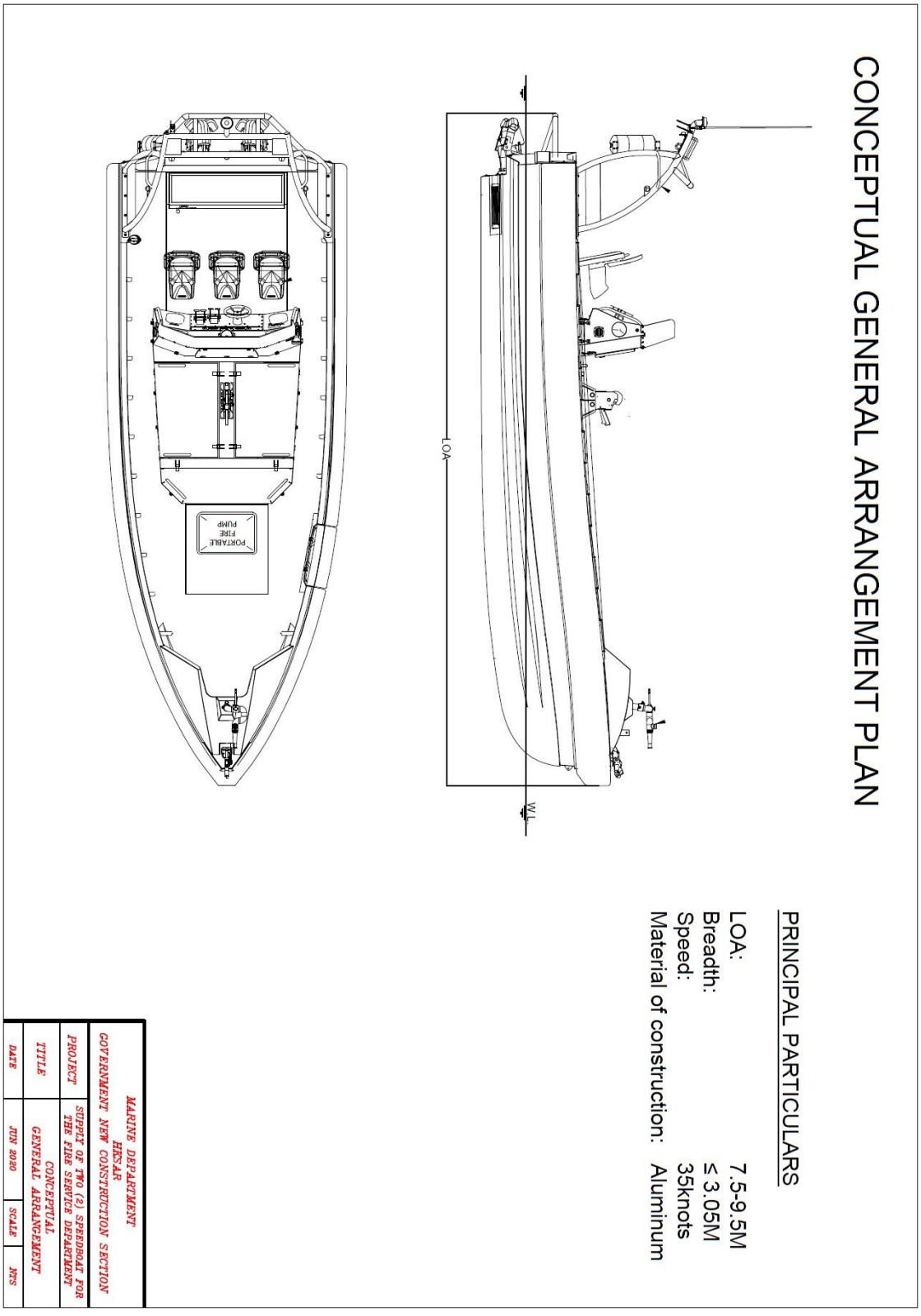
1.10.2 The above applies not only to main engines but also to all other equipment installed in the Vessel. Support and maintenance services must be available (i.e. serviceable) in Hong Kong in respect of all equipment installed in the Vessel and return of the whole or part of the Equipment to the original 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 ROs 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 Conceptual General Arrangement Plan



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 **Eight (8) Speedboats for the Fire Services 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 Whilst 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 Conceptual General Arrangement Plan shown above only serves as guidance and a reference drawing to help to explain the tender requirements stated in this Part VII.

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.

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

2.3 Rules and Regulations

2.3.1 The Vessel shall be issued with a Type Approval Certificate by the RO specified in Paragraph 2.3.3 of this Part VII.

2.3.2 The Contractor shall design, build and supply the Vessel in full compliance with the requirements given in these TS 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 requirements and this Part VII, the final decision shall rest with GNC.

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 requirements of the RO specified in Schedule 9 or the requirements of any of the RO listed below (where it is expressly specified in this Part VII in relation to a particular requirement, another RO which is any one of the ROs listed in sub-paragraphs (a) to (i) below may be designated for compliance with the relevant requirement), and also the requirements further specified in sub-paragraphs (j) to (m) below:

(a)	American Bureau of Shipping	ABS
(b)	Bureau Veritas	BV
(c)	China Classification Society	CCS
(d)	Det Norske Veritas	DNV
(e)	Korean Register of Shipping	KR

(f) Lloyd's Register of Shipping LR

(g) Nippon Kaiji Kyokai NK

(h) Registro Italiano Navale RINA

(i) Russian Maritime Register of Shipping RS

and other entities as specified below:

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

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

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

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

(n) 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 (m) 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

In the event of any inconsistency amongst the above requirements, rules and standards, those mentioned in sub-paragraphs (j) to (m) shall prevail over the requirements of the relevant RO as listed in sub-paragraphs (a) to (i) above.

2.4 Contract Speed

2.4.1 When all of the engines are running at their declared maximum continuous rating (MCR), the guaranteed minimum highest achievable speed shall be 35 knots in WMO Sea States 0 to 2 under Light Operational Load Conditions specified in Paragraph 1.7.5 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 waterjet propulsion system selected shall match the engine profile and avoid cavitations as far as possible.

2.4.3 It is desirable that the Tenderer has committed to a higher Contract Speed for the Vessel than that as specified in paragraph 2.4.1 of the Technical Specifications based on the estimated

propulsive power and characteristic curves of the main propulsion engines for the Vessel with all of main propulsion engines running at 100% MCR submitted in Schedule 7 of Part V. [D]

2.5 Principal Dimensions

2.5.1 The Principal Dimensions of the Vessel shall be:

Length Overall ("LOA"):	7.5 m to 9.5 m	[E]
Extreme Breadth:	Not greater than 3.05 m	[E]
Extreme Draught:	Less than 0.7 metres	[E]
Deadrise Angle at Transom:	Not less than 20 degrees	
Maximum weight of the Vessel:	Not greater than 5,600 kg	[E]

"Length Overall" ("LOA") 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. 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 Twin waterjet propulsion units shall be driven by two marine diesel engines. Each unit shall be in the same specification produced by the same manufacturer. [E]

2.8 Vessel Operating Profile and Environment

2.8.1 The Vessel shall be designed to provide sufficient space for carrying at least three (3) seated persons and ten (10) standing persons. Shock mitigating seats for three (3) crew /officers shall be provided. Detailed provisions regarding the mounting of shock mitigation seats are specified in Paragraph 3.8 of this Part VII. [E]

2.8.2 The Vessel shall be designed for deployment by the FSD on at least 300 days per year including both day and night time operational deployment. The Vessel shall be designed and built to operate in Hong Kong Waters.

Summary of Operational Hours/Range

Number of hours/day:	4 hours/day
Number of days/year:	300 days/year

Endurance for fuel capacity	:	4 hours at the maximum speed capability of the Vessel with full fuel oil tank(s)

2.8.3 The Vessel shall be able to operate safely and have good seakeeping performance within the Hong Kong Waters in rough sea conditions up to and including WMO Sea State 4 set out in Annex 8 of this Part VII.

2.8.4 The Vessel shall have good manoeuvrability and quick response throughout its speed range and capable to operate in open water and shallow 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 should be in a colour contrasting with the hull and consoles' colour. [D]

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

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 FSD.

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;

(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 tanks;

(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.

2.11.2 The designation of permanent ballasts shall only be agreed by GNC.

2.11.3 The Vessel shall perform at all speeds in WMO Sea States 0 to 2 without the following characteristics:

(a) chine walking;

(b) porpoising;

(c) loss of horizon (meaning that the view of the horizon forward of the bow in the seated and standing positions at the console shall not be obstructed by the bow of the Vessel at any time when underway or making way);

(d) loss of directional control;

(e) permanent list; and

(f) engine strain and/or cavitation manifested by engine overspeeding.

2.11.4 The Vessel's deck shall be of a flush design free of trip and snag hazards for both seated positions and areas where officers may be required to move around during the execution of their duties. Where seats and other fixtures and fittings are removable, the requirement for a design which is free of trip and snag hazards shall apply whether the seats and other items are fitted to the Vessel or not.

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 (i) with a deep "V" from the transom to a position amidships and (ii) with a minimum deadrise angle of twenty (20) degrees at the transom. [E]

3.1.2 The strength of the hull structure shall be calculated based on the vertical acceleration at the longitudinal centre of gravity (LCG) being equal to or greater than 6g where g is the gravitational force while fulfilling the Contract Speed specified in Paragraph 2.4.1 of this Part VII. [E]

3.1.3 The strength of the hull structure resulting from the application of the calculation specified in Paragraph 3.1.2 of this Part VII and any other TS requirements shall result in a Vessel that meets or exceeds the top speed of 35 knots limited for structure versus significant wave height 0 – 0.5m.

3.1.4 The vessel's design stresses and load (wave height versus speed), maximum acceleration considered and scantlings calculation including internal structural members shall be designed according to the rules as stipulated in Paragraph 2.3.3 of this Part VII. It shall be capable of withstanding stress coming from wave impact and operation environment conditions. All material and building processes for aluminium 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.

3.1.5 Any openings in hull and deck shall comply with the applicable RO's rules for watertight integrity if not otherwise specified by MD or the FSD at or prior to the kick-off meeting.

3.1.6 The hull design shall incorporate a self-bailing deck with large section scuppers at transom.

3.1.7 The hull structure design loads shall be in accordance with the Vessel operational profile and other applicable requirements.

3.1.8 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.

3.1.9 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.

3.1.10 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.

3.2 Weld and Fabrication

3.2.1 All welding and fabrication shall be implemented according to the applicable requirements stipulated in Paragraph 2.3.3 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 NDT inspection carried out on the Vessels' structure. 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 proposed Vessel shall meet the Intact Stability Criteria and Damage Stability Criteria specified in Paragraphs 3.3.4 and 3.3.7 of this Part VII. [E]

3.3.2 The lines plan with offset table and the preliminary stability information of the Vessel shall be submitted with the tender before the Tender Closing Date. 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 (c) 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 7 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. 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).

(c) 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.

(d) 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. The Vessel must not carry any operational limitations with respect to its stability capability within the operational requirements stipulated in this Part VII. No Official Speed Trials shall be conducted until MD, based on the information given in the inclining experiment report, agrees it is safe to carry out such tests and trials.

3.3.6 Stability Information Booklet

(a) The Contractor shall supply to MD three (3) 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 or other applicable IMO regulations (International Code on Intact Stability, 2008 - 2008

IS Code). Furthermore, stability due to wind and ship rolling for the required service environment of the Vessel shall be calculated. In addition to the requirements stated above, the booklet in its final version shall include:

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

(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.

(c) 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 & Effects
1	Full Load Departure Condition	98%	100 kg	1360 kg (16 persons, plus effects)
2	Full Load Arrival Condition	10%	100 kg	1360 kg (16 persons, plus effects)
3	Light Load Departure Condition	98%	40 kg	255 kg (3 crew, plus effects)
4	Light Load Arrival Condition	10%	40 kg	255 kg (3 crew, plus effects)

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

(ii) The weight of additional payload shall be as stipulated in Paragraph 3.3.6 (c) 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 5.

(d) The Stability Information Booklet shall be approved by the RO before submitting to MD for comments. The Contractor shall provide MD with four copies of Stability Information Booklet (as built) at no extra cost, which must be given to MD at Delivery Acceptance.

3.3.7 Damaged Stability Criteria

Transverse bulkheads shall be arranged to sustain flooding of any one watertight compartment between the adjacent watertight bulkheads and asymmetric flooding due to damage of any smaller watertight compartment between the adjacent watertight bulkheads. The residual stability shall be sufficient to maintain the Vessel afloat with the pre-damage payload on board in case of damage.

Note: The opening(s) to determine the down-flooding angle(s) shall first be agreed by GNC before carrying out the calculations.

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 A Tributyltin (TBT) free fouling-release/anti-fouling paint shall be applied on the following areas below the water line to provide at least two years protection against the marine growth.

(a) Exterior of the hull;

(b) Sea chest, sea chest grate and sea suction pipe; and

(c) Inlet duct, inlet grate, nozzle, and reverse bucket of waterjets.

3.4.6 A TBT free certificate issued by the paint manufacturer shall be submitted before the Delivery Acceptance. The fluoropolymer foul release coating/antifouling paint (e.g. Intersleek 1100SR or equivalent) shall comply with the International Convention on the Control of Harmful Anti-fouling Systems on Ships as adopted by the IMO.

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

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

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

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

3.4.11 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 Steering Console/Engine Compartment

3.5.1 The steering console shall be integrated with the engine compartment casing abaft amidships. It shall be constructed with either marine grade aluminium alloy or Composite Material. The whole console/engine compartment casing shall be designed to be lifted up or removed for the engine survey.

3.5.2 Sufficient hand holds and guard rails shall be fitted on the console/engine casing. They must be non-deflective and fabricated to suit for marine environment, i.e. marine grade aluminium alloy/marine grade stainless steel (316) or other equivalent non-corroding material. Their position, fitting arrangement, and etc. shall be made acceptable to and approved by MD before fitting.

3.5.3 Steering Console

(a) 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 deckplate, 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 the FSD. These mock-up console may also be used for the functions of Electronic Navigational Equipment. The console of an existing craft may be used as the basis for initial discussions.

(b) The console shall be designed to deflect wind up and over the heads of the coxswain in both the seated and standing position and to house the equipment required by the coxswain to control the Vessel.

(c) The console's design shall be optimised ergonomically so that a coxswain of an Asian stature (approximately 1.64 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) Loudhailer control unit and microphone;

(vi) 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;

(vii) Electric horn;

(viii) Siren and flashing beacon control panel;

(ix) Navigation lights, search lights and flood lights switch panel;

(x) GPS receiver;

(xi) Fuel tanks level gauge; and

(xii) One multi-function radar and electronic chart display screen of at least 9 inches.

(f) The Controls, Displays and Equipment

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

(ii) All indication lights, illumination of instrumentation gauges and panel lighting shall be fitted with dimmers for day and night operation;

(iii) 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;

(iv) 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;

(v) 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;

(vi) A waterproof black/grey cover shall be provided to cover each console down to deck level when the Vessel is not in use; and

(vii) Vibration absorbing mats shall be provided on the deck.

3.5.4 Engine Compartment

(a) Engine compartment shall consist watertight hatch cover(s) for easy access to the engine compartment for maintaining and visual check of engines and other main components without disassembling the console/engine casing.

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

3.6 Self-Righting/Aerial Mounting Frame

3.6.1 The Vessel shall be provided with a self-righting system mounted on a frame at the stern of the Vessel, which incorporates an inflatable bag with a heavy-duty coated fabric cover and a CO_2 bottle. In the event that the Vessel capsizes, this self-righting system shall be capable of being activated manually by pulling a release handle. The system shall be dimensioned so that it shall be capable of righting the Vessel in less than 30 seconds at the Light Operational Load Condition as stipulated in Paragraph 1.7.5 of this Part VII.

3.6.2 The self-righting system mounting frame shall be positioned so that the head of a crew member standing at the stern of the Vessel shall not coming into contact with the frame during passage in sea conditions up to WMO Sea State 5.

3.6.3 The self-righting/aerial mounting frame shall be a strong and rigid structure to support the self-righting gear, lightning arrestor, navigation lights, search light, sunroof and other electronic and navigational equipment as appropriate.

3.6.4 The self-righting/aerial mounting frame shall be provided with all necessary fittings including but not limited to brackets for all navigation lights and lightning arrestor as per the Conceptual General Arrangement Plan shown in Paragraph 2.1 of this Part VII.

3.6.5 All hardware such as screws, hooks, hasps, hinges, handles and sliding bolts shall be made of stainless steel or corrosion resistant material with galvanic protection between contacts with aluminium hull or corrosion resistant material.

3.6.6 The self-righting/aerial mounting frame shall not cover or be attached to the console and shall not obstruct operations at the coxswain or commander positions.

3.6.7 The design of the self-righting system and the mounting frame shall be discussed at the kick-off meeting, and shall be submitted to the RO or other entities acceptable by GNC for approval.

3.7 Lockers/Void Spaces

3.7.1 Lockers/Void Spaces

(a) Watertight lockers/storage acceptable to the FSD shall be provided.

(b) The location and dimensions of lockers or other storage acceptable to the FSD shall be discussed during the kick-off meeting and agreed by the FSD.

(c) Lockers or other storage acceptable to the FSD shall be provided for one emergency repair tool kit and all lifejackets onboard.

3.7.2 Air pipes shall be fitted to all tanks, cofferdams, void spaces, tunnels and other compartments which are not fitted with alternative ventilation arrangements.

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

3.8 Deck, Seating and Attachment Systems

3.8.1 The seats shall be designed to prevent occupants from falling or being thrown onto the deck or overboard, to optimise body posture thereby minimising the potential for spinal or other injuries and to mitigate the potentially harmful forces to which the Vessel and crew conducting the type of operations specified in Paragraph 1.2.1 according to the operational profile specified in Paragraph 2.8 of this Part VII may be subjected.

3.8.2 Basic requirements of the seats shall meet the following requirements:

(a) Specifically designed for use aboard small, high-speed marine craft;

(b) Material of the structure: Titanium, stainless steel and/or aluminium alloy;

(c) Materials of upholstery: Water resistant materials such as fire retardant foam/reinforced nylon laminated neoprene/heavy duty cordura laminate; and

(d) Protective covers: Covers shall be supplied to protect all of the seats from rain and ultraviolet radiation when not in use.

3.8.3 Three dampened seats each with a drop-down seat cushion shall be provided immediately aft of the console. These seats shall be designed with progressive damping. The seats shall be fitted with adjustable shock absorbers for light/heavy personnel, a four-point harness, a headrest, pistol grips and a dropdown seat base. A high, adjustable footrest attached to the primary console shall also be provided in front of each seat. All dampened seats above shall have progressive damping travel, height adjustment, fore and aft adjustment.

3.8.4 Suitable handrails and grips, coated with appropriate anti-slip material, shall be provided at the console and at other locations around the Vessel to enable operators to move safely around the Vessel at all times.

3.8.5 All flat, horizontal surfaces above deck level where personnel may step such as gunwales, bow boarding platform and the engine mounting bracket, if practicable, shall be coated with an appropriate anti-slip material.

3.8.6 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 FSD within one month from the date of the kick-off meeting for approval.

3.9 Fender System

3.9.1 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.

3.9.2 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.

3.9.3 The fender shall be resistant to impact, abrasion, outdoor temperature extremes, degradation caused by ultraviolet radiation, ozone and contact with seawater, oil, petrol, diesel, lubricating oil or chemicals. The bow section of the Vessel shall be fitted with additional protection consisting of a tied down sacrificial covering with recessed tie-down points on the bow deck and stem.

3.9.4 Details of the design and the dimensions of the collar 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 Part VII.

3.10 Bow

3.10.1 All gunwale fittings such as cleats and bollards shall be designed to minimise the risks of line tangling or snagging. All deck level tie-down points shall be flush fitting or removable to minimise trip hazards.

3.10.2 The fire-fighting monitor shall be located at the bow of the Vessel as specified in Paragraph 5.6 of this Part VII.

3.11 Survivor Recovery Door (Diving door)

3.11.1 The Vessel shall incorporate a survivor recovery door or diving door at port and starboard side of the beam to facilitate a safe and efficient recovery of a person in the water by on board crew members or diving operation. [E]

3.11.2 The door shall be constructed as an insert diving door sliding on tracks into the cut out opening and locking in position. The sealing of the insert door shall be such that water should not ingress from the gaps whilst sailing. The design shall be appropriate for its function and discussed at the kick-off meeting.

3.12 Foredeck

3.12.1 The Vessel shall be designed with sufficient foredeck area for firefighting and rescue operations.

3.12.2 The foredeck shall be capable of carrying two (2) persons lying on two (2) stretchers respectively.

3.13 Transom and Stern Area

3.13.1 The transom and stern area shall be designed to provide safe and easy access to all machineries for routine checking and troubleshooting even while underway at sea.

3.13.2 Sufficient protection shall be designed and fitted for safety of prevention of man overboard incidents. Man overboard recovery system (net) shall be provided and tightly affixed at the transom of the Vessel.

3.13.3 The outboard section of the waterjets shall be protected by a suitable stern guard, which may also serve as a stern platform. 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 Part VII.

3.14 Anchor, Chains and Strong Points

3.14.1 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.

3.14.2 Two 30 m long 20 mm diameter braided nylon warps for anchoring and towing shall be provided by the Contractor in a suitable stowage.

3.14.3 Two 30 m long 16 mm diameter nylon warps for mooring shall be provided by the Contractor in a suitable stowage.

3.14.4 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 on the stem immediately below the forepeak. 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 Part VII;

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

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

3.14.5 Devices for lifting the Vessel

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

(i) Fixed single-point suspension arrangement

The Vessel shall be designed with a single lifting point with automatic off load release hook. The hoisting structure shall not obstruct the removal of main engines and other machineries. [E]

(ii) 4-Points Lifting Method

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. [E]

(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.

3.14.6 Strong points for mounting the survivor recovery system shall be provided at the starboard side. The arrangement shall be designed so that the survivor recovery system can be rolled into the sea and used to haul a person inside the cradle back up into the Vessel. The mounting arrangement shall be discussed at the kick off meeting and agreed by MD and the FSD.

3.14.7 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 single-point lifting and 4-point lifting designs shall be discussed at the kick off meeting and agreed by MD and the FSD. 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 FSD can check dimensional compatibility with its existing lifting facilities.

3.15 Cathodic Protection

3.15.1 Sacrificial Anodes

(a) Sacrificial anodes shall be installed on the hull and waterjets in accordance with the waterjets manufacturer's recommendations.

(b) The hull shall be provided with adequate cathodic protection to protect the Vessel against corrosion for not less than one year.

Chapter 4 Machinery

4.1 General Requirements

4.1.1 The Contractor should note that the Vessel is for use in Hong Kong and it is desirable that the main engines and any other machinery offered by the Contractor are those at present commonly used by ships operating in Hong Kong Waters, and that they have good support and after sale services locally in Hong Kong.

4.1.2 The Vessel shall be powered by twin inboard diesel waterjets. Both engines shall be four-stroke inboard diesel engines of adequate power for waterjets to deliver the Contract Speed as stated in Paragraph 2.4 of this Part VII.

4.1.3 The Contractor shall be responsible for ensuring the correct installation and setting up of the engines including the choice of waterjets in accordance with the manufacturer's recommendations so as to avoid turbulent flow.

4.1.4 The Vessel shall be equipped and fitted with all machineries described each complying with the specifications set out in this Chapter for such machinery.

4.1.5 Sufficient space 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 engines, gearboxes, fuel oil tanks 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.

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

4.1.7 Provision shall be made to facilitate cleaning, inspection and maintenance of components including but not limited to main engines, waterjet machineries and fire pumps and their associated piping and equipment.

4.1.8 The electrical cables, piping for diesels and hydraulic oil lines run between the console, fuel tanks and the stern of the Vessel shall be suitably designed for ease of maintenance. They shall be supported properly to prevent chafing and unnecessary tension.

4.1.9 Each 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) Each engine shall incorporate one alternator for battery charging.

4.1.10 The Contractor 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 level and range until the fuel tank is empty;

(e) Battery voltage;

(f) Course and speed;

(g) Engine faults and notification alarms; and

(h) Any other data which the supplied system and engines are capable of generating.

(i) Bilge control display panel with alarm

(j) EFFS remote control & display panel

4.2 Main Propulsion Engines

4.2.1 The Vessel shall be equipped with two electrically started, fresh water cooled marine diesel engines of adequate power for the Contract Speed. The engines shall be required for the Vessel with annual operation of not less than 1,500 hours. The diesel engines shall be in compliance with IMO Tier II or U.S. EPA Tier III emission requirements. [E]

4.2.2 Type Approved Certificates of both Engines issued by a RO, as specified in Paragraph 2.3.3 of this Part VII in meeting IMO Tier II or U.S. EPA Tier III emission requirements, shall be provided upon Delivery Acceptance.

4.2.3 Both engines shall be shut down automatically when the Vessel capsized. When the vessel has righted, each engine shall be capable of restarted by the crew.

4.2.4 The two (2) diesel inboard engines shall, in combination with the waterjet units, be capable of achieving the Contract Speed at Paragraph 2.4 of this Part VII. Each engine shall be coupled to its respective waterjet through a reversible gear box and an intermediate shaft. When positioned in neutral, the waterjets shall not generate thrust in any direction.

4.3 Waterjet Propulsion System and Propulsion Controls

4.3.1 For the avoidance of doubt, the propulsion system shall be installed in accordance with the engine maker's instructions.

4.3.2 The Waterjet Propulsion Units

(a) General Provisions

(i) Each waterjet unit shall be driven by a main propulsion engine through marine reduction/reversible gearbox and flexible coupling with clutch in and out.

(ii) The gearbox shall include the following:

1. A flexible coupling of a well-known proprietary make;

2. Build in gear type oil pump; and

3. Oil temperature high alarm.

(iii) The waterjet propulsion system shall include the following alarms with individual warning indications:

1. Low level in lubricating oil tank (if provided);

2. Low lubricating oil pressure (if it is a forced lubricating oil system);

3. Low level in the hydraulic system; and

4. Power failure safety system.

(iv) The waterjet units shall be made of corrosion resistant materials and that the whole system is well insulated and arranged to prevent galvanic corrosion.

(v) The inspection hatch cover shall above the water level and allow ease inspection of the shaft and impeller without lifting the vessel out of water.

(b) The Control System (Speed and Manoeuvring and Reverse Control)

Control and instruments of the main engine and waterjet units shall be designed for a one-man operation in the console.

4.3.3 Emergency Steering

(a) The Vessel shall be designed for retaining safe control when there is any loss of control functions.

(b) The Vessel shall be capable of being handled, controlled, manoeuvred and operated directly using the manual operation mechanism

(c) The forward/reverse and steering operations of the Vessel shall be carried out directly after the system is changed over to the supplied manual mode control.

(d) Sufficient training for the use of the emergency steering supplied, including steering and reversing, shall be provided by the Contractor (qualified instructors) to MD and FSD designated officers to the satisfaction of the Government.

4.4 Fuel Oil (Diesel) Tank

4.4.1 The fuel oil of the engines shall be supplied from one or more fuel oil tanks. Endurance for fuel capacity in respect to paragraph 2.8.2 of this Part VII shall be designed for four (4) hours at the maximum speed capability of the Vessel with full fuel oil tank(s). [E]

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

4.4.3 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.

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

4.4.5 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.

4.4.6 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.

4.4.7 Fuel Oil Tank(s)

(a) Fuel oil tank(s) shall be arranged to allow Vessel operation at acceptable trim in all conditions of loading and with consideration for the requirements for good static and running trim. The Vessel shall be built with one or more independent aluminium fuel tank to service the Vessel's engines. The tank(s), if more than one, shall be interconnected to permit fuel transfer between the tanks.

(b) The aluminium fuel oil tank(s) shall be fitted/installed in the Tank Space, actual location to be designed and accepted by GNC.

(c) 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 hull structures.

(i) Marine grade aluminium (5083 H321 or equivalent) with increased resistance to corrosion shall be the material to construct with.

(ii) The thickness shall sustain the loads due to the mass of the full tank with due consideration given to accelerated forces due to the Vessel's movements at all speeds at sea, without damaging the tank and ship structure.

(d) Internal surfaces of the fuel oil tank shall be left unpainted and shall be cleaned thoroughly to the satisfaction of MD.

(e) Provisions to the fuel oil tank

(i) 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;

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

(iii) 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;

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

(v) 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;

(vi) The fuel oil tank shall be tested by a head of water equal to the maximum to which the tank may be subject, but not less than 2.5 metres above the top of the tank. The static test pressure shall be applied for five minutes without pressure drop. After the test, the test fuel tank shall not show any leakage;

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

(viii) Tank drain shall be provided;

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

4.5 Bilge System

4.5.1 A drainage system, including an electrical bilge pump and a manually back-up pump, shall be constructed and arranged to discharge the bilge of every non-watertight compartment by the Contractor. The electrical bilge pump shall be connected to the main battery through fuse and started by automatic switch. An external high level bilge alarm (i.e. audio and visual) is provided at mast c/w on /off switch at console. 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 Part VII.

4.5.2 The Vessel shall be designed and constructed to minimise the potential risk for the accidental overboard discharge of pollutants (oil, fuel).

Chapter 5 External Fire-fighting System (EFFS)

5.1 General Requirements

5.1.1 The EFFS shall be designed solely for marine fire-fighting operation.

5.1.2 The performance and functional tests of EFFS shall be included as part of Technical Acceptance.

5.1.3 The EFFS shall meet the following requirements:

(a) One electric-priming diesel fire pump rated flow of at least 1200L/min at discharge pressure of not less than four (4) bar. [E]

(b) One fire-fighting monitor shall be fitted at the bow of the Vessel capable of achieving (i) vertical travel and (ii) not less than 210° horizontal movement.

(c) A "Y" shape dividing head shall be fitted to provide connection between the outlet of fire pump and two delivery hoses. The delivery hoses shall be provided to connect the dividing head with (i) fire-fighting monitor & (ii) portable branch.

(d) The EFFS, including the fire pump outlet, "Y" shape dividing head, delivery hose and fire-fighting monitor, shall be fitted with light alloy instantaneous 70 mm male and female coupling at each end. The specification of couplings shall be complying with British Standard BS 336.

(e) Fire main pipes shall be constructed with marine grade stainless steel (316).

(f) Tenderer is encouraged to provide the design features which facilitates the officer in charge to control and receive information of the fire-fighting more easily. [D]

5.2 Fire Pump

5.2.1 The Vessel shall be provided with one electric-priming diesel fire pump for external fire-fighting practice. The fire pump shall be mounted securely on deck with an independent fuel tank. The fire pump shall be operated by centrifugal impeller(s), which is designed for marine and open boat use.

5.2.2 The fire pump shall be fitted and connected to an independent sea suction.

5.2.3 Suction and discharge pressure gauges, safety valves, tachometer and any other gauges and fittings fitted shall be provided and fitted intact with the fire pump before delivery.

5.2.4 The fire pump shall be equipped with an emergency shutdown function. The design and arrangement of the fire pump shall be submitted to GNC for approval before installation.

5.3 Piping System

5.3.1 The piping system of EFFS shall be protected from overpressure. The piping system shall also be suitably protected from corrosion and capable of draining thoroughly during operation.

5.3.2 The piping system between the fire pump and any hull plating shall be full penetration welded. Flange connection shall be permitted only at the fire pump and the sea water discharge valve outlet.

5.3.3 All pipes, flanges, valves and other fittings in the piping system shall be designed and constructed with stainless steel of sufficient thickness to prevent corrosion.

5.3.4 The piping system of EFFS shall be designed to avoid water hammer and similar hydraulic shocks within the system and providing the means to purge air from the piping system at low flow velocities.

5.4 Water Suction, Discharge and Sea Chest

5.4.1 The piping system of water suction shall be designed to avoid cavitation.

5.4.2 The intake of the fire pump shall be designed for the ease of clearing debris from sea in Vessel afloat condition.

5.4.3 Where sea chest outlet piping is needed and provided, a valve shall be provided at or near the suction inlet of the fire pump.

5.4.4 The suction arrangement for the fire pump shall include a sea chest with screened inlet, a valve at the sea chest outlet and a valve vent to atmosphere. The sea chest for EFFS shall only be used solely for fire-fighting purpose.

5.4.5 Sea water inlet and sea chest shall be arranged and located at position as low as practical to avoid clogging due to debris from sea. The sea water inlet suction shall not be impeded by ship motions or water flow from waterjet suction.

5.4.6 The sea water inlet at sea chest shall be fitted with strainer plates at the Vessel's shell. The strainer plates shall possess a clear area at least twice that of the sea valves. The edges of strainer plate slots or holes shall be rounded to prevent the cavitation. Compressed air or other effective means shall be provided for clearing off debris from the strainer plates.

5.4.7 Sea water inlet for EFFS shall be equipped with a shut off valve. The leading edge of inlet pipe shall be rounded to avoid the formation of cavitation.

5.5 Fire-fighting Monitor

5.5.1 The fire-fighting monitor shall be installed at the bow of the Vessel so as to allow an unobstructed range of operation in preventing monitor jets from impinging on Vessel structures and equipment.

5.5.2 Monitor foundations and structural supports shall be designed for all modes of operation, with particular attention given to loadings at maximum output and water jet reactions. Calculations demonstrating adequacy of the design, including water jet reactions specified by the monitor's manufacturer, shall be submitted to GNC before installation for consideration.

5.5.3 The monitor shall be constructed with corrosion- resistant material. It shall be capable of achieving (i) vertical travel controlled by lever and twist lock mechanisms and (ii) not less than 210^{o} horizontal rotation.

5.5.4 The monitor shall be fitted with water jet spray nozzle.

Chapter 6 Electrical System

6.1 General Requirements

6.1.1 Engine alternators, at idle conditions, shall provide sufficient power to maintain the battery charged and all ship equipment (electrical and electronic) servicing including fire-fighting operation.

6.1.2 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 (hereinafter referred to as IEC), Electrical Installations in Ships. The electrical system shall be an insulated two-wire Direct Current (DC) system. The hull shall not be used as a current-carrying conductor.

6.1.3 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.

6.1.4 The electrical equipment shall be capable of operating simultaneously without causing interference to any electronic equipment including the compass. The system shall provide sufficient power to operate all installed electrical systems using a 12 or 24 V DC System.

6.1.5 The Vessel shall be supplied with a comprehensive wiring diagram schematic. The Contractor shall submit a layout plan showing the exact locations of the Equipment. All Equipment shall be easily and safely accessible for inspection and maintenance.

6.1.6 Essential drawings and detailed particulars (such as the rating and capacity, type of all electrical equipment as well as the wiring, circuit breakers, lighting and sockets) shall be submitted for the MD's approval before the completion date stipulated in Annex 2 to this Part VII.

6.1.7 Detailed wiring diagrams of the complete supply and distribution network, including wire size, insulation and sheathing shall be approved by the RO or other entities acceptable by MD when required by the rules and submitted for the MD's approval before the completion date stipulated in Annex 2 to this Part VII.

6.1.8 Connectors shall be mounted to allow for disconnection and reconnection with minimum effort during component removal. Wiring bundles shall be long enough to permit replacement of connectors at least three times without splicing or before replacing the wire bundles. Switches and controls shall be marked to indicate their purpose. Each conductor shall be bear its own unique identification code and marked, on both ends, to identify its function in the electrical system with the exception that tape is not used to mark wiring.

6.1.9 Adequate clearance shall be maintained around equipment to provide space for resiliently mounted equipment excursion, for ventilation and maintenance. Shields shall be installed as necessary to protect electrical equipment from drips or spray resulting from normal operation of or damage to, piping systems. Insofar as practical, equipment shall be located to reduce the possibility of damage or malfunction caused by partial flooding of the space in which the equipment is located and to protect the equipment from accidental physical damage.

6.1.10 All DC equipment shall function over a voltage range at the battery terminals as follows:

(a) 12-volt system: 10.5V to 15.5V

(b) 24-volt system: 21.0V to 31.0V

6.1.11 The length and cross-sectional area of conductors in each circuit shall be such that the calculated voltage drop shall not exceed 10% of the nominal battery voltage for any appliance when every appliance in the circuit is switched on at full load.

6.1.12 All Equipment installed shall be accompanied by operation and maintenance manuals.

6.1.13 The Equipment's installation standards shall serve to enhance safety and not present hazards to the operators, 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 traditional Chinese, or with universally recognisable labels.

6.2 Batteries

6.2.1 Independent group of 12-volt maintenance-free batteries shall be provided for starting of engines. Each group of batteries for engine starting shall be connected to independent DC circuits with a crossover network to other group of batteries. They shall be interchangeable to back up each other, and be capable of being charged by the engine driven alternator individually. Parallel of batteries is not allowed.

6.2.2 The capacities of the batteries shall be sufficient to provide at least six (6) consecutive starts of the engines from cold without recharging and maintain an uninterrupted power supply to the shipboard services (e.g. navigation lights, general lights, alarm).

6.2.3 A separate group of batteries shall be dedicated to the emergency services (e.g. radio communications and signalling, emergency and navigation lights) is required.

6.2.4 The engine-driven alternators shall be able to charge the batteries and to provide 12 or 24V DC power to the shipboard services.

6.2.5 Batteries shall be permanently installed in a dry, ventilated location above the anticipated bilge water level and access from open deck area.

6.2.6 In consideration of the intended operational role of the Vessel, the batteries shall be installed in a manner that restricts their movement horizontally and vertically. A battery, as installed, shall not move more than 10 mm in any direction when exposed to a force corresponding to twice the battery's weight.

6.2.7 Batteries shall be installed, designed or protected so that metallic objects cannot come into unintentional contact with any battery terminal.

6.2.8 Batteries, as installed, shall be protected against mechanical damage at their location or within their enclosure.

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

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

6.2.11 Battery cable terminals shall not depend upon spring tension for mechanical connection.

6.2.12 All circuits (with the exception of those required for starting the engines and powering navigation lighting, electronic devices with protected memory and protective devices such as bilge pumps and alarms, which shall be protected individually with a circuit breaker or fuse as close as practical to the battery terminal) shall be connected to the supply system voltage in a

readily accessible location through a master battery disconnection switch, installed at or as close as possible to the positive conductor from the battery, or group of batteries.

6.3 Distribution Network

6.3.1 12 or 24V DC services shall be supplied from the switchboard in the console through a 2-wire insulated system to the following items:

(a) Navigation light control panel and navigation lights;

(b) Horn;

(c) General lighting;

(d) Compass light;

(e) Instrument panel in the consoles;

(f) Content gauges for the fuel oil tanks;

(g) Hand-held searchlight;

(h) Siren;

(i) Red flashing light

(j) Electric bilge pumps and external high level bilge alarm (ie. buzzer and beacon); and

(k) All other navigational and electronic equipment (as applicable).

6.4 Cables

6.4.1 No electrical equipment, components or cables shall run through or be installed inside the petrol tanks' compartments.

6.4.2 Cables that are not sheathed shall be supported throughout their length in conduits, cable trunking, or trays, or by individual supports at maximum intervals of 300 mm.

6.4.3 Sheathed cables and battery cables to the battery disconnection switch shall be supported at maximum intervals of 300 mm, with the first support not more than one metre from the terminal. Other sheathed cables shall be supported at maximum intervals of 450 mm.

6.4.4 Conductors which may be exposed to physical damage shall be protected by sheaths (armoured cables), conduits or other equivalent means. Cables passing through bulkheads or structural members shall be protected against damage to insulation by chafing.

6.4.5 The metallic sheathing, armour or braid of cable shall be earthed properly at both ends. All bare terminals shall be insulated properly with approved cable insulators.

6.4.6 Wiring shall run along conduits with watertight openings and be secured in such a manner as to allow easy maintenance.

6.4.7 (a) RO approved watertight cable glands shall be provided in way of watertight bulkhead or deck penetrations.

(b) The penetration shall be located as high as practicable and well clear from the ship side.

6.5 Overcurrent Protection

6.5.1 A manually reset trip-free circuit-breaker, or a fuse, shall be installed within 200 mm of the source of power for each circuit or conductor in the system or, if impractical, each conductor shall be contained within a protective covering, such as a sheathing conduit or cable trunking, for its entire length from the source of power to the circuit-breaker or fuse.

6.5.2 The voltage rating of each fuse or circuit-breaker shall not be less than the nominal circuit voltage. The current rating shall not exceed the value for the conductor of smallest diameter in the circuit.

6.6 Switchboard (Panel Board)

6.6.1 Switchboards or panel boards shall be installed in such a way that the control elements, indicating instruments, circuit-breakers and fuses are readily accessible. The terminal side shall be accessible.

6.6.2 Connections and components on panel-boards shall be in locations protected from the expected conditions in conformity with IEC 60529 or equivalent:

(a) IP 67 as a minimum, if exposed to short-term immersion; IP 55 as a minimum, if exposed to splashing water; and

(b) IP 20 as a minimum, if located in protected locations inside the Vessel.

6.6.3 Panel-boards (switchboards) shall be marked permanently with the nominal system voltage.

6.7 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.

6.8 Lighting

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

6.8.2 Independently controlled dimmable walkway lights shall be supplied to cover the fore and aft decks and walkways on both sides of the Vessel.

6.8.3 Independently controlled high-powered white floodlights shall be supplied to cover the fore and aft decks and Vessel's sides.

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

6.9 Navigational and Signalling Equipment

6.9.1 Navigation Lights

(a) Navigation lights 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.

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

6.9.3 The Contractor shall provide the following signalling equipment of a type approved by the FSD:

(a) One all-round red flashing light

(b) One siren; and

(c) One horn.

6.10 Lightning Protection

6.10.1 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.

6.11 Searchlight and Torch

6.11.1 The Contractor shall supply 1 set of 50W high-powered hand-held white searchlight. It can 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. The Contractor shall supply 1 set of waterproof electric torch light with spare bulb and batteries. Facilities for storing the hand-held searchlight and electric torch shall be provided. The type of searchlight, the length of the extension cables, the positioning of the sockets, type of electric torch light and the stowage shall be discussed at the kick-off meeting and shall be agreed by the FSD.

Chapter 7 Life-Saving Appliance (LSA) Arrangements

7.1 General Requirements

7.1.1 The Life-Saving Appliance (LSA) shall meet the following requirements:

(a) A life ring buoy with self-igniting light and a rescue quoit with line attached shall be provided. The name of the Vessel shall be painted on both life ring buoy and rescue quoit.

(b) Thirteen (13) self-inflatable life jackets shall be provided. In addition to the other lifejacket requirements in the International Life-Saving Appliance Code (LSA Code), the name of the Vessel shall be painted on each side of the lifejackets on board. The size of the name painted shall be decided by GNC. The material of paint shall not cause any damage to the lifejacket surface.

(c) Two (2) 2.5-kg dry powder fire extinguishers shall be provided with holding rack.

(d) Survivor recovery system shall be provided and tightly affixed at the starboard side of the Vessel as specified in Paragraph 3.14.6 of this Part VII.

(e) Man overboard recovery system (net) shall be provided and tightly affixed at the transom of the Vessel.

7.1.2 All Life-Saving Appliance (LSA) shall be placed as readily accessible as possible. The positions of LSA shall also be clearly indicated.

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) Loudhailer/Siren and External Broadcasting System;

(b) Echo sounder and Depth Indicator;

(c) Marine Radar;

(d) GPS/DGPS Receiver;

(e) Automatic Identification System (AIS);

(f) International Maritime Mobile (IMM) VHF Radio with GMDSS;

(g) Magnetic Compass and Fluxgate Compass; and

(h) Electronic Chart System (ECS).

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 is preferred, so that information and also the display monitors of different systems, such as ECS, radar system, AIS receiver, can 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 onboard.

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 and the radiation hazard zone of the radar scanner in the Vessel design. All radar and radio equipment shall meet the licensing requirements of the Office of the Communications Authority of Hong Kong.

8.1.7 All installation and cabling in respect of compass, VHF, radar, 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 so that the breaker can be locked 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 Loudhailer/Siren and External Broadcasting System

8.2.1 The loudhailer/siren and external broadcasting system shall be an off-the-shelf product.

8.2.2 The system shall function as a siren and powerful loudhailing system designed especially for hailing other craft in the marine environment. It shall comprise of a master control unit, a control panel, a fist microphone, amplifier, horn type loudspeakers and related components and accessories.

8.2.3 In manual mode, the system shall be capable of generating both a “yelp” siren and a horn signal sound. In automatic mode, the system shall have a selection of at least six (6) warning signal sounds for general marine navigational use.

8.2.4 The master control unit, which shall be completed with fist microphone and microphone hanger, shall be recessed mounted in the control console with the following facilities provided at the front panel:

(a) Power ON/OFF;

(b) Hail volume control; and

(c) Function control.

8.2.5 The loudspeakers shall be of marine grade and weatherproofed to IP66, have a power rating of twenty (20) watts minimum and an impedance compatible with the amplifier.

8.2.6 The master control unit shall be installed in the wheelhouse with its front panel waterproofed to IPX6 standard or better.

8.2.7 The loudspeakers shall be equipped with a volume control system with which the volume can be adjusted to a minimum for night operations and to a maximum level which shall enable messages to be heard 0.2 km away.

8.2.8 The positions of all the system’s main components shall be discussed at the kick-off meeting.

8.3 Echo Sounder and Depth Indicator

8.3.1 The equipment shall consist of a transducer and a digital depth indicator which is recessed mounted at the steering console and capable of providing readout of sea depth in feet, fathoms and meters.

8.3.2 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.

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

8.3.4 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.

8.4 Marine Radar

8.4.1 The equipment shall be a relative motion high performance radar suitable for small vessels and comprises a transceiver, an antenna and a colour display unit, suitable for bright daylight and night viewing.

8.4.2 The transceiver shall be housed in the scanner unit and shall be designed for aloft mounted construction and capable of satisfactory operation at high wind speeds. The scanner assembly shall be housed in a weatherproof housing.

8.4.3 The radar scanner unit shall be installed well clear of obstruction to minimise undue interference and Non-Ionizing Radiation (NIR hazards). Care shall also be taken to ensure the scanner mounting does not give excessive shadow sectors for navigation lights.

8.4.4 Complete interface kit shall be provided to interface the Fluxgate Compass and GPS/DGPS to the radar. The radar shall have interface to accept and display navigation data such as latitude and longitude positions of the Vessel given by the GPS/DGPS receiver.

8.4.5 The Contractor shall pay special attention to any possible radar blind zone, and address this during the design stage and verify it after installation, and rectify it if required. Special attention shall be paid to the equipment installed before the radar scanner like flood lights and/or horn speakers. Care shall also be taken to ensure the mounting does not obstruct the navigation lights.

8.4.6 The radar shall have standard NMEA 0183 interface ports, i.e. National Marine Electronics Association (NMEA) Standard, capable of accepting navigational data from a wide selection of GPS/DGPS Receivers, Electronic Compasses, and to output comprehensive data on all tracked targets in the form of a track table to a wide selection of electronic chart plotters. However, connection of the radar system to the other systems supplied under this Contract via other standard interface types equivalent to NMEA 0183 is acceptable.

8.4.7 The power of the equipment shall be supplied from the 12 or 24 V DC system of the Vessel. The DC system / subsystem powering the IMM VHF Radio shall be with battery backup.

8.4.8 The radar transceiver shall be housed in a radome antenna/scanner unit of maritime type. It shall be designed for aloft mounted construction and capable of satisfactory operation at relative wind speeds of not less than 70 knots.

8.4.9 Guard zones and alarm functions shall be provided in the radar. The zone can be set and shown on the display screen. Audible alarm shall be activated if other vessels enter the zones set.

8.4.10 The radar display unit shall incorporate control keys and processor equipment to integrate, control, operate and display all radar and chartplotter functions and AIS information from the AIS receiver. The Electronic Chart System (ECS) shall be capable of both connecting to and being accessed remotely from the Government router through an Ethernet interface.

8.4.11 The radar display unit shall comprise a flush-mounted LCD colour display of a type suitable for use on an open deck vessel. The display unit shall provide a clear and clutter free picture in all weather conditions and be suitable for viewing in direct sunlight without the need for a viewing hood or the like. The display shall indicate clearly the important parameters

such as radar targets, range marker, bearing line, heading marker and range rings, guard zone and background etc.

8.4.12 On the viewing side of the display unit, the following controls shall be provided:

(a) Power ON/OFF;

(b) Standby/Transmit;

(c) Automatic adjustment of gain, sea clutter and tune keeps targets clearly in view;

(d) True motion displays the vessel's movements relative to fixed targets;

(e) Bearing cursor rotation;

(f) Variable range marker;

(g) Range scale selection;

(h) Display brilliance & illumination;

(i) Selection of background colour and target colour;

(j) Tuning; and

(k) Heading marker ON/OFF.

8.4.13 Performance Requirements

The marine radar shall perform at least the following requirements.

(a) Display Unit

Display:	LCD
Screen size:	9 inch or larger
Resolution:	800 x 480 pixels or better
Display mode:	Head up, Course up, North up and True Bearing Modes (with inputs of compass and speed data)
Range scale:	0.125 nm to 36 nm
Range units:	Selectable from nautical miles, kilometres, and kilo yards
Minimum range:	30 m or better
Range ring accuracy:	1.5% or better of the maximum range of the scale in use; or 30 m, whichever is the greater
Radar bearing accuracy:	1.5 degree or better
Display language:	English and desirably with Chinese
Others:	With Adjustable electronic bearing lines and variable range markers features
Operating temperature:	-10℃ to +55℃ or better
Waterproofing:	IPX6 or better

(b) Transceiver

Operating frequency:	9410 ± 30MHz (X–band)
Overall noise figure:	6 dB or better

(c) Antenna

Operating frequency:	compatible with the transceiver
Aerial Type:	Radome radar antenna (24" or less)
Horizontal beam width:	6.0 degrees or less
Vertical beam width:	25.0 degrees or less
Polarization:	Horizontal
Rotation Speed:	Not less than 24 rpm within satisfactory operation at relative wind speed up to 70 knots. Manual and automatic selection of antenna rotation speed (for example, 24 rpm, 36 rpm or 48 rpm) shall be available according to detection range.
Operating temperature:	-10℃ to +55℃ or better
Relative humidity:	90% or better
Waterproofing:	IPX6 or better

8.4.14 Heading Marker, Bearing Measurement and Display

(a) This thickness of heading marker shall not be greater than 0.5 degree with an accuracy better than 1 degree.

(b) Arrangements shall be provided for bearing measurement with an accuracy of better than 1.5 degree. Bearing discrimination shall be better than 2.0 degrees.

8.5 GPS/DGPS Receiver

8.5.1 The information received by the GPS/DGPS receiver shall be input to the marine radar and display on the marine radar and the screen of the Electronic Chart System (ECS). The output of the receiver shall give the vessel position in a format compatible to marine radar in the NMEA 0183 format. However, connection of the radar system to the other systems supplied under this Contract via other standard interface types equivalent to NMEA 0183 is acceptable.

8.5.2 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.

8.5.3 Capable of input not less than 20 routes of 100 waypoints with 20 character alphanumeric names and icons.

8.5.4 Language to be used is English and desirably with Chinese.

8.5.5 Performance requirements

(a) Display

Display unit:	True sunlight readable 640 x 480 pixel (or better) back-lit LCD Display
Position indication:	Latitude/Longitude, UTM
Position resolution:	4 decimal places
Others:	NAV data, 3-D panorama display

(b) GPS Receiver

GPS Receiver Type:	Equipped with 8 channel parallel receiver or better
Frequency Range:	157.425 ± 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

Frequency range:	283.5-325 kHz
Frequency Step:	500 Hz
Position Accuracy:	5 m or better

(d) Environmental Requirements

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

8.6 Automatic Identification System (AIS)

8.6.1 The equipment shall receive navigation information from local AIS-equipped vessels.

8.6.2 The equipment shall include an AIS receiver which shall be able to receive both Class-A and Class-B AIS information.

8.6.3 The AIS receiver shall be able to receive AIS information to and from AIS-equipped vessel nearby such as dynamic data (vessel position, coordinated universal time (UTC), course over ground (COG), speed over ground (SOG), rate of turn (ROT), heading), static data (maritime mobile service identity (MMSI), vessel names, type of ship, call signs, length and beam, heading, destination, latitude, and longitude, location of position-fixing antenna on the ship), short safety-related messages and other navigation data, from vessel nearby.

8.6.4 The AIS receiver supplied shall be equipped with interface connecting to display including the display of the radar system. The AIS shall allow the radar display to AIS information given by the AIS receiver.

8.6.5 Performance Requirements

(a) Receiver Characteristic

Frequency range:	161.975 MHz and 162.025 MHz
Channel interval:	25 kHz
Receiver sensitivity:	-105 dBm or better
Others:	Dual parallel channel receiver

(b) Aerial and Feeder

(i) The aerial provided shall be marine type aerial with at least 3 dBi gain, vertically polarized, omni-directional and suitable for mounting on the launch.

(ii) The V.S.W.R. of the aerial installed shall be less than 1.5 : 1

(iii) The aerial feeder shall be RG58U type or equivalent

(iv) Coaxial cable lightning suppresser with appropriate earthing connection shall be provided for protecting the radio equipment. All outdoor connector joint shall be properly covered by waterproof tape or material.

8.7 International Maritime Mobile (IMM) VHF Radio with Global Maritime Distress Safety System (GMDSS)

8.7.1 The IMM VHF radio shall meet the licensing requirements of the Office of Communication Authority of Hong Kong.

8.7.2 The Radio shall be fully compatible to GMDSS.

8.7.3 The Radio shall be fully compatible to GMDSS, which is a Class A Digital Selective Calling (DSC) transceiver fully compatible with the International Maritime Organization (IMO) GMDSS carriage requirements.

8.7.4 The equipment shall be equipped with all the entire international maritime VHF channels complete with a fist microphone with press-to-talk switch or telephone handset, mic/handset hanger, mounting bracket and loud speaker.

8.7.5 The equipment shall incorporate with Channel 12 and shall be able to dual watch on Channel 16 or one of the other channels.

8.7.6 The equipment shall complete with antenna and integrated microphone, loudspeaker, control knobs/keys, display screen, etc., necessary for a stand-alone operation. The main unit shall be installed in the coxswain operation area.

8.7.7 The following facilities shall be provided at the front panel of the equipment:-

(a) Power ON/OFF;

(b) “Transmit” indicator, volume and squelch controls;

(c) Socket for plug for microphone and external speaker;

(d) Quick selection of Channel 16 (156.8 MHz);

(e) Channel selection and indicator;

(f) Dual watch mode selection; and

(g) Transmission power selector for HIGH and LOW Power (5W/1W).

8.7.8 Performance Requirements

(a) Transmitter Characteristics

Frequency Range:	156.025 MHz to 157.425 MHz, or better
Frequency Deviation:	Frequency modulation with maximum frequency deviation of +5 kHz
Spurious and harmonics emissions:	-65 dB or better
RF Output Power:	5/1W (High/Low)

(b) Receiver Characteristics

Frequency Range:	156.050 MHz to 161.425 MHz, or better
Sensitivity:	Less than 1 uV for 20 dB SINAD or equivalent
Adjacent Channel Selectivity:	60 dB or better
Spurious Image Rejection:	65 dB or better
Intermodulation:	65 dB or better
Audio output:	Not less than 1 Watt at rated audio power output with less than 10% distortion

(c) Aerial and Feeder

(i) The aerial provided shall be marine type aerial with at least 3 dBi gain, vertically polarized, omni-directional and suitable for mounting on the launch.

(ii) The V.S.W.R. of the aerial installed shall be less than 1.5 : 1

(iii) The aerial feeder shall be RG58U type or equivalent.

(iv) Coaxial cable lightning suppresser with appropriate earthing connection shall be provided for protecting the radio equipment. All outdoor connector joint shall be properly covered by waterproof tape or material.

8.8 Magnetic Compass and Fluxgate Compass

8.8.1 The Contractor shall provide one magnetic compass and one electronic fluxgate compass with digital display.

8.8.2 The fluxgate compass shall consist of at least a sensor unit and a display unit, and be compact and easy to operate. It shall have direct connection to the radar.

(a) An electronic display unit shall be installed at a position for easy viewing of vessel heading by the coxswain.

(b) Digital display is preferred. [D]

8.8.3 The fluxgate compass shall be provided to allow the operation of the radar in north stabilised mode and supply heading direction information to the colour plotter system.

8.8.4 Performance Requirements of fluxgate compass:

Reference:	Either Magnetic North or True North
Accuracy:	+1.00 typical or better
Resolution:	0.1° or better
Deviation Compensation:	Automatic
Operating Temperatures:	0℃ to 50℃
Waterproofing:	IPX5 or better

8.9 Electronic Chart System (ECS)

8.9.1 The ECS shall be able to show the radar, AIS, depth of water by echo sounder, fluxgate compass and ENC information. The aforementioned functions shall be integrated into one multi-function system and present to each display. The console shall consist two displays of ECS.

8.9.2 General Requirements

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

(i) Navigational calculation;

(ii) Chart updating;

(iii) Piloting; and

(iv) Voyage monitoring.

(b) In particular, the electronic chart system shall be capable of:

(i) Reading and loading IHO S-57 (version 3.1) ENC data file and, where necessary, updating the same;

(ii) Working with GPS/DGPS receiver (connected via NMEA 0183 bus);

(iii) Automatic loading of charts depending on vessel's own position and display scale;

(iv) Display in north-up or head-up mode (both possible); and

(v) The electronic chart system shall be capable of both connecting to and being accessed remotely from the Government router through an Ethernet interface.

8.9.3 Performance Requirements

(a) Navigational Features

Total Waypoints: 2000 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

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

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

8.10 Installation Requirements

8.10.1 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 must be observed;

(iii) Receiving apparatus and other electronic equipment which may be affected by radio frequency induced voltages must 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) EMC (electromagnetic compatibility) 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 would not affect the intended operation and functionalities of the equipment.

(j) Installation location

(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

(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 complying with 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

(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

(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

(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

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

(ii) Polarity of power cables shall be labelled.

8.11 Acceptance Test

8.11.1 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 complies 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 dock trial.

8.11.2 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.

8.11.3 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.

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

8.11.5 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.

8.11.6 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.

8.12 Documentation for the Proposed Equipment

8.12.1 The Contractor shall supply with the tenders 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.

8.12.2 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) Parts 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.

8.12.3 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 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

(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 engines 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) Type approval certificate by RO;

(m) 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 on the date specified as Schedule 2 Delivery Schedule of Part V.

(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 (ENE)

10.1.1 General requirements

(a) All training courses shall be held in Hong Kong and delivered by qualified instructors.

(b) The Contractor shall provide appropriate classroom as well as on board training 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.

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

i. Operator Training

ii. Equipment Maintenance Training

(d) The Contractor shall submit a detailed course syllabus and a schedule for conducting the training course.

(e) Each trainee shall receive one copy of comprehensive training documents before the start of each course.

(f) Training manual in Chinese and English shall be provided and submitted to MD and EMSD for approval at least one month prior to commencement of the aforementioned two types of training respectively.

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 22 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 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 FSD 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 15 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

ABS	American Bureau of Shipping
AC	Alternating Current
AIS	Automatic Identification System
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
COG	course over ground
dB	Decibel
dBi	decibel isotropic
dBm	Decibel-milliwatts
DC	Direct Current
DGPS	Differential Global Positioning System
DSC	Digital Selective Calling
ECDIS	Electronic Chart Display and Information System
ECS	Electronic Chart System
ENC	Electronic Navigational Charts
ENE	Electronic Navigational Equipment
GB	Gigabyte
GM	Metacentric Height
GMDSS	Global Maritime Distress Safety System
GPS	Global Positioning System
GZ	Righting Lever

Hz	Hertz
IHO	International Hydrographic Organization
IMM	International Maritime Mobile
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
MMSI	maritime mobile service identity
MSC	Maritime Safety Committee
NIR	Non-Ionizing Radiation

Nm	Nanometre
NMEA	National Marine Electronics Association
PVC	Polyvinyl Chloride
RF	Radio Frequency
RG58U	RG58U Type Coaxial Cable
ROT	rate of turn
rpm	revolutions per minute
RT	Radioactive Test
SINAD	Signal-to-noise and Distortion Ratio
SOG	speed over ground
SOLAS	Safety of Life at Sea
TCG	Transverse Centre of Gravity
TS	Technical Specifications
UTC	coordinated universal time
uV	nano voltage
VCG	Vertical Centre of Gravity
VDC	Voltage of Direct Current
VHF	Very High Frequency
V.S.W.R.	Voltage Standing Wave Ratio
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.

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) 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), 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).

(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.

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, waterjets 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 - Drawings 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	Structural Construction Plan in Mid-Ship and Bulkhead Section	
4	Construction Profile and Deck Plan	
5	Shell Expansion Plan	
6	Tank Capacity Plan	
7	Engine Mounting Arrangement	
8	Power / Speed Estimation and Curve	
9	Intact and Damaged Stability Plan	
10	Details of Navigational / Communication Equipment	
11	Details of Deck Equipment, Outfitting, Furniture, etc.	
12	Details of Engines' Arrangement	
13	Control Console Arrangement and Schematic Diagram	
14	Instrumentation and Control System	
15	Calculation of Fuel Capacity	
16	Details of Electrical and Electronic Equipment	
17	Electrical Load Calculations	
18	Schematic Layout of Electrical Circuits	
19	Paint Schedule	
20	Lightning Protection Arrangement	
21	External Fire-fighting System (EFFS)	
22	Torsional Vibration Calculation (if applicable)	
23	Others as required	

Part VII Annex 4 – Main Items Inspection Timetable

Item No.	Items to be Inspected			Completion Date	
	Hull Structure, Layout and Outfitting Inspection				
H-1	Mould lofting				
H-2	Construction materials – Aluminium plate mark checking for hull and superstructure				
	(a)	Aluminium plate mark checking for hull and superstructure			
	(b)	Material certificates verification			
H-3	Welding consumables & welders certificates				
H-4	Keel laying for hull				
H-5	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)	NDT (X-ray) of welds			
	(g)	Hull internal work inspection			
	(h)	Plating thickness gauging			
H-6	Engine bearers fabrication / welding				
H-7	Superstructure scantling & welding checking				
H-8	Welding construction and pressure tests of tanks				
	(a)	Fuel oil tank			
		(i)	Tank construction (internal/external/fitting)		
		(ii)	Tank pressure test		
H-9	Hose test for hull & superstructure				
H-10	Mock up inspection				
H-11	Installation of various outfitting items				
	(a)	Anchor and chain			
	(b)	Windlass			
	(c)	Seating of heavy equipment and masts			
H-12	Function tests of various outfitting items				
H-13	Watertightness or weathertightness of openings				
	(a)	Manholes			
	(b)	Hatches			
	(c)	Air pipes			
H-14	Painting inspection of different layers				
H-15	Draught marks and vessel dimensions verifications				
H-16	Arrangement of consoles				
H-17	Zinc anodes and lightning system				
	(a)	Installation of zinc anodes			
H-18	Inspection of fire, heat and sound insulation				
	(a)	Fire insulation			
	(b)	Heat insulation			
	(c)	Sound insulation			

H-19	Interior furnishings		
	(a) Console area		
H-20	Life-Saving Appliances		
H-21	External Fire-fighting System equipment		
H-22	Inclining experiment and/or lightship weight measurement		
H-23	Sea trials including operation test of outfitting equipment		
H-24	Towing test static bollard pull test		
H-25	Site towing demonstration trial		
H-26	Cleanliness inspection before acceptance		
H-27	Inventory check in the HKSAR		
H-28	Acceptance and delivery		
	Electrical and Machinery Installation		
EM-1	General inspection on installation of machinery:		
(a)	General inspection on installation of main engines		
(b)	General inspection on installation of waterjets		
EM-2	Main engines:		
(a)	Test of engine safety devices and alarms		
EM-3	Fuel oil system:		
(a)	General inspection & dimension checking of fuel oil system		
(b)	Fuel oil tank low level alarm test		
(c)	Fuel oil tank final cleaning/internal inspection before filling		
(d)	Fuel oil tank high level alarm test		
(e)	Fuel oil tank content gauge calibration and test		
(f)	Inspection of piping penetration of bulkhead and deck		
(g)	Hydraulic test of fuel oil piping		
EM-4	Bilge system:		
(a)	General inspection & dimension checking of bilge system		
(b)	Bilge tank high and low level alarms test		
(c)	Inspection of piping penetration of bulkhead and deck		
(d)	Hydraulic test of piping		
(e)	Functional test of bilge system		
EM-5	Functional test of drainage system		
EM-6	Batteries:		
(a)	Inspection of battery connectors and housing boxes		
(b)	Inspection of battery charger		
(c)	Operational test of battery charger Test of main engines and generator consecutive starting by each group of battery (start/stop at remote and local control)		
EM-7	Electrical installation:		

(a)	Inspection of lightning conductor		
(b)	General inspection of cable layout & checking of cable sizes		
(c)	Inspection of cable penetrations of bulkhead and deck		
(d)	Inspection of transformers		
(e)	Inspection of tally plates		
EM-8	Main switchboard & panels:		
(a)	Cable size checking of electrical switchboard installations		
(b)	Inspection of DC distribution panel		
EM-9	Control console:		
(a)	Inspection of control console		
(b)	Functional test of console controls		
(c)	Inspection of navigation equipment control panel		
EM-10	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-11	Navigational lights and signals		
(a)	Inspection and functional test of navigational lights		
(b)	Test of horn/whistle/siren		
EM-12	Inspection of lightning conductor		
EM-13	Electronic equipment tested by EMSD		

Note:
These 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 – Endurance Performance – Diesel Propulsion

Date of Test:		Place of Test:	
Vessel's Identification:		Vessel's Name:	

Conditions at Endurance and Performance Test			
Person On board	**3 crews +13 other persons**	Dummy Weight	**75 kg**
Fuel (diesel oil)		Other Equipment	20kg for each crew & 10 kg for other persons on board
Sea Conditions	Calm sea condition at wind speed 6 knots, wave height ≤ 0.5 metres and water depth ≥5 metres		

Engines:	**Port Side**	**Starboard Side**	**Waterjets:**	**Port Side**	**Starboard Side**
Maker			Maker		
Type			Type		
Serial Number			Diameter		
Rated Power			RPM		
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. Starboard	rpm
Engine R.P.M. Port	rpm
Max heeling angle	degree

Turning diameter: Ahead turning to port	Ship length
Engine R.P.M. Starboard	rpm
Engine R.P.M. Port	rpm
Max heeling angle	degree

Witness by:	MD Representative	Shipyard Representative

Part VII - Annex 6 – List of Recognized Organisations

Acronym	Name
ABS	American Bureau of Shipping
BV	Bureau Veritas
CCS	China Classification Society
DNV	Det Norske Veritas
KR	Korean Register of Shipping
LR	Lloyd's Register
NK	Nippon Kaiji Kyokai
RINA	Registro Italiano Navale
RS	Russian Maritime Register of Shipping

Part VII - Annex 7 - As-fitted Drawings and Machinery/Equipment documents and information literature to be delivered to the Government at Delivery Acceptance

1. As-Fitted Drawings

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. formats of the following plans and drawings that contain the technical information of the Vessel and its machinery and equipment as they are on the day when the Vessel is accepted by the MD. These are termed the final version of the "As-Fitted" Plans and Drawings, and they shall consist of the following plans and drawings as well as any other plans and drawings 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 in the professional manner, scale, size and style normally required in the ship design and construction business sector. All plans and drawings shall show and be clearly marked with the profile, plan, and section views of the layout, arrangement details, and construction details in the manner required by GNC.

1.2.1 General Arrangement Plan.
1.2.2 Lines plan and offsets data and table.
1.2.3 Stability information booklet and the inclining experiment report (if applicable).
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 (if applicable).
1.2.8 Detailed arrangement and layout plan showing the disposition of all of the main equipment, fittings and fixtures, furniture, hatches, manholes and access openings. The down-flooding openings (points) shall be indicated clearly 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 Keel construction plan.
1.2.14 Steering system and steering arrangement diagrams (if applicable).
1.2.15 Superstructure and deck structural and construction plan (if applicable).
1.2.16 Hull watertight bulkheads' construction plan.
1.2.17 Superstructure to deck connection detailed construction plan (if applicable)
1.2.18 Engine casing to deck connection detailed construction plan.
1.2.19 Deck edge and bulwark (if any) details and construction plan, including detailed structural arrangement drawings of hull to deck connection.
1.2.20 Detailed cathodic corrosion prevention and arrangement plans and drawings for the Vessel throughout.
1.2.21 Mast structural and construction plan and mast equipment arrangement plan.
1.2.22 Anchoring arrangement plan.
1.2.23 Piping diagrams for fuel oil, lubrication oil, bilge, firefighting, scuppers and drains system.
1.2.24 Fire prevention, fire control and firefighting system drawings.
1.2.25 Drawings of the main switchboard and all other switchboards (if applicable) and the electrical system.

1.2.26 Main engines and waterjets arrangement and setting plans and drawings of their fuel lines and exhaust gas piping and arrangement.
1.2.27 Main fuel oil tank drawing and its associated piping and manifold(s), and filling, overflow and ventilation system.
1.2.28 Drawings of the anchor, and the anchoring system.
1.2.29 Lifesaving appliance arrangement plan and fire safety plan (if applicable).
1.2.30 External fire-fighting system Equipment plan.
1.2.31 Distress signals, alarm systems, and internal/external communication arrangement and system plan (if applicable).
1.2.32 Navigation lights, sound and signal diagrams and any other external lighting arrangement plan.
1.2.33 Vessel overall lighting arrangement and light control plan.
1.2.34 Vessel alarm and signals, internal communication systems and public address systems plan.

1.3 Documents to be provided by the Contractor

Not less than one (1) month before the Delivery Acceptance of the Vessel, the Contractor shall provide for GNC's acceptance a list of all documents to be provided.

When the Vessel is delivered to the Government Dockyard, the Contractor shall deliver to the Government all the 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 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	