

Supply of Four (4) Daughter Boats for the Fire Services Department

Part VII – Technical Specifications

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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 of the People’s Republic of China (“Government”) in relation to in relation to **four (4) Daughter Boats** (“Vessels”) 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]; and
 - (b) Those specifications that are not labelled with [E] shall equally form part of the Contract like the specifications labelled as [E], but the Government will not conduct checks at the tendering stage whether the products offered comply with those specifications not labelled with [E]; and
 - (c) Desirable Specifications [D].
- 1.1.3 All this Part VII shall form part of the Contract. As part of the tender evaluation during the tendering stage (viz., completeness check), the Tenderer shall submit all the information in sufficient detail to substantiate that the product and the services offered meet the Essential Requirements as stipulated in Annex C to the Conditions of Tender, failing which its tender will **not** be considered further.
- 1.1.4 All TS, including all Essential Requirements, those without any label (viz., [E] or [D]) and the Desirable Specifications labelled with [D] (if and to the extent the Contractor has indicated compliance in its tender), shall also form part of the Contract and be of equal materiality and importance upon the award of the Contract. The non-compliance with any specifications set out in these TS shall have the same consequences as specified in the Contract. Save during the tendering stage in the manner as mentioned in Paragraph 1.1.2 (b), no differentiation shall be made based on the classification unless otherwise expressly specified.
- 1.1.5 The Vessels 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.
- 1.1.6 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.
- 1.1.7 As mentioned in the definition of “Vessel” in Clause 1.1 of Part IV, unless otherwise expressly stated, references to “the Vessel” shall mean each of the four (4) Vessels. References to “a Vessel” shall mean any such Vessel. Unless otherwise specified, all requirements specified in this Part VII shall apply to each of the four (4) Vessels to be supplied.
- 1.1.8 For the avoidance of doubt, references to “tests” throughout the Tender Documents and the Contract shall include all inspections, surveys, assessments, trials and experiments.

1.2 Statement of Purposes of the Vessels

- 1.2.1 The Vessels shall be used by FSD mainly (i) to perform search and rescue operations; (ii) to serve as daughter boat for coordinating search and rescue operations; and (iii) to serve as independent firefighting units.
- 1.2.2 The Contractor acknowledges and agrees that the Government relies on the professional judgment and skill of the Contractor to ensure that the Vessels are compliant with all of the aforementioned requirements and warrants that it will alter, modify or otherwise change aspects of the Vessels' fittings, fixtures, user interface as required by the Government in order to ensure the ultimate fitness for purpose of the Vessels before the Acceptance Certificate is issued.

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 Vessels for 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 Contractor's nominated shipyard building the Vessels 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 Vessels and also carry out supervision and quality control work in the course of vessel construction.

1.5 Design and Construction Responsibility

- 1.5.1 The Vessels shall be designed and constructed for a service life of not less than fifteen (15) years under reasonable maintenance.
- 1.5.2 It is the SOLE responsibility of the Contractor to supply Vessels which are safe, fit and suitable for the operation of the of the FSD as set out in Paragraph 1.2.1 above and which meet 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.
- 1.5.3 The proposed Vessels shall be issued with a Type Approval Certificate by the Recognised Organisation (RO) or a Certificate of Compliance or a Declaration of Conformity with the rules and regulations specified in Schedule 9 of Part V. [E]
- 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 Vessels except the design stresses and scantling, shall be submitted to GNC for approval before completion of the Vessels design.

- 1.5.5 Even if the Contractor may appoint a Sub-contractor to design the Vessels 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 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 Vessels are located in Asia), and ten (10) working days (if the Vessels are located other than Asia) must be given to GNC before the representatives of GNC and other Government officers are invited to conduct a survey visit of the Vessel. The Contractor shall be fully responsible for any delay if the Contractor fails to give adequate notice as aforesaid.
- 1.6.4 The Contractor shall provide
- (a) an Implementation Timetable, in the form set out in Annex 2 to this Part VII, setting out the major milestones and their scheduled completion dates and incorporating the Delivery Dates specified in Schedule 2;
 - (b) the Drawing Submissions Timetable in the form set out in Annex 3 to this Part VII; and
 - (c) the Main Items Inspection Timetable in the form set out in Annex 4 to this Part VII.

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

The Delivery Date for the Vessels 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 MD during the construction of the Vessels. The weekly report shall be submitted before noon of every Monday.
- 1.6.6 MD 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 Vessels. The Contractor shall cooperate with the consultant(s) and afford them unhindered access to the Vessels 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 officers consider it is unsafe to carry out the test or inspection, the test/inspection will not be carried out. The Contractor shall arrange another additional survey visit at the Contractor's expenses. The Government shall not be responsible for any delay arising from any postponement in conducting the survey visit due to any safety issue as specified in this paragraph.
- 1.6.8 Where any fee charge and associated expense are payable for the services of an RO which are necessary in order to fulfil any obligation of the Contractor under the Contract, the Contractor is responsible to pay the RO all such fees, charges and associated expenses. Such fees shall include charges for drawing approval, surveys (if deemed necessary), issue of certificates, and any other expenses payable to the RO.
- 1.6.9 The Contractor shall provide office space for MD officers and FSD officers during their survey visits and construction progress visits to the Vessels at the shipyard where the Vessels are constructed. The office space shall include, but not be limited to, two (2) desks, six (6) chairs, one (1) telephone, one (1) conference table for 10 persons, drinking facilities, power supply and one (1) cupboard for storage of documents and working clothes. The space provided by the Contractor shall also be fitted with air conditioning, have Internet access, a copying and a printer machine. Cleaning of the space shall be carried out in each working day.
- 1.6.10 The hours of work of MD officers or 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 MD 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 Vessels are safe to go to sea for the intended tests and trials specified in the Contract.
- 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 officer(s). 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 officers, the name, post, duty and experience of each one of the Contractor's staff on board the Vessels during the Official Sea Trial to ensure the safe operation of the trial. The number of persons on board during a particular test or trial has to be agreed by the MD officers. The location of each person on board, which can affect the centre of gravity of the vessel under trial, will need to be first agreed by the 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 Official Speed Trial

- (a) The Official Speed Trial shall be carried out in Hong Kong Waters.
- (b) As part of the Technical Acceptance as specified in Paragraph 1.8.1 of this Part VII, the Contractor shall carry out the Official Speed Trial in the presence of GNC officers or their appointed agents.
- (c) The actual mean speed of each Vessel (i.e. NOT theoretical) shall be measured during the Official Speed Trial runs to determine if the Contract Speed can be achieved.
- (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 FIVE runs in each direction.
- (f) The Contract Speed to be achieved by each Vessel in the Official Speed Trial shall be the minimum highest achievable speed of 30 knots as specified in Paragraph 2.5.1 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) All Equipment shall also be in operation during the Official Sea Trial unless explicitly exempted by MD. This Equipment shall have passed the Technical Acceptance. The information including but not limited to the speed, time of the day, engine running conditions and sea condition shall be properly recorded by the Contractor, and signed as witnessed by the GNC surveyor (or the GNC representatives) during the Official Sea Trial and shall form part of the Official Sea Trial Report. A copy of the Official Sea Trial Report as required in

Paragraph 1.7.6 below shall be given to GNC before Delivery Acceptance. 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.

1.7.6 The following tests, for each Vessel, 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:

(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) port engine running; and (iii) starboard 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

The maximum astern running speed achievable by the Vessel shall be determined by the test.

1.8 Acceptance and Delivery

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

(a) Technical Acceptance

(b) Delivery Acceptance

1.8.2 Technical Acceptance

(a) This includes 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 1.7.5 of this Chapter shall be conducted in Hong Kong Waters, the Endurance Test, Manoeuvrability Test and Crash Stop Test as mentioned in the Paragraphs 1.7.6 (a), (b) and (c), the bench acceptance test and on-site commissioning test for ENE 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.

- (b) All electronic items and their installations shall be approved and inspected by EMSD as part of the Technical Acceptance.
- (c) The Contractor shall supply all necessary equipment and labour at its own cost for carrying out the tests and trials stated in Paragraph 1.8.2 (a) and (b) above.
- (d) 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, shall be delivered at the Contractor's expense to the Government Dockyard. If the delivery of the Vessel in Ready to Use condition is 120 days later than the Delivery Date specified in Schedule 2, at the discretion of Government, the Contract may be terminated according to the applicable terms stipulated in the Contract.
- (b) The Vessels shall be issued with Type Approval Certificate by the relevant RO or a Certificate of Compliance or a Declaration of Conformity with the rules and regulations as specified in Schedule 9 before the Acceptance Certificate is issued by the Government.
- (c) The Delivery Acceptance of the Vessel shall be carried out by GNC in accordance with the terms stipulated in the Contract. The Delivery Acceptance is only completed when the Acceptance Certificate is issued by the Director of Marine.
- (d) The Contractor must demonstrate to MD 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, manufacture'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.
- (h) 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 once the Director of Marine has issued the Acceptance Certificate.

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 Vessels 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 each 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 Vessels 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

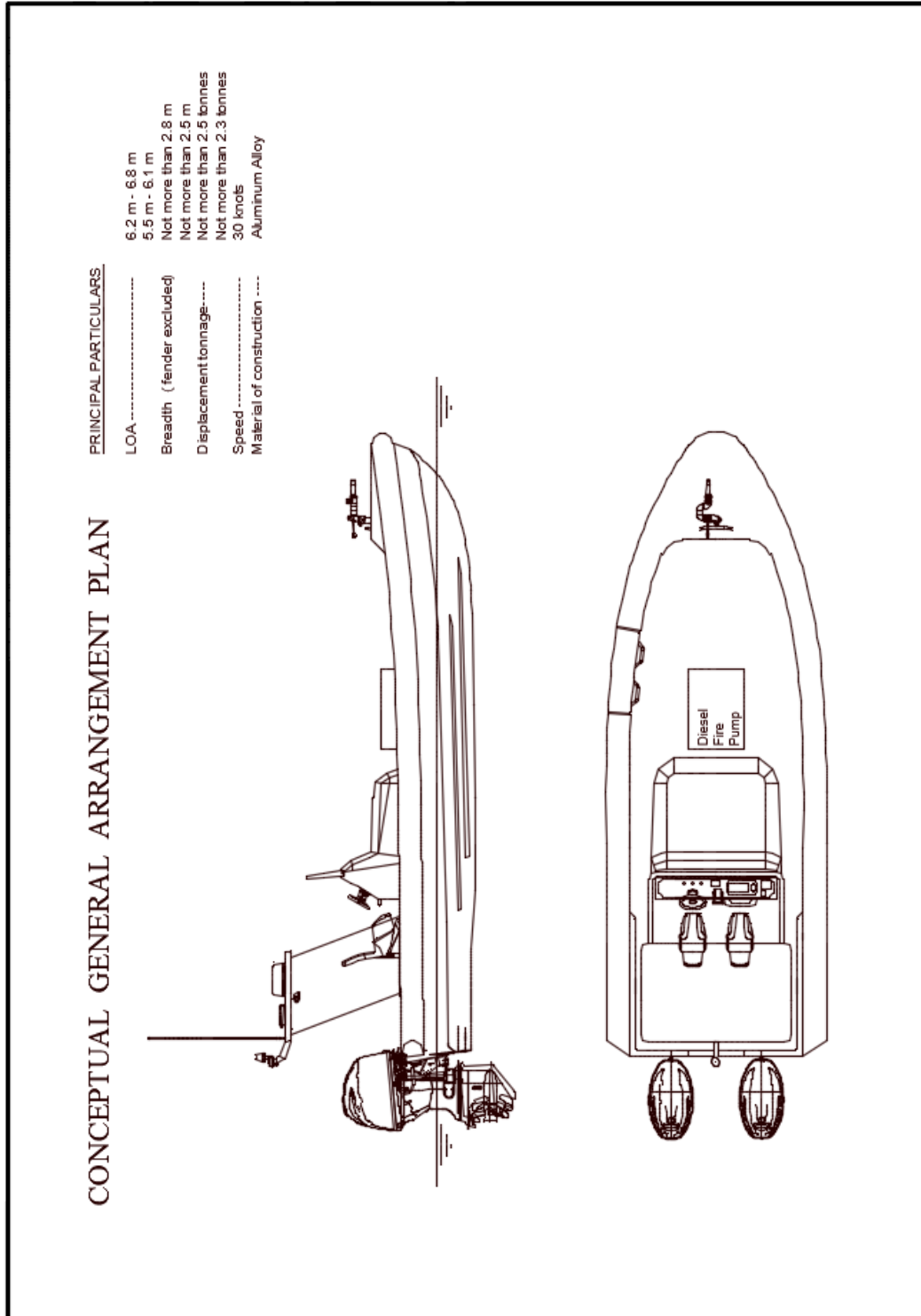
- 1.10.1 The Vessels must be designed for through life support and easy maintenance in the HKSAR based on an operation profile and minimum life expectancy as mentioned in this Part VII.
- 1.10.2 The above applies not only to main engines but also to all other equipment installed in the Vessels. Support and maintenance services must be available (i.e. serviceable) in Hong Kong in respect of all equipment installed in the Vessels and return of the whole or part of the Equipment to the original place of manufacturer or supplier shall not be necessary in order to carry out any repair work.

1.11 Asbestos Free

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

Chapter 2 General Technical Requirements

2.1 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 Vessels. 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 **Four (4) Daughter Boats 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 appropriate designs for the Vessels 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 each 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 Vessels 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" Vessels delivered to the Government.

2.3 Rules and Regulations

- 2.3.1 Each Vessel shall be issued with a Type Approval Certificate by the RO, a declaration of conformity, or a certificate of compliance to national or international standards recognised by GNC.
- 2.3.2 The Contractor shall design, build and supply the Vessels 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 Vessels 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 Germanischer Lloyd | DNVGL |

- (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 an 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”.
- (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 Principal Dimensions

- 2.4.1 The Vessels to be supplied are the daughter boats of the existing fireboats of the Fire Services Department. The Vessels to be built are monohull. Two Vessels shall be constructed with Principal Dimensions A, and the other two shall be constructed with Principal Dimensions B.

The Principle Dimensions A of the Vessels shall be:

Length Overall: 6.2 m to 6.8 m [E]

Extreme Breadth: Not more than 2.8 m (fender not included) [E]

The Principle Dimensions B of the Vessels shall be:

Length Overall: 5.5 m to 6.1 m [E]

Extreme Breadth: Not more than 2.5 m (fender not included) [E]

“Length Overall” means the distance between the foreside of the foremost fixed permanent structure (fender included) and the aftside of the aftermost fixed permanent structure of the Vessel, including outboard engines and out fittings. The Tenderer shall indicate the length overall of each Vessel in Dimension scale in General Arrangement Plan submitted according to Schedule 7 of Part V.

2.5 Contract Speed

2.5.1 When all of the engines are running at their declared maximum rated power, the guaranteed minimum highest achievable speed of all Vessels shall be at least 30 knots in WMO Sea States 0 to 2 under Operational Load Condition specified in Paragraph 2.5.2 of this Part VII. [E]

2.5.2 Operation Load Conditions

	Operational Loading Condition of Daughter Boat with	
	Principal Dimensions A	Principal Dimensions B
Fuel	90%	90%
No of Crew	2	2
Equipment	200 kg	200 kg

2.5.3 The Contract Speed prescribed above shall be achieved without chine walking, porpoising, or other dynamic instabilities. The outboard engines shall match the engine profile and avoid cavitation as far as possible.

2.6 Material of the Construction

2.6.1 The material of hull structure of the Vessels shall be marine grade aluminium alloy.[E]

2.6.2 The plate material shall comply with EN AW 5083 or equivalent.

2.6.3 The console material shall be either marine grade aluminium alloy or composite material.

2.7 Propulsion system

2.7.1 The Vessel shall be propelled by twin outboard engines. The power rating of each outboard engine shall be at least 70 hp and of the same specification produced by the same manufacturer. [E]

2.8 Vessel Operating Profile and Environment

- 2.8.1 The Vessels with Principal Dimensions A shall be designed to provide sufficient space for carrying at least six (6) seated persons, i.e. shock mitigating seats for two (2) crew shall be provided and open jockey seats for four (4) rescued persons shall be provided. The Vessels with Principal Dimensions B shall be designed to provide sufficient space for carrying at least four (4) seated persons, i.e. shock mitigating seats for two (2) crew shall be provided and open jockey seats for two (2) rescued persons shall be provided. Detailed provisions regarding the mounting of shock mitigation seats are specified in Paragraph 3.7 of this Part VII.
- 2.8.2 The Vessels shall be designed for deployment by the FSD on at least 300 days per year including both day and night time operational deployment. The Vessels shall be designed 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 over ground and sea	:	Sufficient fuel for 4 hours full speed operation at 30 knots

- 2.8.3 The Vessels 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 Vessels 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 Vessels. All painting colour scheme for the Vessels 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.
- 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 Vessels or elsewhere as directed by MD and FSD.
- 2.9.4 The Vessels' names shall be marked permanently on both sides and console of the Vessels. The details of 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 Vessels) 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 Vessels shall be provided where necessary.

2.10 Tally Plates

- 2.10.1 The following information shall be displayed on the builder's plate on each Vessel.
- (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 The berthing requirements of Vessels shall match both with the cradle at their corresponding mother boats and the designated point of berth at Government Dockyard.
- 2.11.2 Due to the safe working load of the cranes of the mother boats, the Vessels' displacement of Principal Dimensions A and of Principal Dimensions B, with all equipment and fuel on board, and with the crew excluded, shall be less than 2.5 tonnes and 2.3 tonnes respectively. [E]

2.11.3 The Vessels 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 Each 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.

Chapter 3 Hull

3.1 Structures of the Hull and Scantlings

- 3.1.1 The vessel 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 build 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.
- 3.1.2 Any hatches and 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.
- 3.1.3 The hull design shall incorporate a self-bailing deck with scuppers capable of draining the cockpit in accordance with the ISO 11812:2001 Small Craft – Watertight Cockpits and Quick-Draining Cockpits requirements.
- 3.1.4 The Vessels shall be constructed with internal buoyance tanks. Removal hatches shall be provided for ease of inspection.
- 3.1.5 The hull structure design loads shall be in accordance with the Vessel operational profile and other applicable requirements.
- 3.1.6 The hull construction material shall be new and 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.
- 3.1.7 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.
- 3.1.8 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 offered Vessel shall meet the Stability Criteria specified in Paragraphs 3.3.3 and 3.3.4 of this Part VII. All calculations and drawings must be in metric units. [E]
- 3.3.2 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.

3.3.3 Stability Criteria

Stability criteria shall only be considered satisfactory for the loading conditions set out in Paragraph 2.5.2 if, the following criteria are complied with either:

- (a) The criteria specified in ISO 12217-1 for Category C vessels, or
- (b) As per stability requirements of the RO.

3.3.4 Stability Assessment Booklet

- (a) The Contractor shall supply to MD three (3) copies of the Stability Assessment Booklet. The Stability Assessment Booklet must be given to MD at the time of Delivery Acceptance.
- (b) The Stability Assessment 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, cross curves, vessel displacement, drafts, trim, VCG, TCG, GM, down-flooding angle(s) and other information where necessary;

- (ii) Tank calibration/sounding tables, which shall consist of the locations of tanks (in terms of frame numbers), levels from tank bottom, capacity, and free surface moments, and the locations of the sounding points;
- (iii) The Vessels fulfilling the Stability Criteria as stipulated in Paragraph 3.3.3; and
- (iv) Any other information as reasonably required by the RO and/or GNC.

The Stability Assessment Booklet shall be approved by the RO or relevant certification bodies before submitting to MD for comments.

3.4 Painting

- 3.4.1 Paints shall be of a fire-retardant marine quality and applied in accordance with the manufacturer's specification.
- 3.4.2 Volatile Organic Compounds (VOC) content limits of the paints shall comply with the Controls and Requirements of the VOC Regulation (VOC content limits for regulated vessel paints and regulated pleasure craft paints) of the Regulation of Hong Kong Air Pollution Control Ordinance.
- 3.4.3 Painting schedule shall be submitted for MD approval before commencement of work. The proposal shall contain a list and the detailed specification of the paint intended to be used. Thickness of each coating shall be specified.
- 3.4.4 All painting work shall carry a one-year guarantee provided by the Contractor against defects in material and workmanship. The Contractor shall provide MD at Delivery Acceptance a letter of certification from the paint manufacturer to certify the application of the paint is under the paint manufacturer's quality control and in accordance with the manufacturer's requirements including but not limited to the surface preparation, control of the temperature of the metal surfaces, atmospheric conditions, paint thickness, and method of application.
- 3.4.5 A Tributyltin (TBT) free foul 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; and
 - (b) Sea chest, sea chest grate and sea suction pipe.
- 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 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

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.

3.5.2 Sufficient hand holds and guard rails shall be fitted on the console. 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. The final design of the console shall be manufactured for inspection, modification (if necessary) and confirmation by MD and the FSD. 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 and search lights switch panel;
 - (x) GPS receiver;
 - (xi) Start and priming control of fire pump;
 - (xii) Fuel tanks level gauge (Fuel for both outboard engines and fire pump);
and
 - (xiii) Display screen of at least 9 inches showing all necessary ENE information
as stipulated in Chapter 8.
- (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; and
 - (vi) A waterproof black/grey cover shall be provided to cover each console
down to deck level when the Vessel is not in use.
- (g) A collapsible arch type radar bar shall be provided and retrieved when the vessel
is being hoisted.

3.6 Lockers/Void Spaces

3.6.1 Lockers/Void Spaces

- (a) Watertight lockers/storage acceptable to the FSD shall be provided.
- (b) The locations 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) The lockers or other storage acceptable to the FSD shall be provided for one
emergency repair tool kit and all lifejackets onboard.

3.6.2 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.

3.7 Deck, Seating and Attachment Systems

- 3.7.1 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 2.8.2 of this Part VII may be subjected.
- 3.7.2 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.
- 3.7.3 Two dampened seats each with a drop-down seat cushion shall be provided at the 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 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.
- 3.7.4 The number of open jockey seats with handles, which shall be provided in the Vessels of Principal Dimensions A and of Principal Dimensions B, are four (4) and two (2) respectively.
- 3.7.5 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. The locations of handrails shall be discussed at the kick-off meeting.
- 3.7.6 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.
- 3.7.7 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.

3.8 Fender System

- 3.8.1 Fixed rubber fender shall be fitted to cover the full length of the port and the starboard sides for hull protection purposes.
- 3.8.2 The fender shall be detachable but tightly affixed to the hull. The method of attachment may be by recessed belts, a track system, bolting or other non-adhesive mechanical means agreed by the Government Representative. The design shall ensure that the fender cannot become detached or slide aft as a result of wave action or other unintended external influences.

- 3.8.3 The fender shall be resistant to impact, abrasion, outdoor temperature extremes, degradation caused by ultraviolet radiation, ozone and contact with seawater, oil, petrol, diesel, lubricating oil or chemicals. Heavy duty abrasion resistant D-shape collar foam fendering system with nose cone fender is preferred.

3.9 Bow

- 3.9.1 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. The structure of bow shall be adequately strengthened with optimal fendering for protection from slamming.
- 3.9.2 The fire-fighting monitor shall be installed at the bow of the Vessels as specified in Paragraph 5.6 of this Part VII.

3.10 Survivor Recovery Door (Diving door)

- 3.10.1 The Vessel shall incorporate a survivor recovery door or diving door at the port 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.
- 3.10.2 The door shall be constructed with a diving door for opening and locking in position. The sealing of diving 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.

3.11 Transom and Stern Area

- 3.11.1 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.
- 3.11.2 Sufficient protection shall be designed and fitted for safety of prevention of man overboard incidents.
- 3.11.3 Working platform(s) for engine maintenance purpose shall be fitted at the stern area. Details of the design of stern area 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.

3.12 Devices for lifting the Vessels

- 3.12.1 The Vessels 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:

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 marine grade stainless steel.

- 3.12.2 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.

- 3.12.3 Strong points for mounting the survivor recovery system or rescue frame shall be provided at the starboard side. The arrangement shall be designed so that the survivor recovery system or rescue frame can be rolled into the sea and used to haul a person inside the cradle back up into the Vessel. The size and mounting arrangement shall be discussed at the kick-off meeting and agreed by MD and the FSD.
- 3.12.4 All devices and accessories shall be in accordance with the laws of Hong Kong prior to delivery. The 4-point lifting arrangement 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.

3.13 Cathodic Protection

- 3.13.1 The hull shall be provided with adequate sacrificial anodes to protect the Vessel against corrosion for not less than one year.

Chapter 4 Machinery

4.1 Main Propulsion Engines

- 4.1.1 The Vessel shall be powered by the engines which shall be twin four stroke outboard petrol spark ignition engines of adequate power to achieve the Contract Speed. The engines shall drive stainless steel fixed pitch propellers through the integral gearboxes.
- 4.1.2 The Contractor shall be responsible for ensuring the correct installation and setting up of the engines including the choice of propellers so as to avoid ventilation and cavitation.
- 4.1.3 The declared (rated) power of an engine model or propulsion system shall be the full throttle power at the declared (rated) speed at the final output shaft of the engine or propulsion system as offered for sale by the manufacturer. The power measurements and declarations for the engines and the propulsion system shall comply with the requirements in accordance with International Council of Marine Industry Associations (ICOMIA) 28/83.
- 4.1.4 The emission of the engines shall comply with 3 Stars (Ultra-Low Emission) or higher required by California Air Research Board (CARB) star system that describes exhaust emissions of four-stroke outboard engines or equivalent. [E]
- 4.1.5 Each engine shall be controlled by one set of throttle/forward/reverse lever. The two levers will be conveniently placed for one handed simultaneous operation by the coxswain.
- 4.1.6 The engine throttle control head shall be provided on the right hand side of the steering wheel.
- 4.1.7 The engines shall be equipped with power trim and a switch at the helm that enables the operator to adjust the trim angle on the fly. The engines shall be designed to trim fully in to start, and trim out as the boat gains momentum, until it reaches the point just before ventilation begins.
- 4.1.8 The engine located at the transom shall be easily accessed for maintenance and routine checking even underway. Working platform(s) for engine maintenance purpose shall be fitted at the stern area.
- 4.1.9 The electrical cables, pipings for petrol and hydraulic oil run between the console/fuel tanks and the stern shall be suitably designed to ease the maintenance. They shall be properly supported to prevent chafing and unnecessary tension.
- 4.1.10 Each engine system shall include the following accessories:
- 4.1.11 24V or 12V electrical system c/w alternator and remote starting control;
- (a) Dead-man switch/emergency cut-off;
 - (b) Power trim and tilt system with trim gauge at console;
 - (c) Engine protection system as required by engine manufacturer, with audio and visual warnings at console;
 - (d) Each engine shall incorporate one alternator for battery charging; and
 - (e) Engine tie bar with each pair of engines.

4.2 Engine Installation

- 4.2.1 The outboard engines shall be installed in accordance with the engine maker's instructions and requirements. The Contractor shall submit a certificate/report issued by the engine maker showing that the design and workmanship, power output of the engine installation is suitable for the application/service profile of the Vessel and up to his satisfaction.

4.3 Propellers

- 4.3.1 All propellers shall be of stainless steel with fixed pitch. Removable propeller shrouds shall be provided for propellers but not be fitted during the Official Speed Trial. Detachable propeller guard for each propeller of outboard engine shall be provided.

4.4 Steering System

- 4.4.1 The Vessel shall be fitted with a hydraulic steering system approved by the engine's manufacturer as evidenced by a confirmation issued by the engine's manufacturer.
- 4.4.2 The hydraulic steering system shall be designed with two hydraulic cylinders operating in parallel. The steering capability shall be maintained with one cylinder malfunctioned.
- 4.4.3 The hydraulic oil tank shall be located that ready access is available for level checking.
- 4.4.4 Outboard engines shall be designed so that, with any combination of engine turn and tilt, there shall be no damaging interference between the motor, its accessories, and both the craft-mounted and the engine-mounted system.
- 4.4.5 Connections, fittings, oil fill openings and air bleeders shall be accessible.
- 4.4.6 Components in the system shall be externally protected against corrosion. The complete hydraulic steering system shall be designed to withstand conditions of pressure, vibration, shock and movement without failure or leakage.
- 4.4.7 Hydraulic systems shall be capable of operation throughout an ambient temperature range of -10 °C to +60 °C and be capable of withstanding storage at -30 °C to +60 °C.
- 4.4.8 Materials used in hydraulic steering systems shall be resistant to deterioration by liquids or compounds with which the material may come in contact under normal marine service, e.g. grease, lubricating oil, hydraulic fluid, common bilge solvents, salt and fresh water.
- 4.4.9 The type of hydraulic fluid to be used in a hydraulic steering system shall be specified by the manufacturer of the steering system and shall be stated in the owner's manual. The hydraulic fluid shall be non-flammable or have a flash point of 157 °C or over.
- 4.4.10 Hydraulic lines shall be supported by clips, straps or other means to prevent chafing or vibration damage. The clips, straps or other devices shall be corrosion resistant and shall be designed to prevent cutting, abrading or damage to the lines and shall be compatible with hydraulic line materials.
- 4.4.11 A flexible section shall be installed between rigid piping and cylinder(s).
- 4.4.12 The steering wheel shall be fitted with an anti-slip covering.
- 4.4.13 The piping shall comply with one of the international standards as stated in Clause 2.3.3 to this Part.

4.4.14 All the fittings (hoses and piping) shall withstand the system test pressure without leaks.

4.5 Petrol Tank

4.5.1 One (1) under deck petrol tank with sufficient capacity to fulfil the endurance requirements specified at Paragraph 2.8.2 of this Part VII shall be provided. The design and tests shall comply with the rules and regulations of RO.

4.5.2 The petrol tank shall be constructed with marine grade stainless steel, marine grade aluminium alloy or other materials with equivalent corrosion resistance. The arrangement of petrol tank shall be discussed at the kick-off meeting and shall be agreed by the FSD and MD.

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 petrol engine driven fire pump rated flow of at least 1000L/min at discharge pressure of not less than seven (7) bar shall be mounted securely on deck connecting with steel suction pipe from bottom sea chest. [E]
 - (b) The water shall be discharged to an underdeck fixed piping and connected to a total of two (2) connections, one detachable fire-fighting monitor and an additional light alloy instantaneous 70 mm female coupling at bow.
 - (i) The detachable fire-fighting monitor with independent shut-off valve shall be fitted at the bow of the Vessel capable of achieving (1) at least 135° vertical travel (-45° to +90°) and (2) not less than 240° horizontal movement.
 - (ii) The light alloy instantaneous 70 mm female coupling shall be comprised of an independent shut-off valve at the bow. The specification of couplings shall be complying with British Standard BS 336.
 - (c) The underdeck fixed piping shall be provided at or near the fire pump outlet. The design and piping arrangement of the EFFS shall be discussed at the kick-off meeting and submitted to GNC for approval before installation.
 - (d) The fire main pipes shall be constructed with marine grade stainless steel (316) or marine grade aluminium alloy.

5.2 Fire Pump

- 5.2.1 The Vessel shall be provided with one electric-priming petrol engine driven fire pump for external fire-fighting practice. The fire pump shall be mounted securely with an independent underdeck 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. 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.
- 5.2.3 The minimum water pumping capacity of the pump shall be at least 1000 litres per minute at a discharge pressure of not less than seven (7) bar.
- 5.2.4 The fire pump shall be controlled manually by the integrated control panel at steering console.
- 5.2.5 The fire pump shall be equipped with an emergency shutdown function. The design and piping arrangement of the fire pump shall be discussed at the kick-off meeting and submitted to GNC for approval before installation.

5.3 Water Suction, Discharge and Sea Chest

- 5.3.1 The piping system of water suction shall be designed to avoid cavitation.
- 5.3.2 The intake of the fire pump shall be designed for the ease of clearing debris from sea in Vessel afloat condition.
- 5.3.3 Where sea chest outlet piping is needed and provided, a valve shall be provided at or near the suction inlet of the fire pump.
- 5.3.4 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 shall only be used solely for fire-fighting purpose.
- 5.3.5 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 the outboard engines.
- 5.3.6 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. The strainer plates shall also be effectively kept away from biofouling.
- 5.3.7 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.

5.4 Fire-fighting Monitor

- 5.4.1 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.
- 5.4.2 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.
- 5.4.3 The monitor shall be constructed with corrosion-resistant material. It shall be capable of achieving (i) at least 135° vertical travel (-45° to +90°) controlled by lever and twist lock mechanisms and (ii) not less than 240° horizontal rotation.
- 5.4.4 The monitor shall be fitted with waterjet 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.
- 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 schematic wiring diagram. 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 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 outboard engines. Each group of batteries for engine starting shall be connected to independent DC circuits with a crossover network to other groups 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 each group of batteries specified in Paragraph 6.2.1 above shall be sufficient to provide at least six (6) consecutive starts of the engine 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 dedicated to the shipboard services and emergency services (e.g. radio communications and signalling, emergency and navigation lights) shall be supplied by the Contractor and conform to the RO Requirements.
- 6.2.4 The engine-driven alternators shall be able to charge the batteries and to provide 12-Volt DC power to the shipboard services.
- 6.2.5 Batteries shall be permanently installed in a dry, ventilated location.
- 6.2.6 Batteries shall be installed, designed or protected so that metallic objects cannot come into unintentional contact with any battery terminal.
- 6.2.7 Batteries, as installed, shall be protected against mechanical damage at their location or within their enclosure.
- 6.2.8 Batteries shall not be installed directly above or below a fuel tank or fuel filter.
- 6.2.9 Any metallic component of the fuel system within 300 mm above the battery top, as installed, shall be insulated electrically.
- 6.2.10 Battery cable terminals shall not depend upon spring tension for mechanical connection.
- 6.2.11 All circuits (with the exception of those required for starting the engines and powering navigation lighting, electronic devices with protected memory and protective devices, which shall be protected individually with a circuit breaker or fuse as close as practical to the battery terminal) will 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.

- 6.2.12 The Vessel shall be provided with waterproof socket to charge the batteries. A transformer shall also be provided to connect the socket, thus the batteries can be charged by mother boat and shore power facilities. The arrangement shall be discussed at the kick-off meeting and shall be agreed by the MD and the FSD.

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; and
- (j) 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. Type approved cable penetrations shall be provided at the openings of watertight compartments or deck penetrations.

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; and
 - (iv) Masthead 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

6.11.1 The Contractor shall supply a high-powered hand-held white searchlights. They shall be connected to sockets on board with coiled extension cables of appropriate lengths. Sockets shall be installed on both the port and starboard sides of the console. Facilities for storing the hand-held searchlights shall be provided. The type of searchlight, the length of the extension cables, the positioning of the sockets and the stowage shall be discussed at the kick-off meeting and shall be agreed by the 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) One (1) life ring buoy with marker 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) The no. of self-inflatable life jackets to be provided in each Vessel shall be two (2). 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) One (1) 2.5-kg dry powder fire extinguishers shall be provided with holding rack.
- (d) A rescue frame shall be installed at the starboard side of the Vessel to facilitate rescue of victim at sea. The size and arrangement shall be discussed at the kick-off meeting.

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) Multi-beam sonar;
 - (c) Marine Radar (required for Vessels with principal dimensions A only);
 - (d) GPS/DGPS Receiver;
 - (e) Automatic Identification System (AIS);
 - (f) International Maritime Mobile (IMM) VHF Radio with VHF DSC of GMDSS;
 - (g) Magnetic 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 the display monitor of different systems, such as ECS, radar system, AIS transceiver, 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 be of a type approved by the Office of the Communications Authority of Hong Kong.
- 8.1.7 All siting, 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 Multi-beam sonar

- 8.3.1 The equipment shall consist of a transducer, a processor unit and an interconnection display unit 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 transducer shall be installed at the hull of the Vessel.

- 8.3.3 The interconnection display unit shall comprise of 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.
- 8.3.4 The interconnection display unit shall be interconnected with the Radar, ECDIS and other navigational equipment.
- 8.3.5 The measuring depth shall be from 3 metres to 200 metres or equivalent in fathom or feet 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.
- 8.3.6 The equipment shall display the cross section of the sea column echo in at least 120 degrees port and starboard.
- 8.3.7 Shallow water audible alarms shall be provided. Setting of the alarm depth shall be at the front panel of the equipment.
- 8.3.8 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 160 kHz.
- 8.3.9 The power of the equipment shall be supplied from the 12 or 24 V DC system of the Vessel.

8.4 Marine Radar (required for Vessels with principal dimensions A only)

- 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 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 or NMEA 2000 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.
- 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 transceiver. 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 display 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°C to +55°C 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°C to +55°C 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 Global Positioning System (GPS) / Differential Global Positioning System (DPGS) 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 or NMEA 2000 format. However, connection of the radar system to the other systems supplied under this Contract via other standard interface types equivalent to NMEA 0183 or NMEA 2000 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: 1575.42± 1MHz (C/A code), L1

Sensitivity: -130 dBm or better

Dynamic Range: 25 dB or better

Warm start fix time: Less than 30 seconds

Cold start fix time: Less than 3 minutes

Position Accuracy: 15 m or better

Tracking Velocity: 999 kt or better

(c) Differential Beacon Receiver

Frequency range: 283.5-325 kHz

Frequency Step: 500 Hz

Position Accuracy: 5 m or better

(d) Environmental Requirements

Operating temperature: -15°C to +55°C 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 transceiver which shall be able to receive both Class-A and Class-B AIS information.

8.6.3 The AIS transceiver 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 transceiver 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 transceiver.

8.6.5 Each set of AIS shall include:

(a) AIS 4" (or larger) LCD Colour Graphic Display Unit;

(b) AIS Transponder Unit;

(c) VHF antenna;

(d) GPS antenna; and

(e) Installation / operation handbook

8.6.6 Performance Requirements

(a) General

Power supply: 12 – 24 V D.C.

Default Frequencies: AIS1 (CH 87B) : 161.975 MHz

AIS2 (CH 88B) : 162.025 MHz

Frequency range: 156.025 ~ 162.025 MHz

Transponder size/weight (+ 2%): 221 x 165 x 95 mm, 1.5 kg

GPS size/weight (+ 2%) 90 x Ø65 mm (+140 mm mounting bar), 0.2 kg

(b) Transmitter Characteristic

Power output: 12.5W or 1.0W (41 dBm ±1.5 dB or 30 dBm ±1.5dB)

Antenna impedance: 50 ohms (SO-239)

Channel spacing: 25 kHz

(c) AIS Receiver

Frequency range: 161.975 MHz and 162.025 MHz

Channel interval: 25 kHz

- | | |
|-----------------------|--------------------------------|
| Receiver sensitivity: | -105 dBm or better |
| Others: | Dual parallel channel receiver |
- (d) GPS Antenna & Receiver
- | | |
|----------------|--|
| Antenna: | PATCH ANTENNA /TNC (RG58U) |
| Receiver Type: | 16 channel, L1 frequency, C/A code |
| Accuracy: | Acquisition -140dBm / Tracking -150dBm |
- (e) Environment
- | | |
|------------------------|----------------|
| Operating temperature: | -15°C to +55°C |
| Storage temperature: | -25°C to +75°C |
| Vibration: | IEC 60945 |
- (f) 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) Very High Frequency (VHF) Radio with VHF Digital Selective Calling (DSC) of Global Maritime Distress Safety System (GMDSS)

- 8.7.1 The IMM VHF radio shall conform to the performance requirements and standards adopted by the International Maritime Organization and meet the licensing requirements of the Office of Communication Authority of Hong Kong.
- 8.7.2 The Radio shall be fully compatible to GMDSS and equipped with a lithium battery of lifetime at least 5 years.
- 8.7.3 The Radio shall be integrated with 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

- 8.8.1 The Contractor shall provide one magnetic compass.
- 8.8.2 The magnetic compass shall have a direct-read dial with dial size of at least $2\frac{3}{4}$ inch.
- 8.8.3 The magnetic compass shall have a green night lighting function.
- 8.8.4 The magnetic compass shall have a built-in compensator to adjust for deviation.
- 8.8.5 The power of the equipment shall be supplied from the 12 or 24 V DC system of the Vessel.
- 8.8.6 The compass dome shall be constructed of heavy duty, optically clear polymer, and shall provide clear and accurate magnification of the dial.
- 8.8.7 Performance requirements of magnetic compass:
 - (i) Resolution: 2° or better
 - (ii) Mounting option: Binnacle or flush or bulkhead mount
 - (iii) 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 and Electronic Navigational Charts (ENC) information. The aforementioned functions shall be integrated into one multi-function system and present to the display.
- 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) Working with GPS/DGPS receiver (connected via NMEA 0183 or NMEA 2000 bus);
 - (ii) Automatic loading of charts depending on vessel's own position and display scale;
 - (iii) Display in north-up or head-up mode (both possible); and
- 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°C to +50°C or better
- Storage Temperature: -20°C to +60°C 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 sitting, 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) Induced mutual interference should be within an appropriate level which would not affect normal operation. [D]
- (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 comply to this technical specifications. 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 basin 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) Part list with part numbers and locations (the adjustment/calibration tools/kit/program shall also be included);
 - (h) Maintenance and troubleshooting instructions;
 - (i) Equipment interfacing with wiring diagram with clear signal labelling;
 - (j) Software operation manual for Equipment driven by application software;
 - (k) As fitted conduit/trunking route diagrams for the electronic equipment installed onboard for the purpose of future maintenance; and
 - (l) The design conduit/trunking route diagrams submitted to MD and EMSD for approval during construction stage.

8.12.3 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 and evaluation.

Chapter 9 Services Support

9.1 General Requirements

9.1.1 In determining the appropriate design for the Vessels, 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 Hong Kong.

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

- (a) good access to all installed items for monitoring, service and overhaul; and
- (b) easy access to in-situ service and maintenance in Hong Kong.

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 MD and FSD 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; and
 - (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.

For each Vessel, the Contractor shall supply the following items upon Delivery Acceptance of the Vessels:

- (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; and
 - (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; and
 - (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 Vessels shall be delivered directly to EMSD.
- (b) All items shall be properly documented, preserved and packed.

9.2.4 Photographs

For each Vessel, 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 Hong Kong 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

For each Vessel, 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 Hong Kong);
- (j) Hull construction material certificates 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 Hong Kong as stipulated in Annex 1 of this Part VII - Technical Specifications; and
- (l) Any other certificates as appropriate.

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:
 - (d) Operator Training
 - (e) Equipment Maintenance Training
- (f) The Contractor shall submit a detailed course syllabus and a schedule for conducting the training course.
- (g) Each trainee shall receive one copy of comprehensive training documents before the start of each course.
- (h) 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 Vessels.
- (d) A total of up to 20 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 Vessels.
- (e) A total of up to 30 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 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 20 officers of the MD in Hong Kong upon the Delivery Acceptance of the Vessel. An operation training programme shall be proposed for consideration by GNC which shall include details of depth and duration of the training course. The training instructors must possess suitable qualifications acceptable to MD. A certificate shall also be issued to the trainees by the training instructor or his organisation upon completion of the training course for proof of competence and satisfactory completion of the course.
- 10.2.3 In order to ensure the engineering work-up team and the front-line maintenance teams of the MD and the maintenance personnel of the Government Dockyard acquire full knowledge and appreciation of all aspects of the designs, day to day operation, breakdown, routine maintenance and fault diagnosis of the engine/electrical distribution system, hull structural repair, etc., the Contractor shall therefore provide appropriate train-the-trainer courses for a total of 10 engine operators and 10 maintenance personnel from the Government Dockyard in Hong Kong 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.

Chapter 11 Abbreviations

ABS	American Bureau of Shipping
AIS	Automatic Identification System
AWS	American Welding Society
BS	British Standards
CD	compact disc
CD-ROM	Compact Disc Read-Only Memory
CH	Channel
COG	course over ground
dB	Decibel
dB _i	decibel isotropic
dB _m	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
IMM	International Maritime Mobile
IMO	International Maritime Organization
IEC	International Electro-technical Commission

IP	Ingress Protection
IPX	Internetwork Packet Exchange
ISO	International Organization for Standardization
ITU-R	International Telecommunication Union – Radiocommunication Sector
K	Kilo
kg	Kilogram
kHz	Kilohertz
km	Kilometer
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
MHz	Megahertz
mm	Millimetre
MMSI	maritime mobile service identity
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

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. 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 Schedule 6 in Part V and electronic navigational equipment), fittings and outfit (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, 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, 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 2.2.3 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 Schedule 6 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 Paragraphs 8.1.1 in 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, labour and equipment in order to carry out such work:

2.2.1 Engines

- (a) Renew the lubricating oil and replace the filters for the engines as per the manufacturer's recommendations;
- (b) Clean all the engine air filters and change the filter elements as necessary;
- (c) Clean the coolers of the engines and renew all zinc anodes if provided;
- (d) Check all the engines' belts and adjust if necessary;
- (e) Check tappet clearances for the inlet and exhaust valves, ignition timing and idle speed and adjust if necessary;
- (f) Conduct function tests for the engines' protection system, gauges and other measuring devices; and
- (g) Any other work required or recommended by the engine manufacturer.

All of the work listed at Paragraphs 2.2.1(a) to (g) shall be carried out by the manufacturer's authorised agent. All the work procedures shall comply with the manufacturer's specifications and requirements.

2.2.2 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;
 - (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 2.2.2(a)(iii) above, two coats of touch up primer and one coat of touch up shall be applied; and
 - (v) One full coat of finishing paint shall be applied to the hull below the water line.
- (b) Paint Above the Water Line
 - (i) Damaged paint on the hull above the water line shall be repaired properly. After repair, two coats of touch up primer and one coat of touch up 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 if necessary.
 - (d) Free, clean, grease and recondition all moving parts of the deck fittings, i.e. WT (watertight) hatches, vent covers, etc.
 - (e) Renew all zinc anodes.
- 2.2.3 The following shall be tested at the dock trial / sea trials as part of the Guarantee Slipping:
- (a) Engine control and steering system;
 - (b) Engine alarm and shut down function (including emergency stopping of engines);
 - (c) Navigational equipment, lights and sound signals;
 - (d) Ahead and astern running and crash stop test;
 - (e) Steering trial;
 - (f) Other trials as required by the Government Representative; and
 - (g) Any item or component found defective shall be repaired or replaced.

Milestones		Completion Dates
1	Kick-Off Meeting	To be held within two (2) months after the Contract Date at the Government Dockyard or the Contractor's Shipyard
2	Completion of hull structures	The Contractor shall propose the completion dates of Milestones 2-6 for GNC's approval within two (2) months after the Contract Date.
3	Completion of installation of engines, propellers and steering gear	
4	Completion of installation of electronic navigation equipment	
5	Pre-shipment Construction and Handling Inspection	
6	Shipment to Hong Kong	
7	Delivery Date	

Item No.	Drawings Approval	Completion Date
	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.
	Lines Plan	
	Structural Construction Plan	
	Construction Profile and Deck Plan	
	Shell Expansion Plan	
	Tank Capacity Plan	
	Engine Mounting Arrangement	
	Power / Speed Estimation and Curve	
	Stability Assessment Booklet	
	Details of Navigational / Communication Equipment	
	Details of Deck Equipment, Outfitting, etc.	
	Control Console Arrangement and Schematic Diagram	
	Calculation of Fuel Capacity	
	Details of Electrical and Electronic Equipment	
	Electrical Load Calculations	
	Schematic Layout of Electrical Circuits	
	Paint Schedule	
	Lightning Protection Arrangement	
	Others as required	

Part VII Annex 4 – Main Items Inspection Timetable

Item No.	Items to be Inspected	Inspection Date	Outstanding/ Re-inspection/ Remarks
	Hull Structure, Layout and Outfitting Inspection		
H-1	Mould lofting		
H-2	Construction materials – Aluminium plate mark checking for hull		
	(a) Aluminium plate mark checking for hull		
	(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 mounting fabrication / welding		
H-7	Welding construction and pressure tests of tanks		
	(a) Fuel oil tank		
	(i) Tank construction (internal/external/fitting)		
	(ii) Tank pressure test		
H-8	Hose test for hull		
H-9	Installation of various outfitting items		
H-10	Function tests of various outfitting items		
H-11	Watertightness or weathertightness of openings		
H-12	Painting inspection of different layers		
H-13	Draught marks and vessel dimensions verifications		
H-14	Arrangement of consoles		
H-15	Zinc anodes and lightning system		
	(a) Installation of zinc anodes		
H-16	Interior furnishings		
	(a) Console area		
H-17	Lifesaving appliance		
H-18	External fire fighting system		
H-19	Inclining experiment and/or lightship weight measurement		
H-20	Sea trials including operation test of outfitting equipment		
H-21	Cleanliness inspection before acceptance		
H-22	Inventory check in the HKSAR		
H-23	Acceptance and delivery		
	Electrical and Machinery Installation		
EM-1	General inspection on installation of outboard engines		
EM-2	Outboard engines:		

(a)	Test of engine safety devices and alarms		
(b)	Break in test of outboard engines		
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		
EM-4	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-5	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-6	Main switchboard & panels:		
(a)	Main switchboard & panels - high voltage injection test		
(b)	Cable size checking of electrical switchboard installations		
(c)	Inspection of DC distribution panel		
(d)	Megger test of the electrical system		
(e)	Earthing test of the electrical system		
EM-7	Control consoles		
(a)	Inspection of control console		
(b)	Functional test of console controls		
(c)	Inspection of navigation equipment control panel		
EM-8	Lighting:		
(a)	Inspection and functional test of general lighting		
(b)	Inspection and functional test of emergency lighting		
(d)	Inspection and functional test of searchlight installation		
EM-9	Navigational lights and signals		
(a)	Inspection and functional test of navigational lights		
(b)	Test of siren/loudhailer		
EM-10	Electronic equipment tested by EMSD		
EM-11	Test of noise level during sea trial		

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 and Performance Tests

Date of Test:			Place of Test:						
Vessel's Identification:			Vessel's Name:						
Conditions at Endurance and Performance Test									
Person On board	2		Dummy Weight	N.A.					
Fuel (Petrol)	90% fuel		Other Equipment	200 kg					
Sea Conditions	Sea States 0 - 2								
Engines: Port Side Starboard Side Propellers: Port Side Starboard Side									
Maker			Maker						
Type			Type						
Serial Number			Diameter						
Rated Power			Pitch						
Rated Speed			Direction of Rotation						
Engine Load	Engine Speed (rpm)	Vessel Speed (Knots)	Time (Start)	Time (Finish)	Fuel Consumption (litres/minutes)	Engine Oil Pressure (Bar)	Engine (in) CW Temp. (°C)	Others	Others
___% of rated Power	At Minimum Cruising Speed		Not less 15 minutes						
50% of Rated Power/rpm			Not less 15 minutes						
60% of Rated Power/rpm			Not less 15 minutes						
70% of Rated Power/rpm			Not less 15 minutes						
80% of Rated Power/rpm			Not less 30 minutes						
90% of Rated Power/rpm			Not less 30 minutes						
100% of Rated Power (Endurance Test)			Not less 90 minutes						
Remarks:									
Witness by:		MD Representative				Shipyard Representative			

Part VII - Annex 6 - As-fitted Drawings and Machinery/Equipment documents and information literature to be delivered to the Government after 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. files of the following plans and drawings that contain the technical information of the Vessel and its machinery and equipment as they are when the Vessel is on the day accepted by the MD. These are termed the final version of the “As-Fitted” Plans and Drawings, and they must consist of the following ones as well as any other additional ones that may be required by GNC/MD during the design and construction of the Vessel and before the Vessel is accepted by the Government.
- 1.2 The as-fitted plans and drawings shall be prepared by professional ship draughtsmen and they shall be prepared in a professional manner, scale, size and style normally required of in the ship design and construction business sector. All plans and drawings shall show and be clearly marked for the profile, plan, and section views of the layout, arrangement details, and construction details in a manner required by GNC officer.
 - 1.2.1 General Arrangement Plan
 - 1.2.2 Lines plan and offsets data and table.
 - 1.2.3 Stability Assessment booklet and/or the inclining experiment report and/or light weight measurement.
 - 1.2.4 Vessel construction drawings.
 - 1.2.5 Painting scheme of the whole Vessel.
 - 1.2.6 Vessel draught marking diagram.
 - 1.2.7 Detailed arrangement and layout plan showing the disposition of all main equipment, console layout, fittings and fixtures, hatches, and access openings. The down-flooding openings (points) shall be clearly indicated on the drawings.
 - 1.2.8 Equipment layout diagram.
 - 1.2.9 Hull structural construction and hull scantlings drawings.
 - 1.2.10 Hull shell and frames and the framings arrangement and construction plan.
 - 1.2.11 Hull shell expansion plan.
 - 1.2.12 Steering system and steering arrangement diagrams.
 - 1.2.13 Deck structural and construction plan.
 - 1.2.14 Hull watertight bulkheads construction plan.
 - 1.2.15 Deck edge and bulwark (if any) details and construction plan, including detailed structural arrangement drawings of hull to deck connection.
 - 1.2.16 Detailed cathodic corrosion prevention and arrangement plans and drawings for the Vessel throughout.
 - 1.2.17 Mast/radar bar structural and construction plan and mast equipment arrangement plan.
 - 1.2.18 Piping diagrams for fuel oil, firefighting and scuppers and drains.
 - 1.2.19 Drawings of the main switchboard and all other switchboards and the electrical system.
 - 1.2.20 Outboard engines sets arrangement and sitting plans and drawings of their fuel lines and piping and arrangement.
 - 1.2.21 Fuel oil tank(s) and its associated piping system
 - 1.2.22 Lifesaving appliance arrangement plan.
 - 1.2.23 External Fire Fighting system equipment brochure/literature and its associated arrangements and drawings.
 - 1.2.24 Distress signals, alarm systems, and internal/external communication arrangement and system plan.
 - 1.2.25 Navigational lights, sound and signal diagrams and any other external lighting arrangement plan.
 - 1.2.26 Vessel overall lighting arrangement and light control plan.
 - 1.2.27 Vessel alarm, signals and internal communication systems.
 - 1.2.28 All Electronic Navigational Equipment brochure/literature and its associated arrangements and drawings.
 - 1.2.29 Electrical load calculation.
 - 1.2.30 Any drawing as required by GNC.

1.3 Documents to be provided by the Contractor

- 1.3.1 In not less than one (1) month before the Delivery Acceptance of the Vessel, the Contractor shall provide for GNC acceptance a list of all documents to be provided.
- 1.3.2 When the Vessel is delivered to the Government Dockyard the Contractor shall deliver to the Government all 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 any one of all the engines, machinery, motors, pumps, equipment, fittings and outfitting items of the Vessel.

Part VII - Annex 7 – Definitions of Wave and Sea

Beaufort scale number	Description	Wind speed	Wave height	Sea conditions	Land conditions
0	Calm	< 1 km/h (< 0.3 m/s)	0 m	Flat.	Calm. Smoke rises vertically.
		< 1 mph			
		< 1 knot	0 ft		
		< 0.3 m/s			
1	Light air	1.1–5.5 km/h (0.3–2 m/s)	0–0.2 m	Ripples without crests.	Smoke drift indicates wind direction. Leaves and wind vanes are stationary.
		1–3 mph			
		1–3 knot	0–1 ft		
		0.3–1.5 m/s			
2	Light breeze	5.6–11 km/h (2–3 m/s)	0.2–0.5 m	Small wavelets. Crests of glassy appearance, not breaking	Wind felt on exposed skin. Leaves rustle. Wind vanes begin to move.
		4–7 mph			
		4–6 knot	1–2 ft		
		1.6–3.4 m/s			
3	Gentle breeze	12–19 km/h (3–5 m/s)	0.5–1 m	Large wavelets. Crests begin to break; scattered whitecaps	Leaves and small twigs constantly moving, light flags extended.
		8–12 mph			
		7–10 knot	2–3.5 ft		
		3.5–5.4 m/s			
4	Moderate breeze	20–28 km/h (6–8 m/s)	1–2 m	Small waves with breaking crests. Fairly frequent whitecaps.	Dust and loose paper raised. Small branches begin to move.
		13–17 mph			
		11–16 knot	3.5–6 ft		
		5.5–7.9 m/s			
5	Fresh breeze	29–38 km/h (8.1–10.6 m/s)	2–3 m	Moderate waves of some length. Many whitecaps. Small amounts of spray.	Branches of a moderate size move. Small trees in leaf begin to sway.
		18–24 mph			
		17–21 knot	6–9 ft		
		8.0–10.7 m/s			
6	Strong breeze	39–49 km/h (10.8–13.6 m/s)	3–4 m	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.
		25–30 mph			
		22–27 knot	9–13 ft		
		10.8–13.8 m/s			
7	High wind, moderate gale, near gale	50–61 km/h (13.9–16.9 m/s)	4–5.5 m	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.
		31–38 mph			
		28–33 knot	13–19 ft		
		13.9–17.1 m/s			
8	Gale, fresh gale	62–74 km/h (17.2–20.6 m/s)	5.5–7.5 m	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.
		39–46 mph			
		34–40 knot	18–25 ft		
		17.2–20.7 m/s			
9	Strong gale	75–88 km/h (20.8–24.4 m/s)	7–10 m	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.
		47–54 mph			
		41–47 knot	23–32 ft		
		20.8–24.4 m/s			

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	37–52 ft		
		56–63 knot			
		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	≥ 46 ft		
		≥ 64 knot			
		≥ 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	