Part VII – Technical Specifications

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Chapter 1 – General Provisions

1.1 Introduction

1.1.1 This document (or "Technical Specifications" (or "TS") or "Part VII") sets out the requirements of the Government of the Hong Kong Special Administrative Region ("HKSAR") of the People's Republic of China (hereinafter referred to as the "Government") in relation to **twelve (12) versatile patrol units (each a "VPU"** or "Vessel") for use by the Hong Kong Police Force ("HKPF"). References in the TS to "the VPU" or "the Vessel" mean each of the twelve (12) VPUs.

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

(a) Essential Requirements **[E]**;

(b) Those specifications which are without any label (viz., **[E]** or **[D]**) ("Specifications without Label"); and

(c) Desirable Specifications **[D]**.

1.1.3 As part of the tender evaluation during the tendering stage (viz., completeness check), the Tenderer shall submit all the information sufficiently detailed to substantiate that the product and the services offered meet the Essential Requirements as stipulated in Annex C to the Conditions of Tender, failing which its tender will not be considered further.

1.1.4 All Essential Requirements **[E]**, Specifications without Label, (if and to the extent the Contractor has indicated compliance) 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. Where the Tenderer has indicated non-compliance with any Specification without Label, it shall have proposed Counter-Proposals to such Specifications without Label in accordance with Clause 17.3 of Part II – Conditions of Tender for the Government's evaluation.

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

1.1.6 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 Where design specifications of the Vessel are required to be approved by the specified RO, they must be approved by the RO as well as by GNC and HKPF prior to the manufacture of the Vessel (collectively, "GNC/HKPF"). Where design specifications of the Vessel are not required to be approved by the specified RO, they must be approved by GNC/HKPF prior to the manufacture of the Vessel.

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.

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

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

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

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

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

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

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

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

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

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

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

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

(l) where more than one unit of a subject matter is to be supplied as part of the Work, all requirements stated to be applicable to that subject matter shall apply to each such unit of that subject matter. This is regardless of whether the term "each of" or other cognate expression is used preceding that subject matter. This principle shall apply including without limitation where the subject matter is the Vessel, the Daughter Boat, and the Equipment on each Vessel.

1.2 Statement of Purposes of the Vessel

1.2.1 The Vessel shall be a steel mono-hull with an aluminium superstructure patrol launch powered by a diesel hybrid propulsion system, including a daughter boat per Vessel (total 12 daughter boats) for use by the HKPF in carrying out all of the following operations (each an "operation"):

(a) Maritime Law Enforcement within Hong Kong waters;

(b) Command and Control;

(c) Operational Incident Response;

(d) Maritime Security;

(e) Counter Terrorism;

(f) Search and Rescue (SAR) in Hong Kong and adjacent waters;

(g) Casualty Evacuation;

(h) Disaster Relief;

(i) Immigration, Excise and Conservancy Law enforcement;

(j) Policing support to outlying islands and remote areas; and

(k) Logistical Support

1.3 Authorities

1.3.1 The Government New Construction Section (GNC) of the Marine Department (MD) is the section responsible for the procurement of the Vessel for the Government. GNC may delegate the site supervision work, including plan reviewing work during the construction stage to a private

consultancy firms on behalf of the Government.

1.3.2 Communications Branch (COMMS) is the technical section within the HKPF, which will oversee the work to be provided by the Contractor in connection with the Operational Systems as defined in Paragraph 9.1 of this Part VII and carry out the Technical Acceptance of the Operational Systems on behalf of the Government.

1.3.3 The HKPF is the end user of the Vessel and will participate in tests, inspections and trials together with GNC viz., Technical and Operational Acceptance of the Vessel on behalf of the Government.

1.4 Tenderer and Contractor

1.4.1 In addition to the drawings and information included in the Technical Proposal for the Vessel offered in its tender submission, the Contractor is obliged to prepare and submit comprehensive and detailed technical specifications of the Vessel, together with all necessary drawings and information, as required in this Part VII within the specified period of time and to the satisfactory acceptance by the RO, GNC and HKPF. If no period is specified, they shall be submitted and approved by RO, GNC and HKPF (as the case may be) before the construction of the relevant part of the Vessel or the Daughter Boat. Without prejudice to the Contractor's obligations for compliance with all contract requirements set out in this Part VII (viz all essential requirements, all requirements not marked as essential, and all desirable specifications committed by the Contractor) and any rights of the Government under the Contract or otherwise, the Contractor shall submit to the GNC and HKPF supplementary drawings, information and deliverables that may be deemed necessary for the design and construction of the Vessel as required in Items 1 to 29 (Essential Requirements in Part VII) of Schedule 5 and other relevant parts of the Contract where applicable. Any intended technical solutions to be proposed by the Contractor to ensure the Vessel's or Daughter Boat compliance with each individual paragraph of the Technical Specifications shall be at least equivalent to or no less favourable than the respective contract requirements set out in this Part VII or otherwise, and shall be subject to the prior acceptance by the GNC and HKPF before implementation of such intended technical solutions. In case of any discrepancies on interpretation of the technical specifications stipulated in this Part VII between the Contractor and the Government, the final decision on such intended technical solutions in fulfilling the fit-for-purpose standards and requirements shall be vested in the GNC and HKPF.

1.5 Shipyard

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

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

1.6 Design and Construction Responsibility

1.6.1 The Vessel shall be designed and constructed for a service life of not less than twenty (20) years under reasonable maintenance.

1.6.2 It is the SOLE responsibility of the Contractor to supply a Vessel which is safe, fit and suitable for the intended operational purposes of the HKPF as set out in paragraph 1.2.1 above and which meets all relevant regulations and all 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, subdivision and operational efficiency.

1.6.3 The Vessel shall be designed and constructed in accordance with the rules and regulations of the Recognized Organization (RO) as specified in Schedule 9 of Part V in the version as at the Contract

Date unless the rules and regulations of RO specify that version of such rules and regulations as at the keel laying date of the Vessel shall apply in relation to the relevant requirements specified therein. Unless otherwise expressly stipulated in this Part VII, (a) references to "RO" in this Part VII shall mean the RO as specified in Part V, Schedule 9; and (b) references to "RO Requirements" shall mean the requirement of the rules and regulations of the RO as specified in Part V Schedule 9. Notwithstanding the foregoing, where it is expressly permitted in this Part VII that in relation to any particular requirement (instead of the RO specified in Part V, Schedule 9) another RO which is any one of the RO's listed in Paragraph 2.2.3 (a) to (i) of this Part VII may be designated for confirmation of compliance with the relevant requirement, references to "RO" shall mean such other RO.

1.6.4 The Vessel is required to be issued with a certificate of class with notations by the RO as specified in Part V, Schedule 9, as one of the conditions, before the Acceptance Certificate for the Vessel may be issued. All plans, particulars and documentation which are required for the classification of the Vessel by the RO, in addition to those listed in Annex 3 to this Part VII shall be approved by the RO before submission to GNC for endorsement and final approval prior to commencement of the manufacturing work of the Vessel. Any subsequent modifications or additions shall be treated in the same manner. Those drawings which are not required for approval by the RO shall still be submitted to GNC for approval before work is carried out.

1.6.5 The Contractor shall design, build and supply the Vessel in full compliance with all requirements of the Contract including without limitation the Warranties, this Part VII and the Schedules; which may be over and above what is normally required by any statutory and/or RO's rules and/or regulations. Should there be any contradiction between the rules and regulations of the RO and this Part VII, this Part VII shall prevail unless GNC stipulate or agrees otherwise.

1.6.6 The Contractor may appoint a Sub-contractor to design the Vessel and/or design and supply of the Hybrid Propulsion System, 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.

1.7 Survey and Inspection

1.7.1 Tenderers shall note that the unit price per Vessel as quoted in Part V, Schedule 1, 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).

1.7.2 All electronic items and their installation shall be approved and inspected by COMMS or COMMS representatives as part of the Stage 3 of the Technical Acceptance.

1.7.3 An advance written notice of not less than ten (10) working days 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 of the aforesaid.

1.7.4 The Contractor shall provide:

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

(b) The Drawing Submissions Timetable in the form set out in Part VII, Annex 3; and

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

Each one of the above shall be submitted to GNC for approval within fourteen (14) days after the commencement of the Contract Period.

The Delivery Date(s) for the Vessel(s) as stated in the Implementation Timetable shall be no later than those set out in Schedule 2 of Part V.

1.7.5 Notwithstanding anything in the Contract to the contrary, the Government may suspend payment of any instalment specified in Part V, Schedule 3 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.

A weekly progress report with photographs evidencing the progress with sufficient details agreed by GNC is required to be submitted to GNC during the construction of the Vessel. The weekly report shall be submitted before noon of every Monday.

1.7.6 GNC may designate consultant(s) from the private sector who will be authorized to represent GNC in all technical matters including plan approval related to the construction of the Vessel. The Contractor shall cooperate with the consultant(s) and afford unhindered access to the Vessel at all times during working hours and shall furnish current copies of all drawings, sketches, correspondence, change notices, change orders, test agendas, schedules and other necessary documents where applicable.

1.7.7 After arriving at site for a survey visit, if GNC officers or consultants consider that it is unsafe to carry out the test or inspection, the test/inspection will not be carried out. The Contractor shall arrange for another additional survey visit at the Contractor's expense. 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.

1.7.8 Where any fee charge and associated expenses are payable for the services of the 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.

1.7.9 The Contractor shall provide office space for GNC officers, HKPF officers and consultants during their survey visits and construction progress visits to the Vessel at the shipyard where the Vessel is being constructed. The office space shall include, but not be limited to, two (2) desks, four (4) chairs, one (1) telephone, one (1) conference table, 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 with WiFi connection, and a copying and printer machine. Cleaning of the space shall be carried out on each working day.

1.7.10 The hours of work of the GNC officers, HKPF officers or consultants will be arranged to coincide with those of the shipyard, insofar as is practicable to do so. It is intended that all reasonable steps are taken so that the duties of the GNC officers and consultants can be carried out with maximum efficiency and minimum interference with the Contractor's work.

1.7.11 The final survey and inspection visit will be the Pre-Shipment Construction and Handling Inspection as specified in Paragraph 1.8.1 of this Part VII, the purpose of which will be for the Government to satisfy itself that the Vessel is, in all respects, ready for shipment to Hong Kong (if constructed in a place outside the HKSAR) to undergo the Official Sea Trial. This inspection visit may have been preceded by one or more similar visits following which necessary modification work, if required, was completed. The Contractor shall provide GNC with one (1) month's advanced written notice of its readiness to invite the Government to conduct the Pre-Shipment Construction and Handling Inspection or, otherwise, as agreed by the Government.

1.7.12 A Pre-Shipment Construction and Handling Inspection of the Vessel, as detailed in Paragraph 1.8.1 of this Part VII, shall be conducted at sea in the country in which the Contractor has built the Vessel (if the Contractor has built the Vessel in a place outside the HKSAR) to confirm that the construction of the Vessel conforms with the requirements of Clause 2.5 of Part IV, that any outstanding modification work required to be performed under Clause 2.7 of Part IV, Paragraph 1.2.1 of this Part VII or under any provision of the Contract Documents has been completed satisfactorily. To mitigate the commercial risk which would result from shipment of the Vessel to Hong Kong and possible subsequent failure of the Official Sea Trial specified in Paragraph 1.8.2 of this Part VII, this Pre-Shipment Construction and Handling Inspection shall include but not be limited to a speed trial conducted by the Contractor under the same conditions as set for the official speed trial specified at Paragraph 1.8.2 of this Part VII. The purpose is to enable early identification and rectification of

undesirable performance before shipment.

1.8 Procedures for Vessel Acceptance

1.8.1 Stage 1 of Technical Acceptance - Pre-Shipment Construction and Handling Inspection

(a) Safety of Vessel for Pre-Shipment Construction and Handling Inspection

Prior to conducting the Pre-Shipment Construction and Handling Inspection, an Inclining Experiment as specified in Paragraph 3.3.3 of this Part VII shall have been carried out and the final lightship weight and centre of gravity shall have been determined and approved by the RO and the GNC. All loading conditions used during the Pre-Shipment Construction and Handling Inspection shall be compiled using the approved final lightship weight and centre of gravity and shall meet the intact and damage stability criteria as specified in Paragraphs 3.3.6 and 3.3.7 respectively. Other documentary evidence acceptable to the Government showing that the Vessel is safe to go to sea for the intended tests and trials specified in the Contract shall be submitted.

(b) System Inspection Test

The Contractor will propose and demonstrate to the GNC and HKPF representatives a test protocol to fully demonstrate that the Vessel, the outfitting, machinery, electrical and electronic systems are in complete condition and good working order, as specified in Annex 4 of the Part VII. This will include a practical demonstration of its performance and sea keeping abilities.

(c) Pre-Delivery Construction and Handling Inspection of the Daughter Boat

On completion of construction and prior to shipping to the shipyard constructing the Vessel (VPU), if not the same location, a Pre-Delivery Construction and Handling Inspection of the Daughter Boat shall be carried out by GNC officers and HKPF representatives as per requirements and procedures as given in Annex 15 to this Part VII at or near the site where the Daughter Boat is constructed. Upon successful completion of this Inspection, approval will be given by the GNC for the delivery of the Daughter Boat to the Contractor's shipyard where the VPU is being constructed and shall be installed on the VPU for the Stage 2 - Official Sea Trial.

(d) Pre-Shipment speed trial

Pre-Shipment speed trial shall be carried out at or near the site where the Vessel is constructed and shall be carried out in the presence of GNC officers and HKPF representatives or their appointed agents. The same conditions as set for the official speed trial specified at Paragraph 1.8.2 of this Part VII shall apply in which the test is to be carried out.

(e) Operational Systems

All Operational Systems which are specified to be tested as per Chapter 9 of this Part VII under Stage 1 - Pre-Shipment Construction and Handling Inspection

(f) Hull bottom inspection

Upon successful completion of the pre-shipment speed trial and Handling Assessment, the Contractor shall arrange a hull bottom inspection on the Vessel for GNC officers to check for any hull damage before shipping to Hong Kong. Any hull damage found shall be rectified at or near the site where the Vessel is constructed.

(g) Factory Acceptance Test

All factory acceptance tests mentioned in this Part shall be conducted as part of this Stage 1 of the Technical Acceptance. The Contractor shall provide to the GNC, HKPF and where applicable COMMS the test plan and test results of each of the factory acceptance tests for approval before these tests are deemed successfully completed.

(h) Condition for proceeding to Stage 2

After meeting all the requirements of this Stage 1 of Technical Acceptance – Pre-Shipment

and Handling Inspection, the Vessel shall then be shipped to Hong Kong and to proceed to Stage 2 – Official Sea Trial.

1.8.2 Stage 2 of Technical Acceptance - Official Sea Trial

(a) Condition and location of carrying out the Official Sea Trial

The Official Sea Trial shall be carried out in Hong Kong in the presence of GNC's officers or consultants and the HKPF representatives.

(b) Official Sea Trial Programme

The Contractor shall submit an Official Sea Trial programme for GNC approval, at least fifteen (15) working days in advance of the Official Sea Trial, which shall include details of proposed procedures for carrying out the Official Speed Trial, hybrid performance test, endurance test, ship handling at sea and performance tests, manoeuvring test, heeling test at a turning speed, position keeping and bow thruster tests, crash stop test, astern running test/emergency steering test, anchoring tests and other tests stated in this Paragraph 1.8.2.

The Official Sea Trial programme is to be written in accordance with RO Requirements and requirements set out in this Part VII, making reference to international standard such as ISO 19019-2005: Sea-going vessels and marine technology – Instructions for planning, carrying out and reporting sea trials. Other documentary evidence acceptable to the Government showing that the Vessel is safe to go to sea for the intended tests and trials specified in the Contract shall be submitted.

(c) Costs and expense for carrying out tests and trials

As in all other tests and trials to be conducted for the Vessel acceptance, the Contractor is required to carry out the official sea trial in Hong Kong at its own expense (including the expense of fuel, lubrication oil, crew and other necessary expenses). Before the Official Sea Trial, the Contractor shall observe the certificate of competency and third party insurance requirements under the Laws of Hong Kong.

(d) Contractor's staff onboard the Vessel during the trial

To ensure that the Official Sea Trial can be conducted safely and in accordance with the Laws of Hong Kong, the Contractor shall provide the GNC with appropriate details about each one of the Contractor's staff who will be onboard. These details shall include the name, post, duty, experience and certificate(s) of competency to be submitted at the same time as the Official Sea Trial Programme specified at Paragraph 1.8.2(b) of this Part VII. The number of persons onboard during a particular test or trial shall be agreed by the GNC officers and HKPF representatives. The location of each person onboard, which can affect the centre of Gravity of the Vessel under trial, shall also be first agreed by the GNC officers and HKPF representatives.

(e) Loading conditions for tests and trials

The loading conditions to be used during tests and trials are listed in Annex 5 and as summarised below:

Conditions at tests & trial		
1	Person onboard	16 Persons (at 102.5 kg per person including effect)
2	Fuel oil tanks	not less than 80% fuel tank capacity
3	Fresh water tank	not less than 85% tank capacity
4	Grey water tank	not less than 85% tank capacity
5	Black water tank	not less than 85% tank capacity
6	Store/Utilities	1000 kg
7	Sea Conditions	Sea state 0-2 : wave height 0.1 - 0.5 metres

All loading conditions being used during the Official Sea Trial shall be compiled by using the approved final lightship weight and centre of gravity, and all such loading conditions shall meet the intact and damage stability criteria as specified in Paragraphs 3.3.6 and 3.3.7 of this

Part VII. Other documentary evidence acceptable to the Government showing that the Vessel is safe to go to sea for the intended tests and trials specified in the Contract shall be submitted.

(f) System Inspection Test

The Contractor shall propose and demonstrate to the GNC and HKPF representatives a test protocol to fully demonstrate that the Vessel, the outfitting, machinery, electrical and electronic systems are in complete condition and good working order. This shall include, but not be limited to:

(i) Start test for the main diesel engines, diesel generators, electric motors (E-Motors) and related equipment;

(ii) An anchoring test to meet the RO requirements;

(iii) A noise emission test to confirm compliance with the requirements stipulated in Paragraph 4.1.2(h)(i)(3) of this Part VII;

(iv) A megger test as stipulated in Paragraph 8.4.12 of this Part VII;

(v) A test of the external Fire-Fighting capabilities to confirm compliance with the requirements specified in Chapter 10 of this Part VII;

(vi) A test of the Launch and Recovery System for the Daughter Boat shall be carried out; and

(vii) Other tests required by RO, GNC, HKPF, COMMS or their appointed representatives.

(g) Official Speed Trial

As part of the Official Sea Trial, the Contractor shall carry out the official speed trial to determine whether the Contract Speed, for the main diesel engines as well as operating only on the electric motors as per Paragraph 2.3 of this Part VII, can be achieved in Hong Kong. The Contractor shall carry out the Official Speed Trial in the presence of GNC officers or the appointed consultant(s).

(i) The Official Speed Trial is to be carried out making reference to international standards, such as ISO 15016:2015 - Ships and Marine Technology - Guidelines for the assessment of speed and power performance by analysis of speed trial data, to the satisfaction of GNC.

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

(iii) 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 by a measuring method acceptable to GNC.

(iv) The speed for each run shall be measured by the instruments provided either by:

- the Contractor, on the condition that the instrument has been calibrated by a certified body recognized acceptable to GNC and the HKPF; or
- Global Positioning System (GPS) supplied by the Government; or
- the GPS or Differential Global Positioning System (DGPS) which is properly calibrated (with supporting calibration documents) and installed onboard the Vessel and is acceptable to GNC and HKPF; or
- other speed measuring methods acceptable to GNC and HKPF.

(v) 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.

(vi) The Contract Speed stated in Paragraph 2.3 shall be achieved by the Vessel in the Official Speed Trial Conditions, as specified in Annex 5 of this Part VII, with the engine power at the declared 88% Maximum Continuous Rating (MCR) measured at propeller

shafts. The Contract speed shall be taken from the highest mean speed between to-and-from directions of the runs. If the Vessel fails to achieve the minimum Contract Speed, the Government will deem that the Vessel has failed to pass the Official Sea Trial.

(vii) All Equipment shall also be in operation during the Official Sea Trial unless explicitly exempted by the GNC or HKPF. This Equipment shall have passed the Pre-Shipment Construction and Handling Inspection.

(h) Endurance Test

The Endurance Test shall be carried out for different engine loadings and speeds to obtain the speed/fuel consumption curves (or tabulated data) for the Vessel, with the engine(s) operating within the manufacture recommended engine operating conditions. The test results shall be recorded in accordance with the requirements stipulated in Annex 6 to this Part VII. The report submitted shall include a curve or curves showing ship speed versus propulsion engine(s) rpm and power, with particulars of the vessel loading and displacement in the test(s).

(i) Hybrid Electric Propulsion Test

The Hybrid Electric Propulsion Test shall be carried out to confirm the Vessel's Hybrid Electrical propulsion performance in accordance with the requirements of this Part VII and any additional Contract specifications, to the satisfaction of the GNC and the HKPF.

The Test programme is to be produced by the Contractor and shall include but not be limited to:

(i) A Failure Mode and Effect Analysis (FMEA) test protocol programme shall be drawn up to prove the conclusions of FMEA and meet the requirements of the 2000 HSC Code.

(ii) Contract Speed of the Vessel as required in Paragraph 2.3.2 of this Part VII shall be the mean speed, not less than 8 knots, with Electric Motor (E-Motor) power output at 100%. This is to be measured using the same instruments detailed in Paragraph 1.8.2(g)(iv) of this Part VII. The actual mean speed is to be calculated following the conclusion of the sea trial, carried out as determined in Paragraphs 1.8.2(g)(ii) and (iii) of this Part VII.

(iii) Battery Endurance Test to determine the time which the Vessel can safely operate on Stored Battery Power ONLY. The test is to be carried out at a speed of 5 knots with a Vessel electrical load stated in Paragraph 2.3.3 of this Part VII.

(iv) Engine, auxiliary, battery changeover tests to be carried out to prove the safe operation of the Vessel using any or all the power sources installed onboard the Vessel. It is required that the power source seamlessly transfer from one to the other without causing a negative impact on the Vessel's safety or performance.

(j) Manoeuvrability Test

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

(i) all engines running;

(ii) port engine running; and

(iii) starboard engine running.

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

(k) Heeling Test at a Turning Speed

The Test shall determine the heeling angle during turn for different Vessel speeds with a turning radius of five (5) ship lengths. The Vessel will be tested at a constant speed in a straight course and turn at a turning radius of not greater than five (5) ship lengths with the same engine RPM for both port and starboard turns. The corresponding heeling angle and engine RPM shall be recorded. This test shall be repeated for different forward speeds from 10 knots to 25 knots, or the higher Contract Speed as committed by the Contractor in the Marking Scheme submission, with every 2 knot intervals.

The test shall not be carried on any further when the corresponding heel angle equal to or greater than 10 degrees or the vessel presented a dynamic unstable behaviour. The

corresponding Vessel speed and engine RPM shall be recorded.

(l) Crash Stop Test

This Test shall determine the minimum time and distance required for the Vessel to move from running full ahead to stop and then to full astern, without any damage being caused to the engines or any risk posed to the crew. The results shall be recorded.

(m) Astern Running Test

This Test shall determine the maximum astern running speed achievable by the Vessel. The result shall be recorded.

(n) Emergency Steering Test

This Test shall be carried out to confirm that the Vessel can be steered satisfactorily when the electrical power supply to the steering system has been disabled. The result shall be recorded.

(o) Bow Thruster Test

This test shall be carried out whilst the Vessel is stationary in the water, heading into wind, with the wind speed of less than Force 2 on the Beaufort Wind Force Scale. With the bow thruster operating at full capacity, the time to move the Vessel to a heading of 90° to the original heading shall be measured. This will be repeated to move the Vessel back to the original heading and then to repeat this test for the other direction.

(p) Position Keeping Test

This test shall be carried out to confirm the capabilities of the position keeping system specified in Paragraph 7.12 of this Part VII. This test shall confirm that:

(i) With both the main propulsion propellers and the bow thruster engaged, the Vessel shall be able to hold station and heading without drifting off in conditions of World Meteorological Organisation (WMO) Sea State 3 and Beaufort Wind Force 4;

(ii) If during the test, it is not possible to test in the required limiting weather conditions, the position keeping system capability report, including position keeping capability polar-plot, shall be provided by the system manufacturer to the satisfaction of the GNC.

(q) Operational Systems Test

All Operational Systems are to be tested as per Chapter 9 of this Part VII under Stage 2 of Technical Acceptance – Official Sea Trial.

(r) Hull bottom inspection

Upon successful completion of the Official Speed Trial in Hong Kong, the Contractor shall arrange with GNC officers to carry out a hull bottom inspection on the Vessel to check for any hull damage before delivery. Any hull damage found shall be rectified to the satisfaction of GNC before the Vessel can be accepted.

(s) Submission of Official Sea Trial Report

The Contractor shall provide an Official Sea Trial Report, written in accordance with RO requirements and applicable International standards, acceptable to the GNC. The Report shall contain, but not be limited to the speed, engine/hybrid system and auxiliary engine(s) running conditions, vessel load (fuel and water) conditions, heeling conditions, performance data sought by respective tests or trials, time of day, weather, wind and sea conditions, which will be witnessed and signed by the GNC surveyor (or the GNC representative) and the HKPF representative during the Official Sea Trial. The Official Sea Trial Report shall be submitted to the GNC before Delivery Acceptance.

1.8.3 Stage 3 of Technical Acceptance – Technical and Operational Acceptance

(a) All hull construction, tests, trials and the experiment as required in this Part VII should all have been conducted as part of the Technical and Operational Acceptance including Pre-Shipment Construction and Handling Inspection of the Vessel as stated in Paragraph 1.8.1 of this Part VII, the Official Sea Trial as stated in Paragraph 1.8.2 of this Part VII, the inclining

experiment as mentioned in Paragraph 3.3.3 of this Part VII, the bench acceptance test and on-site commissioning test for ENE as mentioned in Chapter 9 of this Part VII, 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 this Part VII.

(b) All Operational Systems and their installations shall be approved and inspected by COMMS as part of the Technical and Operational Acceptance.

(c) The Contractor shall supply all necessary equipment and labour at its own cost for carrying out the tests and trials stated in Paragraphs 1.8.3 (a) and 1.8.3(b) of this Part VII.

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

1.8.4 Delivery Acceptance

(a) The Vessel, after its successful completion of the Technical and Operational 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 of Part V, at the discretion of the Government, the Contract may be terminated according to the applicable terms stipulated in the Contract.

(b) Documentation required prior to and at Delivery Acceptance shall be provided in accordance with Paragraphs 13.2 and Paragraphs 12.8.2 of this Part VII.

(c) The Contractor must provide fourteen (14) days advance notice, in writing, when the Vessel is considered 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 and Operational Acceptance, the Government does not consider that the Vessel is in a Ready to Use condition.

(d) If the Vessel cannot pass all of the tests required for the Technical Acceptance (all three stages) 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.

(e) During the Delivery Acceptance, the Contractor must demonstrate to the GNC that all hull construction, outfitting, machinery, electrical and electronic equipment are in good working order, and must hand over the Vessel, its fixtures and Equipment to GNC in good and complete condition.

(f) On delivery, the Vessel must be in a clean, tidy, fully fitted and operational condition to the satisfaction of GNC.

(g) Classification Certificate with notations for the Vessel as per Schedule 9 of Part V shall be issued by the relevant RO as specified in Paragraph 2.2.3 of this Part VII before the Acceptance Certificate is issued by the Government.

(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 Vessel under the Conditions of Contract, the original copy of the manufacturer's warranty certificates and all related manuals and documents in respect of all the Equipment, valid for Twelve (12) months from the date of Acceptance Certificate of the Vessel, shall be delivered to GNC upon Delivery Acceptance.

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

1.9.3 The Contractor is responsible for arranging the Vessel for Guaranteed Slipping at the end of the 12-

month Warranty Period. In addition to any defects which the Contractor may be required to fix under Clause 18 of Part IV (Conditions of Contract), the Contractor shall also be responsible for the rectification of any defects found in the course of Guaranteed Slipping. The full scope of the Services to be provided as part of the Guaranteed Slipping is set out in Annex 1 of this Part VII.

1.10 Support Services

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

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

1.10.3 The Contractor shall supply with the Vessel a whole life support plan for the timely procurement of spare/replacement parts and the undertaking of preventative maintenance.

1.11 Asbestos Free

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

Chapter 2 – General Technical Requirements

2.1 Introduction

2.1.1 Without prejudice to the generality of Chapter 1 of this Part, this Chapter contains the more particular technical specification for the Vessels. The significance of Essential Requirements **[E]** is explained in Paragraph 1.1 of this Part VII.

2.1.2 The work to be done under this Contract consists of the design, construction, outfitting, testing and delivery of twelve (12) Versatile Patrol Units (VPU) for the Hong Kong Police Force (HKPF). 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.

2.1.3 The Contractor shall exercise its professional expertise and knowledge to come up with an appropriate design for the Vessel which can comply with all requirements of the Contract. The Conceptual General Arrangement Plan ("GA") at Annex 10 to this Part VII serves only as reference drawings to assist with explaining the tender requirements stated in this Part VII.

2.1.4 During the design and construction of the Vessel, the Contractor shall submit a detailed General Arrangement Plan (GA Plan) for GNC approval and acceptance.

2.1.5 The design of the hull form for the offered Vessel shall be either of the following: **[E]**

(a) the same as the design of another existing mono-hull vessel with the same principal dimensions such as length, breadth and depth, and the same hydrostatic particulars, which is in service as at the Original Tender Closing Date for use by a law enforcement agency or a military organisation or coast guard agency or a company providing maritime security services in Hong Kong or any other part of the world; or **[E]**

(b) a design with modifications from the design based on an existing mono-hull vessel with an LOA between 30m and 45m (both figures inclusive), which is in service as at the Original Tender Closing Date for use by a law enforcement agency or a military organisation or a coast guard agency or a company providing maritime security services in Hong Kong or in any other part of the world. The modified design shall be supported by a model test report in relation to a model test conducted no earlier than 36 months preceding the Original Tender Closing Date at an International Towing Tank Conference (ITTC) member's establishment as at the date of the test report. The test report shall confirm that the ship resistance, speed and powering of the Vessel and shall have confirmed that the model vessel with the modified design complies with the ITTC requirements. **[E]**

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

2.2 Rules and Regulations

2.2.1 The Vessel shall be designed and constructed in accordance with the rules and regulations of a Recognized Organization (RO) acceptable to the GNC in the version as at the Contract Date unless the rules and regulations of RO specify that version of such rules and regulations as at the keel laying date of the Vessel shall apply in relation to the relevant requirements specified therein. The hull (including equipment) and machinery (including electrical installations) of the Vessel shall be assigned with appropriate class notations, which meet the requirement specified in this Part VII. The Tenderer shall state in Part V, Schedule 9, which RO rules and regulations and class notations that will be used in the design and construction of the Vessel.

2.2.2 The Contractor shall design, build and supply the Vessel in full compliance with the requirements given in this Part VII which, to that extent, may be over and above what is normally required by any statutory and RO rules and regulations. Should there be any contradiction between the rules and regulations of the RO and this Part VII, the final decision shall be vested in the Government.

2.2.3 Without prejudice to the general requirement that the Contractor shall perform all Work in full compliance with all applicable laws and regulations and in full compliance with the requirements of the Contract including this Part VII, the construction of the Vessel must comply with the requirements of the RO specified in Schedule 9 of Part V, or the requirements of any of the RO's listed below (where it is expressly specified in this Part VII). In relation to a particular requirement specified in this Part, that of another RO, other than the RO specified in Schedule 9 of Part V and which is any one of the RO's listed in sub-paragraphs (a) to (i) below may be designated as applicable. There may also be other requirements further specified in sub-paragraphs (j) to (o) below which are also applicable. In each of the aforesaid cases, the version as at the Contract Date shall be applicable unless any of these requirements specifies that version of requirements as at the keel laying date of the Vessel.

(a)	American Bureau of Shipping	ABS
(b)	Bureau Veritas	BV
(c)	China Classification Society	CCS
(d)	DNV GL AS	DNV·GL
(e)	Korean Register of Shipping	KR
(f)	Lloyd's Register	LR
(g)	Nippon Kaiji Kyokai	NK
(h)	Registro Italiano Navale	RINA
(i)	Russian Maritime Register of Shipping	RS

And other entities and regulations as specified below:

(j) International Electrotechnical 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 the RO or American Welding Society (AWS) or other applicable international standards or rules acceptable by GNC.

(m) International Regulations for Preventing Collisions at Sea 1972, and all the effective Resolutions by International Maritime Organization (IMO).

(n) International Code of Safety for High Speed Craft, 2000 ("2000 HSC Code") and other applicable IMO regulations.

(o) All other conventions, laws, regulations, guidelines and codes as mentioned in this Part;

(p) 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 2.2.3 (j) to (n) above are applicable, then the applicable standards as specified by the applicable organizations below shall be complied with:

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

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

2.3 Contract Speed

2.3.1 The Contract Speed of the Vessel, when propelled by its two or three main diesel engines (depending on the specifications as proposed in Schedules 6 and 7 of Part V) each running at its 88% maximum continuous rating ("MCR") to be measured at propeller shafts, shall not be less than 25 knots, when running under the conditions of World Metrological Organisation ("WMO") Sea State Code 0 to 2 and under the loading and test conditions summarised in Paragraph 1.8.2(e) of Part VII and more particularly described in Annex 5 to Part VII. **[E]**

2.3.2 The Contract Speed of the Vessel, when propelled by the E-motors of the hybrid propulsion system as proposed in Schedules 6 and 7 of Part V ("hybrid propulsion system") which in turn are powered by the on-board diesel generators of the hybrid propulsion system, shall not be less than 8 knots, under the conditions of WMO Sea State Code 0 to 2 and under the loading and test conditions summarised in Paragraph 1.8.2(e) of this Part VII and more particularly described in Annex 5 to Part VII. **[E]**

At the same time, when this Vessel is operating in accordance with the operation profile and conditions as mentioned above, the on-board diesel generators shall also support the typical house load of the Vessel including air-conditioning and with the bow thruster in active mode. **[E]**

The "typical house load of the Vessel" means the electrical load required to support the vessel under normal operation. The electrical load includes but is not limited to the air-conditioning service, bow thruster, lighting, navigation equipment and electrical appliances for daily crew activities. The house load shall not include electrical loading for emergency activities including but not limited to the fire pump for external fire-fighting system. **[E]**

2.3.3 The Contract Speed of the Vessel, when propelled by the E-motors which in turn are powered by the energy storage system of the hybrid propulsion system, shall not be less than 5 knots throughout a continuous period of 1.5 hours, under the conditions of WMO Sea State Code 0 to 2 and under the loading and test conditions summarised in Paragraph 1.8.2(e) of this Part VII and more particularly described in Annex 5 to Part VII. **[E]**

At the same time, when the Vessel is operating in accordance with the operation profile and conditions as mentioned above, the energy storage system of the Vessel shall also support the typical house load of the Vessel (with the same meaning defined in item 3 above) including air-conditioning but with the bow thruster in inactive mode. **[E]**

2.3.4 At the contract speed of 25 knots, the Vessel shaft speed and torque is to be determined using a calibrated torque meter fitted at the propeller shaft immediately after the gearbox to validate the actual power delivered at not more than 88% MCR engine load measured at propeller shafts. This is to be carried out and witnessed to the satisfaction of the GNC officer(s). Calibration certificates for the torque meter are to be provided to and accepted by the GNC.

2.3.5 The guaranteed speeds prescribed above shall be achieved without porpoising or other dynamic instabilities. The propeller(s) shall match the engine profile to avoid cavitation.

2.4 Principal Dimensions

2.4.1 The Vessel shall comply with the following:

Length Overall (LOA):	35.0 metres to 37.0 metres (both figures inclusive and Fendering included)	**[E]**
Breadth (B):	≤ 9.00 Meters (Fendering Excluded)	**[E]**
Depth (D):	Designed to Suit	
Freeboard at Bow (FB_{BOW}):	< 2.90 Meters	

Maximum Draft (T): < 2.70 Meters

Air Draft (T_{AIR}): < 14.00 Meters

(Note - collapsible antennas are acceptable)

Vessel Height from Keel: < 16.50 Meters

(Note - foldable/dismountable mast is acceptable)

2.4.2 The lightweight of the Vessel, as defined in Paragraph 1.4.34 of IMO 2000 HSC Code, without the daughter boat onboard, shall not be greater than 200 tonnes as limited by the docking facilities.

2.5 Material of the Structure

2.5.1 The vessel shall comply with the following:

- **Material of hull structure:** Marine steel or marine high tensile steel **[E]**
- **Material of superstructure:** Marine aluminium alloy **[E]**

In the case with marine high tensile steel, the Contractor shall ensure that the high tensile steel is of a type commonly used in ship building and is freely available without restriction.

2.6 Vessel Operating Profile and Environment

2.6.1 The Vessel, operated by the HKPF for the operations as listed in Paragraph 1.2.1 of this Part VII shall be built to operate in Hong Kong and adjacent waters to travel within a limit of approximately 50 nautical miles. **[E]**

The Vessel shall comply with the following operational profile and speed profile:

(a) <u>Operational Profile</u>: **[E]**

Number of hours per day:	22 hours/day
Number of days per year:	340 days/year
Endurance for fuel capacity:	at least 14 hours at 25 knots plus 20% margin

(b) <u>Speed Profile (per 24-hour period)</u> **[E]**

Full Speed:	25 knots for 2 hours
Cruising:	10 -15 knots for 4 hours
Loitering:	5 - 8 knots for 4 hours
Idling at sea:	10 hours
Tied up at berth:	2 - 4 hours

2.6.2 The Vessel shall be able to operate safely within Hong Kong Waters in weather conditions up to and including the conditions equivalent to WMO Sea State 6 and Force 8 on the Beaufort Wind Force Scale. It must be capable of surviving and returning to base, if caught offshore by extreme weather conditions equivalent to Force 10 on the Beaufort Wind Force Scale. Reference shall also be made to Paragraph 3.3.5 of Part VII for details.

2.6.3 Ambient Conditions – All machinery, equipment and systems shall be capable of operating at their full design performance under the following environmental conditions:

External air	0 to +40℃
Internal air	0 to +35℃
Machinery Space	+45℃ (All equipment at full rated power)
Maximum seawater temperature	+32℃

2.7 Markings and Colour Scheme

2.7.1 The marking and colour scheme for the Vessel shall be in accordance with the requirements given in this Part VII.

2.7.2 The Contractor shall provide the markings and colour scheme for the Vessel, which shall be in accordance with the requirements given in this Part VII. The colour scheme shall be approved by GNC before application. All painting colour scheme for fittings shall be agreed by GNC.

2.7.3 All labelling shall be in both traditional Chinese and English and as per applicable rules and regulations.

2.7.4 The Vessel's name shall be marked permanently and painted on both sides of the deck house and bow and at the transom centre to GNC and HKPF's satisfaction. Draught marks shall also be marked on both sides of the bow and stern in the same manner as the Vessel name. The full load design draught mark shall be marked port and starboard amidships to the satisfaction of the RO and the GNC.

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

2.7.6 Exits shall be identified and labelled. Stowage locations for LSA including but not limited to life jackets and quantities of life jackets shall be identified as per the requirements specified under the SOLAS regulations.

2.7.7 Fire-fighting equipment to be identified and labelled as per the requirements specified under the SOLAS regulations.

2.7.8 Trip hazards aboard the Vessel shall be appropriately marked.

2.8 Tally Plates

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

(a) Builder's name;
(b) Vessel's name;
(c) Year of build; and
(d) Maximum number of persons including the crew that the Vessel is designed to carry.

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

(a) Equipment contained within consoles;
(b) Electrical and communication equipment;
(c) Air vents and filling pipes for fuel oil tanks;
(d) All valves and equipment on deck;
(e) Control panels, switchboards, distribution boxes and electrical circuits; and
(f) Any other equipment/fitting as required.

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

2.8.3 All cable terminations shall be identified clearly for disconnection and reconnection purposes.

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

2.8.5 List of tally plates shall be provided to GNC for approval.

2.9 Other Design Features

2.9.1 Berthing requirement of the Vessel shall match with the designated points of berth at the Government Dockyard and at the HKPF's operational bases.

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

2.9.3 The use of permanent ballasts on the Vessel shall only be used as agreed by the GNC.

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

2.9.5 Both air and structural induced noise shall be kept to a minimum level in the wheelhouse and accommodation areas in accordance with the 2000 HSC Code.

2.9.6 The contractor shall request the RO to carry out the measurement of the Vessel's Gross Tonnage (GT) and Net Tonnage (NT), as defined in International Convention on Tonnage Measurement of Ships 1969. A statement of compliance for the Vessel stating the measured GT and NT together with the calculation details shall be issued by the RO, and submitted by the Contractor to GNC for records.

Chapter 3 – Hull and Deckhouse

3.1 General Requirements

3.1.1 The Vessel shall be designed and built with a mono-hull form and the hull structure shall be constructed of marine steel/high tensile steel. The superstructure shall be constructed of marine aluminium alloy. All materials shall be new and of a type which has been certified by the RO or other entities acceptable to GNC for shipbuilding purposes. Building processes for construction shall comply with an approved standard. Their selection shall recognize the Vessel through life cycle and service conditions for ease of repair in event of hull damage.

3.1.2 The design stress and load (wave height versus speed), maximum acceleration considered and scantlings calculation including the internal structural members shall be approved by the RO before submitting to GNC for approval.

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

3.1.4 Copies of up-to-date records of structural materials used for vessel construction shall be provided to the RO surveyor and GNC's representative for inspection during the construction stage of the Vessel. Stowage and handling of materials are to be recorded, including construction materials, welding wire and consumables. Aluminium material storage and construction are to be carried out in an entirely separate space (shed/workshop/building) from steel material storage/construction area.

3.1.5 The Contractor shall carry out quality control throughout the construction of the vessel to the satisfaction of GNC.

3.1.6 Strength shall be maintained by ensuring hull structural continuity of main members including bottom girders, 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 fenders and areas likely to experience slamming.

3.1.7 Major penetrations or access openings through the transverse hull bulkheads below the main weather deck level shall be avoided as far as possible. Cable penetrations shall be located as high and as far inboard as possible. Any openings and all penetrations through bulkheads below the main deck shall be fitted with RO approved devices and be so arranged to ensure the bulkheads are to be entirely watertight and their strength is maintained. All watertight bulkheads shall be permanently marked "WT BHD" in a conspicuous position as agreed by the GNC.

3.1.8 The weathertight superstructure located above the main deck shall, in its outside boundaries, have means of closing all openings. Such means shall be of sufficient strength and a design to maintain weathertight integrity in all operational conditions and be acceptable to the RO.

3.1.9 Any opening in the hull and the deck shall comply with the RO’s rules for watertight integrity if not otherwise specified by the GNC or HKPF at the kick-off meeting.

3.1.10 Close attention shall be paid to the fabrication and installation of machinery foundations to insure rigidity of the foundations and continuity with adjacent structures.

3.1.11 The hull structure shall be arranged to accommodate the Vessel's dry docking and lifting requirements in the Government Dockyard in Hong Kong.

3.1.12 All welding and fabrication shall be carried out according to the rules of the RO to oversee the construction work, for example, "Part 2 -Rules for Materials and Welding of Steel Vessels under 90 Meters in Length of American Bureau of Shipping" or American Welding Society (AWS) or other international standards acceptable to the GNC. The welding scheme shall be approved by the RO before work is carried out.

3.1.13 Welded joints shall be carefully designed and constructed to conform to the latest established standards as at the Contract Date to prevent fatigue failure. Cutting for edge preparation shall be performed by qualified person(s) to achieve correct angle, shape and smooth finish of the edges. Only qualified welders shall perform the welding work.

3.1.14 Certification of the qualifications of each individual welder and inspector shall be submitted to the GNC by the Contractor. Welds carried out to procedures without approval or by non-certified welders shall be removed and rectified by the Contractor at the Contractor's expense.

3.1.15 The structural fabrication information 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 in serial and indexed to the controlled manufacturing procedures;

(c) Lofting, cutting, fitting, welding, forming and dimensions of structural components. Measures shall be taken to avoid deformation of structure during fabrication and welding;

(d) Welding and inspection procedures identifying clearly the type and extent of Non- Destructive Testing (NDT) inspections carried out on the Vessel structure according to the RO applicable requirements stipulated in Paragraph 2.2.3 of this Part VII. GNC may extend the NDT requirements subject to the witnessed quality of welding. The Contractor shall submit an NDT inspection plan to the RO and GNC for approval prior to inspection. NDT shall be carried out by an agent approved by the national authority or the RO. The Contractor shall submit an inspection report to the GNC presenting their findings;

(e) Welding, machining, measuring and inspection equipment maintenance and calibration;

(f) Machining, finish surfaces and bolting;

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

(h) The design and manufacturing drawing control procedures, including any of its revisions and updates and records for any re-issue of drawings.

3.2 Hull and Deckhouse Structure

3.2.1 When double bottom is relevant, it is to be accessible by a worker and supervisor. Safe access to the enclosed space shall be ensured. The double bottom is to be painted in accordance with PSPC (Performance Standard for Protective Coatings) requirement.

3.2.2 General Workmanship

(a) Trunks, coamings and openings where applicable shall have radius corners as large as possible.

(b) Fittings and openings through decks, tank tops and bulkheads for pipes and cables shall be properly designed to maintain watertight integrity, reduce transmission of heat, and to minimize transfer of machinery vibration and noise to the hull structure.

(c) Drain holes and air holes shall be provided as necessary to ensure proper venting and drainage of all tanks, compartments, pockets, and voids. All tanks shall have drain holes and air holes of adequate size for full capacity flow to suction and vent lines. There shall be no pockets where water can be trapped at any normal list or trim to be encountered in service.

(d) Sharp corners shall be avoided.

3.2.3 Tightness

(a) Tanks and underdeck compartments shall be tested for water tightness by pressurizing to a head of water in accordance with the RO requirements. If pressurized by air, all fittings and welds shall be checked by application of a soapy solution. No leakage is permitted.

(b) The weathertightness of any fittings on the weather deck and deckhouse shall be demonstrated by directing a water stream from a 12mm diameter nozzle at an output pressure of 2 bar, from a distance not exceeding 1.5m from the fitting, at all parts of the exterior including all windows, doors and hatches. Any leakage detected shall constitute a failure of the test and corrective action(s) followed by re-test(s) shall be performed.

(c) Chalk tests shall be carried out if the above two methods are not practicable. Prior agreement shall be obtained from the RO and the GNC.

(d) All structures and fittings shall withstand the tests described above as applicable.

3.2.4 Fairing

The hull, decks, and deckhouse side wall shall be fair, and shall be free from buckles or uneven edges. Special care shall be taken when aligning and fairing surfaces which are to be joined.

3.2.5 Decks, Platforms, Flats and Stiffness

(a) All decks, platforms and passages shall be sufficiently reinforced to prevent deflection caused by an individual walking or standing on the deck and/or structure of the hull or deckhouse. Structures under or behind fittings shall be adequately strengthened to withstand the load exerted by, or on the fittings.

(b) The main deck shall be fitted with watertight flush deck covers for removal of main diesel engines, as well as other equipment, such as components of the hybrid system and the diesel generators, without moving the main diesel engines.

(c) Adequately secured gratings shall be provided as required and to the GNC's satisfaction. Removable gratings shall be provided where access to valves, equipment, bilge pickups, and to other systems are required.

3.2.6 Penetration of Hull Fittings

(a) Penetration of hull fittings, which are required for equipment in this Part VII, shall be located in convenient locations for maintenance purposes. The number of penetration fittings shall be kept to a minimum.

(b) All penetration of hull fittings located below the waterline shall be fitted with shut-off valves fabricated of metal and having suitable corrosion protection, such as cathodic protection. All shut-off valves shall be of a type approved by the RO.

(c) Where penetration of hull fittings are located below the waterline, the hull external surface shall be fitted with fairings/screens to minimize the drag.

3.2.7 Hull Structural Closures

(a) Inspection cover(s) shall be provided for each fuel oil tank. The inspection cover(s) shall be sized to allow for proper inspection of the entire tank interior. A suitable non-leaking gasket is to be fitted between the tank and the cover. The cover is to be bolted to the tank using stainless steel bolts and self-locking nuts. The arrangement is to be installed to the satisfaction of the RO and the GNC.

(b) The arrangement of the deck hatches shall be submitted to the RO and the GNC, in advance, for acceptance.

(c) Access to underdeck compartments from the main deck shall be provided by watertight deck hatches.

(d) Access to underdeck compartments from the double bottom tank top, when it is relevant, shall be provided by watertight tank top hatches. A minimum of two hatches/manholes are to be fitted per transverse compartment.

(e) Flush deck watertight covers fitted with soft patches or gaskets shall be provided for engine and equipment removal or maintenance purposes over the engine room and bow thruster compartment. Soft patches or gaskets shall be secured properly to the satisfaction of the GNC.

(f) A minimum of one watertight hinged cover shall be provided for access to and from the main deck to each of the engine room, the steering compartment and underdeck battery space.

(g) A minimum of one watertight hinged cover shall be provided for access to and from the main deck to the underdeck crew cabin area.

(h) A flush deck watertight access hinged cover shall be provided for access to and from the main deck to the collision void.

(i) All hinged hatch covers shall be provided with a means to hold them in the fully opened position. A protective measure shall be provided to prevent the crew from accidentally falling into an open hatchway.

3.2.8 Below Main Deck Watertight Bulkhead Closures

(a) Watertight doors are to be provided for access into below deck compartments through watertight bulkheads. The watertight doors are to be RO approved and maintain the fire protection integrity of the bulkhead. The watertight doors are to be with a minimum clear opening to the satisfaction of GNC and HKPF.

(b) Watertight doors giving access to compartments shall have a coaming as per the RO requirements above the tank top or sole level as appropriate.

(c) The number of doors and openings through the watertight bulkheads shall be kept to a minimum.

(d) Watertight doors must be capable of being opened and closed from both sides. The method of opening and closing shall be designed and installed in accordance with the RO's requirements.

3.2.9 Deckhouse Closures

(a) Weathertight doors are to be provided for access into the deckhouse. Entrances shall be made from port, starboard, front and rear sides with a minimum clear opening to the satisfaction of GNC and HKPF. The weathertight doors are to be RO approved.

(b) A First Aid Room shall be located to the rear of the main deck level deckhouse with direct access from aft deck space by a minimum clear opening to the satisfaction of GNC and HKPF.

(c) A Bosun's Store shall be located to the front of the main deck level deckhouse, with direct access from the foredeck by a minimum clear opening to the satisfaction of GNC and HKPF.

(d) Doors giving access to the deckhouse shall have a coaming above the finished main deck surface as per the RO's requirement.

(e) Appropriate locking mechanisms/methods shall be provided for all access doors.

(f) The deckhouse shall be designed to facilitate the removal of engines from the engine room to the shore for maintenance and repair. Openings in the deck and closing hatches shall not affect the structural strength of the deck structure when opened.

(g) All doors in the deckhouse shall have clear, toughened and laminated safety glass fitted. All windows in the deckhouse shall be toughened and laminated safety glass

3.2.10 Wheelhouse Closures

(a) Weathertight doors are to be provided for access into the wheelhouse from the port and starboard sides with a minimum clear opening to the satisfaction of GNC and HKPF. The weathertight doors are to be RO approved.

(b) Doors giving access to the wheelhouse shall have a coaming as per the RO's requirements above the finished upper deck surface.

(c) Appropriate locking mechanisms/methods shall be provided for all access doors.

(d) All doors in the wheelhouse shall have clear, toughened and laminated safety glass fitted. All windows in the wheelhouse shall be toughened and laminated safety glass.

3.3 Stability

3.3.1 The preliminary lines plan ("Preliminary Lines Plan") as well as an offset table ("Offset Table") for the Vessel and the preliminary stability information, including intact and damaged stability calculations as stated in Paragraph 3.3.6 and 3.3.7 shall be submitted with the tender in Schedule 7 of Part V. The damaged stability calculation shall be based on the single compartment damaged with reference to the damage scenario of each compartment of the Vessel. The calculations shall take into account the applicable wind force as noted in Paragraph 2.6.2 of Part VII. All calculations and drawings must be in metric units.

3.3.2 The Vessel shall comply with the intact and damaged stability requirements stated in Paragraphs 3.3.6 and 3.3.7 of this Part VII as well as with applicable RO requirements.

3.3.3 Inclining Experiment

(a) An inclining experiment shall be carried out to determine the lightship displacement and position of the centre of gravity of the Vessel, in accordance with Chapter 8 and Annex 1 of

the Intact Stability Code. The GNC shall have the final decision on which other vessels will undergo an inclining experiment.

(b) At least 15 working days in advance of the inclining experiment, the Contractor shall submit a "Scheme of Inclining Experiment" which includes:

(i) the Vessel's intended loading condition with a comprehensive list covering all items with the corresponding weight and centre of gravity locations, which may affect the Vessel's recorded lightship:

- Items which are not fitted onboard, on the date of the experiment, but should be included in the Vessel's Lightship.
- Items which are fitted onboard, on the date of the experiment, but should not be included in the Vessel's Lightship.

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

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

(iv) the proposed number, location and lengths of pendulum used;

(v) hydrostatic table and tank capacity tables. The increment of draft shall be every 100 mm in the hydrostatic table and the increment of sounding shall be every 5 mm in the capacity tables;

(vi) the list of data to be measured (i.e. drafts, specific gravity of floating water, etc.); and

(vii) The Contractor shall demonstrate the condition for the inclining experiment is stable and safe.

(c) The inclining experiment shall only be conducted:

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

(ii) in the presence of the RO and the GNC and/or appointed consultant.

A request for attendance shall be made at least five (5) working days in advance. The lightship weight and centre of gravity shall be calculated and presented in the inclining experiment report. All spaces and tanks should be kept dry, or tanks being pressed up with the intended liquid. Free surface of liquids remaining onboard shall be taken into account.

(d) This inclining experiment report shall be submitted to and approved by the RO before submission to the GNC for further comments. The report shall include a statement from the Contractor stating that the Vessel shall be safe to go to sea for the intended sea trials specified in the Contract. No sea trials shall be conducted until GNC, based on the information given in the inclining experiment report, agrees that it is safe to carry out sea trials.

3.3.4 Stability Information Booklet

The Vessel shall comply with stability criteria mentioned in this Part VII and other applicable IMO regulations, including but not limited to the International Code of Safety for High Speed Craft, 2000 (2000 HSC Code) and Intact Stability Code. Furthermore, stability due to wind and ship rolling for the required service environment of the Vessel shall be calculated. In addition to the requirements stated above, the booklet in its final version shall include:

(a) The Vessel's particulars, general arrangement drawing showing all compartments and tank positions, hydrostatic curves (or in table from) and cross curves (or in table from);

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

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

and values of the stability criteria; and

(d) Any other information as reasonably required by the RO and/or GNC.

3.3.5 In the preliminary and final stability calculations, the estimated and final (obtained after conducting the inclining experiment) lightship data shall be used respectively. Both the preliminary and final stability information booklets shall include the following loading conditions under different scenarios as mentioned in the table below for the intact and damage stability calculations and any other loading conditions as may be required by GNC for the purpose of such operation:

Case	Loading Conditions	Fuel Oil (%)	Fresh Water (%)	Grey Water (%)	Black Water (%)	Oily Water (%)	Crew (No. of)	Police Officers/ survivors (No. of)	Stores/ Utilities (Kg)	Beaufort Scale
1	Lightship	0	0	0	0	0	0	0	0	8
2	Full Load Departure	98	98	10	10	10	16	100	1000	8
3	Full Load Arrival	10	10	98	98	98	16	100	1000	8
4	Crew only Departure	98	98	10	10	10	16	0	1000	10
5	Crew only Arrival	10	10	98	98	98	16	0	1000	10
6	Fire-Fighting	50	50	50	50	50	16	0	1000	8
7	Crane Operation	50	50	50	50	50	16	0	1000	5
8	Daughter Boat Launch (Davit)	50	50	50	50	50	16	0	1000	5
9	Search and Rescue	50	50	50	50	50	16	No. of survivors to be determined by the Contractor	1000	5, 8 &10

The following notes from (a) to (k) shall be applied to the appropriate loading conditions in the intact and damage stability calculations:

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

(b) Weight of each person is assumed to be 82.5kg with each carrying personal effects of 20kg (for 16 Crew and 100 Police officers in total)

(c) Weight of each survivor is assumed to be 82.5kg with no personal effects.

(d) VCG of each person, while standing, shall be assumed to be 1000mm above the deck where they are likely to be situated. LCG of each person shall be in their most likely position onboard.

(e) Heeling due to high speed turning in various loading conditions shall also be considered in the stability calculations with reference to the 2000 HSC Code.

(f) Heeling due to personnel crowding in various loading conditions shall also be considered in stability calculations with reference to the 2000 HSC Code.

(g) In case of having a davit LARS installed, heeling moments due to davit launching of a fully loaded daughter boat (designed for Davit LARS) on one side in the Daughter Boat Launch (Davit) loading condition shall also be considered in the stability calculations.

(h) Heeling moments due to deck crane with maximum moment applied to port and starboard in the Crane Operation condition shall also be considered in the stability calculations.

(i) Heeling moment due to the external Fire-Fighting Monitor nozzle pointing at beam-port or beam-starboard direction horizontally and ejecting water at full fire pump power shall be considered. This heeling moment shall be applied to the Fire-Fighting condition and included within the corresponding stability calculations.

(j) An exceptional stability case is to be assessed assuming that the Vessel is to recover survivors from the water. In accordance with 2000 HSC Code, the Contractor is to determine the

maximum number of survivors that can be safely carried on deck assuming all persons are situated on one side of the Vessel.

(k) A passenger heeling calculation shall be carried out for the Search and Rescue condition and Full Load Departure and Arrival conditions and shall be included within the Vessel stability booklet.

The final stability booklet shall be approved by the RO before submission to GNC for approval. The Contractor shall supply four (4) copies of the stability information booklet (as built) to the GNC at Delivery Acceptance.

3.3.6 Intact Stability Criteria

(a) The stability of the Vessel shall show the Vessel's compliance with the applicable requirements in Chapter 2 and Annex 8 of the 2000 HSC Code and the calculations shall be with reference to each set of the loading conditions specified in Paragraph 3.3.5 of Part VII. **[E]**

3.3.7 Damaged Stability Criteria

(a) Transverse bulkheads shall be arranged to maintain the stability of the Vessel when flooding of any one underdeck compartment occurs. The residual stability of the Vessel shall meet the applicable requirements in Chapter 2 and Annex 8 of the 2000 HSC Code, with reference to each set of the loading conditions specified in Paragraph 3.3.5 of Part VII. **[E]**

(b) The opening(s) to be used to determine the down-flooding angle(s) shall first be agreed by the RO and the GNC before carrying out the calculations.

(c) An inlet opening is an opening through which progressive flooding may take place if immersed. This would not be an opening closed by a watertight cover or vent fitted with automatic closure.

3.4 Painting

3.4.1 Paint shall be used on surfaces and any parts of the hull, deck, machinery and fittings as directed by the GNC and shall not have adverse effects on the environment and/or health of persons onboard.

3.4.2 The volatile organic compound (VOC) content limits of the paints shall comply with the Hong Kong Air Pollution Control (Volatile Organic Compounds) Regulations CAP 311W.

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

3.4.4 Exterior surfaces of the Vessel above the fully loaded draught mark shall be prepared and painted to a satin finish/appearance/texture.

3.4.5 A Tributyltin (TBT) free fouling-release/anti-fouling paint shall be applied on the exterior of the hull below the water line to provide at least two years' protection against marine growth. A TBT free certificate issued by the paint manufacturer shall be submitted before the Delivery Acceptance. The fluoropolymer foul release coating/antifouling paint shall comply with the International Convention on the Control of Harmful Anti-Fouling Systems on Ships 2001.

3.4.6 The Painting Schedule shall be submitted for the approval of the GNC before commencement of work. The proposal shall contain a list and the detailed specification of the paint intended to be used. The thickness of each coating shall be specified.

3.4.7 The Contractor shall guarantee all painting work for two (2) years against defects in materials and workmanship. At Delivery Acceptance the Contractor shall provide the GNC with a letter of certification from the paint manufacturer signed by qualified coating inspectors to certify that the paint was applied under the paint manufacturer's quality control and in accordance with the manufacturer's requirements including but not limited to the surface preparation (blasting profile and water soluble salt content), surface temperature of the metal surfaces above dew point, atmospheric conditions, (temperature and relative humidity), dry film thickness and method of application.

3.4.8 All steel walls and floor plates shall be degreased, and sand blasted to Sa 2.5 and cleaned before painting. A painting schedule shall be proposed by the Contractor, in consultation with the paint suppliers/ manufacturers, and submitted to the GNC for approval.

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

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

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

3.4.12 A painting report shall be submitted to the GNC upon completion of work.

Chapter 4 – General Arrangement

4.1 Arrangement on Upper Deck, Main Deck and Under Deck

4.1.1 Unless otherwise specified in this Part VII, the Conceptual General Arrangement Plan given in Annex 10 of this Part VII only serves as a reference. It is a reference drawing to help to explain the Tender requirements. It shows a reference layout of the accommodation and compartment arrangement of the Vessel with the following maximum/minimum dimensional guidance considered:

Upper Deck (Wheelhouse) side walkway width	Minimum 700mm
Main deck side walkway width	Minimum 900mm
Clear headroom (Throughout Vessel)	Minimum 2000mm

The Vessel shall be designed and constructed to be capable of carrying all of the following:

Number of crew	16	**[E]**
Number of Standing Police Officers	100	**[E]**

(a) The Tenderer shall submit the General Arrangement Plan for Government considerations at the tendering stage. During the design and construction of the Vessel, the Contractor shall submit a detailed General Arrangement Plan for GNC's approval and acceptance.

(b) It is a contractual requirement that ALL furniture, equipment and facilities, fixtures and fittings, including outfitting of the Vessel that are described in this Part VII, together with their requirements for design and installation standards that are stipulated in this Part VII shall be included in the complete "As- built" Vessel delivered to the Government.

(c) The superstructure comprises of the following compartments:

(i) Wheelhouse (Paragraph 4.2 of this Part VII); and

(ii) Deckhouse (Paragraph 4.3 of this Part VII)

(d) Subject to full compliance with the requirements of stability and subdivision, the underdeck area shall be divided by transverse watertight bulkheads into different compartments. It can be divided as follows subject to individual design:

(i) Fore peak;

(ii) Bow Thruster Space;

(iii) Crew Accommodation Space with Toilets and Showers;

(iv) Crew Mess, Galley and Engine Room Control Office;

(v) Engine Room; and

(vi) Steering Room/ Hybrid Battery Space.

4.1.2 General Provisions

(a) External deck spaces shall include:

(i) Flat bow and aft main deck areas for efficient boarding and mooring operation.

(ii) Side walkway on Upper Deck and Main Deck for easy access to the fore deck and aft deck. Exterior lighting fixtures shall be installed to illuminate the walkways.

(iii) The breadth of the upper deck shall be at least 1m (500mm each side) less than the breadth of the main deck in order to minimise the possible impacts between ships alongside. This should allow the boat to roll 7° before the upper deck edge moves outside the 500mm limit.

(iv) Life rails or lifelines shall be installed along all boundaries whenever there is a danger of personnel falling overboard. Openings in lifelines shall be provided at the

embarkation locations for the Vessel and for the Daughter Boat. These openings shall have braced stanchions on either side and shall be closed with three tiers of stainless steel chain fastened with quick release closures.

(v) The Vessel shall have no bulwark.

(vi) All exterior deck areas shall be covered by an appropriate anti-slip surface for crew safety. The anti-slip paint shall be to the GNC's satisfaction.

(b) All interior decks shall be covered by vinyl composition sheet. Colour to be approved by GNC.

(c) All controls, electrical equipment, high-temperature parts and pipelines, rotating assemblies or any other items in cabins and compartments shall be properly placed, protected and/or insulated to maintain comfort and reduce the risk of injury.

(d) Ballistic Protection

(i) The ballistic protection of the Vessel ("Ballistic Protection") is to be designed and installed in accordance with the requirement of STANAG 4569 Level 2 (or equivalent) noting that by ballistic requirements, the requirements concerning the 20mm Fragment Simulated Projectile are excluded. The Tenderer shall produce a Ballistic Protection plan for the wheelhouse and embarkation lobby. **[E]**

(ii) The service life should be 13 years for composite armour to ensure only one replacement during a 20-year service life for the Vessel.

Details of proposed protection solution are to be discussed at the kick-off meeting.

(e) Windows

(i) All windows shall be of RO approved type.

(ii) All windows shall be weathertight. Window glass shall be fitted in frames and sealed with bedding compound in a weather-resistant rubber channel. All windows shall be constructed using toughened and laminated safety glass. Windows shall be mounted to prevent vibration and rattling, and to provide a cushioning effect to protect the glass.

(iii) A basic layout of the windows is shown in the Conceptual General Arrangement Plan as shown in Annex 10 of this Part VII. Details of all windows shall be submitted to GNC for approval. Weathertightness tests shall be carried out after window installation as per RO requirements and to the satisfaction of the GNC.

(iv) RO type-approved retractable solar UV roller blinds shall be installed on all side windows throughout the Vessel including the Commander's Cabin and First Aid Room. The blinds shall be capable of being retained in position either partially lowered or fully lowered, without swinging due to vessel motions at sea.

(f) Lighting

(i) The lighting shall consist of fixtures installed throughout the Vessel for general illumination.

(ii) Lighting distribution in any compartment which has multiple power sources shall be arranged such that the failure of one circuit does not leave any area without light.

(iii) Unless otherwise specified, LED fixtures shall be used for interior lighting. If a compartment has both normal and emergency lighting requirements, every effort shall be made to combine functions and minimise the number of fixtures required.

(iv) Overhead lighting fixtures shall be installed to provide uniform illumination throughout a compartment without contrasting light and dark areas. In arranging fixtures to provide a uniform level of illumination, they shall be spaced to provide maximum illumination on working surfaces. Lighting shall be arranged to avoid shadows cast on working surfaces by stationary obstructions or by personnel as they perform their normal duties in that compartment. Emergency lighting shall consist of lighting fixtures dedicated to provide the vessel with reduced general illumination during loss of ship service power. The primary source of power for emergency lighting shall be from the ship emergency

battery system. Details can be referred in Chapter 8 and Annex 18 of this Part VII.

(v) Emergency egress routes shall be lit by emergency lighting and include egress route labelling to ensure that they are visible during low light or smoke conditions.

(vi) A suitable degree of flexibility within the lighting system shall be available to enable the operating personnel to adjust lighting intensity and direction in different areas of the compartment, and such arrangements shall also be available for individual instruments and controls.

(vii) Exterior lighting fixtures shall be installed to illuminate the weather decks, ladders, walkways, obstructions such as windlass, low or narrow passageways, and changes in deck level.

(viii) Floodlights shall be installed on the deckhouse structure to provide sufficient illumination for operation of all deck equipment, including launch and recovery of the daughter boat. Lighting shall not interfere with the daughter boat Coxswain's ability to safely manoeuvre the daughter boat in the vicinity of the Vessel. Floodlight illumination shall provide up to 5m from the hull side.

(ix) Equipment onboard shall be fitted properly to avoid injury to persons at all times either during normal or failure-mode operation especially when the Vessel moves off quickly during emergency crash stops, with heavy weather and during ship manoeuvres.

(g) Furniture and Fittings

(i) Built-in furniture shall be adequately secured against ship impacts in case of ship collision or bad weather and sea conditions. All seats shall be secured against 45 degrees of inclination in all directions when all seats are occupied by seated persons. All furniture and seats shall be lightweight, tough and robust. Upholstery such as seat cushions, back rests and settees shall be - fire-resistant e.g. urethane foam to BS3379 or equivalent, and to be of a thickness of not less than 100mm and be covered with leather.

(ii) Lockers shall be provided with built-in locks and keys. They shall be designed and fitted to the satisfaction of the GNC.

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

(iv) All fittings and hardware fitted onboard the Vessel (e.g. coat hooks, ceiling lights, bulkhead mounted lights) shall be of a high-quality stainless steel or other metals with chrome finish provided that galvanic correction due to contact of dissimilar metals are not allowed. They shall be properly fitted in all spaces as directed by the GNC.

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

(vi) All furniture should be fitted as to allow for removal of the underdeck machinery and tanks.

(vii) Grab rails are to be positioned internally and externally as deemed necessary for the Vessel to the GNC's satisfaction.

(h) Insulation and Lining

(i) Insulation:

1. Boundaries and ceilings around the inside of the deckhouse shall be insulated against heat and sound, to be fitted with rockwool of appropriate thickness (minimum 50 mm) or equal and be lined with protective/ decorative panel linings with a hard-wearing surface and sealed against water ingress.
2. The engine room and machinery space(s) shall be effectively protected from fire and sound insulated with asbestos-free materials of adequate thickness, pinned and wire-mesh secured, and lined with incombustible sheathing in accordance with IMO and RO Requirements and acceptable to the GNC.

3. The noise level in the Commander's Cabin and Crew space(s) shall not exceed 75dB when the Vessel is operating at all speeds. The noise level in the wheelhouse shall be less than 65dB to facilitate communication within the compartment and external radio-communications. The Contractor shall make all reasonable efforts to minimize noise and vibration in the Vessel.

(ii) Lining:

1. Panels for walls, ceilings and their joint materials shall be readily removable. The joining method shall provide long-lasting firm and strong attachments between the adjoining members and parts against excessive vibration and shall withstand temperature changes and wear and tear within the life expectancy of the Vessel. The panels shall be fitted to avoid noise generation due to its own vibration or in resonance response to the overall vibratory mode of the Vessel. This requirement applies to all operational speeds of the Vessel. If the noise level is considered unacceptable to GNC, the Contractor shall improve the design and fitting methods of the panel/ceilings. The colour of the lining material shall also be agreed by GNC.
2. The deck or floor of the wheelhouse, officer cabin and crew cabin shall be covered with non-skid, wear resistant and fire-retardant vinyl sheets that are acceptable to GNC. The colour of the floor covering shall be agreed by GNC.

(i) Black water and Grey water

(i) Black water from the underdeck toilets shall be piped to the black water tank and then treated by the sewage treatment plant before being discharged overboard. Black water from the main deck toilets shall be directly piped to the sewage plant for treatment before being discharged overboard.

(ii) Grey water from under deck areas shall be piped to the grey water tank before being discharged overboard. Grey water from the main deck or above shall be directly discharged overboard.

(j) Access, Doors, Ladders and Hatches:

(i) All outfitting including, but not limited to, doors, hatches, ladders, ventilation heads, shall be type approved by the RO for this type of Vessel.

(ii) Detailed specifications of these items shall be provided by the Contractor to the GNC. These shall include the structural arrangement, scantlings, material and welding procedures. These shall be in accordance with RO Requirements or other international standards acceptable to the GNC.

(iii) Flush RO type approved watertight manhole covers shall be used where necessary.

(iv) Where the covers and doors are used for the purpose of escape, they shall be fitted with manual means of locking; and shall be able to be quickly opened from both inside and outside of the compartment. All covers and doors shall be fitted with a retaining device. Hatches/ covers for access to the watertight compartments below the main deck level shall be type approved by the RO. Watertight and weathertight hatches shall be of a hinged type as far as practical.

(v) All deck hatches shall be fitted with a high-quality stainless steel or bronze commercial-grade marine-type locks. Locking of hatch cover(s) affecting escape shall be prohibited. Three sets of keys shall be provided. All keys shall be tagged for identification.

(vi) All door openings to the main deck shall be RO type approved, outwardly opening weathertight type. All doors shall be fitted with hooks or other means to hold them in the fully open position.

(vii) Exterior side deck doors shall be hinged on the forward edge. If the door is accidentally left open, it will be naturally closed as the Vessel manoeuvres forward in accordance with RO requirements.

(viii) All exterior doors shall be fitted with high quality stainless steel or bronze commercial-grade marine lever-type locksets. Three sets of keys shall be provided. All keys shall be

tagged for identification and all locks shall be keyed alike.

(ix) Stairway slopes shall be acceptable to the GNC and shall be fitted with handrails on each side. A minimum width of 600mm shall be provided between handrails.

(x) Exterior handrails on upper deck and main deck shall be constructed of aluminium and steel respectively, painted and strongly secured to the perimeter of the upper deck and main deck to provide support for persons onboard, to prevent them from falling or being thrown on deck or overboard in heavy weather and sea conditions. The design shall consider the circumstances when all persons onboard are lined up together on one side of the deck in case of an emergency situation at sea.

(xi) A gateway is to be fitted on the port and starboard exterior side deck to allow personnel to embark and disembark the vessel.

(xii) Vessel foredeck exterior handrails shall be constructed of steel, painted and strongly secured to the main deck approximately 1000mm inboard of the vessel's perimeter to provide support for persons onboard, to protect them from falling or being thrown on deck or overboard. A fall arrest sliding rail/carriage is to be fitted along the length of the top rail for persons to clip (attach themselves) onto when working on the fore deck (e.g. Hadrian rail or equivalent). The rail shall not restrict the free movement of persons carrying out duties as required. The arrangement is to be indicated on the Tenderers submitted General Arrangement Plan for review by the GNC.

(xiii) Vertical ladders, if provided, shall be fixed to the structure. Vertical ladders shall be equipped with climber safety rail. The width of ladders between stringers shall not be less than 400mm. The treads shall be equally spaced at a distance apart, measured vertically between 250mm and 300mm.

(xiv) The Engine Room, Machinery Spaces and the crew cabin shall be provided with two separated means of access/escape.

(k) Ventilation:

(i) The requirements for ventilators and the ventilation system shall comply with RO Requirements.

(ii) The Wheelhouse, Commander's cabin, First Aid Room, Crew Cabin and Galley shall be protected from gas or vapour fumes from machinery, engine exhaust gas and smells from the fuel system.

(iii) The toilets shall be fitted with an exhaust fan with a capacity of not less than 36 air changes per hour; and a louver at the lower portion of the toilet door shall be provided. There shall be covers for exhaust fans capable of being closed to prevent rainwater and seawater spray ingress.

(iv) Air pipes shall be fitted to all tanks, void spaces, and all spaces and compartments which are not fitted with other types of ventilation arrangements. All air pipes shall be fitted with automatic closure devices to RO's requirement.

(v) The lower edge of openings in exterior air pipes and trunks shall be set at a minimum clearance above the main deck which shall comply with RO requirements.

(vi) All ventilators shall be provided with weathertight covers.

4.2 Wheelhouse

4.2.1 The Contractor shall supply a 3D computer model of the Vessel interior for review by the GNC and HKPF. This shall be supplied in a format acceptable to the GNC. It shall be reviewed and approved in principle by GNC, following which the Contractor shall build and carry out a mockup test of the Wheelhouse including the equipment arrangement, seats and other fittings as required under this Part VII. The mockup shall be inspected and agreed by the GNC.

4.2.2 The outside configuration of the wheelhouse shall be of a design that reduces air resistance, to deflect rain and seawater during heavy weather; and to provide practically all-round visibility at the

steering/helm position of the console area. Pillars shall not be fitted inside the wheelhouse to avoid obstructing the visibility and CCTV coverage.

4.2.3 Two control stations shall be provided in separate areas of the Wheelhouse for general ship navigation as well as command and control operations. The two control stations can be separated by curtains or other means as indicated on the Conceptual General Arrangement Plan in Annex 10 and Figure 9.1 of Paragraph 9.3 of this Part VII.

(a) Forward Ship Navigation Control Station:

It shall be located in the wheelhouse on the centreline, arranged so the Officer of the Watch (OOW) and Coxswain are facing forward with an unobstructed view forward and to the sides of the Vessel. At a minimum, the Ship Navigation Control console(s) shall comply with the IMO requirements. This station shall be designed for the operation of the OOW, Coxswain and Engineer.

(b) Aft Command and Control Station:

It shall be located on the aft end of the wheelhouse. This station shall be designed for the operation of the Commander, Operations/ Electro Optical Sensor System (EOSS) Operator and Communications and Navigation Officer.

4.2.4 Wheelhouse Marine Shock Mitigating Seats:

(a) Six heavy duty pedestal seats with hydraulic damping system, armrest with safety belts for the crew shall be provided for the following personnel:

(i) Commander;

(ii) Officer of the Watch (OOW);

(iii) Coxswain;

(iv) Engineer;

(v) Operations/ Electro Optical Sensor System (EOSS) Operator; and

(vi) Communications and Navigation Officer.

(b) The seats shall have high density foam cushions, adjustable back rest, folding arms, lumbar support and adjustable footrest;

(c) Height and direction of these seats shall be adjustable; and

(d) Seats are to be designed and installed in accordance with the 2000 HSC Code.

4.2.5 The Wheelhouse Control Station shall be situated at the centreline of the Vessel and be at a forward position in the Wheelhouse. Seated at the control station are the Coxswain and the Officer of the Watch. The Coxswain seat should be situated immediately to port of the Vessel centreline. The OOW seat should be situated immediately to starboard of the Vessel centreline. Controls for steering shall be easily reachable by a person of normal Asian stature in the seated position without the need to extend his/ her arms, and without obstructing the Coxswain and the assisting OOW's all-round field of view.

4.2.6 The equipment and means for navigation, manoeuvring control, communication and other essential instruments shall be located sufficiently close together to enable the Coxswain and the OOW to read/receive all the necessary information and be able to use the equipment and controls whilst seated.

4.2.7 Instruments, instrument panels and controls shall be permanently mounted in the consoles, taking into account operational, maintenance and environmental needs.

4.2.8 All instruments shall be logically grouped according to their functions. In order to reduce the risk of confusion, instruments shall not be rationalized by share functions or by inter-switching. The proposed console arrangement shall be reviewed and approved by the GNC and HKPF prior to installation.

4.2.9 Instruments required for use by any member of the operating crew shall be plainly visible and easily read with minimum practicable disposition from his/ her normal seating position and deviation from line of vision, i.e. they will cause minimum risk of confusion under all likely operating conditions.

4.2.10 The instrument panels for the emergency controls and monitoring of the fire-fighting systems shall be at the Engineer's console of the Forward Ship Navigation Control Station. The locations shall be clearly defined and agreed by the GNC and HKPF.

4.2.11 Gauges, indicators, and displays shall be provided with adjustable intensity backlighting. Lighted gauges, alarm indicators, and displays shall be arranged so that they do not reflect on the wheelhouse windows during night operations. Glare should be avoided.

4.2.12 The surfaces of console tops and instruments shall be a dark glare-free colour. Surface finishing and interior linings in the wheelhouse should be of a matt non-reflecting finish to facilitate day and night operation.

4.2.13 The following controls, displays and equipment are required to be incorporated into the Forward Ship Navigation Control Station so that all relevant controls can be reached from any normal working position (e.g. sitting, standing or both):

(a) Steering shall be controlled by a steering wheel and a quick action lever control (joystick);

(b) Position Keeping control panel and joystick;

(c) Engine speed and clutch controls;

(d) Hybrid system control and monitoring panel;

(e) Rudder or steering angle indicators;

(f) Rate of turn indicators;

(g) Bow thruster monitoring panel;

(h) Operational Systems and displays;

(i) Speed log;

(j) Echo Sounder;

(k) Gyro Stabilizer control and monitoring panel;

(l) Lighting control panel incorporating controls for navigation lights, alarms, search lights, and flood lights;

(m) Main and auxiliary engine monitoring indicators and tachometers;

(n) Hybrid battery monitoring indicators and alarms;

(o) Instrument, control and alarming system for major machinery containing start/stop switches;

(p) LED colour monitors linked to the Vessel's CCTV System;

(q) External broadcasting system, public address and intercom system;

(r) VHF radio receiver's stowage positions and power sockets;

(s) Electric horn, siren, and blue flashing beacon control panel;

(t) Magnetic compass; and

(u) Wind speed and direction display.

4.2.14 The Wheelhouse Engine Remote Control Console at the Forward Ship Navigation Control Station shall be fitted for the engineer(s) to monitor the Engine Room condition and attend to any alarms as quickly as possible.

4.2.15 The Wheelhouse Engine Remote Control Console shall have a monitor screen for monitoring the engineering system. The screen shall be multi-functional and can be switched over to a different engineering system as required.

4.2.16 Besides the engineering system monitor, the Wheelhouse Engine Remote Control Console shall perform the control and operation function provided by the equipment supplier either by touch screen or alternative arrangement accepted by the GNC and HKPF.

4.2.17 The engineering system being monitored and controlled at the Wheelhouse Engine Remote Control Console shall be displayed on the Multi-Function Display. Details shall be discussed at the Kick-off meeting. It shall include but not be limited to:

(a) Main diesel engine including reduction gear;
(b) Diesel Generator;
(c) Hybrid system including battery management system;
(d) AC Electrical system;
(e) Water-Mist system;
(f) Sprinkler system (if applicable);
(g) Fire detection system;
(h) General engineering system including fire pump control, bilge alarm and pump control, tank level gauge (freshwater tank, grey water tank, black water tank, fuel oil tank, lubricating oil, oily bilge tank, etc.);
(i) Sewage system;
(j) Oily water separator;
(k) Meter/Gauge indicating the quantity of fuel remaining in the fuel tanks;
(l) Meter/Gauge indicating the quantity of fresh water in the freshwater tank(s);
(m) Meter/Gauge indicating the quantity in the grey water, black water and oily water tanks;
(n) Marine growth protection system; and
(o) Air conditioning system;
(p) Intercom between Wheelhouse Engine Remote Control Console and Engine Control Console in the engine room control office;
(q) Watertight and weathertight door and hatch open/close monitoring system;
(r) Bow thruster system;
(s) External Fire-Fighting System (including fire-fighting monitor control and monitoring panel); and
(t) Any other controls, gauges or monitors as required by the GNC.

Detailed arrangements of the aforesaid monitor display shall be agreed by the GNC and HKPF.

4.2.18 The monitoring, control and operation of the engineering system shall be replicated to the Engine Control Console in the Engine Room Control Office at the under deck. There shall be a control change over switch at the Wheelhouse Engine Remote Control Console and at the Engine Control Console in the Engine Room Control Office, which shall allow the Engineer-in-charge to select which control console is active. Only one of the control consoles shall be active at any one time to prevent two persons trying to control the systems at the same time.

4.2.19 The following displays and equipment shall be incorporated into the Commander's console so that all the relevant controls can be reached from any normal working position (e.g. sitting, standing or both):

(a) As specified in Paragraph 9.3.1(f) of this Part VII, one (1) 32" high definition multi-function display, which is the dedicated display of X-band solid state Marine High Performance Radar, which shall be capable of displaying at least the following systems' images via Integrated Navigation System:
    (i) X-band solid state Marine High Performance Radar;
    (ii) X-band solid state Navigation Radar;
    (iii) ECDIS;
    (iv) Electro Optical Sensor System (EOSS);
    (v) Marine Situational Awareness System (MARSAS) provided by the HKPF as described in Paragraph 9.29.2 of this Part VII; and
    (vi) Others.
(b) Details of the system functionality to be discussed with and approved by the HKPF and GNC.

4.2.20 The following displays and equipment shall be incorporated into the Operations/ Electro Optical Sensor System (EOSS) Operator console so that all relevant controls can be reached from any normal working position (e.g. sitting, standing or both):

(a) As specified in Paragraph 9.3.1(e) of this Part VII, two (2) 32" or larger multifunction displays, acceptable to the HKPF, are to be located at the Operations Officer's console. One of the displays shall be dedicated for operating the MARSAS and, the other display shall be for operating the EOSS and used as an extended MARSAS display. It can also display other systems' images via the Integrated Navigation System.:

(b) Details of the system functionality are to be discussed with and approved by the HKPF and GNC.

4.2.21 The following displays and equipment are required to be incorporated into the Communications and Navigation Officer console so that all relevant controls can be reached from any normal working position (e.g. sitting, standing or both):

(a) As specified in Paragraph 9.3.1(g) of this Part VII, one (1) 32" high definition multi-function display which can display at least the following and other system's images via Integrated Navigation System:

(i) ECDIS; and

(ii) X-band solid state Navigation Radar.

(b) In addition to the multifunction display, the following monitors shall be fitted at the Communications and Navigation Officer's console:

(i) Secure AIS;

(ii) GPS;

(iii) Direction Finder;

(iv) VHF; and

(v) Police TETRA radio system (to be supplied by the HKPF).

(c) Operator panel of Wired and Wireless Intercom (Talkback) System shall be provided for communications between the Wheelhouse Control Station and other persons onboard when required.

(d) Additionally, as specified in Paragraph 9.3.1(i) of this Part VII, within close proximity of the Communications and Navigation Officer's console, there shall be a large working chart table designed and installed as follows:

(i) Provision for one (1) 55" ECDIS/ Multi-Function Display that shall be fitted flush within the chart table and that also can be erected at an angle to the user's preference.

(ii) The chart table shall also be able to handle paper charts, paper documentation and for general use as a desk. The display screen shall be protected from scratching and damage.

(iii) The displays and equipment are to be designed so they can be reached from a fixed standing position.

(e) Details of the system functionality are to be discussed and approved by the HKPF and GNC.

4.2.22 Visibility

(a) The visibility from the wheelhouse shall not be obstructed;

(b) Large rear view side mirrors, and CCTV cameras shall be installed at locations to allow the coxswain to safely manoeuvre the Vessel to a berth and have a clear view during such operation;

(c) One CCTV camera shall be fitted port and starboard, amidships, to facilitate direct downward viewing to the side of the Vessel;

(d) Vision blind spots or sectors shall be as few and small as possible, and in any case, they must not adversely affect the keeping of a safe-look-out from the helm position in the wheelhouse; and

(e) All equipment fitted in the vicinity of the control station should not obstruct the view of the Commander, Coxswain, OOW and other crew members working in the Wheelhouse.

4.2.23 Windows

(a) Wheelhouse window frames/ mullions shall be kept to a minimum, whilst maintaining required structural strength and stiffness in accordance with RO Requirements. They shall not be installed directly in front of any workstation.

(b) All Wheelhouse windows shall be provided with sunscreens of readily adjustable type. Forward facing windows shall be inclined forwards and provide visibility which is free of any glare under all normal operating conditions. The Wheelhouse front windows shall be inclined from a vertical plane topside out to reduce unwanted reflection, at an angle of not less than 10° and not more than 25°.

(c) Wheelhouse windows shall be arranged to provide for the maximum practicable visibility for navigation, boat operations and conducting helicopter winching operations. All wheelhouse front windows shall be fitted with retractable tinted solar blinds to reduce glare (American Standard Window Film ASWF or equivalent). Forward wheelhouse windows shall be fixed. A minimum of one sliding window on each side of the wheelhouse shall provide visual access to the sides of the Vessel for manoeuvring. Details of the sliding windows shall be discussed at the kick-off meeting.

(d) Electrically operated window wipers shall be installed on all wheelhouse front and forward side windows. They shall be of heavy-duty marine type and selected to sweep a minimum of 75% of the clear area of the window to which they are mounted. The wipers shall effectively clear the glass and maintain good vision in heavy rain conditions. The operating mechanism and control equipment shall be located inside the wheelhouse. The control equipment for each wiper shall be located on or near the wiper it controls, within easy reach of the operator. The wipers shall be operated independently. Two sets of spare wiper blades shall be provided for each window wiper installed for the vessel.

(e) An electrically operated freshwater window washer system for all windows with wipers shall be provided. The window washer system shall provide a spray in sufficient quantity and with a spray pattern that shall remove a film of salt spray from the area covered by the wiper. The washer system controls shall be located adjacent to the window wiper controls.

(f) Details of all the windows including the window glass thickness should be submitted to RO and GNC for approval prior to installation.

4.2.24 The following fittings and equipment shall be provided, at minimum, in the wheelhouse to the satisfaction of HKPF and GNC:

(a) One (1) display board for posting plans, charts and notices etc.;

(b) Two (2) wall mounted fans of diameter 300mm;

(c) One (1) set of pigeonholes for the stowage of international code flags;

(d) One (1) set of international code flags suitable for the mast;

(e) One (1) shelf for the stowage of logbooks and files with retention bar;

(f) One (1) dial type inclinometer and one barometer with thermometer for marine use;

(g) One (1) electric powered marine wall-mounted clock;

(h) Seven (7) cup holders;

(i) Two (2) wastebaskets (to be concealed);

(j) One (1) lockable key cabinet shall be of the size required to provide a separate hook for the keys to each lock. Each key hook shall be labelled to identify the purpose of the key;

(k) Three (3) lockable storage boxes for the storage of binoculars, to be fitted in the vicinity of the Coxswain and OOW. Three (3) waterproof and fog proof 7 x 50 marine binoculars for daytime use shall be provided;

(l) Seven (7) coat hooks;

(m) As many storage cupboards/lockers as possible within the space without compromising working areas or Wheelhouse visibility;

(n) One (1) framed fire and safety plan of appropriate size;

(o) Non-slip handholds at suitable locations for crew movement in rough sea conditions; and

(p) One (1) approved type first aid box.

4.3 Deckhouse Interior Outfit

4.3.1 The deckhouse on the main deck shall be subdivided into a series of compartments. Reference can be made to the Conceptual General Arrangement Plan, Annex 10 of this Part VII. Designs affecting habitability, including all elements of design and construction, shall be considered to make the vessel more liveable and comfortable. Arrangements of accommodations and workspaces shall maintain clear traffic patterns and maximum utilization of space. Runs of piping, wiring and ductwork shall be avoided in living compartments, sanitary compartments and mess room.

4.3.2 Subject to structural design considerations, the deckhouse shall be subdivided by structural and non-structural bulkheads as required. The deckhouse shall include the following compartments:

(a) Commander's Cabin;

(b) First Aid Room;

(c) Wet Room;

(d) Two (2) Crew Shower and Toilet facilities;

(e) Embarkation Lobby;

(f) Server Room;

(g) Weapons and Ammunition Storeroom;

(h) Pyrotechnics Storeroom;

(i) Life Saving Appliance and Special Equipment Stowage; and

(j) Bosun's Store.

4.3.3 The Contractor is to pay due attention to the positioning of structural and non-structural bulkheads within the deckhouse, to minimize the transfer of noise and vibration throughout the space. Wherever possible, bulkheads shall not be located in and shall be kept away from passageways, showers, washrooms and water closet spaces.

4.4 Commander's Cabin

4.4.1 The Commander's cabin shall have en-suite bathroom and have easy access to the Wheelhouse. It shall be designed to comply with the International Labour Organization (ILO) Maritime Labour Convention (MLC) 2006 as applicable.

4.4.2 Notwithstanding anything in this Part VII to the contrary, the Commander's Cabin shall, as a minimum, include the following:

(a) One (1) Multifunction display, acceptable to HKPF, for displaying MARSAS, ECDIS and Navigation Radar respectively;

(b) One (1) single bed;

(c) One (1) lockable storage for clothes, toiletries and personal effects;

(d) One (1) bookshelf with retention bar;

(e) One (1) desk with drawers;

(f) One (1) desk chair without wheels;

(g) One (1) wall mounted clock;

(h) One (1) wall mounted fan of diameter 300mm;

(i) Two (2) wall mounted (240V AC) electrical sockets (Type G for Hong Kong) with dual USB

charging ports (or equivalent);

(j) Four (4) clothes hooks;

(k) Intercom terminal; and

(l) One (1) en-suite bathroom with hot and cold-water supply equipped with the following:

(i) The en-suite bathroom door shall be fabricated from aluminium and open outwards and capable of being opened from the outside. The lower portion of the door should have a louver. All fixtures, partitions and laminations shall be approved by the GNC and HKPF. All wet spaces shall be provided with a surrounding coaming fully welded to the Vessel's deck. It is to be painted in a suitable coating.

(ii) One (1) electric exhaust fan capable of not less than 36 air changes per hour. The exhaust air shall be routed outside of the Vessel's superstructure. There shall be covers for exhaust fans capable of being closed to prevent rainwater and seawater spray ingress.

(iii) Sewage flushed from toilets on the main deck shall be piped to a sewage treatment plant before discharge overboard;

(iv) The Commander's cabin bathroom shall be fitted with non-slip flooring and waterproof grating.

(v) One (1) western style toilet with a stainless steel wash basin (with hot and cold fresh water mixer tap) including a towel bar, grab bar, and soap dish;

(vi) One (1) water delivery point under the wash basin with a plastic hose for cleaning of the en-suite bathroom.

(vii) One (1) non-slip shower tray separate from the toilet. The shower shall be fitted with hot and cold-water mixer unit.

(viii) One (1) mirror with vanity lights;

(ix) One (1) toilet paper holder;

(x) Stainless steel handrails as appropriate to allow for safe use of the facility while at sea;

(xi) One (1) secured waste bin;

(xii) Drain(s) to be provided to avoid water accumulation on the toilet floor. Floor covering shall pitch to a floor drain, which is to be piped to the grey water tank.

4.5 First Aid Room

4.5.1 The Vessel shall be designed with a "First Aid Room" to provide medical care when required. The First Aid Room shall be located adjacent to and with direct access from the aft main deck.

4.5.2 As a minimum, it shall be equipped with the following:

(a) Suitable numbers of wall mounted (240V AC) electrical sockets (Type G for Hong Kong) with dual USB charging ports (or equivalent) shall be provided. Details to be discussed at the kick-off meeting.

(b) Locker with four (4) Paraguard type stretchers and associated medical first aid equipment.

(c) A minimum 1000-Watt non-flammable surface 220V AC wall mounted heater shall be provided and mounted using a detachable retention device in the First Aid Room.

(d) One (1) stainless steel sink with medical type water tap with hot and cold water supply.

(e) One (1) stainless steel soap dispenser.

(f) One (1) examination couch of appropriate height with portable steps shall be provided and installed in the First Aid Room. The top of the couch is to be padded with 100mm thick foam and covered with waterproof heavy gauge imitation leather. Removable side rails shall be provided to prevent patient falling off the couch in heavy weather. Storage space with sliding doors shall be provided under the couch.

(g) Medical lockers for storage of medical supplies.

(h) One (1) electric exhaust fan capable of not less than 36 air changes per hour. There shall be covers for exhaust fans capable of being closed to prevent ingress of rainwater and seawater spray.

(i) Storage and power provision for one (1) Automated External Defibrillator and Two (2) first aid boxes (to be provided by the HKPF) shall be provided.

Details to be discussed at the kick-off meeting.

4.5.3 The partition walls and doors of the First Aid Room shall be of a sandwich construction including fire retardant, heat and noise insulating materials to maintain a sound level not exceeding 75dB(A) inside the room.

4.5.4 The First Aid Room shall be fitted with a separate air conditioning and ventilation system which is independent of the rest of the superstructure. The exhaust air shall pass through a certified HEPA filter and be routed outside of the Vessel superstructure with no risk of recirculation. This is important to provide protection to other persons onboard from a contagious patient in the First Aid Room.

4.6 Wet Room with Drying Locker

4.6.1 A Wet Room shall be designed and directly accessible from external passageways on the main deck.

4.6.2 The wet room floor is to be non-slip wash down with deck drains provided to avoid water accumulation. The floor covering shall be pitched to a floor drain which is to be piped to the grey water tank.

4.6.3 A floor tracking system is to be run fore and aft throughout the wet room at 350mm transverse spacing to provide suitable anchor/ tie down points for various payloads including stores and mission equipment. It shall be fitted to the satisfaction of HKPF/GNC.

4.6.4 Two (2) electric exhaust fans which are to be collectively capable of not less than 36 air changes per hour. The exhaust air shall be routed outside of the Vessel's superstructure. There shall be covers for exhaust fans capable of being closed to prevent rainwater and seawater spray.

4.6.5 Two (2) mesh drying storage cabinets capable for hanging sixteen (16) crew member's foul weather gear and personnel protective equipment shall be provided.

4.7 Crew Shower and Toilet Facilities

4.7.1. Two (2) Crew washrooms with hot and cold water supply shall be arranged on the main deck. One of the washrooms shall be additionally equipped with a non-slip shower tray and located adjacent to the Wet Room.

(a) Each washroom shall be well ventilated. One (1) electric exhaust fan capable of not less than 36 air changes per hour shall be provided, and the exhaust air shall be routed outside the Vessel.

(b) The washroom door shall be of aluminium opening outwards and can be opened from the outside. The lower portion of the door should have a louver. All fixtures, partitions and laminations shall be approved by the GNC and HKPF. All wet spaces shall be provided with a surrounding coaming fully welded to the Vessel's deck. It is to be painted in a suitable coating.

(c) The washroom shall be fitted with non-slip flooring and waterproof grating.

(d) Sewage flushed from toilet shall be treated by the sewage treatment plant before discharge overboard.

(e) As a minimum, each washroom shall have the following:

(i) One (1) western style toilet with a stainless steel wash basin (with hot and cold fresh water mixer tap) including a towel bar, grab bar, and soap dish;

(ii) One (1) water delivery point under the wash basin with a plastic hose for cleaning the

washroom;

(iii) One (1) mirror with vanity lights;

(iv) One (1) toilet paper holder;

(v) One (1) waste bin;

(vi) Three (3) clothes hooks;

(vii) Drain(s) are to be provided to prevent water accumulation on the toilet floor. Floor covering shall pitch to a floor drain, which is to be piped to the grey water tank; and

(viii) For the washroom equipped with a non-slip shower tray, the shower shall be fitted with a hot and cold water mixer unit.

4.8 Embarkation Lobby

4.8.1. Near amidships within the Deckhouse on the main deck, there is to be an open plan area for embarkation and disembarkation from the Vessel superstructure.

4.8.2. To port and starboard, the RO type approved weather tight door is to be fitted. This is to allow for the safe embarkation and disembarkation of the Vessel's crew and on occasions up to 100 Police Officers for personnel transit from one operational base to another. The Embarkation Lobby is indicated on the Concept General Arrangement Plan for reference.

4.8.3. Within the space, there shall be 20 bulkhead mounted coat hooks for hanging crew's clothing.

4.8.4. The embarkation lobby shall be ballistic protected. For details refer to Paragraph 4.1.2(d)(i).

4.9 Server Room

4.9.1 Within the Deckhouse, a Server Room shall be designed and installed. The room is to be a dedicated room directly below the Wheelhouse Control Station and housing Vessel electronic navigation and communications equipment. It is important the Server Room is placed close to the Wheelhouse Control Station to minimize cable run lengths.

4.9.2 The Server Room shall be environmentally controlled and monitored. A remote display is to be fitted in the Wheelhouse Engine Control Station so the Vessel Engineer can monitor the temperature and humidity within the Server Room.

4.9.3 The Server Room shall be ventilated and have air-conditioning to the satisfaction of HKPF and the GNC.

4.9.4 The Server Room arrangement, stowage of computer equipment and server racking is to be designed and submitted for approval by HKPF prior to installation onboard the Vessel.

4.9.5 The Server Room shall be lockable with a built-in lock. Three sets of keys shall be provided. All keys shall be tagged for identification.

4.9.6 The Server Room shall be large enough to install three (3) 600(L) x 600(W) ETSI standard equipment cabinets. The height of cabinets can be adjusted subject to the ceiling height. The equipment cabinet shall be provided by the Contractor and securely mounted on the deck with anti-shock facility.

4.9.7 The Contractor shall provide both 220V AC and 24V DC power supplies in the server room. The power loading of each power supply shall be at least 3kW. The power loading shall be discussed with HKPF during the kick-off meeting. The Contractor shall provide at least four (4) fuse spurs for each power supply.

4.9.8 The Server Room shall have cable containments, which can reach to at least the Wheelhouse, mast, main deck and under deck.

4.10 Weapons and Ammunition Storeroom

4.10.1 A dedicated room shall be designed and located on the main deck for the storage of weapons and ammunition.

4.10.2 The Weapons and Ammunition Storeroom should be located in positions where surrounding compartments and passageways provide a protective buffer against external attack or impact.

4.10.3 The Weapons and Ammunition Storeroom should be separated from accommodation spaces by at least one intervening compartment. The Weapons and Ammunition Storeroom shall be protected from adjacent spaces by structures meeting the IMO SOLAS A60 standard including the doors and should be located as far away as possible from the accommodation spaces.

4.10.4 Compartments adjacent to Weapons and Ammunition Storeroom should not contain high fire risk stores, equipment (including electrical items), processes or activities. Such compartments include:

(a) Refuelling points,

(b) Main and auxiliary machinery spaces,

(c) Compartments used for storing or mixing paint and solvents or other stores having a flashpoint less than 60.5℃,

(d) Compartments used for storing acids,

(e) Fuel and oil tanks,

(f) Compartments containing chemicals,

(g) Engine exhaust uptakes,

(h) Galleys and,

(i) Battery compartments.

4.10.5 If a machinery space or engine exhaust uptake is adjacent to the Weapons and Ammunition Storeroom boundary, ventilated air spaces shall be provided between the space or uptake and the Weapons and Ammunition Storeroom boundary.

4.10.6 High fire risk equipment and electrical fittings should not be fitted to the external surfaces of the Weapons and Ammunition Storeroom boundaries. Where this is unavoidable, equipment and cabling shall be at least 50 mm clear of the boundary to assist boundary cooling and facilitate ships structural maintenance.

4.10.7 Electrical cables passing through adjacent compartments, but not associated with equipment therein, should be continuous i.e., with no junction boxes fitted and meet the IMO SOLAS A60 requirements.

4.10.8 Compartments adjacent to the Weapons and Ammunition Storeroom (except heads, bathrooms, tanks, lobbies and airlocks), as well as the storeroom itself, shall be fitted with fire detectors linked to audible and visual alarms in the vessel's fire protection system.

4.10.9 The storage facilitates for weapons and ammunition shall be designed to allow handguns, ammunition and other weapons to be stored in the same room. Finalized details of the types and quantity of weapons and ammunition are to be discussed at the kick-off meeting but at a minimum stowage should be provided for the following weapons and ammunition:

(a) Three (3) Long Barrel Weapons;

(b) Fifteen (15) Handguns;

(c) Fifteen (15) Pairs of handcuffs;

(d) Fifteen (15) Extendable batons;

(e) One (1) Signal Pistol;

(f) Fifteen (15) OC Foam irritant aerosols; and

(g) Drawers for the safe stowage of approximately 800 rounds of small arms ammunition of various calibres.

4.10.10 Suitable racking, drawers, cupboards, cabinets and safe are to be designed to safely contain the weapons and ammunition, with the ammunition stored in HKPF approved packaging (e.g. H83 metal boxes). Supports for stowages shall not be affixed to hull plating.

4.10.11 Stowages shall be designed to allow water from the fire suppression system to cool all weapons and ammunition in the stowage. Any shelves shall have a drainage hole to allow water from fire suppression systems to cool weapons and ammunition in the stowage.

4.10.12 A minimum of 75 mm shall be provided between the rear, sides and undersides of stowages and the Weapons and Ammunition Storeroom boundaries to permit effective boundary cooling.

4.10.13 The height of stowages shall be limited to permit effective spray coverage of stored weapons and ammunition from the overhead sprinklers. Subject to design limitations the distance between the tops of stowages and sprinkler heads should not be less than 300 mm.

4.10.14 In addition to storing the arms and ammunition on board, the storeroom is to be used by HKPF Officers for the loading and unloading of arms. The storeroom should include:

(a) Provision for loading and unloading bay/two clearing traps;

(b) Mounting/stowage arrangements for Ballistic Bags/ Collectors.

4.10.15 The environment within the Weapons and Ammunition Storeroom shall be controlled to ensure stored weapons and ammunition serviceability is not affected by temperature or humidity fluctuations.

4.10.16 The Weapons and Ammunition Storeroom shall be lockable with a built-in lock. Three sets of keys shall be provided. All keys shall be tagged for identification.

4.11 Pyrotechnics Storeroom

4.11.1 The Pyrotechnics Storeroom is to be designed for stowage of the following pyrotechnics, which shall be contained in standard H83 or H82 metal storage boxes:

(a) Six (6) red illuminating parachute flares;

(b) Eight (8) white illuminating parachute flares;

(c) Ten (10) 1" white signal cartridges;

(d) Ten (10) 1" red signal cartridges;

(e) Ten (10) 38mm white illuminating cartridges;

(f) Four (4) red distress signal flares;

(g) Two (2) orange smoke buoyant markers (if not fitted on the vessel);

(h) Two (2) MOB smoke markers with light (if not attached to lifebuoys on Vessel exterior side deck); and

(i) Capacity to store an amount of reserve ammunition / CS Gas (Two (2) multi-burst grenades and Ten (10) CS556 multi-burst projectiles).

4.11.2 The storage shall be carefully designed and installed to prevent the pyrotechnics moving whilst the vessel is underway as well as to facilitate ease of removal in emergencies.

4.11.3 Either a metal cage, suitable racking, drawers, cupboards or cabinets are to be designed to safely contain the pyrotechnics. Supports for stowages shall not be affixed to hull plating.

4.11.4 The Pyrotechnics Storeroom shall be protected from adjacent spaces by structures meeting the IMO SOLAS A60 standard including the doors and should be located as far away as possible from the accommodation spaces.

4.11.5 Stowages shall be designed to allow water from the fire suppression system to cool all pyrotechnics in the stowage. Any stowage capable of retaining water shall be provided with a practical means of drainage.

4.11.6 A minimum of 75 mm shall be provided between the rear, sides and undersides of stowages and the Pyrotechnics Storeroom boundaries to permit effective boundary cooling.

4.11.7 The height of stowages shall be limited to permit effective spray coverage of stored pyrotechnics from the overhead sprinklers. Subject to design limitations the distance between the tops of stowages and sprinkler heads should not be less than 300 mm.

4.11.8 Compartments adjacent to the Pyrotechnics Storeroom shall not contain high fire risk stores, equipment (including electrical items), processes nor activities. Such compartments include:

(a) Refuelling points,

(b) Main and auxiliary machinery spaces,

(c) Compartments used for storing or mixing paint and solvents or other stores having a flashpoint less than 60.5℃,

(d) Compartments used for storing acids,

(e) Fuel and oil tanks,

(f) Compartments containing chemicals,

(g) Engine exhaust uptakes,

(h) Galleys and,

(i) Battery compartments.

4.11.9 If a machinery space or engine exhaust uptake is adjacent to the Pyrotechnics Storeroom boundary, ventilated air spaces shall be provided between the space or uptake and the Pyrotechnics Storeroom boundary.

4.11.10 High fire risk equipment and electrical fittings should not be fitted to the external surfaces of the Pyrotechnics Storeroom boundaries. Where this is unavoidable, equipment and cabling shall be at least 50 mm clear of the boundary to assist boundary cooling and facilitate ships structural maintenance.

4.11.11 Electrical cables passing through adjacent compartments, but not associated with equipment therein, should be continuous i.e., with no junction boxes fitted and shall meet the IMO SOLAS A60 requirements.

4.11.12 Compartments adjacent to the Pyrotechnics Storeroom (except heads, bathrooms, tanks, lobbies and airlocks), as well as the Pyrotechnics Storeroom, shall be fitted with fire detectors linked to audible and visual alarms in the vessel's fire protection system.

4.11.13 The environment within the Pyrotechnics Storeroom shall be controlled to ensure stored pyrotechnics serviceability is not affected by temperature or humidity fluctuations.

4.11.14 The storage arrangements are to be approved by the GNC and HKPF prior to installation.

4.11.15 The Pyrotechnics Storeroom shall be lockable with a built-in lock. Three sets of keys shall be provided. All keys shall be tagged for identification.

4.12 Life Saving Appliance and Special Equipment Storage Room

4.12.1 A designated room shall be designed and located on the main deck for stowage of life saving equipment and specialist equipment. Specialist equipment storage will include Unmanned Aerial System (UAS) and Remote Operated Vehicle (ROV) with the specific storage dimensions to be provided by the HKPF at the kick-off meeting.

4.12.2 The room shall be equipped with facilities to store up to one hundred (100) common lifejackets (Developed Common Lifejacket for both adults and children, MD Notice No.69 of 2019) acceptable to MD. In addition, space is required for 100 Thermal Protection Aids and any other associated equipment as specified by the GNC. The Contractor shall provide the corresponding common lifejackets and Thermal Protection Aids.

4.12.3 Stowage facilities for fire extinguishers shall also be provided.

4.13 Bosun's Store

4.13.1 A Bosun equipment stowage space shall be designed and is directly accessible from the fore deck.

4.13.2 It shall provide sufficient space, as a minimum, for stowage of spare mooring lines, towing ropes, typhoon mooring equipment and fenders.

4.13.3 The space shall be fitted with non-slip wash down flooring.

4.13.4 Galvanized steel shelving is to be fitted around the perimeter of the space for the storing of the equipment.

4.14 Chain Locker and Fore Peak Compartment

4.14.1 The Chain Locker and Forepeak Compartment shall be arranged at the foremost part of the hull. The position of the collision bulkhead and its construction shall comply with the applicable RO Requirements. Suitable ventilation shall be arranged for the compartments and shall meet the requirements of the RO.

4.14.2 A flush watertight hatch cover shall be provided on the main deck for access into the forepeak compartment. An access ladder shall be provided.

4.14.3 A store space with steel walls shall be arranged inside the fore peak compartment. This will form the chain locker. Suitable perforated marine plywood lining shall be provided at all interior sides of the chain locker for storing anchor chains.

4.14.4 Suitable means of drainage shall be provided. When required, water can be pumped out from this space.

4.14.5 A flush watertight hatch should be provided for access to the Chain Locker by ladder.

4.15 Bow Thruster Space

4.15.1 The Bow Thruster Space shall be located under the main deck and aft of the fore peak compartment.

4.15.2 The space shall be sufficient to house the following equipment:

(a) Bow thruster tunnel, propeller and electrical power pack;

(b) External Fire-Fighting pump and electrical power pack;

(c) Racking and support structure for fitting of local operating panel(s), cabling, junction boxes and any other supporting equipment;

(d) Emergency Fire Pump; and

(e) Any other equipment as required by the GNC and HKPF.

4.15.3 The Contractor shall design and install the space in accordance with the 2000 HSC Code with respect to the required structural fire protection, fire detection and fire suppression and shall meet the requirements of the RO. Noise and vibration transfer to the Superstructure and living spaces shall be avoided.

4.16 Under Deck

4.16.1 Under deck shall include the following compartments:

(a) Crew Cabins;

(b) Crew Mess;

(c) Galley;

(d) Engine Room;

(e) Engine Room Control Office;

(f) Tank Space;

(g) Steering Gear Compartment; and

(h) Designated Battery Compartment, if appropriate.

4.17 Crew Cabins

4.17.1 Crew cabins shall be designed and sufficient for eighteen (18) officers. Two (2) crew bathrooms with shower facility shall be provided on the same deck within the crew accommodation area.

4.17.2 One (1) crew cabin that includes one bunk bed, for a maximum of two persons, shall be provided. In addition, four (4) crew cabins that include two bunk beds each, for a maximum of four persons in each cabin shall be provided. The crew accommodation space shall be designed in accordance with the requirements of Maritime Labour Convention (MLC), 2006.

4.17.3 Each crew cabin, as a minimum, shall include the following:

(a) Bunk beds with dimensions agreed by the GNC and HKPF;

(b) One (1) individual locker per bed/ per person;

(c) One (1) electric wall mounted clock;

(d) Two (2) wall mounted fans of diameter 300mm;

(e) One wall mounted 240V AC electrical sockets (Type G, Hong Kong) with dual USB charging ports (or equivalent) per bed;

(f) One (1) cup holder per bed;

(g) One (1) berth light per bed;

(h) One (1) privacy curtain per bed;

(i) Four (4) clothes hooks;

(j) One (1) desk with one (1) desk chair with no wheel to be provided for the two-person cabin only.

4.17.4 Emergency escape from the crew cabins directly to the main deck shall be provided. Each crew bathroom shall be provided with hot and cold water supply and, as a minimum, shall include the following:

(a) The bathroom door shall be of aluminium and open outwards, and capable of being opened from the outside. The lower portion of the door should have a louver. All fixtures, and partitions are to be commercial grade stainless steel and approved by the GNC and HKPF. All wet spaces shall be provided with a surrounding coaming fully welded to the Vessel's deck.

(b) One electric exhaust fan capable of not less than 36 air changes per hour. The exhaust air shall be routed to outside of the Vessel.

(c) Sewage flushed from underdeck toilets shall be piped to the black water tank and treated by the sewage treatment plant before discharge overboard.

(d) One (1) western style toilet with a wash basin including a towel bar, grab rod, and soap dish;

(e) One (1) water tap under the wash basin with a plastic hose for cleaning of the bathroom.

(f) One (1) non-slip shower tray separate from the toilet. The shower shall be fitted with hot and cold water mixer unit.

(g) One (1) mirror with vanity lights;

(h) One (1) toilet paper holder;

(i) One (1) secured waste bin;

(j) Drain(s) to be provided to prevent water accumulation on the toilet floor. Floor coverings shall pitch to a floor drain, which is to be piped to the grey water tank; and

(k) Four (4) clothes hooks.

4.18 Crew Mess

4.18.1 The Crew Mess shall seat at least 10 personnel, with the following minimum equipment to be provided and installed.

(a) Dining table and benches, with stowage space underneath the benches;

(b) Two (2) electric wall mounted fans of 300mm diameter;

(c) Four (4) 240V AC electrical sockets (Type G, Hong Kong) with dual USB charging ports (or equivalent);

(d) One (1) refrigerator, the size and type of the refrigerator to be determined by the HKPF;
(e) One (1) microwave oven;
(f) One (1) distilled water dispenser; and
(g) One (1) 50-inch 4K UHD LED TV.

4.19 Galley

4.19.1 A closed plan galley equipped with cold and dry food storage shall be designed to allow full unencumbered safe operation to serve four meals underway per day. As a minimum, the galley shall include the following:
(a) Four (4) Electric Hob Rings with suitable sea rails and pan holders;
(b) Stainless steel food preparation area;
(c) One (1) refrigerator, the size and type of the refrigerator to be determined by the HKPF;
(d) One (1) freezer, the size and type of the freezer to be determined by the HKPF;
(e) One (1) microwave;
(f) One (1) stainless steel sink with tap with hot and cold water supply and water filter, type to be determined by the HKPF;
(g) One (1) oven;
(h) One (1) stainless steel potable hot water heater;
(i) One (1) stainless steel paper towel dispenser;
(j) One (1) stainless steel trash bin with cover;
(k) Stainless steel cabinets/ cupboards and drawers for storage of food and snack items; and
(l) Eight (8) 240V AC Electrical Sockets (Type G, Hong Kong).

4.19.2 The galley shall be designed and installed in accordance with the requirements of Maritime Labour Convention (MLC), 2006 and 2000 HSC Code.

4.19.3 Ventilation, structural fire protection, fire detection, fire suppression, food preparation requirements and other requirements of the IMO 2000 HSC Code shall all be adhered to and to the satisfaction of the RO and the GNC.

4.20 Engine Room Control Office

4.20.1 An Engine Room Control Office shall be designed and located outside but adjacent to the Engine Room (Machinery Space). The Engineering crew shall be able to access this compartment easily to attend to any alarm relating to the machinery in the Engine Room.

4.20.2 The Engine Room Control Office, as a minimum, shall include the following:
(a) Display with CCTVs images to show the Engine Room condition;
(b) Three (3) multi-function display screens to monitor, control and operate various engineering systems, including but not limited to:
(i) Main diesel engine including reduction gear;
(ii) Diesel Generator;
(iii) Hybrid system;
(iv) Steering system
(v) AC Electrical system;
(vi) Water-Mist system;
(vii) Sprinkler system (if applicable);
(viii) Fire detector system;

(ix) General engineering system including fire pump control, bilge alarm and pump control, tank level gauges (fresh water tank, grey water tank, black water tank, fuel oil tank, lubricating oil, oily bilge tank);

(x) Sewage system;

(xi) Oily water separator;

(xii) Marine growth protection system;

(xiii) Air conditioning system;

(xiv) Intercom between Wheelhouse and Engine Room Control Office;

(xv) Watertight and weathertight door and hatch open/close monitoring system; and

(xvi) Any other controls, gauges or monitors as required by GNC.

4.20.3 The mentioned information in 4.20.2 (b) shall be recorded together with the associated alarms and protective actions.

4.20.4 The Tenderer shall propose and provide an Integrated Monitoring and Control System (IMACS) to analyse and show the trends for operation/maintenance assessment including an onboard advisory system to advise the crew onboard how to optimise the performance and economy of the Vessel and increase crew ride comfort in varying sea states, reducing risk of crew fatigue and increasing operational capability. The Tenderer shall be able to provide evidence of a similar in service system deployed on either Government or commercial vessels of a similar or large size than the Vessel.

4.20.5 An on-board data server shall be provided to allow real-time data to be securely transmitted to a shore office or Command and Control Centre. A separate Ethernet network shall be built-in to the vessel so that different sensors in different compartments can be connected quickly to the on-board data server, with the option to expand the number of and type of sensors to meet changing operational or maintenance requirements in the future without disrupting the IMACS network. Additional sensors may be added to provide more comprehensive data for analysis including draft sensors to calculate displacement and accelerometers.

4.20.6 An on-shore advisory system shall also be provided to allow fleet operational health and performance monitoring by HKPF and future connectivity with other HKPF systems, with the option to provide different users to have different level of access to the data of the system.

4.20.7 Remote software update shall be provided to allow both the onboard and on-shore system software to be updated through a cloud-based platform. It is desirable that the perpetual license to be provided if a license to use and/or update the system is required. HKPF shall not be required to pay any periodic fees and charges for using the system.

4.20.8 The system shall provide a storage for a year of recorded data that may be downloaded by USB device or other data transfer media.

4.20.9 The monitoring, control and operation of the engineering systems shall be replicated in the Wheelhouse Engine Remote Control Console. A control change-over switch at the Wheelhouse as well as at the Engine Room Control Office shall be installed to allow the Engineer-in-charge to select which control console is in command while the other one shall retain the display function. At any one time, only one of the control consoles can be in command.

4.20.10 Details of the IMACS shall be discussed in the kick off meeting.

4.21 Tank Space(s)

4.21.1 The tank space(s) shall meet the applicable IMO requirements and RO requirements and shall be designed to accommodate:

(a) Fuel oil storage tank(s) with manhole cover(s);

(b) Fuel daily tank(s) with manhole cover;

(c) Stainless steel fresh water tank with manhole cover;

(d) Stainless steel grey water tank, black water tank and oily water with manhole covers;

(e) The tank manhole shall be sized to the satisfaction of GNC and RO.

4.21.2 Transfer Pump shall be provided to transfer fuel oil between fuel oil storage tank(s) and fuel oil day tank.

4.21.3 The tank space(s) shall be designed and installed as low as possible within the vessel.

4.21.4 The tank space(s) shall be designed with flush watertight cover(s) for servicing and maintenance access.

4.21.5 Adequate ventilation shall be provided in the space(s) in accordance with RO and GNC requirements.

4.22 Engine Room

4.22.1 The engine room layout shall be in accordance with IMO and the RO requirements. For the avoidance of doubt the following specific requirements shall be complied with by the Vessel.

4.22.2 Special attention shall be paid to the engine room layout for main diesel engines and machinery maintenance and repair. The layout of the engine room shall be approved by the GNC.

4.22.3 The engine room compartment shall be designed for unattended engine room operation and protected by fixed FM200 Fire-Fighting system. A RO approved water-mist system shall be provided as the secondary fire suppression system.

4.22.4 The machinery associated piping system and fittings shall be installed and protected so as to minimise the risk to personnel onboard.

4.22.5 All hot surfaces susceptible to impingement of flammable liquids shall be insulated. The insulation shall be impervious to flammable liquids and vapours.

4.22.6 Floor plates, handrails and guards shall be referenced to Paragraph 7.23.

4.23 Steering Gear Compartment

4.23.1 The layout of the steering gear compartment shall be arranged for easy and convenient installation, operation and access for maintenance/ repair.

4.23.2 The space shall be readily accessible to and from the main deck and from below deck via a watertight door.

4.23.3 Provisions are to be made for emergency steering in accordance with RO requirements to the satisfaction of the GNC.

4.23.4 The floor shall be covered with galvanised steel chequered plate.

4.23.5 Galvanised steel chequered plates adjacent to valves, shafts, etc., shall be easily removable for the ease of maintenance.

4.23.6 Hinged access plates shall be fitted to provide access to valves. Suitable arrangements shall be provided for hinged plates to avoid/minimize rattling noise.

4.23.7 Forced ventilation shall be provided for this Steering Gear Compartment.

4.24 Designated Battery Compartment

4.24.1 A dedicated battery compartment shall be provided for the storage of Lithium Ion (Li-ion) batteries rated in excess of 50kWh capacity. The space shall be designed to meet the RO's requirement and to the satisfaction of GNC.

4.24.2 The designated battery compartment shall be:

(a) Designed and built to watertight unless the RO/ GNC stipulates a higher requirement;

(b) Designed and built in accordance with RO structural fire protection requirements;

(c) RO type approved heat and smoke fire detector is to be installed to the satisfaction of the RO and GNC;

(d) Suitable ventilation system together with air temperature controls shall be provided in

accordance with RO/ GNC/ Battery supplier's requirements;

(e) Proper detection of gases that may be emitted from batteries shall be provided according to the RO's and manufacturer's requirements;

(f) Designed and built considering the need for pipe and cable routing from the Battery Space to the Engine Room;

(g) RO type approved automatic fire damper is to be fitted to provide ventilation in accordance with RO/ GNC requirements;

(h) Fire suppression system is to be fitted in accordance with RO requirements and to the satisfaction of GNC.

(i) Other hybrid electrical equipment can be fitted within the space. This is to be designed and installed by the battery/ hybrid supplier appointed by the Contractor to the satisfaction of RO and GNC.

4.25 Engineer Stores / Locker

4.25.1 An Engineer's Store/Locker shall be provided for the storage of oil, refrigerants, grease and ready to use tools and spares. The Store/Locker should be situated in the Steering Gear Room. The store/locker is to be provided with special protective flooring. Details shall be discussed at the kick-off meeting.

4.26 Mast

4.26.1 One self-supporting mast shall be fitted on the wheelhouse top with navigational lights, police blue lights, diving light, horn signals, radar scanner and other electronic and Navigation Equipment, including the lightning arrestor/dissipator, ensign hoist, two signal hoists, antennas, GPS, VHF, UHF and mobile transceivers (as indicated on the Conceptual General Arrangement Plan).

4.26.2 The structure of the mast associated with its mountings and fixtures shall be designed so that all the equipment as stated in this Part VII can be operated in all weather conditions, with general provisions as follows:

(a) The mast is designed to accommodate all the navigation lights, police blue lights and signal lights indicating types of operation and meet the requirements of COLREG 1972. Arrangement shall also be provided for the hoisting of navigational signal shapes, national and regional flags and flags provided by HKPF.

(b) Fittings and foundations shall be constructed to prevent tearing of flags or rigging. Fittings and equipment shall be accessible for maintenance. Masts, spars, staffs and gaffs shall be watertight. Arrangements of masts, spars, staffs and gaffs shall obtain least interference between electronic equipment, minimize blind and shadow sectors for Radars, Long Range Thermal Camera, and SATCOM antenna.

(c) Access for maintenance and servicing of equipment and its fittings shall be provided.

(d) All equipment and their cables, conduits, connectors, junction boxes, glands and fittings shall be waterproof and be able to function in all weather conditions at sea.

4.26.3 Ensign staff for flags shall be supplied with the length and size to be confirmed with the GNC and HKPF. All hardware for the ensign staff, such as screws, hooks, hasps, hinges, handles, sliding bolts etc. shall be made of stainless steel.

4.26.4 The mast and antennas can be designed and installed to be foldable, if required, to comply with the air draft and docking requirements stipulated in Paragraph 2.4 of this Part VII.

4.27 Bow and Stern Deck Areas

4.27.1 The deck floor shall be covered with anti-slip paint/material to the satisfaction of the GNC and HKPF.

4.27.2 Notwithstanding requirements specified in other sections, the fore deck shall have the following

equipment/ fittings:

(a) One (1) Remote Fire Monitor as detailed in Chapter 10 of this Part VII;

(b) One (1) Windlass as detailed in Paragraph 4.28.2 of this Part VII; and

(c) One (1) Ready Use Locker shall be provided on the main deck for stowage of portable fenders and mooring lines.

(i) The locker shall be fabricated with a hinged lid capable of being opened to 90° with locking device fitted to prevent the lid falling on the crew whilst using the locker.

(ii) The locker shall be open, without shelving, and as large as practical within the deck space available to the discretion of the GNC.

4.27.3 Notwithstanding requirements specified in other sections, the aft deck shall have the following equipment/ fittings:

(a) One (1) launch and recovery system ("LARS") compliant with the requirements of the Safety of Life at Sea Convention ("SOLAS") (where applicable) for stowing, launching and recovering of one (1) ≤ 6.8m self-righting daughter boat, as further specified in Chapter 12 of Part VII (viz., the Daughter Boat). The LARS shall be designed so that launch and recovery, with a minimum of two crew onboard the Daughter Boat, can be performed safely using a dedicated control panel. The LARS, based on the design and model as proposed in Schedules 6 of Part V, shall be proprietary made and have been used on similar existing vessel (viz., a monohull vessel with LOA between 30m and 45m (both figures inclusive)) as at the Original Tender Closing Date. Stern or davit LARS shall be used. **[E]**

(b) In event a Davit LARS is employed, it shall be proprietary made. In addition, the Davit LARS shall be designed and installed as follows to the satisfaction of the RO, GNC and HKPF:

(i) Integrated Independent Hydraulic Power Pack;

(ii) Small footprint, easy for installation onboard;

(iii) To be bolted/ welded (to be agreed with RO & GNC) to the main deck supporting foundation;

(iv) Anti-pendulum device with docking head, providing a safe and stable working environment for the crew during launch and recovery in rough sea condition;

(v) Integrated wave compensation, hydraulic winch with constant tensioning system;

(vi) Stainless steel for all shafts, piping and fittings;

(vii) Self-lubricating bearings;

(viii) A fixed control stand;

(ix) Remote-control belly box, with hoisting, lowering and emergency stop controls;

(x) Easy access for periodic maintenance, service and repair;

(xi) Integrated shock absorber (hydraulic dampener);

(xii) Integrated boat supports;

(xiii) Davit shall have emergency system according to SOLAS, to allow for launching of daughter boat in the event of total loss of Vessel power; and

(xiv) The design shall be able to withstand and operate in sea state 5 or higher and to be a proven one which has been used onboard a similar existing vessel.

(c) In event a Stern LARS is employed, the system shall be proprietary made. In addition, the Stern LARS shall be designed and manufactured in accordance with RO requirements (where applicable) and be acceptable to GNC and HKPF, with the details to be discussed during the kick-off meeting.

The Stern LARS design shall be able to withstand and operate in sea state 3 or higher with proven current usage on navy, coastguard or other law enforcement vessels for the launching and recovery of RHIB type craft

(i) The Stern LARS shall be designed so as to ensure:

(1) Very fast launch and recovery of the fully manned Daughter Boat in emergency situations.

(2) This shall be achieved through an intuitive system enabling crews to become proficient operators in a short period of time;

(3) Simplicity of operation so that launching and recovery of the fully manned Daughter Boat shall be achieved by a single operator using either a dedicated control panel on the rear deck, without the need for additional crew to be present on the stern deck or in the slipway, or by a single crewman on board the Daughter Boat using a remote control unit.

(4) No other persons shall be required to manually assist in any way, during either the launching or recovery operation, except to drive the Daughter Boat away from the stern after launching and on recovery, to drive the Daughter Boat to successfully connect with the first sets of mechanically driven wheels that will move the Daughter Boat up the slipway to recover the Daughter Boat;

(5) Safe operations and crew comfort are imperative in all operational conditions including in both day and night time in the sea states stipulated. The launching and recovery shall be achieved by mechanical means, without the use of suspended loads, hooks, lines or arresting cables during normal operation, reducing the risk of accidents or injuries occurring during launching and recovery.

(6) In addition, to enhance safety during the launching and recovery of the Daughter Boat, the crew shall be in their seated operating positions on the Daughter Boat, without the need to move about the deck to assist in releasing or attaching the Daughter Boat.

(7) Through life serviceability and ease of maintenance shall be available locally, with minimal downtime due to mechanical, electrical or other defects.

(8) The Stern LARS system shall be able to be adjusted to craft of a similar length to the original Daughter Boat but with different hull shapes and propulsion systems if required in the event that the Daughter Boat is replaced in the future.

(9) The Stern LARS system shall be able to launch and recover unmanned craft such as Unmanned Surface Vessels (USV's) and Autonomous Underwater Vehicles (AUV's) if required in the future.

(ii) The Stern LARS system shall consist of the following:

(1) The daughter boat, which shall have reinforced bottom structures for use with Stern LARS especially in adverse weather conditions.

(2) The Stern LARS local fixed control stand with control panel as well as a portable control panel with 15 metre cable to launch and recover the Daughter Boat, which shall be stowed in a weathertight cabinet. The panel shall be located adjacent to the slipway to have a clear view over the slipway. Optional remote control from the Daughter Boat shall also be available.

(3) The Stern Slipway

(3.a) The Daughter Boat shall be stowed on, launched and recovered from the stern slipway with a SWL up to 12 tonnes.

(3.b) The hydraulically-powered, semi-automatic slipway system shall be part of the hull structure and shall be installed along the centre line of the vessel.

(3.c) The system shall include a number of hydraulically operated wheel pair assemblies, each including adjustable structural support brackets, rails for

deck installation, solid rubber tires on wheel rims, hydraulic motors and gearboxes with overrunning clutches and fail-safe parking brakes. The wheel pair assemblies shall be mounted on rails in parallel rows, with the tilt, height and distance between the wheels capable of being manually adjustable to conform to a range of daughter boat hulls.

(3.d) The stern slipway shall have a slope which shall be 10-12° slope angle to enable launching by gravity when required for the range of the operating trims, whilst reducing incidence of swamping by the sea or the daughter boat during launching and recovery in the event of mechanical power being unavailable. The slope angle shall be optimised for ease of launching and recovery operations. The shape of the slipway shall be appropriate to the shape of the bottom of the Daughter Boat as well as any mechanical devices required for launching and recovery.

(3.e) An emergency boat recovery system and a control system to assist the mechanical launching and recovery of the Daughter Boat shall be installed including emergency launch and recovery by accumulator and UPS.

(3.f) On launching, the hydraulically operated wheel units will automatically drive the Daughter Boat down the slipway slope from its parking position until the Daughter Boat floats free.

(3.g) On recovery, the Daughter Boat shall be able to engage the slipway at a range of speeds up to 7 knots higher than the speed of the mother vessel.

(3.h) When the Daughter Boat enters the slipway from the water overrunning clutches shall allow free rotation of the wheels in the recovery direction until the boat speed and wheel drive speeds match at which point the hydraulically operated wheel units will automatically drive the Daughter Boat up the slipway slope to its parking position.

(3.i) End stoppers shall automatically set the Daughter Boat in the parking and stowage position and engage fail-safe brakes on the drive wheels allowing the safe embarkation and disembarkation of the crew.

(3.j) Sufficient transom slipway sill immersion shall be provided to achieve a smoother launch and recovery and reduce impacts on the Daughter Boat.

(3.k) The stern slipway shall be painted with corrosion resistant marine grade paint. 'Traffic' areas not directly under the daughter boat are to be painted with non-slip paint.

(3.l) Guard rails shall be installed around the stern slipway well to act as a safety barrier to protect the daughter boat and prevent personnel falling into the stern slipway well. Access gates in the guard rails shall be provided for accessing the Daughter Boat.

(3.m) A system of indicator ‘line up’ lights shall be positioned indicating the status of the slipway and the angle of approach for the Daughter Boat crew.

(iii) Stern Door/Ramp

(1) The stern door/ramp when closed shall protect the stowed Daughter Boat from damage and swamping by following seas or rogue waves.

(2) The stern door/ramp shall be of a bottom hinged swing-out type operated by hydraulic cylinders with mechanical securing means and shall be equipped with hydraulically powered wheel drive units.

(3) The stern door/ramp serves to extend the slipway in the open position and close it when the system is not being operated.

(4) Guide poles shall be located at the port and starboard extremities of the ramp to guide

the Daughter Boat during recovery operations.

(5) Alternative means shall be provided for closing the stern door/ramp in case of hydraulic power failure.

(6) The stern door/ramp should have an extremely high strength to weight ratio and be made entirely in carbon fibre with internal beam web reinforcement with low maintenance requirements.

(7) The stern door/ramp should be operated by a minimum of two (2) hydraulic cylinders, with two (2) hydraulic locking cylinders with mechanical locks and locking arrangement.

(iv) Recovery Winch

(1) One (1) 5 tonne, hydraulic driven, backup recovery winch for emergency hauling of the daughter boat onto the slipway (in case of motor failure on the boat or failure on the slipway drive system).

(v) Power and control system redundancy

(1) The hydraulically-powered, semi-automatic slipway system, stern doors and emergency launching and recovery mechanisms, shall all incorporate power and control system redundancy.

(2) A hand pump shall be included for launching the Daughter Boat in case of dead ship.

(d) One (1) ≤6.8m Self-Righting Daughter Boat shall be supplied per Vessel and be designed and built in accordance with requirements detailed in Chapter 12 of this Part VII.

(e) One (1) Marine Knuckle Boom Crane shall be commercially available and fitted on the aft deck. The crane shall assist in the recovery of unconscious person from water and other lifting requirements. The crane shall be designed as follow:

(i) Marine Knuckle Boom Crane with the following capacity:

- not less than 950kg at 3.6m outreach;
- not less than 200kg at 11m outreach;

(ii) To be bolted or welded to the main deck foundation structure in accordance with the RO Requirements and to the satisfaction of GNC;

(iii) Local control stand with protection cover with lock and key to prevent corrosion and unauthorized operation; and

(iv) The crane shall be a marine type of satisfactory standard and acceptable to GNC. It shall be installed and tested in accordance with the RO Requirements to the satisfaction GNC.

(f) One (1) Deck Store for the stowage of cleaning equipment, paint and other flammable stores. The space is to be racked out, ventilated and well organized to the satisfaction of GNC.

(g) One (1) Deck Trash Locker for external storage of rubbish bags accumulated during the 24-hour operation. Locker to be sized to satisfaction of the GNC.

(h) One (1) dedicated Helicopter Winching Area marked on the deck, situated to the portside at the aft deck for emergencies. The area shall be arranged as follows:

(i) The surface shall be painted with a non-slip finish. A yellow "x" or symbol determined by the GNC shall be permanently marked on the deck, sufficiently large enough that it can be seen by helicopters;

(ii) An anchoring device shall be incorporated into the deck in the winching area to stabilize the lift if necessary;

(iii) Railings for protection of persons shall be provided around the aft deck, with spacing such that a person laying on deck will not be swept away, in accordance with the RO Requirements.

(iv) Fire-fighting equipment, suitable for use on flammable liquid fires shall be provided in

close proximity to the area to the satisfaction of the GNC; and

(v) Sufficient lighting with emergency back-up power shall be positioned to ensure clear indication of the dedicated winching area when operating in dark/reduced visibility conditions arranged to the satisfaction of the GNC.

(i) Two (2) Rescue Zones are to be located on the aft deck, one (1) on the port side and one (1) on the starboard side. The dedicated rescue zones are to be kept clear from obstructions, for the safe recovery of MOB (Man overboard). The zones are to be arranged and equipped as follows:

(i) A shipside recessed ladder is to be incorporated into the Vessel's structure on the port and the starboard sides as indicated on the Conceptual General Arrangement for reference. The ladder rung spacing is to be arranged in accordance with the RO Requirements and to the satisfaction of the GNC. The rungs should have a non-slip coating. The ladder may also be used for the deployment and recovery of a diver;

(ii) A minimum width of 2m gate shall be incorporated into the perimeter guardrails in the rescue zones to the satisfaction of GNC and the HKPF;

(iii) Four (4) Jason's cradles, two (2) on the port and two (2) on the starboard are to be stored in the close proximity to the rescue zones. Suitable sockets, fittings or eyes shall be fitted to the deck to facilitate attachment of the Jason's cradles. These can be used as scramble nets or floats to assist in the recovery of MOB;

(iv) Two (2) swing portable derrick(s), shall serve the port and starboard rescue zones. Each portable derrick shall be fitted with a winch of sufficient safe working load limit, to lift a Jason's cradle with a person in or holding onto the cradle. The two portable derricks should be fitted in close proximity to the rescue zones either on the superstructure side or on the main deck and integrated into the perimeter guardrails; and

(v) The design of the derricks, davit and knuckle crane shall be in accordance with CAP 548I, Merchant Shipping (Local Vessels) (Works) regulation, Hong Kong Shipping Ordinance, HKMD, Section 45 "Strength Calculation etc. in Respect of Cranes".

(j) Two side steps and lower working platforms shall be incorporated on the port and starboard sides and at near amidships, to be accessed from the main deck via a fold-up, light weight deck section that can be secured in the open position, to provide an operational platform slightly above the waterline, to facilitate safe crew interaction with vessels during law enforcement operations, rapid and safe transfer of crew and other persons to and from the daughter boat, deploying and recovering ROVs, deploying and recovering divers and, functioning as a secondary rescue area to facilitate recovery of persons from the water. **[D]**

(i) The working platform should be recessed approximately 1 metre in and be no more than 2 metres in length, with the height of the platform approximately 0.25 metres above the waterline, with a raised protective wave deflecting outer shield formed by an extension of the outer hull, with rounded edges and adequate padding around the edge of the hull extension to prevent injury to persons deploying into or being recovered from the water;

(ii) The platform should be self-draining and equipped with adequate safety handles, clip on points for crew safety harnesses and removable safety chains that can be lowered when in operational use. In addition, attachment points should be provided for a Jason's cradle;

(iii) Access should be provided by two sets of stairs, one facing aft and one facing forward. Both access stairs and the platform should be painted with an appropriate anti-slip paint, with adequate safety handles and clip on points for crew safety harnesses;

(iv) Cleats for temporary mooring of small craft alongside shall be provided in the recess with additional mooring cleats at the main deck above;

(v) Full details are to be discussed in the kick-off meeting.

4.28 Anchoring, Mooring and Towing

4.28.1 Anchor

(a) The anchoring equipment arrangement and performance shall be in accordance with the RO's requirements. The anchor stowage shall be arranged for efficient handling and securing of the anchor, with consideration given for other functions such as mooring and towing operations. The arrangement shall be capable of retrieving and storing the anchor(s) in all operating conditions.

(b) At least one high holding power type anchor approved by the RO for this type of vessel and acceptable to the GNC shall be provided with its associated swivel, shackles, stowage cable or cable and warp and means of recovery.

(c) The Vessel shall be provided with adequate and safe means for releasing the anchor and its cable and warp.

(d) The means of release shall be suitable for safe operation even when the anchor cable or warp is under load.

(e) Adequate means and arrangements shall be provided to secure the anchor under all operational conditions.

(f) Adequate stainless steel chain shall be provided with shackle(s). Materials other than stainless steel shall be approved by the GNC and HKPF. All equipment to be sized in accordance with RO Requirements.

(g) The anchor shall be handled by use of an electric windlass and associated fittings. Water ingress from the main deck shall be kept to a minimum, a spurling pipe shall be fitted on the deck leading down to the chain locker.

(h) A spare anchor shall be fitted in accordance with RO Requirements.

(i) Quick release arrangement shall be provided to release the anchor in emergency.

4.28.2 Windlass

(a) An electric windlass with its associated gypsy and warping drum, cable stopper, hawse pipe, bollards, bow roller(s) and fairleads shall be provided to give an easy run for anchor chain cables and mooring lines. The windlass shall be fitted with an emergency manual operating mechanism.

(b) The windlass shall be capable of lifting one anchor with sufficient length of chain, at a speed of at least nine (9) meters per minute.

(c) Control of the windlass shall be located in the vicinity of the windlass through a starter control unit enclosed in a watertight cabinet.

(d) Emergency stop button for the windlass shall be provided at the wheelhouse control station and locally.

(e) Windlass protective canvas shall be provided.

4.28.3 The Vessel shall be protected from or to minimize the possibility of the anchor and cable damaging the hull structure during operation (including in bad weather and rough sea conditions).

4.28.4 The size of the chain locker shall be suitable for self-stowing of chain by gravity in all sea conditions.

4.28.5 Where necessary, suitable fairleads, bitts and mooring ropes shall be provided and fitted according to RO Requirements. All mooring ropes shall incorporate Snap Back Arrestor Technology.

4.28.6 Two stainless steel boat hooks with 3-metre staves and stowage arrangement shall be supplied.

4.28.7 Typhoon Mooring Arrangement

a) In order to safely moor the Vessel offshore during a typhoon, the Vessel shall be tied up to an existing offshore swinging mooring buoy, as shown in Annex 11 to this Part VII. The typhoon mooring system shall be designed for the Vessel to be moored under extreme weather conditions at typhoon signal number 10 in Hong Kong. Details for typhoon warning signal system with the corresponding wind speeds are also shown in Annex 11 to this Part

VII.

b) The Vessel is to be secured on to the mooring buoy using two (2) typhoon mooring lines (one (1) on the port side and one (1) on the starboard side).

c) The typhoon mooring lines shall be fibre ropes with high strength, light weight, high resistance to abrasion, UV light and chemicals.

d) On the Vessel centreline, a Panama type roller fairlead, which is made of stainless steel with grease points for the rollers, shall be fitted at the bow to guide the ropes to the buoy with a centre roller in the fairlead to separate the port and starboard ropes. This shall be made of stainless steel with grease points for rollers and designed to meet the RO requirement and to the satisfaction of GNC and HKPF.

e) The typhoon mooring lines are to be made fast onto port and starboard side two-pin mooring bollards in a figure of eight. At the buoy end, the termination of the fibre mooring rope shall be fitted with a suitable shackle in order to connect on to the mooring buoy. The spliced eyes should be fitted on galvanised steel thimbles as the interface between the rope eye and the pin of the connecting element.

f) The bollards shall also be designed and installed so they can be used for an emergency tow by other vessel(s) as required by the RO.

g) Only RO type-approved components shall be used in the typhoon mooring system. Design, manufacture and NDT shall be to the satisfaction of RO and GNC.

4.28.8 A towing bollard shall be mounted on the aft deck at the Vessel's centreline for towing a vessel of similar size and displacement at speeds of five (5) knots. The bollard is to be sized in accordance with RO Requirements. Consideration shall be made for the Stern LARS subject to the design.

4.29 Fenders

4.29.1 Bow pushing fender:

(a) The fender shall be designed and installed to absorb stresses which are exerted onto the vessel.

(b) The fender shall be of rubber construction. The top and bottom edges of the fender shall be chamfered back at 45°.

(c) The hull structure shall be adequately reinforced to sustain loads from pushing onto other vessels of similar size to the Vessel during interception exercises. The strengthened area shall cover one sixth (1/6) of the Vessel’s length from the bow between the waterline and main deck. In this area, the longitudinal intervals between frames shall be halved.

4.29.2 Side and Stern Fenders:

(a) Fixed steel half-tubular fender section of suitable size is to be welded continuously along the ship side and stern to provide protection between the waterline and main deck. The size and arrangement shall be submitted to the GNC for approval prior to installation.

(b) The hull structure shall be suitably strengthened for the fendering arrangement.

4.29.3 The Contractor is to supply portable air-filled fenders of adequate size and strength to support the Vessel during alongside mooring operations. The number required and size shall be agreed with the GNC.

4.30 Cathodic and Hull Surface Protection

4.30.1 The steel hull, shaft brackets, propellers, tail shafts and stern tubes underwater shall be protected by a cathodic protection system for at least one year from the date of Delivery Acceptance.

4.30.2 No toxic substances are to be released from sacrificial anodes.

4.30.3 An effective shaft earthing system shall be provided to protect the shaft lines, bearings and propellers.

4.31 Marine Growth Protection System

4.31.1 The Vessel shall be fitted with a Marine Growth Protection System. The system is to operate at two parts per billion. The system is to produce copper ion in the water system to protect the pipeline/machinery systems from marine growth.

4.31.2 Within each sea strainer/sea chest, an anode is to be fitted. The anodes are to be controlled by a DC control panel which is to be controlled and managed by the Vessel engineer.

4.31.3 Each Copper Anode shall be suitably sized to suit the total flow rate of sea water through each strainer. This is to be calculated and to be submitted for approval by GNC prior to installation.

4.31.4 Each anode shall be supplied with an integral nylon mounting arrangement and its own integral cathode to ensure that currents are correctly controlled.

4.32 Lightning Protection

4.32.1 The Vessel shall be fitted with a lightning protection system, acceptable to the RO, to protect the persons onboard and the electronic equipment installed onboard.

4.32.2 The methods and working principles of the lightning protection system shall be submitted to the GNC for approval prior to installation.

Chapter 5 Fire Safety Equipment

5.1 General Provisions

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

5.1.2 All spaces onboard the Vessel shall be assessed in accordance with the 2000 HSC Code and RO Requirements in order to define the applicable level of structural fire protection. Spaces which likely require protection include but are not limited to the Vessel's engine room, bow thruster space, galley, designated battery space, Weapons and Ammunition Storeroom, Pyrotechnics Storeroom and supporting structures of the Wheelhouse Control Station.

5.1.3 Fire-resisting bulkheads and decks shall be constructed to resist exposure to fire as per the 2000 HSC Code and RO Requirements for that specific location. The main load-carrying structures shall be arranged to distribute loads such that there will be no collapse of the construction of the hull and deckhouse when it is exposed to fire.

5.1.4 The hull, structural stiffeners, bulkheads, decks, deckhouses and pillars shall be constructed of approved non-combustible materials as required in the International Code for the Application of Fire Test Procedures (FTP Code) as defined by Chapter II-2 of SOLAS and RO Requirements.

5.1.5 The arrangement of pipes, ducts and electrical cables penetrating the engine room's fire resisting division shall ensure that the fire-resisting integrity of the division is not impaired, and necessary testing shall be carried out in accordance with the FTP code.

5.1.6 All furniture shall be constructed entirely of approved non-combustible materials or fire restricting materials to meet the RO Requirements.

5.1.7 All upholstered furniture, curtains and suspended textile materials shall be manufactured to resist the propagation of flame in accordance with the FTP Code.

5.1.8 All deck, deckhead and side panel finish materials shall comply with the FTP Code.

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

5.1.10 Any thermal and acoustic insulation fitted shall be of non-combustible or of fire-restricting material. Vapour barriers and adhesives used in conjunction with insulation, as well as insulation of pipe fittings for cold service systems need not be non-combustible or fire restricting, but they shall be kept to the minimum quantity practicable and their exposed surfaces shall have low flame spread characteristics.

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

5.1.12 Signage in accordance with IMO Resolution A.654(16) shall be placed in appropriate locations to the satisfaction of GNC and HKPF.

5.2 Fire Detection System

5.2.1 An approved automatic fire detection system, in accordance with the 2000 HSC Code and RO Requirements, shall be fitted on the Vessel.

5.2.2 The fire detection master control panel shall be located at the Wheelhouse Engine Remote Control Console with a repeater panel at the Engine Control Console in the Engine Room Control Office.

5.2.3 The fire detection system shall initiate audible and visual alarms which are distinct in both respects from the alarms of any other systems onboard that do not indicate fire. The alarms shall be sounded sufficiently to ensure that the alarms are heard throughout the vessel including all the machinery

spaces and observed at the Wheelhouse Engine Remote Console and the Engine Control Room Console.

5.2.4 Fire detectors shall be installed in all compartments throughout the Vessel. The detection system is to consist of both heat and smoke detectors in accordance with the 2000 HSC Code and RO Requirements and to the acceptance of the GNC and the HKPF.

5.3 Fixed Fire-Fighting System for Machinery Spaces

5.3.1 Fixed Fire extinguishing systems in the engine room and other applicable spaces including but not limited to bow thruster space, battery space(s) shall be a fixed FM200 fire-fighting system with applicable 2000 HSC Code and RO requirements for engine room protection.

5.3.2 The FM200 fire-fighting system including the control station and storeroom shall be protected from accidental activation. An audible and visual alarm shall be triggered once the system is accessed/activated. The sound and visual alarms shall be distinguished from other alarms. The sound and visual alarms shall be heard and seen in the spaces to be protected e.g. wheelhouse, engine room(s), engine control room, and the other applicable machinery spaces.

5.3.3 The FM200 fire-fighting system control station shall incorporate various designs/devices to ensure the following actions are properly completed in sequence before releasing the FM200:

(a) Shut-off the power supply to the fuel pumps, ventilation fans, air-conditioning system circulation fans, etc., and triggering an audible and visual activation alarm of the FM200 system throughout the vessel. This shall include but not be limited to the wheelhouse, engine room(s), engine room control office and other applicable spaces.

(b) Shut-off the fuel supply from the fuel tanks to the engines, and the outlets of any other oil tanks in the engine room, via quick-closing devices.

(c) Close the fire dampers of the engine room ventilation system and the air-conditioning system if applicable.

5.3.4 The gas bottles for the system shall be stowed outside the space they are protecting, but if possible, close by to prevent the need for long pipe runs. The bottles are to be adequately protected from weather, and due consideration shall be given to the ventilation of the storage space. A forced mechanical ventilation system shall be provided if the storage space is located below the open deck.

5.3.5 The fixed fire-fighting system diagram is to be submitted to the RO for approval and subsequently to GNC prior to installation onboard the vessel.

5.3.6 In addition to the FM200 system installed onboard, a water-mist system (a fixed pressure water-spraying fire-fighting system) shall be installed as a supplementary system in the engine room and other applicable spaces as required. The water-mist system is to be compliant with applicable RO Requirements. Activation of the water-mist system shall trigger an audible and visual alarm in the Wheelhouse, Engine Room(s), the Engine Control Room and other applicable spaces as required. The water-mist system diagram is to be submitted to the RO for agreement and subsequently GNC and HKPF for acceptance prior to installation onboard the vessel.

5.3.7 The water-mist system shall be connected to the freshwater tank. Once activated, it shall produce water-mist for extinguishing fire in the designated area. A low level alarm shall be fitted at the freshwater tank and would be activated when the water volume is below 1500L.

5.3.8 The designated protected area shall include those potentially high temperature areas (e.g. exhaust piping) with inherent fire risk caused by accidental oil splash.

5.3.9 The protection of fire-fighting personnel, in particular safety access and escape from the fire scene, shall be considered in the design of the system.

5.3.10 The designated protected areas shall be submitted to GNC and HKPF for acceptance.

5.3.11 Further details of the arrangements and installations of the FM200 fire-fighting system and water-mist system are to be discussed during the kick-off meeting.

5.4 Portable Fire Extinguishers

5.4.1 An adequate number of portable fire extinguishers compliant with Chapter 4 of the FSS Code and IMO Resolution A951 shall be provided to serve all compartments in the Vessel and be so positioned as to be readily available for immediate use. In addition, at least one extinguisher of the relevant type for that particular space shall be positioned outside each entrance, including the Engine Room, battery space(s), bow thruster space and galley.

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

5.4.3 In the Wheelhouse Control Station, Server Room and other spaces containing electrical or electronic equipment or appliances necessary for the safety of the Vessel, fire extinguishers should be provided with extinguishing media which are neither electrically conductive nor harmful to the equipment and appliances.

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

5.4.5 Portable fire extinguishers should be provided with a mechanism to identify if they have been used.

5.5 Fire Pumps

5.5.1 Two (2) AC electric fire pumps are to be fitted onboard the Vessel. One is the main fire pump located in the engine room and the other one is the emergency fire pump, which shall be located in a compartment outside the engine room so that in the event of a fire in either compartment, at least one fire pump shall remain operational.

5.5.2 Each fire pump shall have sufficient capacity to pump water from a sea chest to deck hydrant with a jet throw of at least 12 meters (horizontal). The fire pump shall be controlled from the Wheelhouse Engine Remote Control Console or the Engine Control Console in the Engine Room Control Office. The fire main and fire pump shall be designed and installed in accordance with RO Requirements and relevant regulatory body requirements.

5.5.3 The emergency fire pump shall have independent sea suction. Arrangement shall be to the satisfaction of GNC. The power source for the emergency fire pump shall be independent from the diesel generators. Therefore, an engine room fire cannot put the emergency fire pump out of action. Hybrid battery power shall be the power source for the emergency fire pumps, as shown in the Annex 18 of this Part VII, with prior RO and GNC acceptance. An emergency power source for the control circuit is still necessary if an AC inverter is adopted.

5.5.4 Isolating valves, to separate the section of the fire main within the engine room containing the main fire pump or emergency fire pump, shall be fitted in an easily accessible and tenable position outside the engine room. The fire main shall be so arranged that when the isolating valves are shut, all the hydrants on the Vessel except those in the engine room referred to above, can be supplied with water by the emergency fire pump through pipes which do not enter this space. The spindles of manually operated valves shall be accessed easily and all valves shall be clearly marked.

5.5.5 The hydrant shall be supplied with a complete set of fire-fighting accessories including appropriate length of fire hose made of suitable material and spray/jet nozzle. The hose and nozzle shall be stowed inside a firebox located in the vicinity of the hydrant. All equipment shall be designed and installed in accordance with RO Requirements.

5.5.6 Two jets shall be produced simultaneously to reach any position of the Vessel. The jet produced shall also reach the highest point of the vessel.

5.5.7 An isolation valve shall be provided to separate the engine room from the deck main in order to maintain emergency fire pump operations in the event of any engine room damage.

5.5.8 Hydrants shall be so arranged that any location on the Vessel can be reached in accordance with RO Requirements to satisfaction of GNC.

5.5.9 A separate deck washing pipeline shall be provided from a fire main line at the discretion of GNC and HKPF.

5.6 Fire Control and Safety Plan

5.6.1 Copies of the Fire Control and Safety plan approved by the RO and GNC shall be framed and permanently displayed in the Wheelhouse and in the Embarkation Lobby. The plan shall be drawn using graphical symbols in accordance with IMO Resolution A.654(16).

5.6.2 The contents of the Fire Control and Safety Plan shall meet the requirements of GNC and HKPF.

5.6.3 The text of the Fire Control and Safety Plan shall be in English and Traditional Chinese.

5.7 Additional Protection by Alarm System

5.7.1 When the Vessel is afloat and unmanned, the fire detection system and the bilge alarm system shall continue to function. An external audible and visual alarm shall also be fitted on the top of the deckhouse to bring the attention of persons ashore.

5.7.2 The additional protection should be capable of being turned on and off as required.

Chapter 6 Lifesaving Appliances (LSA) and Arrangements

6.1 General Provisions

6.1.1 Lifesaving appliances shall be provided on the Vessel at appropriate locations in accordance with the RO Requirements.

6.1.2 Signage in accordance with IMO resolution A.760(18) shall be placed in appropriate locations to the satisfaction of GNC and HKPF.

6.1.3 Lifesaving appliances shall be of approved types conforming to the International Life-Saving Appliance Code (LSA Code) adopted by the Maritime Safety Committee of the IMO by Resolution MSC.48(66) and approved by a RO.

6.1.4 A Lifesaving Arrangement Plan approved by RO, GNC and HKPF, in a frame, shall be permanently displayed in the Wheelhouse and Embarkation Lobby. Symbols in accordance with The IMO Resolution A.760(18) shall be used.

6.1.5 Life jackets shall be so placed as to be readily accessible and their positions shall be clearly indicated.

(a) Inflatable lifejackets for the crew of 16, for everyday use, shall be provided by HKPF.

(b) One hundred (100) common lifejackets (Developed Common Lifejacket for both adults and children MD Notice No.69 of 2019) acceptable to MD are to be provided, for use by Police passengers or casualties evacuated or rescued and travelling onboard the Vessel. These shall be stored in the Life Saving Appliance and Special Equipment Storage Room referred to in Paragraph 4.12 of this Part VII.

(c) Lifejacket donning instructions shall be posted at suitable positions around the Vessel.

(d) All lifejackets are to be marked with "Police" in both English and Traditional Chinese together with the Vessel Name.

6.1.6 Liferafts

(a) Liferafts are to be provided and installed in accordance with the LSA Code and RO requirements.

(b) Liferafts are to be fitted with a hydrostatic release. In addition, liferafts are to be installed with a quick deployment cradle such that one (1) person can manually deploy the liferaft(s) in unfavourable sea and weather conditions.

(c) Subject to RO approval, two (2) 20-person liferafts, positioned in a cradle, one (1) port and one (1) starboard shall be fitted onboard the Vessel.

(d) Liferafts are to be marked with "Police" in both English and Traditional Chinese together with the Vessel Name.

6.1.7 In total six (6) lifebuoys shall be provided. Two (2) lifebuoys shall be provided with MOB smoke markers and lights. Two (2) lifebuoys shall be provided with lights. Two (2) lifebuoys shall come with 50 metre buoyant lines. All lifebuoys are to be marked "Police" in both English and Traditional Chinese together with the Vessel Name and reflective tapes.

6.1.8 Four (4) sets of scrambling net (Jason's Cradle) shall be provided, with mounting points fitted at the locations as required, as shown in Paragraph 4.27.3 (i) (iii) of this Part VII. Details shall be discussed at the kick-off meeting.

6.1.9 Ten (10) sets of safety harness shall be provided.

6.1.10 An Emergency Position Indicating Radio Beacon (EPIRB) shall be provided and fitted onboard the Vessel and is to be mounted in the vicinity of the Wheelhouse with float free capability.

6.1.11 AIS PLB/MOB transponders, with automatic activation and manual activation capability, are to be provided and mounted on a storage board, which shall be positioned near the entrance of the wet room, near the crew life jacket storage location. Transponders are to be readily available and to be worn by crew when they are working on the open deck when underway. Each transponder is to be numbered so a missing crew member can be easily identified.

6.1.12 The Contractor will be responsible for the application for Maritime Mobile Service Identity (MMSI) numbers from the Hong Kong Office of the Communications Authority (OFCA)

6.1.13 Emergency Escape Breathing Device(s) (EEBD) are to be fitted onboard the Vessel in accordance with RO Requirements.

Chapter 7 Machinery

7.1 General Requirements

7.1.1 The Contractor should note that the Vessel is for use in Hong Kong. The main diesel engines, gearboxes, diesel generators, and any other machinery offered by the Contractor shall be commonly available in Hong Kong and shall have good availability of spare parts. Good technical support and maintenance services shall be available locally in Hong Kong.

7.1.2 The Vessel shall be equipped and fitted with all machineries described in Chapter 7 of this Part VII. The Spare Parts provided shall be of the same model as supplied for the Vessel and shall equally comply with all specifications set out in Chapter 7 of this Part VII.

7.1.3 Two accesses separated by a reasonable distance shall be provided to the Engine room. One of them shall be directly from the main deck. The design of the engine room layout shall be approved by RO and agreed by GNC. The machinery with the associated piping systems and fittings relating to the main diesel engines and generators shall be of a design and construction adequate for the intended service. It shall be so installed and protected as to minimise Occupational Safety and Health (OSH) hazards to persons on-board. Due regard shall be paid to moving parts, hot surfaces and other hazards. The design shall take into consideration the materials used in construction, the purpose of equipment and the working conditions of which the equipment will be subjected to and the environmental conditions on board. Cushions/protections on the overhead cable trunks for preventing head injury to the crew shall be provided.

7.1.4 Sufficient space and headroom in the vicinity of the machinery for local operation, inspection and routine maintenance for all the machinery shall be provided. Procedures and sequences for complete removal of the major items, such as the main diesel engines, gearboxes, diesel generators, fuel oil tanks, etc. shall be carefully designed and provided. This shall enable their removal from the Vessel for maintenance in a practicable manner with a view to avoiding the need for cutting the deck or shell plate.

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

7.1.6 Provision shall be made to facilitate cleaning, inspection and maintenance of main diesel engines, generators, fire pumps, etc. and their associated piping and equipment.

7.1.7 Drip trays are to be provided at service points, including oil and fuel filters, to avoid leaked fluids from spilling into the Vessel's bilges.

7.1.8 Lifting brackets for moving heavy equipment shall be provided at the appropriate locations in the Engine room, the Engine room entrance and other locations as deemed necessary. The lifting capacity shall be marked with its Safety Working Load after a load test to GNC's satisfaction. The Contractor shall provide the specially made tools and/or temporary structures, as needed, to facilitate the moving/removal of heavy equipment, not limited to within the Vessel but also outside the Vessel.

7.1.9 The machinery installation shall be suitable for operation as in an unmanned machinery space. The monitoring and controls, including automatic fire detection system, bilge alarm system, remote machinery instrumentation and alarm system shall be centralized in the Wheelhouse Engine Remote Control Console and the Engine Control Console in the Engine Room Control Office.

7.2 Main Propulsion Engines

7.2.1 The Vessel shall be equipped with two (2) or three (3) (depending on the specifications proposed by the Tenderer in Schedules 6 and 7 of Part V), electrically started, fresh water-cooled marine diesel engines of adequate power for attaining required Contract Speed. The rating of the engines, as published by the manufacturer, shall support an annual operation profile of 3000 hours taking into account of the Speed Profile as stated in Paragraph 2.6.1 of this Part VII. The diesel engines shall meet IMO Tier II emission requirements. **[E]**

7.2.2 Type approval certificates issued by RO or other entities acceptable to GNC, showing compliance with IMO Tier II emission requirements shall be provided.

7.2.3 The minimum time between major overhaul for the main propulsion engines shall be not less than 10,000 hours.

7.2.4 The diesel engines are to be turbo-charged to ensure high power density and therefore power to weight ratio.

7.2.5 A main diesel engine shall drive a fixed-pitch propeller through a reduction gear with Power Taking In (PTI) and Power Taking Off (PTO) functions. The operating condition of the propeller shall not overload the main diesel engines.

7.2.6 The propulsion system of the Vessel shall be a parallel hybrid propulsion system with the capability to run on the main diesel engines or E-motors (powered by the diesel generators or the energy storage system) or a combination of both.

7.2.7 The main diesel engine's exhaust pipes and silencers shall be protected according to the RO Requirements for the safety of personnel on-board, and minimise heat transfer into the machinery space. All components of the exhaust system shall be so arranged and installed that transmission of heat, noise or vibration to the Vessel structure can be minimised.

7.2.8 The diesel engines are to be supplied with appropriate on-engine lubricating oil filtration, e.g. pressure driven centrifugal oil filter, to maximize the possible engine hours available between oil changes.

7.2.9 The installed diesel engines shall be capable of operation on Euro V diesel and B5 diesel complying with the specifications set out in Chapter 311L Schedule 1 – Air Pollution Control (Motor Vehicle Fuel) Regulation of the Laws of Hong Kong.

7.3 Main Diesel Engines Control

7.3.1 The controls and instrumentation of the main diesel engines shall be designed for operation with an engineer situated at either the Wheelhouse Engine Remote Control Console or the Engine Control Console in the Engine Room Control Office. All Control Consoles shall be ergonomically laid out and grouped. Details of the instrumentation and controls are listed in Paragraph 4.2.13 and Paragraph 4.20 of this Part VII.

7.3.2 The design and installation shall follow the RO and IMO requirements (where applicable and also complying to 2000 HSC Code requirements).

(a) For the avoidance of doubt the following requirements shall also be met:

(i) Instrumentation and control systems for the main and auxiliary machineries shall be designed for unmanned machinery space operation;

(ii) The Wheelhouse Engine Remote Control Console and the Engine Control Console in the Engine Room Control Office shall be designed to allow for one-man engineering operation, and shall centralise all the instrumentation and control devices for the remote operation of the main and major machineries on board;

(iii) All Local Operating Panel (LOP) controls shall be operative in the Vessel's "deadship" condition, i.e. when there is no AC electrical power supply for the whole Vessel;

(iv) The LOP for each engine shall be situated close to each engine for convenient engine-side control; and

(v) The monitoring probes and sensors fitted to the main and auxiliary machineries shall be of a type-approved by the RO. These units shall be the signal sources for the Control Consoles, LOP gauges and communication panels. If LCD is used for this system, it shall be easily seen by the operator.

(b) The following instrumentation and control devices shall be provided at the Wheelhouse Engine Remote Control Console and the Engine Control Console in the Engine Room Control Office:

(i) Start/stop keys or push buttons which are to be fitted with guard covers and running/stop

indication lamps for each of the main diesel engines;

(ii) RPM control device for each of the main diesel engines;

(iii) Clutch control and on/off indication devices for each of the clutches used in the propulsion;

(iv) Engine tachometers with running hour meter;

(v) Sea water cooling pressure;

(vi) Coolant water temperature and pressure;

(vii) Engine lubricating oil temperature and pressure gauges;

(viii) High cooling water temperature alarm;

(ix) Engine low lubricating oil pressure alarm and trip;

(x) Engine exhaust gas pyrometer;

(xi) Overspeed alarm and trip;

(xii) Real-time fuel rate; and

(xiii) Any other instrumentation recommended by the engine maker.

7.3.3 Standard manufacturer's local control panels shall be fitted in Engine Room.

7.4 Diesel Engine Electric Generator Sets (Diesel Generators)

7.4.1 Two (2) or more electrically started, fresh water-cooled diesel generators with excitation method compatible with the design of power distribution system as stated in the Paragraph 8.3 Electrical Power Distribution System of this Part VII, brushless and ventilated type, shall be installed subject to the design. The rating of the engines shall be for Unrestricted Continuous Operation with not less than 10% overload capability. Synchronizing operation is required.

7.4.2 Type approval certificates issued by the RO or other entities acceptable to GNC, showing compliance with IMO Tier II emission requirements shall be provided.

7.4.3 The diesel generators installed shall be capable of operation on Euro V diesel and B5 diesel complying with the specifications set out in Chapter 311L Schedule 1 – Air Pollution Control (Motor Vehicle Fuel) Regulation of the Laws of Hong Kong.

7.4.4 Each diesel generator at its continuous service rating, shall have sufficient capacity for:

(a) The supply of all house loads in expected normal operation excluding the usage of bow thruster. The supply of peak load demand may be achieved solely by the use of all the diesel generators in parallel.

(b) The starting of the largest loads expected in the normal course of operation other than the Fi-Fi pump.

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

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

7.4.6 The design and installation of diesel generators, switchboard and associated wiring shall be in accordance with the RO Requirements. In addition, the following is required:

(a) Each diesel generator shall be provided with a Type Approval Certificate from the RO;

(b) Each generator shall be resiliently mounted; and

(c) The arrangement of electrical and piping system shall allow quick dismantling and replacement of the unit.

7.5 Diesel Generator Control

7.5.1 The controls and instrumentation of the generator shall be arranged at the Wheelhouse Engine Remote Control Console and the Engine Control Console in the Engine Room Control Office. The

engineers shall be able to decide which control station they are to work from using a dedicated selector switch. The remote control of the start and stop of the main diesel engines shall also be provided in the Engine Room Control Office. The instrumentation in the consoles shall be comprehensive in Multi-Function Display and include but not be limited to the following:

(a) RPM;

(b) Running hours;

(c) Cooling water temperature;

(d) Cooling water flow/pressure;

(e) Exhaust gas temperature;

(f) Lubricating oil pressure;

(g) Real-time fuel rate;

(h) Battery charger ammeter;

(i) Fault indicating and alarms;

(j) Protective functions such as over speed, low lubricating oil pressure and other functions as required by the engine manufacturer, RO and GNC;

(k) Any other parameters and protective functions recommended by the engine manufacturers; and

(l) A standard manufacturer's local control panel shall be fitted in Engine Room.

7.6 Instrumentation and Control

7.6.1 The Wheelhouse Engine Remote Control Console and the Engine Control Console in the Engine Room Control Office are to be provided with comprehensive instrumentation and controls for remote operation and monitoring of main diesel engines, diesel generators and other auxiliaries to facilitate unattended Engine Room operation.

7.6.2 One fire detector panel and one engine room FM200 and water-mist system fire-fighting panel shall be installed at each of the Engine Control Consoles in the Wheelhouse and the Engine Room Control Office.

7.6.3 All the instruments such as temperature sensors, pressure sensors, level gauges, etc. shall have type approval certificates issued by the RO. The Contractor shall provide copies of the type approval certificates to GNC on or before the Delivery Acceptance.

7.6.4 All indication lights, illumination of instrumentation gauges fitted on the consoles in the Wheelhouse shall be fitted with dimmers for night and day operation.

7.6.5 Emergency stopping function of the main diesel engines shall be provided at the Wheelhouse Control station, the Wheelhouse Engine Remote Control Console and the Engine Control Console in the Engine Room Control Office.

7.7 Reduction Gearboxes

7.7.1 The reduction gearboxes shall be mounted to the ship's structure and shall be part of the hybrid system as detailed in Paragraph 11.4 of this Part VII. Gearboxes shall be provided with clutches, alarm sensors and switches.

(a) Gearbox oil heat exchangers shall be mounted on the reduction gearbox and piped to the engine cooling circuits as specified by the manufacturer.

(b) Reduction gears shall be sized to provide both low and high-speed performance, shafts shall rotate outboard (over the top) when the Vessel is moving forwards.

7.7.2 The gearboxes shall be provided with alarms for low oil level and oil temperature. Alarms shall be repeated both locally and at each remote control station as required.

7.7.3 The gearboxes shall be supplied with a Type Approval Certificate from the RO.

7.8 Propeller Shafts, Stern Tubes, Propellers

7.8.1 All the components of the shafting system shall be in accordance with RO Requirements.

7.8.2 All the components of the shafting system shall be of adequate strength and stiffness to withstand the most adverse combination of the loads without exceeding acceptable stress levels for the material concerned.

7.8.3 Stern Tubes

(a) Water lubricated stern tubes shall be Type Approved by RO. Propeller shaft bearing shall be RO approved, water-lubricated composite type. Forward and after ends of stern tubes shall be bored for bearings and a dripless shaft seal system shall be fitted to the inboard side of each stern tube.

(b) The material of the stern tube should be bronze/ 316L stainless steel.

7.8.4 The propeller shafts shall be manufactured from corrosion resistant material, such as 316L stainless-steel or equivalent approved by RO and to satisfaction of GNC.

7.8.5 The propellers shall be of fixed pitch type and designed to minimize the cavitation and vibration in shell plating and hull girder.

7.8.6 Propellers shall turn outboard over the top when the Vessel is moving ahead.

7.8.7 Propellers shall be selected to achieve the Contract Speed with 88% Maximum Continuous Rating (MCR) power of main diesel engines only, measured at propeller shafts immediately after the gearboxes.

7.8.8 The materials for shaft brackets, shafts, keys and locking nuts shall be compatible for use with the hull and propeller materials. All components shall be designed and submitted for approval by the RO.

7.8.9 Each propeller shall be fitted with a rope-cutting device without inducing adverse flow to the propellers.

7.8.10 The propellers and stern tubes shall be protected by a cathodic protection system for 2 years' service life from Delivery Acceptance. An effective shaft earthing system shall be installed as stated in Paragraph 4.30.3 of this Part VII.

7.8.11 Torsional vibration analysis of the engine and propeller shafting system shall be submitted to the RO for approval and then submitted to GNC for acceptance.

7.9 Steering Gear System

7.9.1 The steering gear system shall be a twin or triple rudder arrangement, which depends on the number of main diesel engines subject to individual design. It shall comply with the RO Requirements.

7.9.2 The main steering gear and rudder stock shall be:

(a) Of adequate strength and capable of steering the ship at maximum ahead service speed which shall be demonstrated; and

(b) Capable of putting the rudder over from 35° on one side to 35° on the other side with the ship at its deepest seagoing draught and running ahead at maximum ahead service speed and, under the same conditions, from 35° on either side to 30° on the other side in not more than 28 seconds.

7.9.3 Electro-hydraulic steering gear with two independent power units, each running unit shall be capable of providing the maximum torque operating on the rudders. A select switch shall be installed in the Wheelhouse to enable the crew to run any of the units or both.

7.9.4 The system shall include motor driven pumps, reservoir/filter units, emergency manual helm pump, rudder transmitter limit switch, rudder angle indicators, actuating cylinders, master helm control and one non-follow-up controller.

7.9.5 The rudder(s) shall be controlled by a helm wheel and joystick in the control station of the wheelhouse. The Coxswain shall be able to use either helm wheel or joystick. The helm wheel shall

be of a non-skid type of appropriate size acceptable to GNC. The power electro-hydraulic pumps should be capable of being started and stopped in the wheelhouse, the Engine Room Control Office and the steering gear room. Individual back-up control shall also be provided.

7.9.6 Individual illuminated rudder angle indicators with dimmer switch, running and overload alarm should be provided at the Wheelhouse Control station, the Wheelhouse Engine Remote Control Console and the Engine Control Console in the Engine Room Control Office.

7.9.7 An emergency steering system shall be provided in accordance with the RO Requirements.

7.9.8 A change-over switch shall be provided at the Wheelhouse Control station for switching the steering control between the wheelhouse and local control in the steering gear room.

7.10 Rudders and Rudder Stocks

7.10.1 The rudders shall be designed, manufactured and installed in accordance with the RO Requirements.

7.10.2 Local rudder angle indicators shall be fitted at the suitable locations in the steering gear room clearly identifying the rudder to which they relate. The port and starboard degree markings in intervals not greater than one (1) degree shall be permanently marked and distinguished by red (port) and green (starboard) in English and Traditional Chinese.

7.10.3 Extremes of rudder travel shall be provided with mechanical stoppers to the satisfaction of the RO and GNC.

7.10.4 The rudder stock and rudder blade shall be of 316L stainless steel or equivalent and shall be designed, manufactured and installed to meet the RO Requirements.

7.10.5 Upper bearings shall be provided with an automatic greasing unit.

7.10.6 Lower bearings on the rudder stock shall be water-lubricated.

7.11 Bow Thruster

7.11.1 An AC electric variable speed type bow thruster is to be fitted for docking and position keeping.

7.11.2 The bow thruster is to be capable of manoeuvring the Vessel with rotation about the centre of gravity and shall be suitable for this size of vessel and the corresponding windage area with a thrust capacity not less than 10kN.

7.11.3 The bow thruster system shall be interfaced with the position keeping system specified in Paragraph 7.12 of this Part VII and the hybrid system specified in Chapter 11 of this Part VII. The Contractor shall ensure the proposed system, components, arrangement and design are all suitable for that purpose e.g. proper interfacing features, frequent start/stop operation, etc. The proposed system, components, arrangement and design shall be submitted for RO and GNC approval.

7.11.4 The bow thruster shall keep the Vessel in a stationary position when the fire monitor of the external fire-fighting system specified in Chapter 10 of this Part VII is working horizontally at 45 degrees at the same side plus 15% reserve power for wind and current.

7.11.5 The bow thruster shall be positioned as forward as practicable. It shall be located below the waterline with sufficient depth to prevent air from being sucked into the tunnel but above the keel with the trim and dynamic motion responses considered. The minimum diameter of the propeller should not be less than 500mm.

7.11.6 The electric bow thruster shall be driven by a permanent magnet motor equipped with soft starting arrangement, variable frequency drive (VFD) of active front end type, and joystick control. The VFD shall be RO approved and equipped with:

(a) Stall prevention;

(b) Current limitation & overcurrent protection;

(c) Short-circuit protection;

(d) Undervoltage & overvoltage protection;

(e) Ground fault protection;

(f) Power supply phase failure protection; and

(g) Motor thermal protection through sensing of the motor winding temperature.

7.11.7 The wheelhouse navigation console shall be provided with joystick and basic panel with the following features:

(a) VFD alarm;

(b) Motor alarm (e.g. high temp and overload alarm etc.);

(c) Power supply to the control system failure;

(d) Indicator showing direction of thrust;

(e) Load indicator of motor; and

(f) Interface with the position keeping system specified in Paragraph 7.12 of this Part VII;

The concerned alarm and status of the bow thruster should also be provided on the wheelhouse engineer control console.

7.11.8 The bow thruster room shall be adequately spacious to accommodate the bow thruster motor and its associated systems (VFD, control panel and cooling system, etc.), the external fire-fighting (Fi-Fi) pump motor with similar configuration as the bow thruster motor, and, as well as, an emergency fire pump. The bow thruster room shall also be adequately ventilated so as to enable the heat generated by the components e.g. motor, variable frequency drive (VFD), starter panel, etc., to be carried away in order to maintain the bow thruster room in similar condition as the external ambient conditions.

(a) The ventilation arrangements in the Bow thruster room shall ensure dampness and condensation do not accumulate thereby lowering the insulation resistance of the motors.

(b) The ventilation arrangements in the bow thruster room shall consider the needs for crew to conduct routine operational and maintenance work and also for crew access in emergencies. Therefore, arrangements shall be proposed to ensure the safety of working personnel which shall be accepted by the RO, HKPF and GNC.

7.11.9 A steel tube is to be incorporated into the Vessel structure to house the bronze/stainless steel propeller. The tube, if rolled, and welded should be non-destructive tested before installation into the Vessel hull. Once fitted, the surrounding welds should be non-destructive tested. This shall be carried out in accordance with the RO Requirements.

7.11.10 A flexible coupling is to be fitted between the bow thruster motor and the drive shaft.

7.12 Position Keeping

7.12.1 A position keeping system shall be provided. The system shall automatically hold the Vessel in a predetermined position and heading by controlling the speed (RPM) of the Vessel's propellers and bow thruster and adjusting the Vessel's rudder angles. A control panel shall be fitted at the Wheelhouse Control Station within the reach of coxswain to enable the aforesaid control and adjustment. **[E]**

7.12.2 The position keeping system shall be integrated with the control and power management system of the hybrid system, as detailed in Paragraph 11.7 of this Part VII. The Electric Mode and E-motors shall be used for position keeping without the main diesel engines as detailed in Paragraph 11.3(b), Part VII, and are to be used to achieve the required RPM of the Vessel's propellers. The position keeping system shall be able to use the maximum output of the E-motors and the bow thruster, as needed.

7.12.3 The system shall provide a lost position alarm when the vessel drifts off the target position outside a pre-set range/radius. The user shall be able to adjust the range/radius.

7.12.4 It shall be possible to control the system to drive the Vessel manually using the joystick of the position keeping system, or by selecting the position (longitude & latitude) and required heading for position keeping, via a navigation display/control panel located at the Wheelhouse Control Station.

7.12.5 The position keeping system shall be designed and installed to receive input data from the DGPS, Gyro Compass and anemometer for wind speed/direction.

7.12.6 A position keeping test is to be carried as detailed in Chapter 1 of this Part VII.

7.13 Seakeeping Device

7.13.1 A gyroscopic roll stabilization ("Gyro-stabilizer") system is to be installed onboard the Vessel. It is to reduce roll motion and, thus, to improve Vessel seakeeping when the Vessel is at stop or slow speed. A maximum of two Gyro-stabilizers shall be fitted in the Vessel. Each Gyro-stabilizer must be a vacuum type, compact and self-contained. **[E]**

The Gyro-stabilizer(s) shall provide a reduction in percentage of root-mean-square (RMS) of the roll angles in resonant waves not less than those shown in the table below for each given sea state when compared to the rolling of the Vessel without the gyro-stabilizer system. **[E]**

Significant Wave Height (m)	Roll Reduction %
0.50	70
1.00	60
1.50	45
2.00	30

7.13.2 The Gyro-stabilizer(s) is to be positioned such that it can be serviced, maintained and overhauled without removing major components/sub-assemblies from the Vessel. In addition, the location shall be subject to minimal slamming acceleration forces and shall not be positioned in the forward part of Vessel to minimise the slamming effects.

7.13.3 It is a requirement that the noise emitted by the gyroscopic roll stabilizer(s) shall not exceed 75dBA when measured in a static zero forward speed operation, at a distance of 1m in all directions.

7.14 Machinery Spaces Ventilation

7.14.1 The Machinery Spaces Ventilation system shall be designed to the satisfaction of RO and GNC.

7.14.2 Arrangements shall provide sufficient air to the engines and shall provide adequate protection against damage due to ingress of foreign matter.

7.14.3 The air supply inlet vents shall be connected to louvers of efficient design in preventing ingress of water during extreme weather and sea conditions. The fire dampers shall be remotely and locally controlled. The coaming of the vents shall be of adequate height

7.14.4 The engine room, bow thruster space and designated battery compartment(s) shall be adequately ventilated so to ensure that when machinery therein is operating at full power in all weather and sea conditions, including heavy weather. An adequate supply of air can be maintained to the compartments for the safety of personnel and the normal operation of the machinery.

(a) All spaces containing machinery shall be provided with forced ventilation and the design shall be such that any hot spot or "dead air" area is avoided.

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

7.14.5 Steering gear compartment and tank space(s) shall be provided with forced ventilation. The ventilation arrangements shall be adequate to ensure that the safe operation of the Vessel is not compromised.

7.14.6 As guidance, the ventilation air to the compartment as stated should limit the temperature rise in a machinery space to 10℃ above the ambient temperature.

7.14.7 As the prime movers draw combustion air from within the compartment, the total ventilation air shall be based on ISO Standards for Shipbuilding in Air-conditioning and Ventilation of spaces in ships (e.g. ISO 7547 & ISO 8862) as a minimum but should not be less than that required for combustion plus 50%. The ventilation air is to be determined in accordance with manufacturer prescribed requirements to the satisfaction of GNC.

7.14.8 Automatic shut-off devices shall be provided according to the RO Requirements when the FM200 system is to be activated.

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

7.15 Air-Conditioning System

7.15.1 The air conditioning system shall be a central sea water cooled chiller system. A minimum of two (2) sea water cooled chiller units are to be provided.

7.15.2 Each chiller cooling unit shall be independent and have 100% capacity according to the calculated cooling load, which shall ensure that the temperature and humidity within the Deckhouse, Wheelhouse and Accommodation area are maintained at the following levels:

Summer

	Value	Notes
External Air Temperature	40℃	85% relative humidity
Internal Air Temperature	21℃	60% relative humidity
Sea Water Temperature	≤30°C	

This is required for sixteen (16) crew members onboard. An acceptance test of the complete system shall be carried out to verify the effectiveness of the system and that such as in compliance with the requirements set out in Part VII.

7.15.3 The refrigerant shall be CFC and HCFC free.

7.15.4 Emergency stop switches for the system in addition to the normal power "on/off" switches shall be installed at the Wheelhouse Engine Remote Control Console and the Engine Control Console in the Engine Room Control Office. The emergency stop switches shall be automatically activated when the FM200 system is to be triggered.

7.15.5 Mold and bacteria resistant replacement filters shall be fitted at air inlets.

7.15.6 The fan coil blower units within the Wheelhouse, Deckhouse and accommodation compartments on and below the main deck shall be carefully located for efficient operation, as recommended by the air-conditioning manufacturer, with due consideration to air moisture in the sea environment. Condensate drains are to be fitted and routed directly overboard. The location of all equipment shall be accepted by GNC and the HKPF prior to installation onboard.

7.15.7 The cooling air shall be evenly distributed. An individual control unit for temperature and airflow shall be provided in each compartment.

7.15.8 The volume of fresh air shall be treated before being fed into the system to avoid undue condensation formed on any metallic surface on board the vessel. The treated fresh air shall be induced into the air-conditioned area based on the ISO 7547 standard for Shipbuilding – Air-conditioning and ventilation of accommodation spaces and there shall be not less than $25m^3$/hour per person [for Sixteen (16) Crew] so as to keep the CO_2 levels low and sufficient for health reasons. Shut-off facilities for the fresh air supply shall be provided.

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

7.15.10 All air-intakes shall be located away from the machinery exhausts to maintain the on-board air quality.

7.15.11 It is required that independent air-intakes, re-circulation air and blower units are installed in the First Aid Room to reduce the risk of contagious persons infecting other persons living and working onboard the Vessel, as detailed in Paragraph 4.5.4 of this Part VII.

7.16 Piping System

7.16.1 Piping connections and joints shall be constructed and designed in accordance with the RO Requirements. Pipe bends should be kept to a minimum and have sufficient large radius to facilitate smooth flow.

7.16.2 The piping material shall be marine grade 316L stainless steel or equivalent agreed by the HKPF and GNC. The thickness and material shall be acceptable to the RO.

7.16.3 All pipes shall be secured in position to prevent chafing or lateral movement. Long or heavy lengths of pipe shall be supported by bearers, so no undue load is carried by the pipe connections, pumps or fittings to which they are attached.

7.16.4 Suitable provision for expansion shall be made, where necessary.

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

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

7.16.7 Watertight bulkheads, decks or structural members having pipeline penetrations shall be designed and installed in accordance with the RO Requirements. Watertight and structural integrity must be maintained and approved by the RO and to the satisfaction of GNC.

7.16.8 The material of the gaskets shall be capable of resisting chemical attack from the fluid being conveyed. Means to prevent galvanic corrosion shall be provided if different materials are used in the system.

7.16.9 All piping and equipment shall be labelled and colour-coded. Each pipe running through each compartment shall be colour-coded, labelled and have the direction of flow marked, in at least two (2) places. Colour coding of machinery and piping shall be in accordance with ISO 14726:2008.

7.17 Fuel Oil System and Fuel Oil Tank

7.17.1 As Government vessels are committed to utilize sustainable/renewable fuel blends, the propulsion engines and the diesel generators of the Vessel shall be able to use B5 diesel containing a fatty acid methyl ester content of 5%, as determined in accordance with the document published by the European Committee for Standardization commonly known as EN 14078:2003.

7.17.2 The fuel oil of the main diesel engines and diesel generators shall be supplied from one or more fuel oil tanks. The Contractor is free to design the number and location of the fuel oil tanks to fulfil the specification requirements. The arrangement is to be submitted to the RO and GNC for approval prior to installation onboard the Vessel.

7.17.3 Quick closing valves (controlled from the main deck) shall be fitted to the fuel oil tank outlets along with drip trays.

7.17.4 The system design and filtration systems shall be approved by the main diesel engine and diesel generator manufacturers.

7.17.5 The tanks shall be tested according to the RO requirements and witnessed by the RO and GNC.

7.17.6 An electric motor-driven pump shall be provided for transferring fuel between tanks.

7.17.7 An independent fuel transfer pump with a controllable flow rate up to 200 litres/min and associated pipelines shall be provided, in order to transfer fuel out of the vessel, if needed.

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

7.17.9 The filling pipe shall be of a metallic construction and be a permanent fixture from the deck and secured to the tank. A screwed cap and name plate inscribed 'Fuel Oil' together with Chinese '燃油' shall be provided at the filling point. Flexible hoses are not permitted as filling pipes.

7.17.10 Duplex filter sets shall be fitted in the fuel supply lines to each of the main and diesel generator engines, and the arrangements shall be such that any filter can be cleaned without interrupting the supply of filtered fuel oil to the engines.

7.17.11 Water separators with drains shall be fitted to each fuel supply line to the engines.

7.17.12 The material and design of the fuel piping system shall meet the RO requirements.

7.17.13 Fuel Oil Tanks

(a) Fuel oil tanks shall include fuel oil storage tanks and a daily service tank, which are to be inter-transferable. The fuel oil shall be filled into the storage tanks only, while the engines will normally draw fuel oil from the daily service tank. If needed, fuel oil can also be drawn from the storage tanks as a contingency.

(b) Fuel oil tanks shall be arranged to allow Vessel operation at an acceptable trim in all loading conditions and shall consider the requirements of good static and running trim.

(c) The tank plate thickness shall sustain the loads due to the mass of the full tank with due consideration given to acceleration forces caused by the Vessel's movements at all speeds at sea, without damaging the tank and ship structure. No roll reduction due to gyro-stabiliser shall be considered.

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

(e) The tank(s) shall be installed so that the loads due to the mass of the full tank(s) are safely transmitted into the Vessel structure. The tanks shall not be directly adjacent to any other tanks carrying liquid of any kind.

(f) Requirements of the tank:

(i) A tank content level gauge in litres and low-level alarm shall be fitted at the Wheelhouse Control station, the Wheelhouse Engine Remote Control Console and the Engine Control Console in the Engine Room Control Office;

(ii) A high-level alarm is also to be fitted;

(iii) The following shall be provided for each tank:

1. Rigid fuel suction pipe intake with appropriate clearance to the tank bottom in accordance with the RO requirements;
2. An inspection hatch;
3. Air vent with flame trap on deck;
4. Remote quick closing device operated at the fixed fire-fighting control station (from main deck);
5. A drain pipe with self-closing valve/cock;
6. Drip traps underneath the drain valve/cock, fuel filter, water separator;
7. Sounding pipes with steel doubler welded on the bottom of tank, self-closing device and a chained cap; and
8. Tank drain plug at a location as low as practically possible within the fuel oil tank(s).

(iv) Fuel oil sloshing in the tanks shall be minimised and trapped vapour or airlock shall be avoided;

(v) The fuel oil tank(s) shall be tested by a head of water equal to the maximum to which the tank may be subject, but not less than 2.5m above the top of the tank. The static test

pressure shall be applied for 5 minutes without pressure drop. After the test, the tested fuel tank shall present neither leakage nor deformation. The test is to be witnessed by the RO and GNC; and

(vi) The compartment or space containing the fuel oil tank shall be fitted with two ventilating pipes in an arrangement acceptable to the RO and GNC.

7.18 Fresh Water System

7.18.1 Fresh Water Tank Arrangement:

(a) At least two independent marine-grade 316L stainless-steel fresh water tanks with a total capacity of not less than 5000 litres shall be arranged in the Vessel to supply fresh water to the main deck, under deck and crew space as required and to the satisfaction of GNC.

(b) The tanks shall be inter-connected and served by two sets of fresh water pumps. An independent fresh water transfer pump with a minimum flow rate of 200 litres/min and associated pipelines shall be provided, in order to transfer fresh water between vessels.

7.18.2 The fresh water shall be supplied by a fresh water pump to achieve a stable pressure at the taps to GNC's satisfaction. The system shall provide potable fresh water throughout the Vessel. Cold freshwater taps completed with PVC braided/reinforced transparent hoses shall be fitted to locations to provide a rinse off facility for cleansing purposes to the satisfaction of GNC and HKPF.

7.18.3 The fresh water tank(s) shall be flushed clean and sterilized before installation and delivery of the Vessel. The tank(s) shall be tested by a head of water equal to the maximum to which the tank may be subject, but not less than 2.5m above the top of the tank. The static test pressure shall be applied for 5 minutes without pressure drop. After the test, the tested fresh water tank shall present neither leakage nor deformation. The test is to be witnessed by the RO and GNC;

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

(a) Inspection/cleaning access cover;

(b) Filling pipe with padlocked cap;

(c) Vent pipe; and

(d) A tank(s) contents level gauge in litres and low-level alarm at 1500 litres, as described in Paragraph 5.3.7 of this Part VII, shall be fitted at the Wheelhouse Engine Remote Control Console and the Engine Control Console in the Engine Room Control Office.

7.18.5 The tank(s) shall be installed so that the loads due to the mass of the full tank(s) are safely transmitted into the Vessel structure. The tank(s) shall not be directly adjacent to any other tanks carrying liquid of any kind.

7.18.6 The thickness shall sustain the loads due to mass of the full tank with due consideration given to accelerations caused by the Vessel's movements at all speeds without damaging the integrity of the tank and the Vessel's structure. No roll reduction due to gyro-stabiliser shall be considered.

7.18.7 The fresh water supply unit shall be provided with a starter, pressure switch, pressure gauge, relief valve and suction valve. The freshwater pump shall maintain the pressure automatically.

7.18.8 Domestic freshwater piping shall be made of copper or 316L stainless steel. Certification for the piping material shall be submitted before the delivery of the Vessel. The welding joints of the domestic fresh water piping's shall be free from lead. The domestic fresh water from the fresh water tank shall be free from any substance harmful to health and shall comply with the Government requirements for domestic water. Drinking water filters accepted by GNC shall be provided at the taps in the galley. A Legionella Test is to be carried out to the satisfaction of GNC prior to Delivery Acceptance.

7.19 Bilge System

7.19.1 The Vessel shall be fitted with a bilge system designed and installed in accordance with the RO Requirements.

7.19.2 A bilge audible and visual alarm panel shall be fitted in the Wheelhouse Engine Remote Control Console and the Engine Control Console in the Engine Room Control Office covering all underdeck watertight compartments.

7.19.3 When the Vessel is afloat and unmanned, the bilge alarm system shall continue to function. When the audible and visual alarm in not acknowledged after a time period of five (5) minutes, the audible and visual alarm shall be extended externally to on-shore command stations and other locations as requested by the HKPF. In addition, the audible and visual alarm shall be extended externally to an audible and visual alarm fitted on the top of the deckhouse to attract the attention of persons ashore.

7.19.4 A bilge water holding tank, sized suitably for the Engine Room volume to the satisfaction of GNC, shall be provided in the engine room. Marine grade 316L stainless steel shall be used for the bilge water holding tank.

7.19.5 Any bilge water in the engine room, bow thruster space, tank space(s) and steering gear room shall be pumped to the bilge water holding tank by a bilge transfer pump.

7.19.6 An oily water separator (OWS) is to be fitted in order to comply with updated MARPOL requirements. The OWS shall be used to separate oil from bilge water, not exceeding 15ppm (parts per million) oil content before discharge overboard. The OWS is to be designed and installed to the RO Requirements with the following features:

(a) A capacity of not less than $0.5m^3$/hour;

(b) Low power consumption;

(c) Simple operation with continuous monitoring of the oil content at discharge;

(d) Oil content meter and alarm to be provided. When the alarm is triggered, the overboard discharge shall be automatically stopped;

(e) Local servicing and maintenance, including provision of spare parts in Hong Kong; and

(f) Type Approved by the RO.

7.19.7 A waste oil/sludge tank is to be fitted for the collection of accumulated waste oils from the OWS and from drip trays under oil filters, fuel filters and fuel pumps. The content of the waste oil / sludge tank shall be transferable to ashore.

7.19.8 All bilge system pipework shall be made of galvanised steel. It is to be designed and installed in accordance with the RO Requirements to the satisfaction of GNC.

7.19.9 An emergency bilge suction inlet shall be fitted to the sea water pump with the largest capacity in the engine room to the satisfaction of the RO and GNC.

7.20 Seawater System

7.20.1 All sea valves shall be compatible with the hull material.

7.20.2 Separate sea chests shall be provided for the main diesel engines, diesel generators, air-conditioning system, and the cooling system for the hybrid propulsion system including the battery banks, if needed. The sea chests shall be installed in the vicinity of their respective seawater pump suctions but with adequate distance between each other to avoid water flow disturbance. Further, the location of the sea chest shall minimize the chance of entraining air while the Vessel responds to heavy weather and sea conditions.

7.20.3 Seawater piping shall be constructed of marine grade 316L stainless steel pipe or equivalent in accordance with the RO Requirements and to the satisfaction of GNC. A suitable strainer with isolation valves and air vent shall be fitted to each seawater system. Due consideration shall also be given to the provision of quick and easy access to the seawater strainers.

7.20.4 Cathodic protection and marine growth protection system are to be installed as detailed in Paragraph 4.30 and 4.31, respectively, of this Part VII.

7.21 Sanitary, Grey and Black Water System

7.21.1 One (1) stainless-steel grey water holding tank with capacity of not less than 750 litres shall be installed in the tank space(s) or other compartment (acceptable to GNC) for clean waste water. Two electric pumps shall be provided to pump the grey water overboard from the tank automatically. Under normal operating conditions, only one pump will be used while the other one will be on auto-standby. Alternative piping shall be arranged for the grey water from the main deck and above to discharge directly overboard through a non-return shipside valve.

7.21.2 Two sanitary/sea water pumps with normally one on auto-standby shall be installed in the engine room to supply sea water for sanitary services. Stable pressurized seawater shall be distributed to toilets for flushing.

7.21.3 The black water from toilets shall be fed into a Black Water Tank before transferring into the Sewage Treatment Plant and then discharged overboard or ashore. Alternative piping shall be arranged for black water to discharge directly overboard from the Black Water Tank through a non-return shipside valve.

7.21.4 The Sewage Treatment Plant (STP) shall be designed and installed as follows:

(a) It is to be a biological STP suitable for a minimum of 16 persons;

(b) It is to be compact in design so as not to encroach on available Vessel space;

(c) It is to be fitted in either the tank space(s), engine room or bow thruster space and shall be easily accessible for maintenance and servicing;

(d) Low power consumption;

(e) The STP is to be Type Approved by the RO, suitable for this vessel type and designed and installed to the acceptance of GNC; and

(f) The performance of the Sewage Treatment Plant shall comply with updated IMO requirements.

7.21.5 Galley, shower, wet room and toilet scuppers and sinks shall be designed to discharge into the grey water holding tank.

7.21.6 The tank(s) shall be fitted with a level gauge and high-level alarm indicator, which shall be presented in the Control Consoles.

7.21.7 The grey and black water tanks shall be fitted with proper air vents which shall be kept away from all other ventilation intakes.

7.21.8 Sanitary and grey water piping shall be made of Marine Grade 316L stainless steel pipe.

7.22 Open Deck Drainage System

7.22.1 The Vessel shall be fitted with an open deck drainage system to the RO Requirements.

7.22.2 Upper deck piping is to be constructed of marine grade aluminium. Below the main deck, scupper piping is to be constructed of Marine Grade 316L stainless steel.

7.23 Floor Plates, Handrails and Guards

7.23.1 The floor of the engine room, steering room and bow thruster space shall be covered with aluminium checker plates which shall be properly secured but easily removable for safe operation. Proper insulation shall be applied to avoid galvanic corrosion.

7.23.2 All boundary bars, handrails, gratings, ladders, platforms, stanchion and vertical supports in the Engine room, steering room and bow thruster space shall be of lightweight construction and fulfil the requirement of the Code of Practice for HK Local Vessels. For easy maintenance, floor plating shall be easily removable for accessing the bilges, pumps, shaft, pipework and strainers.

7.23.3 Removable access plates shall be fitted to provide access to valves. Suitable arrangements shall be provided for plates to avoid rattling noise.

7.23.4 Removable guards for the protection of personnel and machinery shall be provided over exposed moving parts of the machinery, hot pipe work, etc.

7.23.5 Splash plates, casings, fenders, screens, etc. shall be provided for the protection of personnel and machinery.

7.24 Engineer's Store

7.24.1 As detailed in Paragraph 4.25 of this Part VII, an Engineer's Store is to be provided within the steering room or engine room for the storage of lubrication oil, refrigerants, grease and ready to use spare gears and tools.

Chapter 8 Electrical System

8.1 General Requirements

8.1.1 All the electrical equipment and their installations are to comply with the Requirements of the RO.

8.1.2 All electrical equipment and their installations shall comply with the Regulations of the International Electrotechnical Commission (hereinafter referred to IEC), Electrical Installations on Ships in the version as at the Contract Date unless the regulations specify that version of such regulations as at the keel laying date of the Vessel shall apply in relation to the relevant requirements specified therein.

8.1.3 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 circuit conductors before heat can damage the conductor insulation, connections or wiring-system terminals.

8.1.4 The tripping and response times of protective devices shall all be taken into consideration in order that electrical faults shall not cause interruption of other electrical circuits so far as is practicable.

8.1.5 The difference in the tripping and response characteristics of AC and DC system shall be taken into account in the selection of protective systems and devices. The selection shall comply with RO and IEC requirements and shall be agreed by GNC.

8.1.6 Back-up DC supply shall be provided for the control circuits of essential power sources [e.g. generator engine, AC/DC converter/inverter for DC grid, Hybrid battery (ESS), Shore supply etc.]. The arrangement is to ensure the system can maintain normal functionality during power failure or cold start.

8.1.7 All electrical apparatus shall be so constructed and installed as not to cause injury when handled or touched in the normal manner.

8.1.8 Exposed metal parts of electrical machines or equipment, which are not intended to be live but which are liable under fault conditions to become live, shall be earthed.

8.1.9 Three-phase three-wire system with insulated neutral shall be adopted for the AC distribution system. Neither earthed neutral nor hull return system shall be accepted.

8.1.10 A two-wire insulated distribution system shall be used for the DC system.

8.1.11 All metal sheaths and armour for cables shall be electrically continuous and shall be earthed.

8.1.12 All electric cables and wiring external to equipment shall be at least of a flame-retardant type and shall be so installed as not to impair their original flame-retardant properties.

8.1.13 Cables and wiring serving essential or emergency power, lighting, internal communications or signals shall so far as practicable be routed clear of galleys, laundries, and other high fire risk areas.

8.1.14 Cables and wiring shall be installed and supported in such a manner to avoid chafing or other damage.

8.1.15 All components shall be marked in both English and traditional Chinese to indicate their use. Each cable shall be clearly labelled and carry its own unique identification code. The language on all control panels shall be in both English and traditional Chinese.

8.1.16 For each main and distribution system, whether primary or secondary, for power, heating or lighting, the insulation level to earth shall be continuously monitored and an audible and/or visual indications of abnormally low insulation values shall be provided.

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

8.1.18 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, etc.) shall be submitted to the RO for approval and GNC for endorsement before installation.

8.1.19 All installations shall be provided with manuals in both English and traditional Chinese for operation and maintenance.

8.1.20 The standard of installation shall enhance the Equipment's safety features. It shall not present any hazards to the operator, e.g. all metal panels exposed to the operator shall be grounded. Warnings of any potential hazards shall be displayed in both English and traditional Chinese, and/or with internationally recognized labels to the satisfaction of GNC.

8.1.21 The system shall be incorporated with the hybrid system and the requirement of this chapter shall apply to the on-board electrical system as a whole wherever applicable.

8.1.22 Capacitors used in the system (e.g. electronic equipment, semi-conductor converter, VFD, etc.) shall have a discharge rate in compliance with IEC and RO requirements. Protection shall be provided to avoid personnel coming into contact with the capacitors unless the voltage is at a safe level.

8.1.23 Due to the difference in response times between the DC and the AC sides, arrangements shall be made to provide sufficient current to activate the protective device and trip the circuit for the complete system (including semi-conductor converter protection, motor drive, etc.).

8.1.24 All equipment installed onboard shall comply with IEC and RO requirements and be subject to final approval from GNC.

8.1.25 A Schematic diagram for the electrical system is presented in Annex 18. This diagram shall only be taken as a guidance for better understanding of this chapter.

8.2 Electrical Power Main System

8.2.1 Main sources of electrical power of sufficient capacity to supply all those services necessary for the operation of the vessel, including house loads and the propulsive requirements as stated in Chapter-11 of Part VII, shall be provided. These main sources shall consist of at least two diesel generators or more, subject to the actual design, and the battery bank (ESS) mentioned in Chapter 11of this Part VII.

8.2.2 The electrical power supply shall be mainly provided by two (2) or more main diesel generators subject to the actual design (380V), 3-phase, 3-wire insulated system. The generators shall have unrestricted continuous rating and be located in the Engine Room.

8.2.3 The capacity of each diesel generator shall be capable to supply those services necessary to provide normal operational conditions of propulsion and safety.

8.2.4 In addition, the ESS shall be such as to ensure that, with all the diesel generators or their primary source of power out of operation, it shall be capable of providing the electrical services necessary to start the main diesel engines, and feed the E-motors for propulsion, from a dead ship condition.

8.2.5 The system shall be so arranged that the electrical power supply will be maintained or immediately restored in the case of loss of any one of the diesel generators and/or the ESS.

8.2.6 The main (DC) busbar shall be subdivided into at least two parts and be connected by a suitable device (e.g. solid state switch) or other approved means. This is to enable the isolation of the malfunctioning sector(s) and to avoid interruption of the functioning sector(s). So far is practicable, the connection of diesel generators and other duplicated equipment shall be equally divided between the parts.

8.2.7 The AC output of the generators should be rectified and boosted up to the required DC voltage and fed to the DC busbar.

8.2.8 The output of the E-motor (when acting as generator) is also fed to DC grid via AC/DC converter. The switchboard shall be an Active Front End type to enable power to be transferred either to or from the E-motor and DC Busbar.

8.2.9 The boost up and change of DC voltage can be achieved by semi-conductor inverter with prior acceptance by the RO and GNC.

8.2.10 Automatic generator synchronization device and arrangement shall be provided. Automatic equal power sharing shall be provided.

8.2.11 The voltage variation of the complete electrical system (AC and DC main and sector) shall always be controlled within the required limits in accordance with the RO and IEC requirements. The voltage drop caused by supplying to the distribution system (AC and DC) shall also be within the prescribed limits of the RO and IEC.

8.2.12 The frequency and harmonic distortion of the AC electrical system shall always be controlled within the required limits in accordance with the RO and IEC requirements and protection shall be provided to safeguard this.

8.2.13 An electrical single line diagram and load schedule assessment for both the AC and DC systems shall be developed by the Contractor in accordance with the RO requirements. The diesel generators shall be sized based on a 15% growth margin above the predicted maximum load condition including house load, air conditioning load, E-motor propulsive load and bow thruster load but excluding the external fire-fighting pump load.

8.2.14 Vessel's electrical load assessment schedule shall include summer and winter, static and transient, loads on AC, DC and shore power. The Vessel's electrical load assessment schedule shall be approved by the RO and GNC prior to installation onboard the Vessel.

8.2.15 The diesel generators shall maintain an output voltage within ±5% over the entire load and within a frequency range of ±1.5Hz.

8.2.16 The diesel generators starting circuit shall be 24V DC. Starting and normal shutdown controls shall be installed at the Wheelhouse Remote Engine Control Console and Engine Control Console in the Engine Control Office together with other monitored generator engine key parameters. An AC voltmeter and ammeter shall be directly connected to existing wiring systems with the use of a double-pole, double-throw (DPDT) transfer switch/centre-off switch for an ammeter to read both legs (AC Voltage reading). A local operating panel should also be fitted on the generator engines.

8.2.17 The diesel generators shall be protected against short-circuits and overloads by multi-pole circuit breakers.

8.3 Electrical Power Distribution System

8.3.1 The electrical power supply system shall comprise a DC main system (DC grid), AC and DC sub-system, Hybrid switchboard, etc.

8.3.2 The AC sub-system shall comprise, but not be limited to, AC switchboards (all main and distribution including 380 and 220 V), AC transformer, switchgears, cabling and equipment.

8.3.3 The DC sub-system shall comprise, but not be limited to, DC switchboards, switchgears, cabling and equipment.

8.3.4 The semi-conductor converter and associated equipment shall comply with the RO and IEC requirements wherever applicable and be agreed by GNC.

8.3.5 When Pulse Width Modulation (PWM) is adopted for the DC/AC inverter, the connected equipment (e.g. cabling, motor etc.,) shall be capable of withstanding the rate of voltage increase.

8.3.6 The DC grid shall be divided into at least two sections with an electronic protective device in between. The arrangement is to enhance the protective response and also prevent a complete power failure due to single electrical fault.

8.3.7 The protective device shall be selected for the purpose served and the circuit (i.e. AC or DC) to be protected. The activation of the protective device shall not cause any interruption to other equipment. Therefore, the response time, current characteristics and hierarchical position of the protective devices shall be duly considered.

8.3.8 The DC grid shall provide power to the AC and DC sub-systems. It shall be connected to the Hybrid switchboard, VFD of variable speed motors (i.e. external fire-fighting water pump, bow thruster, etc.) and all other sub-circuits via suitable protective devices.

8.3.9 Each section of the DC main busbar shall be connected to the AC sub-system via an inverter. The isolating transformer shall be installed in between the inverter and the AC sub-system. The arrangement shall be such that electrical faults on either side would have no direct impacts on the other side.

8.3.10 The output of the isolating transformer shall be 3-phase with insulated neutral.

8.3.11 The output from each isolating transformer shall be capable of cross connection to the other and capable to take-up the total AC loading. Details shall be addressed at the kick-off meeting.

8.3.12 Synchronization, interlock and positive safety means shall be provided for the transformer output if parallel running is required.

8.3.13 Irrespective of the above, arrangements shall be provided to allow the isolating transformers to run in parallel whenever necessary.

8.3.14 Regenerated power which may be produced by the motor (e.g. bow thruster, fire pump) shall be managed by measures such as active front end.

8.4 Switchboard

8.4.1 The switchboard refers to the main and distribution switchboards, which comprise the AC switchboard, DC switchboard and Hybrid switchboard, providing main and emergency power to the electrical systems. The system shall be designed in conjunction with the Hybrid system supplier and shall incorporate the Hybrid propulsion and Hybrid charging system. The Hybrid switchboard is to be designed and installed in accordance with the requirements of the Hybrid system supplier, the RO and to the satisfaction of GNC.

8.4.2 The main and distribution switchboards shall be so arranged as to give easy access to apparatus and equipment, without danger to personnel. The sides, the rear and, where necessary, the front of switchboards shall be suitably guarded. Exposed parts having voltages to earth exceeding 50 V shall not be installed on the front of such switchboards. Where necessary, non-conducting mats or gratings shall be provided at the front and rear of switchboards.

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

8.4.4 Instruments indicating voltage, frequency, current and power, shall be provided for the whole system (AC and DC and each sector) in accordance with the RO and IEC requirements and agreed by GNC.

8.4.5 The free passageway in front of or behind switchboards shall provide unobstructed access to a door for easy escape in case of emergency e.g. fire.

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

8.4.7 Earthing monitoring system and indicator shall be provided through the electrical systems and be available at different sectors of systems (including AC and DC, primary and secondary) to facilitate the identification of the earthing fault.

8.4.8 Switchboards shall be permanently marked with the nominal system voltages.

8.4.9 Self-standing marine type switchboards of steel and aluminium construction with adequate ventilation louvres shall be fitted in an accessible and well-ventilated position in the engine room/ Engine Room Control Office.

8.4.10 Due consideration shall be given in respect of the switchboard location with a view to avoid any risk of damage or electrical fault resulting from oil and water spray, coolant leakage of any kind, or other mechanical hazards. Adequate guardrail(s) and insulated mat(s) shall also be provided. The switchboard location shall be approved by the RO and GNC prior to installation onboard the Vessel.

8.4.11 Switchboard panels shall be hinged at the front for easy access. Anti-rattle rubber strips or equivalent should be fitted to all doors. All parts are to be accessible for inspection, maintenance or replacement to the satisfaction of GNC.

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

8.4.13 An appropriate laminated electrical diagram shall be affixed to each switchboard.

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

8.5 Electricity Distribution Network

8.5.1 The distribution of the electricity to the equipment is through circuit breakers fitted on an electrical distribution panel.

8.5.2 Power distribution panels/electrical distribution boards shall be located at the Engine Room Control Office.

8.5.3 Circuit breakers/ fuses shall be provided for each circuit. The adoption and selection of the protective devices shall be in accordance with IEC and RO requirements and accepted by GNC.

8.5.4 The circuit breakers and fuses shall have sufficient capacity in withstanding faulty current and interruption not less than the maximum short circuit current at the relevant point of their installation.

8.5.5 Fuse switches using fuse element to make/ break contacts are not accepted in place of switches.

8.5.6 Circuit breakers shall be of the proper voltage rating, manual reset type, designed for inverse time delay, instantaneous short circuit protection and be capable of being repeatedly opened and closed without damage. Open and close position indicators shall be provided for each and every circuit breaker. All circuit breakers shall be labelled to identify the corresponding circuit being protected.

8.5.7 Twenty (20) percent (minimum of three) spare circuit breakers shall be provided in each distribution panel, both AC and DC. The Vessel's electronic navigation equipment shall be supplied from an independent distribution panel, which shall in turn be supplied from a single breaker in the main DC Panel.

8.5.8 Twenty (20) percent spare wiring penetrations or two spare wiring penetrations, whichever is greater, shall be provided through each bulkhead except the forward collision bulkhead. Spare penetrations shall be plugged to watertight using a type approved gland to the satisfaction of the RO and GNC.

8.5.9 A 24V DC two (2) wire insulated distribution system is to be installed onboard the Vessel for critical emergency electrical systems including emergency lighting, control of diesel generators and main diesel engines, and the ENEs, etc., in accordance with the RO Requirements.

8.5.10 All 24V DC supply panels shall be fitted with miniature circuit breakers of double-pole type with overcurrent/ short circuit trips. All junction boxes shall be readily accessible, and the supply panel shall be positioned inside the wheelhouse. A special arrangement is required for the navigational lights supplied from this panel.

8.6 DC Power Source

8.6.1 DC power (24V) shall be provided for routine and emergency power circuits.

8.6.2 The main DC power source is to be fed from the DC main switchboard (via the distribution switchboard). The output of the DC main switchboard busbar is connected to 24V routine supply circuit via DC/DC converter. The configuration shall be approved by the RO and accepted by GNC.

8.6.3 The Energy Storage System (ESS) with Lithium Ion Batteries shall be connected to the DC main switchboard via a DC/DC converter. The output from the diesel generators shall be connected to the DC main switchboard via the AC/DC converters.

8.6.4 The load sharing between the diesel generators shall be determined by the Power Management System described in Chapter 11 of this Part VII.

8.6.5 DC power for Main Diesel Engines and Generator Starting:

(a) An independent bank of 24V batteries or supply via DC/DC converter from the DC main switchboard shall be provided for starting each of the main diesel engines and each of the diesel generators. The arrangements shall be approved by the RO and accepted by GNC.

(b) The capacity of the supply power shall be sufficient to provide at least six consecutive starts of each one of the main diesel engines, and at least six consecutive starts of each of the diesel generators from cold, without recharging.

(c) Electrical connections shall be arranged so that an alternate power supply can be used to start any of the main diesel engines or diesel generators by operating a change-over switch in the Engine Control Console in the Engine Room Control Office or the wheelhouse remote engine control console.

(d) The batteries if applicable shall be charged by engine driven alternators with backup service provided by an automatic battery charger. If not inherent in equipment design, interlock or protective devices shall be provided to prevent simultaneous charging from the charger and the alternator. The battery charger shall also be prevented from charging the batteries during engine starting.

(e) The battery chargers, if provided, shall provide automatic control between float and bulk or absorption charge modes. Each charger shall also be provided with a voltmeter, voltage regulator, selector switch, blocking rectifier and the required devices for protecting the chargers against short circuit, reverse connection, excessive temperature and overloading. The capacity of each battery charger shall be sufficient for charging one set of completely discharged starting batteries to a fully charged condition within ten (10) hours. Battery chargers shall be able to perform a quick charge function, which is manually selected as required.

(f) Batteries, if provided, shall be portable, maintenance-free, heavy duty, deep cycle and produced from environmentally friendly materials. They will have a minimum life expectancy of five years, or 200 full discharge cycles at full load, rated in accordance with the RO requirements.

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

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

(i) The ventilation piping shall be routed to/from a protected location where any emitted gases will be safely dispersed. Cable glands are to be provided to maintain the integrity of the battery box ventilation.

8.6.6 DC power for Routine and Emergency supply:

(a) 24V batteries power supply shall be provided by the main switchboard via DC/DC converter for routine DC supply.

(b) Dedicated 24V batteries shall be provided for emergency DC supply.

(c) In the event of a main electrical AC power failure, 24V DC emergency batteries shall act as an uninterrupted emergency supply for all communication equipment, navigation and emergency lighting and other essential equipment (including but not limited to steering, fire monitoring and control system, vital instrumentation and control systems) for the Vessel to return to base.

(d) This emergency supply shall come into operation automatically in the event of a main electrical power supply failure. The capacities of these sets of batteries shall be sufficient to maintain the emergency supply in accordance with the RO requirements, but in no case shall be less than a period of six (6) hours. The emergency battery set shall be capable of maintaining its

voltage throughout the discharge period within 12% above or below its normal voltage without recharging. The battery set shall automatically connect to the emergency lighting system in the event of a failure of the main electrical power supply.

(e) The emergency battery set and its switchboard shall be located above the uppermost continuous deck and shall be readily accessible from the open deck. They shall not be located forward of the collision bulkhead. The compartment shall be well ventilated and designed to prevent ingress of water. The batteries shall be positioned and installed in accordance with the RO requirements to the satisfaction of GNC.

8.6.7 Emergency 24V DC services shall be supplied from the switchboard through a 2-wire insulated system to the following items:

(a) Navigation light control panel and navigation lights.

(b) Horn.

(c) Emergency lighting.

(d) Compass light.

(e) Instrument panel in wheelhouse control console, wheelhouse remote engine control console, and engine control console in the engine room control office.

(f) Public address system.

(g) One hand-held searchlight and fixed searchlight(s).

(h) Siren.

(i) Any other navigational and electronic equipment as requested by GNC.

8.6.8 The batteries as required in Paragraphs 8.6.4 (if applicable) and 8.6.5 shall be subject to continuous float charge under normal operation of the Vessel by an automatic battery charger.

8.6.9 Battery charger installations shall meet the RO requirements including:

(a) The chargers shall be sized such that a completely discharged battery set can be recharged to 80% capacity within 8 hours (100% at 10 hours). The battery chargers are to use bulk and absorption modes of charging, such that at the end of the charge, the current shall be tapered by a float mode.

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

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

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

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

8.6.10 An instruction plate with a schematic wiring diagram illustrating the operating procedures and precautions for the selection of battery sets and charging of batteries shall be provided in the vicinity of the charger, battery selection switchboard and charging distribution board.

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

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

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

8.6.14 A battery disconnection switch shall be installed in the positive and negative conductor from the battery, or battery sets, connected to the distribution system. The switch shall be in a readily accessible location, as close as practical to the battery or battery sets.

8.6.15 Local information plates showing the Voltage, Ampere-hour rating, group number and application shall be provided for each battery set.

8.7 Shore Power Supply and Connection

8.7.1 The shore power shall be capable of supplying the AC loading of the vessel whilst it is berthed alongside and supplying the power for charging the hybrid battery (ESS) starting from cold.

8.7.2 The required AC loading and charging power shall be proposed by the Contractor and agreed by GNC at the kick-off meeting.

8.7.3 An isolation transformer shall be fitted. A moulded case circuit breaker for the shore connection box shall be provided on the main switchboard.

8.7.4 The shore connection box shall be capable of receiving 380-415V three phase 50Hz system, and the cables between the connection box and the switchboard shall be of sufficient capacity to supply the necessary electrical equipment.

8.7.5 The shore power shall be arranged to supply the loading of the vessel whilst the vessel is berthed alongside (i.e. particular distribution panel to be provided). The arrangement shall be such as to avoid the necessity of starting up the generator whilst the vessel is alongside and connected to the shore power. The capacity of the power source and the equipment supplied shall be discussed and agreed by GNC at the kick-off meeting.

8.7.6 An earthing terminal shall be provided for connection of the Vessel's earthing to the shore earthing.

8.7.7 An instruction shall be provided at the connection box to provide full system information and the procedures for connection.

8.7.8 The shore power system shall be interlocked to prevent the Vessel's diesel generators from providing power to the shore at the same time. Indicating lights for "shore power available", "shore power breaker on" and "shore power breaker closed" to be fitted.

8.7.9 The Contractor shall provide a 1:1 isolation transformer for the shore power supply to the AC loading. The core of the isolation transformer shall be completely insulated from the case. The isolation transformer enclosure shall be drip-proof. The transformer shall be rated for continuous operation at the full capacity of the shore power connection.

8.7.10 A connection shall be provided between the shore power supply and the ESS via AC/DC converter. An interlock shall also be provided between the shore power supply and the DC grid to prevent simultaneous power supply from both sides.

8.7.11 The watertight connection box shall be designed with a quick release device.

8.7.12 Not less than 30 meters longshore connection power cable of adequate rating with quick release watertight plug shall be provided.

8.7.13 The shore connection power cable shall be fitted with compatible connections to mate with existing facilities at the Government Dockyard and be identified by GNC. Suitable stowage onboard shall be provided for the cable.

8.8 AC Distribution Boards and Circuit Breakers

8.8.1 Several electrical distribution panels shall be installed throughout the Vessel for AC electrical distribution. Panels shall be of a drip-proof steel construction with hinged doors.

8.8.2 Moulded case circuit breakers are to be fitted as far as possible on all sub-circuits. Where this is not possible, fuses may be used and subjected to GNC acceptance. Where the sub-circuit is three phase or where the current is above 60 Amps, the moulded case circuit breakers shall be fitted with thermal and magnetic tripping devices.

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

8.8.4 Circuit breakers shall act as protective devices only and shall not be used for switching purposes. An individual on/off switch shall be installed for each electrical fitting.

8.8.5 All distribution boards and circuit breakers are to be clearly labelled with the name of each circuit.

Labels are to be in both English and traditional Chinese.

8.9 Motor and Control Gear

8.9.1 Where a starter is situated remotely from the motor, stop and start buttons shall be provided near the motor for local operation. All electric motors for essential services shall have separate start and stop push buttons plus running indication lights (with dimmer control) at the wheelhouse remote engine control console and the engine control console in the engine room control office.

8.9.2 The related requirements in Chapter 11 of this Part VII shall also apply to the variable speed motors and their associated electronic equipment (e.g. VFD, semi-conductor converter etc.,) adopted in the system.

8.9.3 Soft-starting shall always be taken into consideration to avoid excessive system voltage drop.

8.9.4 Motors installed in the engine room and other enclosed spaces shall be of semi-enclosed drip proof type. Motors installed in locations exposed to weather or moisture shall be of waterproof construction. Insulation of motors shall meet the RO requirements.

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

8.10 Cables and Wiring

8.10.1 Cables which may be exposed to physical damage shall be protected by sheaths, conduits or other equivalent means. Cables passing through bulkheads or structural members shall be protected against damage to insulation caused by chafing.

8.10.2 Where cables are protected by pipe conduits, the space factors of the pipe conduit shall conform to IEC regulations in order to prevent bunching of wires and to minimize earth faults.

8.10.3 Cables shall have minimum dimensions in accordance with IEC regulations or other equivalent international standard acceptable to GNC, or the conductor manufacturer's rated current carrying capacity, based on the load to be supplied and allowable voltage drop for the load to be carried.

8.10.4 Cables are to be flame-retardant, marine type, low smoke, zero halogen according to IEC 60332-3. Their selection and method of application are to comply with IEC 60092-352 and the RO requirements.

8.10.5 Cabling for emergency systems shall also comply with the higher fire survival rate stipulated in IEC 60331 and the RO requirements.

8.10.6 Cables in voltage-critical circuits, such as starter motor circuits and navigation light circuits, whose output may vary with system voltage, shall be sized in compliance with the component manufacturer's requirements.

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

8.10.8 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. Cushioning/protection on the overhead cable trunk for preventing crew head injuries shall be provided in the engine room.

8.10.9 Sheathed cables and battery cables to the battery disconnect switch shall be supported at maximum intervals of 300 mm, with the first support not more than 1m from the terminal. Other sheathed conductors shall be supported at maximum intervals of 450 mm.

8.10.10 Cabling shall be run along perforated metal trays and shall be secured in such positions as to allow easy maintenance.

8.10.11 Cabling inside accommodation areas shall be run behind linings, but shall not be embedded inside the insulation, which shall have removable panels for inspection and maintenance.

8.10.12 RO approved watertight, fire resistant and gas tight cable sealing systems shall be provided by way of watertight bulkhead or deck penetrations. The penetration should be located as high as practicable and well clear from the ship side.

8.10.13 Separation is to be provided on cable runs for power cables, instrument cables, control cables and computer network cables in accordance with manufacturer's recommendations and in line with the requirements of IEC 60533 Annex 'C'.

8.10.14 Each electrical cable that is part of the electrical system shall have means to identify its function in the system.

8.10.15 Cables and the wiring terminals of different AC and DC power supply voltages in the junction box, fuse box as well as the equipment terminal box shall be laid separately and shall have a distinctive code and labelling system for easy identification.

8.10.16 Tally plates showing the cable size shall be provided for each of the main power cables.

8.11 Lighting Fixtures

8.11.1 General lighting shall be provided for all compartments and shall be arranged to give sufficient illumination to all working areas for normal operation. All lighting shall be equipped with LED bulbs including the navigation lights.

8.11.2 The general lighting system described herein shall be composed of fixtures permanently installed as necessary to provide the levels of illumination required to an approved standard. The system shall include fixtures, switches, panels, boxes, and cabling for the distribution system supplying the lighting fixtures. Fixtures shall be accessible for maintenance and cleaning.

8.11.3 General lighting shall have individual or group switches to conserve power.

8.11.4 All lighting in the wheelhouse control panel shall be fitted with a dimmer control for night time operation. It shall also be possible to set internal lights within the wheelhouse and accommodations spaces to red light for night operations.

8.11.5 Emergency exit routes shall be identified and illuminated as required by the RO requirements. 24V DC emergency lighting shall be provided for emergency embarkation stations, open decks, all compartments and internal passageways to clearly indicate the exits so that occupants shall be able to find their way out of the accommodation, as per the RO requirements. Such lighting shall be connected to the emergency lighting switchboard and be automatically illuminated when power to the normal lighting is lost.

8.11.6 Suitable lighting shall be provided in all working areas such as galley, crew/commander's desks, First Aid Room, chart table and other areas determined by GNC.

8.11.7 Controls shall be provided within each compartment for illumination therein. Each light shall be manually controlled by a switch located at the primary entrance to that compartment and switches for this purpose shall be installed near the access and located so as not to be obscured when the door is open. A separate switch shall be provided in each compartment to control each group of lights. Switches shall break both sides of the circuit (double pole). Fixtures shall be installed so that illumination will not be obstructed by fixed pipes, ducts, bins and berths.

8.11.8 Fixtures shall be mounted so as not to vibrate in any operating condition and so that the Vessel vibration will not harm the fixtures. Fixtures shall be selected and mounted to maintain the maximum possible headroom.

8.11.9 All sockets, terminal blocks, switches and receptacle interiors shall be made of non-flammable phenolic material.

8.12 Navigation Lights

8.12.1 All navigational and signal lights to be provided shall be in compliance with the International Regulations for Preventing Collisions at Sea (1972 as amended) (COLREGs) and all applicable (IMO) Resolutions. Type approval certificates in respect of each model of the navigational and signal lights issued by a RO shall be provided on or before the Delivery Acceptance at the latest.

8.12.2 The lighting shall be controlled from a control and alarm signal panel in the wheelhouse. Each navigation light circuit shall be provided with a switch, protection fuse, indicating lamp and alarm. A dimmer for the panel indication lights, buzzer stop and lamp test buttons shall be fitted.

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

8.12.4 The following navigational and signal lights (with double-pole circuit breakers), sound signalling devices and shapes shall be provided:

(a) Port-side light (double tier, easy to access and the corresponding controls);

(b) Starboard-side light (double tier, easy to access and the corresponding controls);

(c) Stern light (double tier, easy to access and the corresponding controls);

(d) Masthead light (double tier, easy to access and the corresponding controls);

(e) Anchor light;

(f) Helicopter light;

(g) Combined Not Under Command (NUC) and diving lights;

(h) Two masthead white lights in vertical line (forward arc) and a towing light above the stern light as per IRPCS (to indicate a tow less than 200m);

(i) One all-round flashing blue light on top of mast without restriction, indicating the Vessel is a Police Vessel;

(j) Black Ball (3 nos);

(k) Black diamond;

(l) Whistle;

(m) Bell;

(n) Horn; and

(o) Any other navigation lights as required.

8.12.5 Three (3) sets of spare bulbs shall be provided for the navigational and signal lights.

8.13 Search Lights

8.13.1 Three (3) proprietary make 220V AC LED remote power-operated searchlights shall be installed on top of the wheelhouse.

8.13.2 One (1) long range (HID 800W capable of a minimum of 1.5 Lux at 5km) and one (1) short range (HID 800W capable of minimum 2.4 Lux at 1km) shall be fitted at the forward end of the superstructure facing forwards (0°) and capable of turning ±135°.

8.13.3 One (1) long range (HID 800W capable of minimum of 1.5 Lux at 5km) shall be fitted at the aft end of the superstructure facing aft (180°) and capable of turning for ±135°.

8.13.4 All search lights are to be remotely controlled. Search lights are to be capable of being networked together so the operator can control any searchlight from any of the three (3) controllers. A change-over button should be provided to allow the operator to select which searchlight they are intending to operate.

8.13.5 Search light controllers are to be provided at the Commander's console, Wheelhouse Control Station and at the EOSS operator console.

8.13.6 All search lights are to be integrated into the radar and using inputs from radar to manoeuvre the search light.

8.13.7 High quality covers are to be provided for each searchlight. Suitable fastenings are to be fitted to searchlights/ wheelhouse top to facilitate fitting of searchlight covers.

8.13.8 One (1) 24V DC LED portable search light (with luminosity equivalent to not less than 150W conventional type) with a 30 meters waterproof cable reel and plug shall be provided. Portable search lights are to be stored in the wheelhouse.

8.13.9 The searchlight shall be programmable to broadcast International Morse Code light signal of L (. _..). [D]

8.14 Floodlights

8.14.1 Eight (8) AC 500W LED floodlights to be fitted, with remote operation from the wheelhouse (operational console to be confirmed with GNC). All maker's standard fittings and accessories shall be provided.

8.14.2 The floodlights are to be fixed to the wheelhouse roof providing full illumination of the deck and surrounding water.

8.14.3 The arrangement is to be designed and installed to the satisfaction of GNC and HKPF.

8.15 Power Receptacles/ Sockets

8.15.1 Receptacles/sockets installed in locations likely to be subjected to rain, spray or splashing shall have a minimum protection of IP 55, in accordance with IEC60529 when not in use, e.g. protected by a cover with an effective weatherproof seal.

8.15.2 A system of 220V AC 13A and 24V DC 5A socket outlets shall be provided in the engine room, bow thruster space and steering gear room.

8.15.3 Sufficient socket outlets for 220V AC and 24V DC shall be provided in the wheelhouse to the satisfaction of GNC.

8.15.4 Socket outlets for 220V AC with dual USB charging ports (or equivalent) shall be provided throughout the Vessel as required by GNC and HKPF.

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

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

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

8.15.8 The following areas are deemed to be hazardous and as such shall not have electrical cables led through unless specifically required for services within the space:

(a) Pyrotechnics Storeroom;

(b) Weapons and Ammunition Storeroom;

(c) Deck Store containing paint and/ or cleaning fluid; and

(d) Any spaces containing flammable/ dangerous goods to the discretion of GNC.

8.15.9 Only flameproof or intrinsically safe electrical equipment is to be used in these areas.

8.15.10 No electrical wiring is to be fixed directly to the outside of the bulkheads adjacent to these areas/ compartments/ spaces.

8.15.11 Any cabling which is required within the space is to be screened and earthed in accordance with the RO requirements. Where access to cabling is required, dust tight conduit boxes are to be provided.

8.15.12 Starters, socket outlets and light switches are not to be installed within hazardous spaces.

Chapter 9 Operational Systems

9.1 Overview of Requirements

9.1.1 The Contractor shall supply, deliver, install, commission, conduct trial test and provide 12-month warranty services from the date of the Acceptance Certificate, provision of operational and maintenance service manual, and training for all of the on-board command and operational systems (hereafter collectively referred to as "Operational Systems") to meet the purposes of the Vessel outlined in Chapter 1.2 of this Part VII. "Operational Systems" include the Integrated Navigation System (INS), all Electronic Navigation Equipment (ENE) listed in Paragraph 9.4.1 below including Marine Situational Awareness System (MARSAS) which shall be supplied by HKPF, and all other communication systems to be supplied by the Contractor.

9.1.2 The Tenderer shall submit his technical proposal for the Operational Systems in Schedules 6 and 7 of Part V.

9.1.3 As the design, construction and introduction of all 12 Vessels could take a number of years from proposal until delivery of a Vessel, particularly the later models in the Class, the proposal should contain a plan for ensuring the future proofing of the technology specified in the yet to be delivered Vessels.

9.2 General Requirements

9.2.1 All Operational Systems shall be marine type and comply with the relevant regulations of the Safety of Life at Sea Convention (SOLAS), International Electrotechnical Commission (IEC) and the International Telecommunications Union recommendations in the International Radio Regulations (ITU-R), unless explicitly stated otherwise. They shall comply with all relevant (IMO) recommendations on performance standards and operational features. All radio communications equipment, including radars and radios, shall also comply with the requirements of the Office of the Communications Authority (OFCA) of the HKSAR.

9.2.2 The Contractor shall observe and adopt the International Commission on Non-Ionizing Radiation Protection (ICNIRP) Guidelines [formerly International Radiological Protection Association (IRPA) Guidelines] and the Code of Practice issued by OFCA of the HKSAR on the limits of exposure to radio frequency electromagnetic fields in the frequency range from 100 kHz to 300 GHz for the protection of operators, workers and the public against Non-Ionizing Radiation (NIR) hazards so as to provide a safe and healthy working or living environment under all normal conditions. In case of multiple simultaneous exposures, the combined effect of such exposure shall also be assessed in accordance with the ICNIRP Guidelines.

9.2.3 The Contractor shall warrant that all Operational Systems and materials used, irrespective of whether they are in operation or not, shall comply with the health and safety standards adopted by the World Health Organization in particular in relation to all harmful radiation. The Contractor shall also disclose in writing the existence of any radio frequency radiation hazard emitted from the Equipment, which is harmful to human beings under normal operating conditions, by the safety standards adopted by ICNIRP, American National Standards Institution (ANSI), or other equivalent national or international standards.

9.2.4 All Operational Systems shall be suitable for round-the-clock operations with equipment displays that shall have adjustable brightness levels and be suitable for viewing under different lighting conditions, including direct sunlight, day, dusk, dawn and at night without causing eye-strain, glare and/or discomfort. Equipment control keys and buttons shall be suitably backlit with adjustable brightness levels to aid operation in the dark. All Operational Systems shall perform effectively even under the most adverse weather conditions.

9.2.5 The main components of the Operational Systems shall be installed inside the Server Room and the Wheelhouse of the Vessel. All designs and installation/mounting proposals shall be approved by the GNC and HKPF prior to the commencement of any such work.

9.2.6 In addition to the submission of layout plans to the GNC and HKPF, to facilitate the optimal design, user-friendliness, effectiveness and easy accessibility for inspection and maintenance of all on-board systems, following Contract award, during the design phase the Contractor shall construct a full-size wheelhouse mock-up for comment and approval by the GNC and HKPF. The mock-up shall show the positions and arrangement of the actual Operational Systems and other equipment before construction and installation commences. During the mockup meeting, the Contractor shall provide drawings that show the installation locations of all the other Operational Systems that are installed on the mast, roof top, inside the consoles and other locations, before construction and installation.

9.2.7 In addition to all the Operational Systems (viz the Integrated Navigation System (INS), all other Electronic Navigation Equipment (ENE) listed in Paragraph 9.4.1 of this Part VII and all other communication systems) that the Contractor is required to provide for each Vessel under Chapter 9 of this Part VII, the Contractor shall also provide two complete sets of these Operational Systems (one set equal to the same quantities as installed on one Vessel) as Contract Spare Parts in Schedule 1. In the event that any equipment is substituted during the Contract Period, the Contractor shall supply two sets of the substitution equipment as spare parts.

9.2.8 All the equipment of the Operational Systems of the Vessel and its spare parts shall have good technical support and maintenance services available locally in Hong Kong upon the completion of the Warranty Period for the first Vessel. **[E]**

9.2.9 Design Standards

(a) Environmental Conditions

(i) All Operational Systems shall be capable of operating continuously to the specifications contained in this Part VII throughout its normal life span in the HKSAR climate and environment. The following parameters shall apply unless otherwise stated:

1. Ambient temperature between 0 ℃ and 40 ℃ and between -5 ℃ and +50 ℃ if the equipment (including antennae) is exposed to the open air.
2. Relative humidity up to 95%, non-condensing.
3. Salt and chemical corrosion as found in a tropical coastal atmosphere.
4. Materials that promote mould growth shall not be used.

(ii) The Operational Systems shall be capable of withstanding the knocks and jolts likely to occur during repair work or rough handling.

(b) Power Supplies

(i) The power supply for all Operational Systems shall be protected by appropriate circuit-breakers.

(ii) All Operational Systems shall be capable of working normally when powered by the Vessel's battery-backed DC and AC supply systems. DC/DC converters and AC/DC converters etc. shall be provided if the equipment cannot operate at this voltage.

(iii) Six (6) spare power supply connections shall be required with a negative earth and be connected to a designated 12/24 Volt DC (nominal) battery-backed power supply. The battery shall be charged up when an engine generator is working.

(iv) There is a possibility of DC leakage through the negative grounding to the DC battery power bank on the supplied equipment if it is not connected properly. The Contractor shall take precautions to prevent this type of leakage, e.g. by using an isolation converter.

(v) The power supply of all Operational Systems shall be compatible with the Vessel's electrical system. If necessary, a voltage stabiliser or regulator shall be provided and installed to maintain the Operational Systems in proper working condition when connected to the unsteady DC voltage from the generator.

(vi) Adequate provision shall be made to protect the Operational Systems from the adverse effects of excessive voltage, current spikes and surges.

(vii) Suitable devices shall be incorporated for protecting the Operational Systems and

accessories against damage due to lightning and unregulated DC power supply on board.

(c) Safety

(i) All Operational Systems supplied shall be of a safe design and shall be installed in a safe manner as approved by the GNC and HKPF. The standard of installation shall enhance the equipment's safety features and not present any hazard to the user.

(ii) All Operational Systems shall be properly grounded to an electrical earth. The installation shall not present any hazard to the user in any way, e.g. grounding of all metal parts exposed to the user.

(iii) Electrical contacts and PCBs shall also be protected in an appropriate manner that does not impair their electrical characteristics.

(iv) Lightning protection devices (e.g. lightning surge arrestors/dissipators) are required, particularly for antennae installed outside the protection zone of the Vessel's own lightning protection device.

(v) The lightning surge arrestors/dissipators of each feeder cable shall be grouped and concentrated in a "lightning arrestor panel" for ease of maintenance.

(vi) Warnings of any potential hazard associated with the Operational Systems shall be displayed in traditional Chinese characters, English and universally recognised labels in easily visible and prominent positions.

(d) Design Practice

(i) All systems shall be designed for prolonged, continuous and reliable operation, i.e. twenty-four (24) hours per day and 365 days per year.

(ii) The normal serviceable life of the Operational Systems shall be a minimum of five (5) years operation on board the Vessel. Evidence of a service life exceeding five years will be evaluated accordingly as well as that of future proofing the expected upgrade in technology.

(iii) The design, construction and installation of the Operational Systems shall be to a standard of engineering acceptable to COMMS.

(iv) The display digits in the Operational Systems control panels and displays shall be easily legible.

(v) To facilitate night time operations, Operational Systems control panels shall have a dimming function enabling the light emitted from the Operational Systems display to be regulated progressively.

(vi) All units, sub-assemblies, components and adjustable controls of the same type shall be both mechanically and electrically interchangeable without the need for changing connections or wiring. They shall be readily accessible for maintenance purposes.

(vii) Correct impedance matching shall be maintained at all interfaces between any items of any equipment (e.g. audio at 600 ohms or RF at 50 ohms).

(viii) Adequate testing points and other testing facilities, e.g. extension boards, testing probes, shall be provided to permit ease of maintenance.

(ix) Any equipment installed in an external position and exposed to the maritime environment shall have the level of IP protection appropriate to its function and position.

9.2.10 Appearance and Protective Finish

(a) Metal surfaces shall be either corrosion resistant or protected against corrosion for a period of at least three (3) years by high grade enamel painting, plating, galvanising, anodising, or any other suitable surface treatment.

(b) Any such protective layer shall be smooth, continuous, and free from blemishes and scratches.

9.2.11 Installation Standards

(a) All Operational Systems, except portable systems, shall be fixed firmly in place. Fastenings and supports shall support their loads with a safety factor of at least three (3).

(b) The Operational Systems shall be supplied with all auxiliary items required including but not limited to the following for normal operation:

(i) connectors;

(ii) circuit-breakers;

(iii) lightning arrestors/dissipators;

(iv) power sockets;

(v) plugs; and

(vi) cables.

(c) RF connectors (of suitable impedance) shall be provided and used for connecting the RF cables, antennae and radio equipment.

(d) All exposed connectors shall be protected by weatherproof material (e.g. 3M self-adhesive tape or equivalent) to prevent water ingress.

(e) Special attention shall be paid to the compass safe distance [Marine Guidance Note MGN 57 (M+F) and IMO Resolution A.694 (17)] of the ENE and the Radiation Hazard Zone of the radar scanner in the Vessel's design. Positioning of the Operational Systems and the associated accessories shall be planned carefully in respect of their relative distances to eliminate any chance of radio interference that might occur in service.

(f) Installation shall be to the highest standard to ensure:

(i) The relevant Merchant Shipping Notices ('M' Notices) published by the Department of Transport (London) in respect of setting and installing the compass, VHF radio and sounding devices are observed in the version as at the Contract Date unless the rules and regulations of RO specify that version of such rules and regulations as at the keel laying date of the Vessel shall apply in relation to the relevant requirements specified therein.

(ii) Satisfactory performance of the Operational Systems.

(iii) Protection from mechanical and water damage.

(iv) Ease of accessibility for maintenance and repair.

(v) Manufacturers' recommendations are followed strictly.

(vi) Precautions and measures shall be taken and adopted in the installation of the Operational Systems to ensure that the g-forces and vibration encountered by the Vessel travelling at high speed in rough seas will not affect the operation of any of the Operational Systems.

(vii) The installation in the external environment shall withstand the conditions stated in Paragraph 9.2.9(a)(i) of this Part VII.

(g) Adequate measures to prevent interference between the electronic equipment shall also be provided for receiving apparatus and other electronic equipment which may be affected by frequency induced voltage that shall include being earthed, screened and protected according to the rules, regulations and recommended practices regarding screening of electric wiring.

9.2.12 Cable Laying

(a) General Cable Requirements:

(i) All cables shall be rated and sized properly.

(ii) The signal cables shall be screened properly to reduce the cross-talk level as necessary.

(iii) All feeder cables shall be of one length, without joints, from antennae to the Equipment and from equipment to equipment, unless such joints are necessary under the specific installation conditions encountered or for ease of maintenance. All joints if provided shall be reliable and durable.

(b) Cables shall be laid in concealed cable trunks and trays inside consoles or other compartments or under the deck floor unless approved otherwise by the GNC and HKPF, with due consideration given to the ease of maintenance of the Vessel as a whole. Solutions adopted

shall not pose occupational safety and health risks such trip, snag or impact hazards to the Vessel's crew during operations.

(c) Watertight rubber grommets, insulated bushes or cable glands shall be used to protect the cables when passing through the metal covers of distribution boards, boxes, or any other metal work or exposed structure.

(d) The Contractor shall be responsible for the supply, installation and inter-connection of all cables and all related installation materials within the system, and the final connection between the power supply and any of the Operational Systems.

(e) Wires and cables shall be as short as practicable with sufficient slack:

(i) To enable parts to be removed and replaced during servicing without disconnecting other parts.

(ii) To facilitate field repairs of broken or cut wires.

(iii) To facilitate movement of the Equipment for maintenance purposes.

(f) All wiring terminations shall be finished in a neat and approved manner and shall be identified separately by a unique identification wiring code number.

9.2.13 Labelling and Marking

(a) All Operational Systems supplied shall carry the name, trademark or other means of identifying the manufacturer.

(b) Major Operational Systems units and sub-units shall carry a permanent label with serial numbers for identification purposes.

(c) All panels, sub-assemblies of the Operational Systems and internal and external cables shall be marked or labelled clearly with their own unique identification codes, in English, in a permanent manner so as to identify each individual function. Such labels shall be recorded and organised properly in a document and handed over to COMMS through the GNC prior to Delivery Acceptance.

(d) All switches, connectors, jacks or receptacles shall be marked clearly, logically and permanently during installation. All wires and cables shall be identified at every termination and connection point with permanent type markers.

(e) The DC circuit-breakers controlling the Equipment shall be labelled clearly.

9.2.14 Acceptance Test

(a) The acceptance tests for each Operational System shall comprise of three (3) parts: bench tests, Factory Acceptance Test (FAT) and on-site commissioning tests as follows:

(i) Bench tests shall be performed on the Operational Systems to demonstrate their technical compliance with the published specifications. The bench test, if not carried out in the HKSAR in the presence of COMMS representatives, may be accepted in the form of a test report from the original equipment manufacturer certifying that the tests have been conducted and passed satisfactorily before the Equipment left the factory.

(ii) The Contractor shall carry out the FAT in the presence of the GNC and HKPF representatives to demonstrate that each Operational System item individually and that all Operational Systems as a whole were installed properly and function as intended. If the Vessel is not constructed in the HKSAR, the Equipment FAT shall be conducted at the manufacturer's shipyard before the shipping of the Vessel to the HKSAR in accordance with the procedures specified at Paragraph 1.8.1(e) and (g) of this Part VII.

The on-site commissioning tests shall be carried out by the Contractor in Hong Kong, as part of Stage 2 and 3 of the Technical Acceptance, in the presence of the GNC and HKPF representatives after completion of installation of all Operational Systems. This includes any additional Operational Systems provided to the Contractor by the HKPF for installation as specified in Paragraph 9.29 of this Part VII.

(iii) The on-site commissioning tests shall include an inventory check, an NIR hazard test, an inspection of the installation of the Operational Systems and thorough technical,

functional and integration tests of individual Operational Systems and all Operational Systems together as a whole and a sea trial to verify that the Operational Systems have been commissioned properly and are ready to be put into service on the Vessel.

(b) The Contractor shall ensure and demonstrate, as part of the on-site commissioning tests, that the electric and magnetic fields as well as the power density radiated from all installed Operational Systems do not expose occupational personnel and members of the general public to radiation in excess of the limits contained in the 1988 IRPA Guidelines specified in Paragraph 9.2.2 of this Part VII. Prior to the issuance of the Acceptance Certificate, the Contractor shall provide a full written report stating that the installation of the ENE complies with the stated NIR safety standards.

(c) At least two (2) months prior to the bench tests, the FAT and the on-site commissioning tests, the Contractor shall submit details of the schedules and test procedures for all Operational Systems for approval by the HKPF. When all of the test procedures have been agreed by the HKPF, they shall be followed during the relevant tests. Any delay in the submission of these procedures may lead to a corresponding delay in their agreement and, hence, in the commissioning of the Equipment for which the Contractor will assume the financial liability.

9.2.15 Documentation

(a) At least six (6) weeks prior to Delivery Acceptance, for each individual item of equipment of the Operational System, the Contractor shall supply to COMMS, through GNC, three (3) paper copies of the operational manuals and maintenance manuals in English (at least one (1) original) and two (2) soft copies in DVD format. For the avoidance of doubt, these three (3) sets of operation and maintenance manuals are in addition to those required as part of the documentation for each Vessel. The manuals shall provide the information listed below:

(i) Description of the principle of operation.

(ii) Details of installation and setting up procedures.

(iii) Maintenance instructions including mechanical assembling and disassembling procedures.

(iv) Schematic diagrams and block diagrams with their respective descriptions.

(v) Fault finding and calibration procedures.

(b) Drawings showing the proposed design of conduit/trunking routes for the equipment installed on board, including future maintenance considerations shall be submitted to the GNC and COMMS for approval before installation.

(c) At Delivery Acceptance, the Contractor shall supply:

(i) Operational manuals and maintenance manuals specified in Paragraph 9.2.15(a) above (to have been supplied at least six (6) weeks prior to Delivery Acceptance).

(ii) Properly organised individual equipment testing results including details of test and calibration procedures.

(iii) On-site commissioning and sea trial reports of all equipment as witnessed by COMMS.

(iv) The initial parameter settings and readings of all equipment at the time of the on-site commissioning.

(v) "As installed" drawings showing the positions of all individual items of the equipment installed and the routing of the interconnecting cables between equipment.

(vi) A block diagram showing the interconnections between all equipment units complete with their technical protocols and the wiring schedule.

(vii) “As fitted” diagram showing the locations and positions of all circuit-breakers controlling the power to the equipment.

(viii) The completed NIR Report as required by Paragraph 9.2.14(b) of this Part VII.

(d) The documents specified at Paragraphs 9.2.15(a) to (c) of this Part VII and the training materials specified in Paragraph 14.1.8 of this Part VII shall be supplied in both paper copy and in DVD

format or other format acceptable to COMMS.

(e) The Contractor shall not use confidentiality as a reason for withholding the supply of relevant documentation as required by the GNC and HKPF.

9.2.16 Electronic Components/ Spares Parts/ Spare Units / Maintenance

(a) The Contractor shall commit to provide spare parts for the equipment for a period not less than five (5) years from the date of the successful commissioning of the last Vessel.

9.2.17 Warranty Services

(a) The Contractor shall provide a one (1) year free Warranty Period without any qualification for all Operational Systems with effect from the issue date of the Acceptance Certificate in respect of the Vessel on which the Operational System is fitted.

(b) The Contractor shall rectify any fault within seven (7) days of first being requested by COMMS in writing to do so. The Contractor shall extend the Warranty Period for any item of equipment constituting the Operational System which has broken down and required repair for a period equal to the period between the date of breakdown and the resumption of operation and service.

9.3 Integrated Navigation System

9.3.1 The Contractor shall supply and install an Integrated Navigation System (INS) to allow the Coxswain, Officer of the Watch (OOW), Operations/EOSS Operator, Communications/Navigation Officer, Engineering Officer and the Vessel Commander in the Wheelhouse and in the Vessel Commander's Cabin, to switch and view the screen(s) most appropriate to the given operation that they are carrying out. (The conceptual design of Wheelhouse layout can be referred to Figure 9.1 below.) The INS shall provide the Vessel operator(s) with a user interface to be used in normal operation providing access to all data or video supplied by the Operational Systems, unless otherwise stated. The INS shall consist of the following minimum specifications:

(a) Three (3) multifunction displays, of a size to be agreed by the HKPF, are to be located in the Wheelhouse, overhead and in view of the Coxswain and OOW, dedicated to display CCTV images of the exterior and interior of the Vessel for manoeuvring and security monitoring purposes respectively. They are to be positioned so they do not compromise the forward view out of the wheelhouse windows. The displays/ monitors shall have the following minimum specifications:

(i)	Native Resolution:	1280 x 1024 pixels or better
(ii)	Contrast ratio standard:	1000:1 (typical)
(iii)	Light Intensity Standard:	350cd/m² (typical)
(iv)	Viewing Angle Standard:	±85 ° (typical) (up/down/left/right)
(v)	Multi-touch screen:	Yes

(b) Three (3) 26" or larger IMO compliant multifunction displays, acceptable to the HKPF, located in the Wheelhouse Control Station for displaying Conning Information, ECDIS and Navigation Radar respectively, forward of the Coxswain and OOW seated position. The displays are to be fitted within a console which is to be angled such that the view on the display(s) is not compromised by glare. The displays/monitors shall have the following minimum specifications:

(i) Native Resolution: 1920 x 1080 (HD) pixels or better
(ii) Contrast ratio standard: 1500:1 (typical)
(iii) Light Intensity Standard: 300cd/m² (typical)
(iv) Viewing Angle Standard: ±88°(typical) (up/down/left/right)
(v) Max Colours: 16.7 million
(vi) Multi-touch screen: Yes

(c) One (1) 26" or larger multifunction display, acceptable to the HKPF, is to be located in the Wheelhouse Control Station forward of the Coxswain and OOW seated positions, to display a repeated image from the Marine Situational Awareness System (MARSAS) or the Electro Optical Sensor System (EOSS) specified in Paragraph 9.3.1(e) of this Part VII. The displays are to be fitted within a console which is to be angled such that the view on the display is not compromised by glare. The display/ monitor shall have the following minimum specifications:

(i) Native Resolution: 1920 x 1080 (HD) pixels or better
(ii) Contrast ratio standard: 1500:1 (typical)
(iii) Light Intensity Standard: 300cd/m² (typical)
(iv) Viewing Angle Standard: ±88°(typical) (up/down/left/right)
(v) Max Colours: 16.7 million
(vi) Multi-touch screen: Yes

(d) One (1) 26" or larger multifunction display, acceptable to the HKPF, is to be located in the Wheelhouse Control Station, forward of the Coxswain and OOW seated position, to display the Alarm and Monitoring System Information. The displays are to be fitted within a console which is to be angled such that the view on the display is not compromised by glare. The display/ monitor shall have the following minimum specifications:

(i) Native Resolution: 1920 x 1080 (HD) pixels or better
(ii) Contrast ratio standard: 1500:1 (typical)
(iii) Light Intensity Standard: 300cd/m² (typical)
(iv) Viewing Angle Standard: ±88°(typical) (up/down/left/right)
(v) Max Colours: 16.7 million
(vi) Multi-touch screen: Yes

(e) Two (2) 32" or larger multifunction displays, acceptable to the HKPF, are to be located at the Operations/EOSS Operator console. One of the displays shall be dedicated for operating the MARSAS and, the other display shall be for operating the EOSS and may be used as an extended display for MARSAS. The Contractor shall provide a video port from EOSS multifunction display for MARSAS terminal integration. The displays/ monitors shall have the following minimum specifications:

(i) Native Resolution: 3840 x 2160 (UHD, 4K) pixels or better
(ii) Contrast ratio standard: 1000:1 (typical)
(iii) Light Intensity Standard: 300cd/ m² (typical)
(iv) Viewing Angle Standard: ±89°(typical) (up/down/left/right)
(v) Max Colours: 16.7 million (RGB 8-bit)
(vi) Multi-touch screen: Yes

(f) One (1) 32" multifunction display, acceptable to the HKPF, is to be located at the Launch Commander's console. The Launch Commander's console shall provide a dedicated display of the High Performance radar, but the display shall also be able to switch among all displayed information of the multifunction displays as specified in Paragraph 9.3.1 of this Part VII. The display shall have the following:

(i) Native Resolution: 3840 x 2160 (UHD, 4K) pixels or better
(ii) Contrast ratio standard: 1000:1 (typical)
(iii) Light Intensity Standard: 300cd/ m² (typical)
(iv) Viewing Angle Standard: ±89°(typical) (up/down/left/right)
(v) Max Colours: 16.7 million (RGB 8-bit)
(vi) Multi-touch screen: Yes

(g) One (1) 32" IMO compliant multifunction display, acceptable to the HKPF, is to be located at the Communications/Navigation Officers Control Console. The Communications/ Navigation Officer shall be able to switch the video feed between all multifunction displays as specified in Paragraph 9.3.1 of this Part VII, but primarily it will view a second independent ECDIS. The display/monitor shall have the following minimum specifications:

(i) Native Resolution: 3840 x 2160 (UHD, 4K) pixels or better
(ii) Contrast ratio standard: 1000:1 (typical)
(iii) Light Intensity Standard: 300cd/ m² (typical)
(iv) Viewing Angle Standard: ±89°(typical) (up/down/left/right)
(v) Max Colours: 16.7 million (RGB 8-bit)
(vi) Multi-touch screen: Yes

(h) One (1) 32" multifunction display is to be located at the Wheelhouse Remote Engine Control Console. The engineer shall be able to switch the video feed between the conning page, control/alarm monitoring system and CCTV system. The display/monitor shall have the following minimum specifications:

(i) Native Resolution: 3840 x 2160 (UHD, 4K) pixels or better
(ii) Contrast ratio standard: 1000:1 (typical)
(iii) Light Intensity Standard: 300cd/ m² (typical)
(iv) Viewing Angle Standard: ±89°(typical) (up/down/left/right)
(v) Max Colours: 16.7 million (RGB 8-bit)
(vi) Multi-touch screen: Yes

(i) One (1) 55" multi-touch multifunction display, acceptable to the HKPF, that can be rotated from a horizontal table position to a vertical position for viewing is to be provided. When used as a table, the surface shall have a protective cover to enable it to be used as a conventional chart table. When used as a multifunctional display the operator shall be able to switch between all multifunction display video feeds as specified in Paragraph 9.3.1 of this Part VII. The display shall have the following minimum specifications:

(i) Native Resolution: 3840 x 2160 (UHD, 4K) pixels or better
(ii) Pixel Pitch (RGB): 0.315 (H) x 0.315 (V) millimetres
(iii) Contrast ratio standard: 4000:1 (typical)
(iv) Light Intensity Standard: 450cd/m² (typical)
(v) Viewing Angle Standard: ±89 °(typical) (up/down/left/right)
(vi) Max Colours: 16.7 million (RGB 8-bit)
(vii) Multi-touch screen: Yes

(j) One (1) 26" multifunction display, acceptable to the HKPF, is to be located at the Commander's cabin. The Vessel Commander shall be able to switch between all multifunction display video feeds as specified in Paragraph 9.3.1 of this Part VII to display repeated images from the MARSAS, ECDIS and Navigation. The location and fixing of the display shall be discussed in the kick-off meeting but should, ideally be located on the wall above the Commander's desk at head height (when seated at the desk) to permit easy viewing. The

display/monitor shall have the following minimum specifications:

(i) Native Resolution: 1920 x 1080 (HD) pixels or better

(ii) Contrast ratio standard: 1500:1 (typical)

(iii) Light Intensity Standard: 300cd/m² (typical)

(iv) Viewing Angle Standard: ±88 ° (typical) (up/down/left/right)

(v) Max Colours: 16.7 million

(vi) Multi-touch screen: Yes

9.3.2 The INS shall be so configured that it is possible to select the following modes of presentation on each of the multifunction displays as specified in Paragraph 9.3.1 of this Part VII:

(a) Radar - radar image only;

(b) Radar - radar image with chart image;

(c) Widescreen Radar – full screen radar with chart image for high performance radar;

(d) ECDIS- chart image only;

(e) ECDIS - chart image overlaid with radar image;

(f) Conning display; and

(g) Other system video images, including MARSAS, EOSS and CCTV.

9.3.3 The multifunction display shall have NMEA 0183 and /or NMEA 2000 interface ports capable of accepting navigational data from a wide selection of equipment including Differential Global Navigation Satellite System (DGNSS), Secure AIS (S-AIS), radars and satellite compass, gyro compass and, of providing data on all tracked targets in the form of a track table.

9.3.4 The Integrated Navigation System (INS) shall be connected by a dual path network(s) with all the ENE as listed in Paragraph 9.4.1 of Part VII so that the data and images generated from each such ENE can be shown on the display monitors of the INS. The ENE to be connected to the INS must include ECDIS, radars, S-AIS, DGNSS, satellite compass, echo sounder, CCTV, MARSAS, EOSS and all others as listed in Paragraph 9.4.1 of Part VII. The information and images can be shared and viewed on all displays as listed in paragraphs 9.3.1(a) to (j) of Part VII. The network(s) shall be dual path network(s) with redundancy incorporated so that no service interruption would occur in the event of any single failure in the network(s). Any necessary network security equipment including firewall, for network isolation from other onboard networks shall be provided and installed by the Contractor at no extra cost to the Government. The processing power of the network security equipment shall fit to the design. **[E]**

9.3.5 The INS shall have video switching functions so that the video images of all multifunction displays specified in Paragraph 9.3.1 of this Part VII can be selected and displayed on any of the other multifunction displays in the INS. The Contractor shall provide user friendly interfaces so that the operators can select video sources to any multifunction displays flexibly.

9.3.6 The video switching function of the INS shall be capable of receiving a minimum of sixteen (16) inputs and outputting to sixteen (16) displays/monitors. This is to be entirely configurable to the satisfaction of the HKPF.

9.3.7 The INS shall provide at least two (2) video input ports from the INS for extending MARSAS terminal videos to other display units within the vessel as specified in Paragraph 9.29.2(d)(x) of this Part VII.

9.3.8 All the INS multifunction displays specified in Paragraph 9.3.1 of this Part VII shall provide a direct feed to the Operational Systems input from which it is considered to be the primary display. Should there be a failure in the video switching system or INS, it shall be brought to the attention of the OOW, via an audible and visual alarm, and the INS displays shall return to their default primary function so the Vessel can continue normal operations.

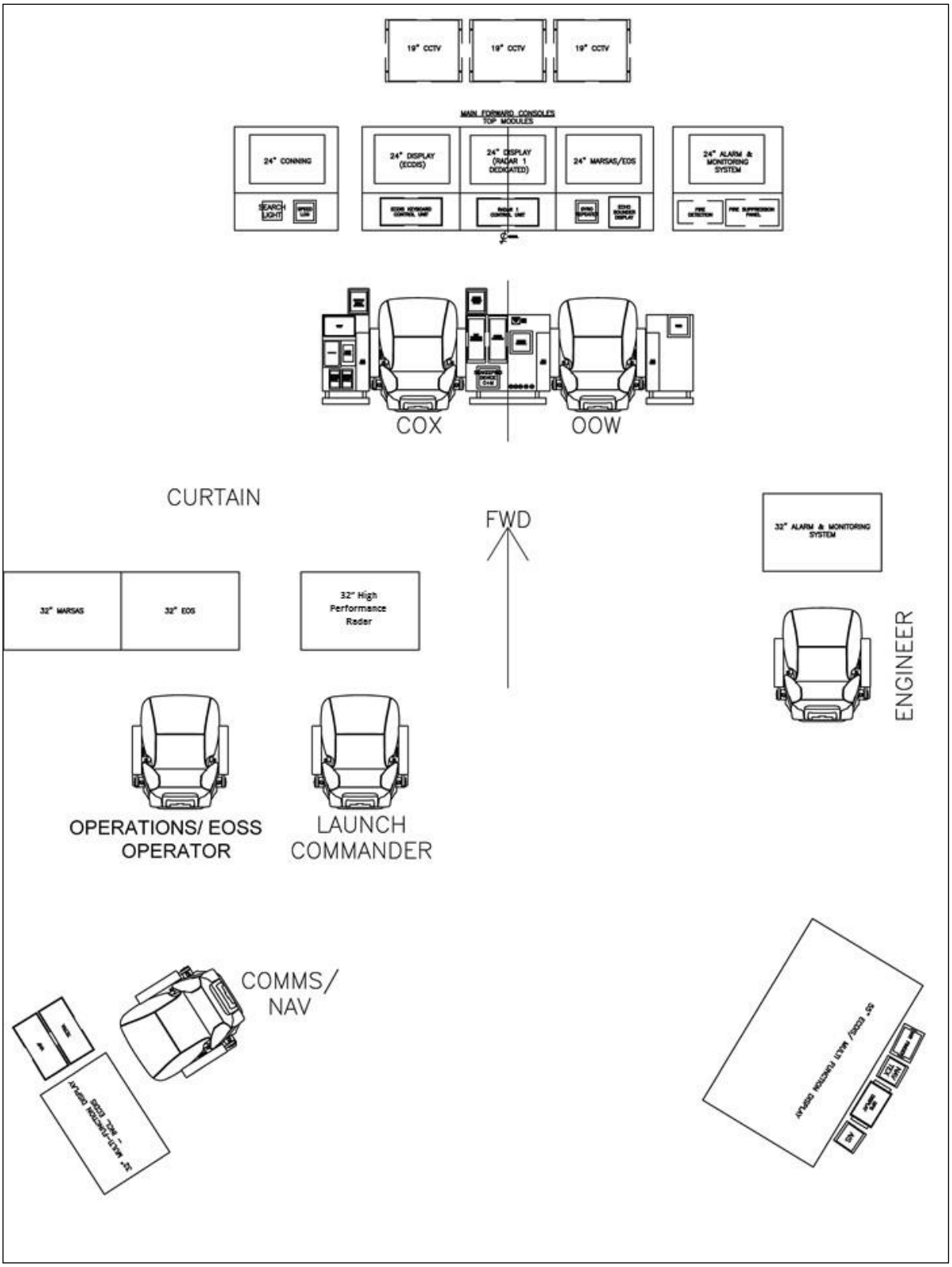


Figure 9.1 – Conceptual design of Wheelhouse layout

9.3.9 The INS shall support and allow HKPF to substitute any brand and model of Operational Systems equipment in the future.

9.3.10 It is preferable that the INS is an off-the-shelf product. Otherwise, the Contractor shall provide free services for defect rectification, upgrades and system enhancements during the Warranty Period.

9.3.11 The Contractor shall submit an INS detailed design proposal that includes schematic diagrams, equipment list, equipment specifications and functional description to HKPF for approval within three (3) months after the contract has been awarded. HKPF has the right to request the Contractor to provide demonstration with no extra cost to the Government. The purpose of the demonstration is to prove that the proposed INS complies with the functional requirements specified in Chapter 9.3. The demonstration can be provided in the form of a video recording.

9.4 Description of the Electronic Navigation Equipment

9.4.1 The 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 Electronic Navigation Equipment to be fitted onboard the Vessel and integrate with the INS:

(a) Loudhailer/Siren with USB or equivalent Player and Public Address System;
(b) Magnetic Compass;
(c) Gyro Compass System;
(d) Gyro Repeater;
(e) Satellite Compass;
(f) IMO Compliant Navigation Radar with ARPA;
(g) High Performance Radar;
(h) Differential Global Navigation Satellite System (DGNSS);
(i) Electronic Chart Display and Information System (ECDIS);
(j) Echo Sounder;
(k) Wind Speed/Direction Sensor;
(l) Secure Automatic Identification System (S-AIS) Transponder;
(m) Conning Data Collection and Information Display;
(n) Speed and Distance Through Water;
(o) Sound Reception System;
(p) International Maritime Mobile (IMM) VHF Radio with GMDSS;
(q) Marine Band Hand-held Waterproof Radio Transceiver;
(r) Government Mobile Data Equipment and Antennae;
(s) CCTV System;
(t) Voyage Data Recorder (VDR);
(u) Electro Optical Sensor System (EOSS).
(v) Wired and Wireless Intercom (Talkback) System;
(w) International Civil Aviation Organization (ICAO) air band receiver;
(x) Direction Finder; and
(y) Installation/Space/Cabling for the HKPF MRCS, MARSAS and SATCOM.

9.4.2 The Contractor shall provide all labour, material, transportation, installation calibration, testing and commissioning, Warranty Services during the Warranty Period and test Equipment, and anything else necessary to complete the work required in this chapter. References to 'Equipment' in this Chapter 9 of Part VII shall mean the above-mentioned Equipment in (a) to (y). References to "Electronic Navigation Equipment" or "ENE" throughout the Tender Documents or Contract shall mean each set of the abovementioned Equipment in (a) to (y).

9.4.3 All Equipment offered shall be designed for marine application and shall operate effectively under arduous conditions, for example: poor weather, strong winds, heavy rain, high humidity and severe vibration. Exposed components shall be weatherproof and adequately protected against water ingress

to protect all electronic Equipment fitted on board.

9.4.4 All components of each equipment exposed to the weather shall be suitably protected against the marine environment. Internal components shall be suitably protected against water/moisture ingress and incorporate sufficient heat dissipation mechanisms (e.g. ventilation, conduction) to protect the Equipment.

9.4.5 The Contractor, in the Vessel design, shall pay attention to the compass safe distance of the Equipment and the radiation hazard zone of the radar scanner. All radar and radio equipment shall be of a type approved by the Office of the Communications Authority of Hong Kong.

9.4.6 All siting, installation and cabling in respect of the compass, VHF, radar, and other appropriate Equipment shall comply with the relevant rules, regulations and Laws of Hong Kong.

9.4.7 All Systems and electrical appliances shall have a Hong Kong warranty with an on-site maintenance capability available.

9.4.8 When the generation/use of calendars is 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.

9.4.9 The circuit-breaker for the Operating Systems shall be equipped with a lockout device so that the breaker can be locked during maintenance of the Equipment.

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

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

9.5 Loudhailer/ Siren with USB or Equivalent Player and Public Address System

9.5.1 The Contractor shall supply and install a Loudhailer/Siren System for external broadcast with a Public Address System for on deck and internal broadcast within the Vessel. The systems shall be specially designed for maritime purposes.

9.5.2 The Loudhailer/Siren System shall comprise the following:

(a) a master control unit in the Wheelhouse and two (2) waterproof horn type loudspeakers, in conformance to IP65 or higher, located forward and aft of the Vessel;

(b) shall be capable of generating a 'Yelp' siren and a horn signal sound in manual mode;

(c) It shall also have a selection of at least four (4) warning signal sounds in automatic mode, at appropriate selectable time intervals, for general marine navigational use, namely:

(i) Under power, under way and making way;

(ii) Under power, under way and not making way;

(iii) Towing / restricted manoeuvring;

(iv) At anchor; and

(v) Others to be confirmed.

(d) The system shall incorporate at least four (4) police siren alarms namely "manual alarm", "wail alarm", "warble alarm" and "steady alarm".

(e) The system shall support MP3 and WAV audio file formats and shall allow changing siren alarm patterns by updating associated audio files.

(f) There shall be a volume control for the external broadcasting speakers, which shall be adjustable to full power for messages to be heard 0.5km away from the Vessel, down to a minimum level when issuing instructions to a vessel in close proximity.

(g) The master control unit, which shall include a fist microphone for delivering speech and a microphone hanger, shall be recessed and mounted in the Wheelhouse control console with the following facilities provided on the front panel:

(i) Power ON/OFF;

(ii) Hail volume control; and

(iii) Function control.

(h) The horn type loudspeaker shall be IP65 class or higher waterproof reflex type, 8 Ohms impedance with power rating not less than 30 Watts (actual rating shall match with amplifier).

(i) A USB or equivalent player shall be provided and integrated with the Loudhailer/Siren System in such a configuration that the audio signal from the USB or equivalent player can be broadcast through the Loudhailer/Siren System. The USB or equivalent player shall at least support MP3 and WAV audio file formats. The USB or equivalent player should be equipped with an SD card drive.

9.5.3 Public Address System

(a) The Contractor shall supply and install a Public Address System for providing a one-way internal voice broadcast within the Vessel and the on-deck crew from a Public Address System Control Panel installed in the Wheelhouse.

(b) The Public Address System Control Panel shall have selection buttons to make all zone or selected zone announcements, a push-to-talk button to activate the microphone, a siren button to generate an alarm (all zones), a gooseneck microphone and volume control.

(c) The Public Address System shall provide at least six (6) zone selections as well as all zones selection. The Contractor shall discuss and confirm the definition of each zone with HKPF during the kick-off meeting.

(d) The outdoor speakers shall be 15 Watt or more and at least IP66 class waterproofing. Indoor speakers shall compliant with the requirements of the 2000 HSC Code.

(e) The positions of the Public Address System Control Panel as well as the quantity and position of the speakers shall be proposed by the Contractor and finalized in the detailed design stage.

(f) All the indoor areas, rooms and outdoor areas shall be covered by the Public Address System.

9.6 Magnetic Compass

9.6.1 The Contractor shall supply and install one (1) magnetic compass (with a spare bowl) situated at the Wheelhouse Control Station at the main steering position. The compass shall be mounted in a gimbal device, in the deck head.

9.6.2 The compass shall have illumination from the primary and emergency power supply and shall be dimmable. The compass shall be provided with the required correcting device suitable for the Vessel.

9.6.3 The magnetic compass is to be supplied in accordance with the RO's requirements.

9.6.4 The magnetic compass shall be capable of operating without power supply.

9.6.5 The magnetic compass shall be adjustable, be properly calibrated in Hong Kong, and the Contractor shall supply a deviation card for the magnetic compass.

9.7 Gyro Compass System

9.7.1 The gyro compass system shall be type approved by the RO in accordance with the IMO 2000 HSC Code.

9.7.2 The gyro compass system shall be a fibre optic type with a settling time of less than 15 minutes.

9.7.3 The gyro compass system shall consist of a gyro compass, a control and display unit and a distribution unit.

9.7.4 The gyro compass system shall allow integration of additional sensors including magnetic compass, satellite compass, DGNSS, speed log and external rate-of-turn gyro. This is to provide a backup to

the gyro and during 'start-up'.

9.7.5 The gyro compass system shall be equipped with an automatic speed and latitude error correction suitable for the speed, motion and characteristics of the Vessel.

9.7.6 The gyro compass system shall be capable of connecting to other on-board navigation equipment, including but not limited to: radars, ECDIS, DGNSS, MARSAS and others through NMEA 0183 or 2000 interfaces.

9.7.7 Performance requirements of the gyro compass:

(a)	Reference:	Either magnetic north or true north.
(b)	Heading Accuracy:	±0.1°or better
(c)	Resolution:	0.1° or better
(d)	Start-up time:	15 minutes or below
(e)	Deviation Compensation:	Automatic
(f)	Operating Temperatures:	-10℃ to 55℃ or better
(g)	Waterproofing:	IP X5 or higher
(h)	Output port:	NMEA

9.7.8 The display unit shall be a colour TFT LCD and will display the gyro true heading, magnetic compass heading, speed, position in latitude and longitude, date and time and, alarms.

9.8 Gyro Repeater

9.8.1 A gyro repeater is to be fitted in the Wheelhouse, in a position acceptable to the GNC and HKPF, to allow sights to be taken. In addition, another gyro repeater is to be fitted in the Steering Gear Room at the emergency steering position. Each repeater is to have the following features:

(a) Actual versus command heading function;

(b) Choice of true or magnetic heading;

(c) Turn-rate indicator;

(d) Display unit; and

(e) Waterproof to IP65 or higher.

9.8.2 In order to assist an officer deployed to the emergency steering position, a rudder angle indicator is to be installed in accordance with the RO's requirements and acceptable to the HKPF.

9.9 Satellite Compass

9.9.1 The Contractor shall supply and install one complete satellite compass set. The satellite compass shall consist of at least a sensor unit and a multifunction digital display unit. The unit shall be compact and recessed in the console. The Contractor shall discuss and confirm the installation location of the multifunction digital display unit with HKPF during the kick-off meeting.

9.9.2 The satellite compass sensor unit shall be connected to the radars, ECDIS, MARSAS and other Equipment as necessary via a NMEA 0183 or NMEA 2000 standard interface.

9.9.3 The sensor unit shall incorporate two or more satellite receivers from at least two types of satellite positioning systems.

9.9.4 The satellite compass shall incorporate integrated 3-axis rate gyro and acceleration sensors to deliver fast start-up times and shall be capable of providing heading updates during temporary loss of satellite signals (i.e. during navigation under bridges).

9.9.5 Performance:

(a)	Reference:	Either Magnetic North or True North
(b)	Warm-up Time:	Less than one second

(c)	Accuracy:	+1.0° typical
(d)	Resolution:	0.1°
(e)	Deviation Compensation:	Automatic
(f)	Operating Temperatures:	Sensor unit: 0 °C to 50°C
(g)	Waterproofing:	Sensor unit: IPX5 or higher, multifunction digital display unit: IPX6 or higher

9.10 IMO Compliant Navigation Radar with ARPA

9.10.1 The Contractor shall supply a navigation radar compliant with the latest radar performance standards of IMO ("IMO compliant navigation radar") in the version as at the Contract Date unless the rule and regulations of the IMO specify that the version as at keel laying date of the Vessel shall apply. It shall be X-band and have an independent transceiver and scanner. The radar image is to be displayed on the displays/monitors detailed in Paragraph 9.3 of this Part VII.

9.10.2 General requirements of the navigation radar:

(a) The navigation radar equipment shall comprise of:

(i) One (1) antenna;

(ii) Masthead turning unit;

(iii) Transceiver;

(iv) Sensor interface unit;

(v) Control panel; and

(vi) Panel computer inclusive of security device software.

(b) The navigation radar shall be compliant with the IMO performance standard (IMO MSC.192(79)).

(c) The navigation radar operational range shall be equal to or greater than 0.125 to 48 nautical miles minimum.

(d) The navigation radar shall provide a clear display under normal sea and rain clutter at all ranges.

(e) The radar shall provide Asterix Category 240 radar video output with Ethernet interface. Otherwise, a convertor is to be provided so that the output can be converted to Asterix Category 240 for interfacing with MARSAS.

(f) The radar shall have an interface to incorporate all navigational data such as latitude/longitudinal position of the Vessel given by the DGNSS receiver, satellite compass, AIS, gyro compass and other Equipment.

(g) The Contractor shall ensure that the type and provisions of the radar are appropriate to the class of Vessel.

(h) The navigation radar shall be fitted with an Automatic Radar Plotting Aid (ARPA) which shall be capable of providing a minimum of 100 tracked targets. The radars shall provide data on any chosen target. All tracked targets shall support Closest Point of Approach (CPA) with target based and Time-based Closest Point of Approach (TCPA) features. The collision avoidance function shall be able to display 'no go areas' directly on to the radar screen.

(i) The radar shall allow the operator to set CPA (Closest Point of Approach) and TCPA (Time to Closest Point of Approach) parameters/limits to highlight targets, providing the operator with a full situational awareness picture to aid the tracking of fast targets in areas of high traffic.

(j) Targets shall be capable of being displayed in an intercept mode during pursuits.

(k) The navigation radar shall be capable of displaying up to 200 or above AIS targets with up to 20 or above active AIS targets.

(l) The navigation radar shall be capable of displaying charts without obscuring the radar image.

(m) The radar shall be capable of supporting both automatic and manual tracking.

(n) The navigation radar shall be capable of displaying targets with both True and Relative Motion vectors.

(o) Target information shall be capable of being communicated via NMEA 2000 (Ethernet) or NMEA0183 to the MARSAS, EOSS systems and search light.

(p) The transceiver shall be housed in a scanner unit and shall be designed for mounting aloft in a weatherproof housing and capable of withstanding high winds.

(q) The radar scanner unit shall be installed clear of any obstructions to minimize undue interference and Non-Ionizing Radiation (NIR hazards).

(r) The radar shall have an interface to incorporate and display AIS information such as vessel names, call signs, heading, destination, Maritime Mobile Service Identity (MMSI), latitude and longitude and other navigation data provided by the S-AIS.

(s) The Contractor shall pay special attention to any possible radar blind sectors and shall address this during the design stage and verify such after installation and rectification, if required. The Contactor shall pay special attention to the Equipment installed around the radar scanner including flood lights and/or horn speakers.

(t) The proposed navigation radar shall connect to an Ethernet switch and be capable of multicasting the radar video stream.

(u) The radar shall have standard NMEA 0183 and/or NMEA 2000 (Ethernet base) interface ports to receive navigational data from a wide selection of DGNSS receivers and electronic compasses, S-AIS and to output comprehensive data such as tracked targets in the form of a track table to be available for the ECDIS and MARSAS.

(v) The Equipment shall be powered from the 220V AC system of the Vessel.

(w) The radar shall be capable of setting acquisition zones where both visual and audible alarms or warnings are activated when other vessels enter the set zone(s).

(x) The radar shall be displayed on one or more of the INS displays/monitors as specified in Paragraph 9.3.1. It shall provide a clear and clutter free picture in all weather conditions and be suitable for bright daylight and night viewing. It shall clearly indicate important parameters such as radar targets, range marker, bearing line, heading marker, range rings, guard zones and background, and other necessary information.

(y) The navigation radar shall have at least the following operational controls/features:

(i) Operator selection of North Up, Head Up, Course Up;

(ii) True Motion (TM) and Relative Motion (RM) modes;

(iii) At least four (4) different brightness levels;

(iv) Information displaying Vessel's own latitude/longitude, position and speed;

(v) Trails;

(vi) Range rings;

(vii) At least two (2) Variable Range Markers (VRM);

(viii) At least two (2) Electronic Range and Bearing Lines (ERBL);

(ix) Manual and automatic rain and sea clutter suppression;

(x) Gain control;

(xi) Range up and down;

(xii) Target and own ship vectors;

(xiii) Centre picture, offset picture, maximum view ahead;

(xiv) Acknowledge alarm;

(xv) Panel brilliance;

(xvi) Target intercept – execute intercept manoeuvres between vessels;

(xvii) Immediate indication of fast-moving targets;

(xviii) Freeze Frame Facility – to allow the video picture to be frozen, for example, for use when own ship is on radio silence. The operator can activate this function or it can be imposed remotely via an external additional unit;

(xix) Helicopter Approach Sector - used as an aid to guide a helicopter on approach to a selected location;

(xx) Position Keeping - used to verify that vessels in a convoy are keeping to their correct position with respect to own ship;

(xxi) Drop line - used to define a line that is perpendicular to own ships heading. Any target moving away from own ship and crossing this line are automatically dropped;

(xxii) Navigation lines;

(xxiii) Electronic Cursor;

(xxiv) Track management; and

(xxv) Target identification - enables the desired on-screen target ID to be displayed by selecting the target information.

(z) On the viewing side of the display unit, the following controls shall be provided:

(i) Power ON/OFF;

(ii) Standby/Transmit;

(iii) Automatic adjustment of gain, sea and rain clutter to tune and clearly display targets;

(iv) True Motion display of the Vessel's movements relative to fixed targets;

(v) Bearing cursor rotation;

(vi) Electronic Bearing Line (EBL);

(vii) Variable Range Marker (VRM);

(viii) Range scale selection;

(ix) Display brilliance and illumination;

(x) Selection of background colour and target colour;

(xi) Tuning; and

(xii) Heading marker ON/OFF.

(aa) The navigation radar shall fulfil the following minimum performance requirements:

(i)	Reference:	Magnetic and True North
(ii)	Warm-up Time:	< 180 seconds
(iii)	Distance Accuracy:	<1% of the range scale in use or 25m whichever is the greater
(iv)	Bearing Accuracy:	<1°
(v)	Operational Maximum Wind Speed:	At least 100 knots
(vi)	Scanner Size:	≥2.4m (8 feet)
(vii)	Scanner Rotation:	28 rpm or 45 rpm
(viii)	Beam Width H/V:	≤1°/24°
(ix)	Transceiver Output Power:	25kW

(x)	Operating Temperatures:	external equipment –25℃ to +55℃, internal equipment: –15℃ to +55℃.
(xi)	Waterproofing	antenna/scanner unit: IP65 or higher

(bb) The OOW or other operators shall be capable of selecting the following modes of presentation at the radar display:

(i) Radar image only;

(ii) Plotter image only; or

(iii) Plotter image overlaid with radar image.

(cc) The navigation radar shall provide visualization and indication of conning data through an always visible section in the display.

9.11 High Performance Radar

9.11.1 The Contractor shall supply one X-band high performance radar with an independent transceiver and scanner. The high performance radar is to be displayed on the INS displays/monitors detailed in Paragraph 9.3 of this Part VII.

9.11.2 The high performance radar system shall be capable of detecting very small targets such as inflatable craft, high speed craft, buoys, wooden stakes and persons in the water in World Meteorological Organization (WMO) sea state 2 or less.

9.11.3 The high performance radar shall be capable of 360˚ fully automatic track acquisition.

9.11.4 The high performance radar shall consist of one X-band solid state radar consisting of the following minimum specifications:

(a) One (1) antenna;

(b) Turning unit with transceiver;

(c) Multi-beam solid-state transceiver with output power minimum 80W;

(d) Sensor interface unit;

(e) Control panel; and

(f) Panel computer inclusive of security device software.

9.11.5 The radar should provide Asterix category 240 video output with Ethernet interface. If not possible a convertor should be provided to convert the radar output to Asterix category 240 radar video for interfacing with MARSAS.

9.11.6 The high performance radar shall be capable of superior performance when compared with a standard navigation radar. In particular it shall:

(a) Provide a clear display even with severe sea and rain clutter at all standard ranges without missing small, elusive targets fully automatically.

(b) Operational range shall be equal to or greater than 0.125 to 48 nautical miles minimum.

(c) Auto-track function shall be able to acquire and track a minimum of five hundred (500) targets. The auto-track function must acquire and track all surface vessels fully automatically without any operator action. All tracks must be provided with instant vector changes as a result of a target changing course or speed above that provided by a normal ARPA radar. All tracks must be correlated with AIS.

(d) All tracks must be available as a track-table for external systems.

(e) All tracked targets shall support Closest Point of Approach (CPA) with target-based and Time-based Closest Point of Approach (TCPA) features.

(f) Be based on frequency modulated solid state transceiver technology and frequency diversity (multiple sub-frequency operation).

(g) The receiver must provide a dynamic range >100dB. The receiver minimum detectable signal must > 120dBm.

(h) The transmitter duty cycle must ≥20%.

(i) The radar must be able to detect the following small targets as a minimum:

(i) RCS of 2.5m^2 / 2-metre high / small 10-metre boat in sea state 5 and 16mm rain. Minimum Pd of 100% at 4NM or greater.

(ii) RCS of 10m^2 / 2-metre high / speedboat at high speed in sea state 2 and clear Minimum Pd of 100% > 6.5NM.

9.11.7 The high performance radar shall have at least the following operational controls/features:

(a) The high performance radar must be capable of operating as a multifunction display:

(i) Radar (IMO compliant);

(ii) Chart radar (IMO compliant);

(iii) ECDIS with radar overlay (IMO compliant);

(iv) Conning display; and

(v) Detection mode using the entire screen for the radar display.

(b) Operator selection of North Up, Head Up, Course Up;

(c) True Motion (TM) and Relative Motion (RM) modes;

(d) At least four (4) different brightness levels;

(e) Information displaying Vessel's own latitude/longitude, position and speed;

(f) Trails (none, short, medium, long and permanent);

(g) Range rings;

(h) At least two (2) Variable Range Markers (VRM);

(i) At least two (2) Electronic Range and Bearing Lines (ERBL);

(j) Gain control;

(k) Sector power and transmission control with a minimum 16 user programmable sectors. Each with variable power, full power or no transmission. Must be relative or true as selected by operator.

(l) Manual and automatic rain and sea clutter suppression;

(m) Range up and down;

(n) Radar video presentation

(i) In radar and Chart radar 8 levels according to the IMO radar performance standard; and

(ii) In Detection Mode the radar video must be displayed in 256 levels corresponding to the radar video return amplitude

(o) Target vectors;

(p) Target interception vectors - an operator is capable of planning and execution an interception from a selected origin, either own vessel or other selected vessel;

(q) Range units on radar in nautical miles;

(r) Position keeping - used to verify that vessels in a convoy are keeping to their correct position with respect to own vessel;

(s) Remote marker input - a remote marker input from an external system;

(t) Remote marker output - enables your cursor's position to be outputted to other nodes;

(u) Centre picture, offset picture, and max view ahead selections available;

(v) Acknowledge alarm; and

(w) Panel brilliance.

9.11.8 The high performance radar transceiver shall be of low radiation emission solid state type. It shall be designed for mounting externally and be capable of operating when subjected to vibration and relative wind speeds of up to 100 knots.

9.11.9 The high performance radar antenna/scanner shall be capable of operating when subjected to vibration and relative wind speeds of up to 100 knots.

9.11.10 The high performance radar antenna/scanner shall, as far as practicable, be installed well clear of any obstruction to minimise undue interference and NIR hazards.

9.11.11 The high performance radar shall be capable of being aligned with the heading of the Vessel.

9.11.12 The high performance radar shall fulfil the following performance requirements:

(a)	Reference:	Magnetic and True North
(b)	Distance Accuracy:	<1% of the range scale in use or 25m whichever is the greater
(c)	Cell size:	6m for 12 nautical mile range or better
(d)	Bearing Accuracy:	<1°
(e)	Operational Maximum Wind Speed:	> 100 knots
(f)	Scanner Size:	≥2.4m (8 feet)
(g)	Scanner Rotation:	28 rpm and 45 rpm
(h)	Beam Width H/V:	< 1°/24°
(i)	Transceiver Technology:	Solid State with frequency diversity (including 6 sub-frequencies providing 6 separate radar beams)
(j)	Transceiver Output Power:	≥ 80W
(k)	Digital radar video output protocol for external systems in Asterix category 240	
(l)	Operating Temperatures:	external equipment: –25℃ to +55℃, internal equipment: –15℃ to +55℃.
(m)	Waterproofing:	External equipment IP65 or higher

9.11.13 The high performance radar shall have an interface to incorporate all navigational data such as latitude/longitudinal position of the Vessel given by the DGNSS receiver.

9.11.14 The transceiver shall be housed in a scanner unit and shall be designed for aloft mounted installation and be capable of satisfactory operation in high wind speeds. The scanner assembly is to be housed in a weatherproof housing.

9.11.15 The high performance radar scanner unit shall be installed to ensure the scanner mounting does not result in excessive shadow sectors for navigational lights.

9.11.16 The radar scanner unit shall be installed clear of any obstructions to minimize undue interference and Non-Ionizing Radiation (NIR hazards).

9.11.17 The radar shall have an interface to incorporate and display AIS information such as vessel names, call signs, heading, destination, Maritime Mobile Service Identity (MMSI), latitude and longitude and other navigational data provided by the AIS.

9.11.18 The Contractor shall pay special attention to any possible radar blind sectors and shall address this during the design stage and verify such after installation and rectify, if required. The Contactor shall pay special attention to the Equipment installed around the radar scanner including flood lights and/or horn speakers.

9.11.19 The Contractor shall provide sufficient vertical and horizontal separation between the navigation radar scanner and the high performance radar scanner to facilitate maintenance works.

9.11.20 The radar shall have standard NMEA 0183 or NMEA 2000 (Ethernet base) interface ports, i.e. National Marine Electronics Association (NMEA) Standard, capable of accepting navigational data from a wide selection of DGNSS receivers and electronic compasses, AIS and to output comprehensive data on all tracked targets in the form of a track table to a wide selection of electronic chart plotters. The radar system shall have standard NMEA 0183 or NMEA 2000 (Ethernet base) interface ports to the other systems supplied under this Contract.

9.11.21 The Equipment shall be powered from the 220V AC system of the Vessel.

9.11.22 The high performance radar shall be displayed on one or more of the INS displays/monitors. It shall provide a clear and clutter free picture in all weather conditions and suitable for bright daylight and night viewing. It shall indicate clearly the important parameters such as radar targets, range marker, bearing line, heading marker, range rings, guard zones and other necessary information.

9.12 Differential Global Navigation Satellite System (DGNSS)

9.12.1 The Contractor shall supply and install a DGNSS which fulfils the following general requirements:

(a) The DGNSS shall integrate with radars, AIS, ECDIS, VDR and MARSAS to provide real time Vessel position and clock signal in the NMEA 0183 and NMEA 2000 format.

(b) The DGNSS shall consist of the following;

(i) 7" ultra-bright high contrast colour multi-function LCD display units. The Contractor shall discuss and confirm the installation location of the multi-function LCD display unit with HKPF during kick-off meeting;

(ii) Touch screen and/or keyboard;

(iii) DGNSS to be compatible with GPS and GLONASS satellite positioning systems;

(iv) DGNSS to have Receiver Autonomous Integrity Monitoring (RAIM) functionality to provide an alert when position accuracy is below user set limit.

(v) DGNSS to be displayed at the Wheelhouse Control Station and at the Navigation/Communications Console and anywhere else required by HKPF;

(vi) Automatic, manual or remote dimming;

(vii) Capable of integrating with AIS, radars, ECDIS, VDR, MARSAS and others;

(viii) The DGNSS antenna/receiver shall be connected to the radar for the provision of DGNSS related data, such as position fix, time, speed over ground and course over ground;

(ix) The DGNSS system shall be fully compatible with the radar;

(x) The DGNSS system shall support Serial NMEA 0183, Serial 26-pin D-sub, Serial 9-wire RS232, Serial 3-wire RS232 and Ethernet (NMEA 2000); and

(xi) The DGNSS shall support at least the following data displayed at the DGNSS multi-function LCD display units and through outputs to the INS;

1. Position (latitude/longitude): to at least four (4) decimal points
2. Horizontal Position accuracy (at speed of 15kt): less than or equal to 10m
3. Course: 1∘resolution
4. Speed: 0.1 knot or 0.1 km/hour resolutions with at least three (3) digits
5. Date and time: selectable as GMT or local mode
6. Satellite status information

9.12.2 The DGNSS's antenna and receiver shall fulfil the following minimum technical requirements:

(a)	Receiver Type:	8 or more channel parallel receiver
(b)	Receiving Frequency and Code:	1,575.42 MHz (C/A code)
(c)	Position Accuracy:	Within + or - 30 metres rms or better 95% of the time
(d)	Warm Start Time:	Less than 30 seconds
(e)	Ambient temperature:	0∘C to 55∘C or better
(f)	Waterproofing:	IPX7 or better
(g)	Correction:	IALA compliant Beacon RTCM SC-104

9.13 Electronic Chart Display and Information System (ECDIS)

9.13.1 Two (2) independent ECDIS systems located in the Wheelhouse Control Station and the Communications/Navigation Officer Control Console. The ECDIS shall be compliant to IMO performance standards (IMO MSC.232 (82)) in the version as at the Contract Date unless the standards specify that version of standard as at the keel laying date of the Vessel shall apply in relation to the relevant requirements specified therein. The ECDIS image shall be capable of being displayed through the INS on the 55" multi-touch display. The location of the primary display for each ECDIS is to be agreed prior to installation onboard the Vessel.

9.13.2 The ECDIS shall display the radars, S-AIS, DGNSS, depth of water indicated by the echo sounder and navigation information in one picture.

9.13.3 The ECDIS shall enable the operator to execute in a convenient and timely manner all route planning, route monitoring and positioning currently performed on paper charts. It should be capable of continuously plotting and displaying the ship's position.

9.13.4 General Requirements:

(a) ECDIS must be provided with the following functions:

(i) Navigational calculation;

(ii) Chart updating;

(iii) Piloting; and

(iv) Voyage monitoring.

(b) The ECDIS shall be equipped with detailed navigational sea charts covering the entire Hong Kong waters and surrounding areas.

(c) The ECDIS shall be capable of displaying information received from the S-AIS.

(d) The ECDIS shall be capable of interfacing with the radar, echo sounder, DGNSS and other Equipment attached to the INS.

(e) The ECDIS processor unit shall be capable of high-performance processing to enable rapid and responsive screen operations.

(f) The ECDIS display shall be capable of displaying radar information, radar tracked target information, S-AIS and other data layers as appropriate.

(g) The ECDIS shall provide appropriate alarms and indicators in respect of the information displayed as well as for providing Equipment malfunction alerts.

(h) The ECDIS shall be capable of loading and reading IHO S-57 (Version 3.1) electronic navigational chart (ENC) data files. The ECDIS shall also be capable of handling different chart formats e.g. both full and differential format versions of S-57 digital charts, SevenCs DirectENC charts, SevenCs Bathymetic ENCs, ARCS charts, VPF charts and others.

(i) The chart information used by the ECDIS shall be the latest edition at the delivery of the Vessel, which can be corrected by official updates (both full and differential format versions of S-57 digital charts, SevenCs DirectENC charts, SevenCs Bathymetic ENCs and others) produced by the Hong Kong MD with the capability of displaying updates on the ECDIS.

(j) The ECDIS shall be capable of displaying both English and traditional Chinese characters on the ENC. The ECDIS shall be capable of storing and replaying historical information for at least the preceding 12 hours.

9.13.5 Performance Requirement

(a) Navigational Features

(i) Total Waypoints: 2000 or more

(ii) Routes: 50 route plans or more

(iii) Alarm: including but not limited to, proximity alert, cross-track error, and arrival /anchor watch

(b) The ECDIS is to be fully compatible with the navigational radar and high performance radar allowing the seamless transfer of radar images, radar targets and all proximity alarms.

(c) The power supply shall be either 24V DC or 240V AC via an RO type approved UPS of an appropriate size.

(d) Environmental

(i) Operating Temperature: -10˚C to +50˚C

(ii) Storage Temperature: -20˚C to +60˚C

9.14 Echo Sounder

9.14.1 The Contractor shall supply and install an Echo Sounder System with the sonar unit securely installed on the body of the Vessel. The Echo Sounder shall be as follows:

(a) The Equipment shall consist of a transducer and a digital depth indictor front panel which is flushed mounted at the steering console and capable of displaying depth information in feet, fathoms and meters.

(b) The measured depth shall be between 0m and 5000m with at least three selectable ranges to indicate shallow, mid and deep ranges. The unit of measurement shall be selected at the front panel of the Equipment.

(c) Shallow water audible and visual alarms shall be provided when entering an area with a depth shallower than the pre-set depth, which should be selected on the front panel of the Equipment.

(d) The accuracy of depth readings shall be greater than + 5% of the full scale range.

(e) The peak to peak transmitting pulse power of the transducer shall not be less than 200 Watts and the nominal operating frequency shall be 200 kHz.

(f) There shall be an isolating switch to switch off the recorder in case of shortage of recording paper but the Equipment for sensing and indicating the depth shall still operate and function as in normal working condition.

(g) The transducer shall not interfere or be interfered with by other Equipment on the vessel.

(h) The echo sounder supplied shall be completely compatible with all systems using the NMEA 0183 or 2000 standard and be capable of interfacing through the INS with the navigational radar, high performance radar, multi-function displays, ECDIS, compass, DGPS and other Equipment as necessary. The echo sounder supplied shall be connected to the navigation radar display.

9.14.2 Echo sounder display shall be:

(a) 10.4” colour LCD with adjustable backlight and full dimming capability with day/night pre-sets;

(b) Either 24 V DC or 220-240V AC Power Supply;

(c) Provide data Output in NMEA 0183 and / or NMEA 2000 format;

(d) Provide output for external VGA;

(e) Provide output for printer; and

(f) Type approved in accordance with IMO Requirements.

9.15 Wind Speed/Direction Sensor

9.15.1 The Contractor shall provide and install a marine type solid state ultrasonic wind speed and vane direction sensor(s). The sensor(s) shall be of high accuracy, robust as well as compact and be mounted on the mast in an unobstructed location.

9.15.2 The sensor shall connect and provide data to the INS. The Contractor shall provide and install a digital display unit in the Wheelhouse to provide a digital display of true and apparent wind speeds and direction.

9.15.3 The sensor shall use the NMEA 0183 or NMEA 2000 standard interface to share information with other ENE included in the INS.

9.15.4 The wind speed sensor shall fulfil the following requirements:

(a) Range: 0-120 knots or above

(b) Accuracy: ± 2% (at 24 kts)

(c) Resolution: 0.01 knots

9.15.5 The wind direction sensor shall fulfil the following requirements:

(a) Range: 0-359º

(b) Accuracy: ± 3º

(c) Resolution: 0.1º

9.16 Secure Automatic Identification System (S-AIS) Transponder

9.16.1 General Requirements

(a) The Equipment shall receive information from AIS-equipped vessels.

(b) The Equipment shall be a Class A universal AIS complying with IMO MSC. 74(69) Annex 3, IEC 61993-2, ITU-R M.1371-3, ITU-R M.493-13, ITU-R M.825(DSC), IEC60945, IEC61162-1/2.

(c) The AIS transponder (receiver module) shall be capable of receiving AIS information from AIS equipped vessels including: 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 name, type of ship, call sign, length and beam, destination, latitude and longitude, location of position-fixing antenna on the ship), short safety-related messages and other navigational data.

(d) The AIS supplied shall be compatible with all systems using NMEA standard and be capable of interfacing with the navigation radar, high performance radar, multi-function displays, ECDIS, compass, and DGNSS and the INS.

(e) The AIS shall be capable of operating in at least three (3) modes, including but not limited to:

(i) Normal mode – function as a normal SOLAS Class A AIS broadcasting and receiving without encryption;

(ii) Secure mode – only encrypted AIS data will be broadcast, both encrypted and non-encrypted AIS messages will be received; and

(iii) Passive mode - no AIS will be broadcast, both encrypted and non-encrypted AIS messages will be received.

(f) It shall be possible to edit AIS message information relating to navigation and ship information.

(g) The S-AIS shall be capable of easily identifying other ship's status by providing electronic chart data.

(h) The S-AIS shall have a self-restoring function to enhance stability.

(i) The S-AIS shall have a user-friendly one touch keypad (or equivalent).

(j) Each set of S-AIS shall include:

(i) A display with minimum dimensions of 250mm x 130mm;
(ii) An AIS transponder unit;
(iii) A VHF antenna;
(iv) A GPS antenna; and
(v) Installation/operation handbook.

9.16.2 The AIS shall be capable of the following performance requirements:

(a) General Requirements

(i)	Power Supply	: 24V DC
(ii)	Default Frequencies:	
	AIS1 (CH 87B)	: 161.975MHz
	AIS2 (CH 88B)	: 162.025MHz
	DSC (CH70)	: 156.525MHz
(iii)	Frequency Range	: 155-163MHz
(iv)	Transponder Size/Weight (+2%)	: 237mm W x 79mm H x 170mm D, 1.7kg

(b) AIS Transmitter

(i)	Power Output:	12.5W or 1.0W (±1.5dB)

9.16.3 The S-AIS shall support cipher DES, AES and support cipher keys:

(a) up to 128 time limited keys;
(b) manual keys input; and
(c) external application input.

9.16.4 The S-AIS shall be equipped with internal GPS for time synchronisation and be connected the GPS system and Satellite Compass.

9.16.5 Each S-AIS shall be supplied with one (1) VHF Antenna of

(a) Frequency: 149-162.5MHz;
(b) VSWR: 1.5:1;
(c) Polarization: vertical;
(d) Max Power: 100W;
(e) Impedance: 50ohm; and
(f) Surge arrestor connecting to the lightning ground of the Boat

9.16.6 Each S-AIS shall be come with one (1) GPS Antenna with Antenna Element:

(a) Centre Frequency: 1575.42MHz;
(b) Output VSWR: <1.5:1;
(c) Polarization: Right Handed Circular Polarization; and
(d) Output Impedance: 50 ohm.

9.16.7 The GPS antenna shall come with a low noise amplifier with:

(a) Centre Frequency: 1575.42MHz;
(b) Power Gain 28 +/- 4.5dB;
(c) Band Width: at least 2MHz;
(d) Supply Voltages support 5V DC; and
(e) Output Impedance: 50 ohm.

9.17 Conning Data Collection and Information Display

9.17.1 The INS shall collect and display the following information at the Wheelhouse Control Station. The Conning Information screen should be adjusted to display the information desired by an operator whether it is one of the items listed below or all. Details will be discussed in the kick-off meeting.

(a) Vessel speed GPS and through the water;

(b) Distance travelled through the water;

(c) Vessel heading;

(d) Mode of Propulsion;

(e) Propeller RPM/Load;

(f) Rate of turn indicator;

(g) Rudder angle;

(h) Fuel consumption;

(i) CCTV; and

(j) Other information deemed necessary by HKPF, GNC or proposed by the Contractor.

9.18 Speed and Distance Through Water

9.18.1 A device shall be fitted to measure speed and distance through the water and be integrated with the INS for display at the Wheelhouse Control Station.

9.18.2 The speed and distance measuring device should be type approved by the RO.

9.18.3 A transducer is to be fitted to the hull, such that the system will operate without disturbance when the Vessel is operating at full speed in all sea conditions.

9.18.4 The transducer is to be located away from any sea water inlets or hull appendages so as not to disturb the flow of water across the transducer.

9.19 Sound Reception System

9.19.1 As the Wheelhouse is enclosed, a sound reception system shall be fitted to allow the OOW to hear sound signals made by other vessels, particularly when operating in restricted visibility.

9.19.2 Waterproof noise cancelling microphones are to be fitted fore and aft on the exterior superstructure of the Vessel.

9.19.3 Speakers are to be fitted inside the wheelhouse at the OOW's console. A volume control is to be provided to allow the OOW to adjust the noise level as appropriate.

9.20 International Maritime Mobile (IMM) VHF Radio with GMDSS

9.20.1 The Contractor shall supply two (2), console mounted International Maritime Mobile (IMM) VHF radios equipped with GMDSS functionality.

9.20.2 The positions of the two (2) IMM VHF radios are to be determined and agreed by the HKPF during the design of the Wheelhouse and in the mockup.

9.20.3 General Requirements:

(a) The IMM VHF radio shall be of a type approved by the Office of the Communications Authority of Hong Kong (OFCA).

(b) The radio shall be fully compatible with the Global Maritime Distress Safety System (GMDSS) with a Class A Digital Selective Calling (DSC) transceiver fully compliant with the International Maritime Organization (IMO) GMDSS carriage requirements.

(c) The radio shall be equipped with all the international maritime VHF channels with a fist microphone and press-to-talk switch or telephone handset, mic/handset hanger, mounting

bracket and loudspeaker.

(d) The radio shall have a dual watch mode selection switch, incorporating Channel 16 with any other selected channel.

(e) The following functions shall be available on the front panel of the radio:

(i) Power ON/OFF;

(ii) Transmit indicator, volume and squelch controls;

(iii) Socket for microphone and external speaker plugs;

(iv) Quick selector for Channel 16;

(v) Channel selector and indicator;

(vi) Independent dual watch mode selection switch; and

(vii) Transmission power selector for HIGH and LOW Power (25 W/ 1 W).

(f) The operating temperature range of the radio shall be -5°C to +55°C. The water ingress protection for the radio shall be IP X7 or higher.

(g) The radio shall include an exterior antenna, integrated microphone, loudspeaker, control knobs/keys, display screen and all connectors and accessories to provide the functionality required.

9.20.4 Performance Requirements:

(a) Transmitter Characteristics

(i)	Frequency Range:	156.000MHz to 157.425MHz, or wider
(ii)	Frequency Deviation:	Frequency modulation with maximum frequency deviation of +5 kHz
(iii)	Spurious and Harmonics:	-60dB or better
(iv)	RF Output Power:	Transmission power selector for: (a) High at five (5) watts nominal and (b) Low at one (1) watt nominal.

(b) Receiver Characteristics

(i)	Frequency Range:	156.000 MHz to 163.425 MHz or wider
(ii)	Sensitivity:	Less than -119dBm for 20 dB SINAD or equivalent
(iii)	Adjacent Channel Selectivity:	65dB or better
(iv)	Spurious Image Rejection:	65dB or better
(v)	Intermodulation:	65dB or better
(vi)	Audio Output:	At least 0.2 watt at rated output with less than 10% distortion.

(c) Aerial and Feeder

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

(ii) The V.S.W.R. of the aerial and cabling as 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 to protect the radio equipment. All outdoor connector joints shall be suitable for the marine environment (i.e., IP X5 or higher).

(d) Loudspeaker

(i) 6W or above.

9.21 Marine Band Hand-held Waterproof Radio Transceiver

9.21.1 General Requirements

(a) The Contractor shall provide four (4) GMDSS IMM VHF waterproof handheld transceivers.

(b) Each portable IMM VHF transceiver shall be of proprietary make and complete with two sets of rechargeable batteries, battery charger, helical antenna with V.S.W.R. not exceeding 1.5:1 and carrying case (with shoulder strap or belt clip).

(c) The operation period of each fully charged battery shall not be less than eight hours per charge (10% transmit, 10% receive, 80% stand-by). The charger shall be designed for 220V AC input power supply and equipped with a BS 1363 type 13A power plug.

(d) The portable transceiver shall, as a minimum, be capable of transmitting and receiving on all 55 International Maritime VHF channels, together with the private maritime VHF single frequency channels 96 (157.925MHz) and/or 99 (157.975MHz).

(e) The transceiver shall be of robust, waterproof, light weight design and made with shock proof material suitable for handheld radio communications both on the Vessel and ashore.

(f) The transceiver shall be fully solid state and of software programmable carrier frequency type. Add-on crystal for carrier frequency will not be acceptable.

(g) The unit shall be a type approved model accepted by OFCA for maritime frequency band application.

9.21.2 Performance Requirements

(a) The transceiver shall, as a minimum, incorporate the following controls/switches/functions:

(i) Power on/off button;

(ii) Volume control;

(iii) High/low transmitting power switch;

(iv) Press to talk switch;

(v) Built-in microphone and loudspeaker;

(vi) Channel selector operating channel display; and

(vii) Sockets for external microphone, press to talk and loudspeaker.

(b) The transceiver shall comply with the following:

(i) Operating frequency range: International Maritime VHF Band;

(ii) No. of Operating Channels: 99 (programmable);

(iii) Channel spacing: 25kHz; and

(iv) Housing IP Category: IP 57.

9.22 Government Mobile Data Equipment and Antennae

9.22.1 The Government Mobile Data Equipment and Antennae shall include the following equipment:

(a) Encrypted mobile router;

(b) Antennae; and

(c) Ethernet switch(es).

9.22.2 The encrypted mobile router shall meet the following specifications:

(a) Wide Area Network (WAN) Interface:

(i) 2 x Embedded 4G Frequency Division – Long Term Evolution (FD-LTE) Modem with

Multi-input Multi-output (MIMO) antennae;

(ii) 1 x Embedded 4G Time Division – Long Term Evolution (TD-LTE) Modem with MIMO antennae;

(FD-LTE Band: 2, 4, 5, 14, 17 and 27; TD-LTE Band: 38, 39, 40 and 41)

(iii) 1 x Embedded 4G TD-LTE Modem with MIMO antennae;

(TD-LTE with operating frequency band between 1.785 GHz to 1.805 GHz)

(iv) 1 x 10/100BaseTX Gigabit Ethernet; and

(v) 1 x 802.11a/b/g/n WAN interface with MIMO antennae.

(b) Ethernet interface:

(i) 8 x 10/100BaseTX Fixed port with Power over Ethernet capabilities compliance with Institute of Electrical and Electronics Engineers (IEEE) 802.3at class 4 standard; and

(ii) 1 x 802.11a/b/g/n interface with MIMO antennae.

(c) Requirement:

(i) Load Balancing

(ii) IPv4 and IPv6 support

(iii) USB or equivalent LTE/3G Modem support (3G Band: 1, 2, 4, 5 and 8)

(iv) WAN/Mobile Bandwidth Bonding which is compatible with the Multi-Wan Bonding router

(v) IPsec VPN

(vi) 256-bit AES Encryption

(vii) PPTP VPN Server

(viii) QoS for VoIP

(ix) Speed Fusion connections to existing HKPF router (Peplink380)

(d) Environmental:

(i) The mobile router specified at Paragraph 7.5.1(a) above shall be contained within a housing protected to IP67 or higher and securely locked to the Vessel. The whole housing shall be easily detachable for maintenance purposes

(ii) Operation temperature at least between -20℃ and +65℃

(iii) Humidity: 15% – 95% (non-condensing)

9.22.3 The Contractor shall provide six (6) pairs of weatherproof MIMO antennae as specified in Paragraphs 9.22.2(a) and 9.22.2(b) of this Part VII.

9.22.4 The weatherproof MIMO antennae for WAN interface as specified in Paragraphs 9.22.2(a) of this Part VII shall be installed in/on the mast. The Contractor shall provide and install cables as well as connect the cables to the antennae and encrypted mobile router.

9.22.5 The weatherproof MIMO antennae for Ethernet interface as specified in Paragraphs 9.22.2(b) of this Part VII shall be installed on the ceiling of Wheelhouse. The installation location of the MIMO antennae shall provide full WIFI coverage in the Wheelhouse. The Contractor shall provide and install cables, as well as connect the cables to the antennae and encrypted mobile router.

9.22.6 The Vessel's electronic equipment including the radar, DGNSS, S-AIS, electronic compass, MARSAS and ECDIS specified above and other systems as necessary, shall be connected to the Government data network by means of the encrypted mobile router specified at Paragraph 9.22.1(a) of this Part VII.

9.22.7 If there is a requirement to connect the Vessel's electronic systems to the Government data network specified at Paragraph 9.22.6 of this Part VII, exceeds the number of Ethernet connections specified at Paragraph 9.22.2(b) of this Part VII, the Contractor shall provide additional waterproof Ethernet

switches of the same specifications to meet the requirement.

9.22.8 The Contractor shall reserve three (3) 10/100BaseTX Fixed port with Power over Ethernet for future system use.

9.23 CCTV System

9.23.1 The Contractor shall supply and install a CCTV System to provide a 360° view of the exterior of the vessel to assist with navigation and in particular berthing of the vessel as well as the rear and front deck for view of operations being carried out at these locations. Interior views are to include the unmanned machinery spaces, the Weapons and Ammunition Store, the Pyrotechnic Store and the Wheelhouse.

(a) The locations of the CCTV cameras shall be determined with the HKPF either in the kick-off meeting after the Contract is awarded or during the design phase of the Vessel.

(b) Unless otherwise specified, all CCTV cameras shall comply with the following technical requirements:

(i) All cameras shall be IP based, high definition camera (1920 x 1080p), waterproof, vandal-resistant type, Infrared Cut Filter (ICR) day and night dome pan-tilt-zoom cameras. They shall be marine type and shall be suitable for operation in a rough sea environment.

(ii) All cameras shall have an image stabilization function to accommodate rough sea conditions.

(iii) All cameras shall be capable of covering diagonal views using wide angle lens or standard lens according to the actual condition.

(iv) All camera images shall be recorded within a Digital Video Recorder (DVR).

(v) The DVR shall have sufficient disk space to archive fourteen (14) days of video images from all cameras in high definition format at 30 frames per second.

(vi) CCTV images shall be displayed on relevant multi-function displays on the Wheelhouse Control Station and the INS. Exterior CCTV views of the port/starboard/ aft areas shall be permanently displayed on the overhead monitors. Interior CCTV images shall be displayed at the Engineering Officer's Console.

(vii) An Uninterruptible Power System (UPS) shall be designed, supplied and installed to sustain the operation of the CCTV system for a minimum of sixty (60) minutes.

(viii) The CCTV system shall be equipped with a control panel or virtual control panel, installed in the Wheelhouse to allow the operator to control the pan-tilt-zoom function of the selected camera. These requirements will be discussed further during the design phase.

(ix) The CCTV system shall be capable of providing an instant playback function from the video file recorded in the DVR.

(x) The CCTV system shall be provided with time from the DGNSS for clock synchronization, which will be displayed on the recorded images.

9.23.2 CCTV for general purpose:

(a) The CCTV system shall consist of at least thirty two (32) channels covering including but not limited to the following areas:

(i) At least two (2) cameras on the port side;

(ii) At least two (2) cameras on the starboard side;

(iii) At least one (1) camera facing aft for navigation purposes;

(iv) At least one (1) camera facing the helicopter winching area;

(v) At least one (1) camera facing the daughter boat LARS system;

(vi) At least one (1) camera facing forward to view operations on the bow;

(vii) At least two (2) cameras in the engine room;

(viii) At least one (1) camera in the bow thruster space;

(ix) At least one (1) camera in the steering gear room;

(x) At least one (1) camera in the wheelhouse;

(xi) At least one (1) camera in the Weapons and Ammunition Storeroom;

(xii) At least one (1) camera in the Pyrotechnics Storeroom;

(xiii) At least one (1) camera facing the entrances to the Weapons and Ammunition Storeroom and the Pyrotechnics Storeroom; and

(xiv) Cameras for other interior locations that will be discussed and confirmed with HKPF during the kick-off meeting.

The Contractor shall ensure that at least 95% of each area listed above is properly covered. If this is not possible, additional cameras are to be fitted to the satisfaction of the HKPF and GNC.

(b) A dedicated camera shall be installed in a location that best covers the area in front of the Vessel. This camera shall be a fixed camera with a wide field of view of at least 120° and with Infra-Red (IR) Light Emitted Diodes (LEDs) enabling operations to be conducted in poorly illuminated areas or weather conditions.

(c) The control and monitoring of the CCTV system shall be from the Wheelhouse.

9.24 Voyage Data Recorder (VDR)

9.24.1 A VDR meeting the specifications listed in IMO IEC 61996-1 shall be fitted to the Vessel for the purposes of post incident review.

9.24.2 The VDR shall satisfy the following performance requirements:

(a) Data collection unit (DCU)

(i)	Recording period	: 720 hours or better
(ii)	Recorded media	: Removable Solid State Drive
(iii)	Built in UPS	: Two (2) hours or above
(iv)	Number of audio interface input	: Ten (10) or above
(v)	Number of serial data input	: Twelve (12) or above
(vi)	Number of Ethernet data input	: Seven (7) or above
(vii)	Interface	: Support NMEA 0183 or NMEA 2000 (Ethernet base)
(viii)	Remote Alarm Display Panel	: 4.3 inches' colour LCD or better

9.24.3 The Contractor shall record all necessary items to VDR in accordance with the requirements of IMO IEC 61996-1 standard in the version as at the delivery of the Vessel unless the standard specify that version of such standard as at the keel laying date of the Vessel shall apply in relation to the relevant requirements specified therein and include at least the following:

(a) Bridge microphones;

(b) VHF;

(c) ECDIS;
(d) Navigation Radar;
(e) High performance radar;
(f) DGNSS;
(g) Gyro compass;
(h) Satellite compass;
(i) Echo sounder;
(j) Secure AIS;
(k) Wind sensor; and
(l) Speed log.

The Contractor shall provide a laptop computer with installed playback software for playing back the recorded files from the VDR. Extraction of data from the VDR shall be possible via USB or equivalent.

9.25 Electro Optical Sensor System (EOSS)

9.25.1 The EOSS System shall consist of the following key components:

(a) One (1) Daylight camera;
(b) One (1) cooled Thermal Imaging (TI) camera;
(c) Laser range finder (LRF); and
(d) Pan-tilt pedestal with stabilization (Pedestal) suitable for the daylight camera, cooled TI camera and LRF.

9.25.2 Display Unit, Central Equipment, UPS and Control Panel

(a) The EOSS shall be of maritime design and be suitable for use onboard the Vessel. All outdoor equipment shall have a protection rating of IP 56 or higher meeting the weather and environmental conditions expected at the operational locations. The EOSS shall be fully capable of operating in Beaufort Sea State 8 and withstanding, without damage, the effect from Beaufort Sea State 10.
(b) Each EOSS shall operate continuously with a minimum life expectancy of ten (10) years from the date of the EOSS acceptance.
(c) The EOSS shall be capable of operating in all the environmental conditions found in Hong Kong with the Contractor paying particular attention to the humid weather found during the spring, with seasonal fog and the tropical summer with frequent heavy rain. The Contractor shall refer to the information available from the Hong Kong Observatory.
(d) The Pedestal together with the cameras shall be capable of being fixed to the mast or roof of the Wheelhouse. The Contractor shall propose appropriate installation locations, either on the mast or the roof of the Wheelhouse for the Government representative's consideration during the implementation phase. The location of the EOSS shall take into account the position of the radars and not cause a blind spot in radar coverage.
(e) The EOSS shall be capable of providing both video and radar tracking in azimuth, selectable by the operator onboard. The Contractor shall be responsible for connecting and configuring the interface of the onboard radars.
(f) The EOSS shall be equipped with at least four (4) NMEA0183 and/or NMEA 2000 signal ports. The Contractor shall be responsible for connecting and configuring the ports with the DGNSS and gyro or electronic compass installed on the Vessel to enable the Vessel's position, heading and time information to be displayed and recorded on the EOSS images.
(g) The EOSS shall be equipped with one (1) Pelco-D standard control interface and one (1) ONVIF profile S standard control interface for MARSAS control purposes with such external control functions being capable of being enabled or disabled at the EOSS control panel.

(h) The EOSS shall be equipped with one (1) additional video interface using Internet Protocol-based H.264 for integration with MARSAS.

(i) The EOSS shall always have the Vessel heading and Pedestal bearing (both azimuth and elevation) shown on the display unit(s) incorporated into the INS.

(j) The EOSS shall be designed and proven for normal viewing and observation using the daylight camera and cooled TI camera unit, without the need for frequent or day-to-day manual cleaning of lenses and viewing devices of the Equipment mounted externally. In case any such cleaning is required, it shall be carried out mechanically and be activated at the control panel of the EOSS.

(k) In case desiccating facilities and air or gas filling are required, the frequency that desiccators need to be changed and / or the frequency that air or gas purging needs to be carried out, under the normal operating environment, shall not be more than once every two months. Change of desiccators and / or air or gas purging shall not require complicated tools or skills so that such activities can be completed within one (1) hour by a non-skilled operator.

(l) The EOSS shall be capable of selecting, at the control panel, the display of video to be derived from the cooled TI camera unit or daylight camera on the display unit. Switching of the video between the daylight camera and cooled TI camera unit shall take less than five (5) seconds.

(m) The EOSS shall have an emergency isolation switch (lockable by padlock and properly covered/protected to prevent inadvertent operation) located in the Wheelhouse to shut off the power supply, including isolating the power output of the uninterrupted power supply of the EOSS, for maintenance of the EOSS equipment or in the event of an emergency.

(n) Each EOSS shall conduct self-diagnosis either when the EOSS powers up or when activated by an operator at the control panel. The self-diagnosis result shall be shown on the display unit.

9.25.3 Daylight Camera

(a) The daylight camera shall be capable of recognizing a coastal craft of twelve (12) meters in length and three (3) meters in beam, from least seven (7) kilometres range under a visibility of ten (10) kilometres (the visibility shall follow the definitions given by the Hong Kong Observatory) based on the Johnson Criteria for determining detection and recognition ranges.

(b) The daylight camera shall have a narrow field of view of 2.3 degrees or less and wide field of view of at least thirty (30) times the narrow field of view.

(c) The daylight camera shall be able to zoom in or out continuously between the narrow and wide fields of view.

(d) The daylight camera shall have auto-defogging capability for providing clear video even under foggy or misty environmental conditions.

(e) The daylight camera shall have an auto-iris facility or quick response capability fit for various lighting conditions. The auto-iris operation shall not cause any degradation to the camera performance.

(f) The daylight camera shall not exhibit the characteristics of lagging, video retention, blooming, transfer smear or video distortion and shall have high resistance to magnetic flux.

(g) The daylight camera shall switch to black and white mode automatically under low light conditions.

(h) The daylight camera shall be mounted on the same Pedestal as the cooled TI camera unit and LRF. All power, control and video cables connecting the daylight camera with the Pedestal shall be in plug and socket arrangement for ease of future maintenance.

(i) The daylight camera shall include all necessary optical lenses that form an integral part of the EOSS.

(j) The daylight camera shall be of modular construction and the camera unit as well as casings shall be of removable type for ease of maintenance.

(k) The daylight camera shall meet the following technical requirements:

(i)	Image Sensor	: At least 1/3", Colour Operation
(ii)	Active Picture Elements	: At least 2 megapixels
(iii)	Horizontal Resolution	: At least 1,024 Lines
(iv)	Signal to noise ratio	: Higher than 50dB (weighted, AGC Off)
(v)	White balance	: Fixed or full-time automatic
(vi)	Automatic Gain Control	: 6dB minimum, on/off selectable
(vii)	Backlight compensation	: Auto adjust, on/off selectable
(viii)	Synchronization	: Line/generation lock
(ix)	Sensitivity	: Minimum 0.4 lux for colour operation

9.25.4 Cooled Thermal Imaging (TI) Camera Unit

(a) The cooled TI camera unit shall be capable of recognizing a coastal craft of twelve (12) meters length by three (3) meters beam, at least five (5) kilometres away and detecting a person in the water at least one (1) kilometre away under a visibility reading of ten (10) kilometres (the visibility shall follow the definitions given by the Hong Kong Observatory) based on the Johnson Criteria for determining detection and recognition ranges.

(b) The cooled TI camera unit shall be capable of focusing between infinity and thirty (30) meters or less in the narrow field of view, and between infinity and two (2) meters or less in the wide field of view. When focused at infinity, it shall be capable of compensating for possible changes of focus over the operating temperature range.

(c) The cooled TI camera unit shall provide both auto and manual foci, selectable by the operator, at the control panel with an auto focus time of less than three (3) seconds.

(d) The cooled TI camera unit's temperature window shall be able to produce a full video output over a temperature range of 0°C to 50°C or better with adjustable offset from 2 to 40°C or better.

(e) The cooled TI camera unit's average NETD per pixel shall be less than twenty (20) mK.

(f) The cooled TI camera unit's video signal shall display all pixels (at least 640 x 480) on the display unit and the EOSS shall be capable of recording video signals on the recorder.

(g) The cooled TI camera unit shall include all necessary optical lenses forming an integral part of the EOSS.

(h) The cooled TI camera unit shall be capable of operating twelve (12) hours per day, seven (7) days per week continuously, though on occasions it may be operating for twenty-four (24) hours per day.

(i) The cooled TI camera unit shall be a passive system incorporating a cooled type detector operating in the infrared band for detecting, recognizing and identifying a target through sensing its inherent thermal radiation under day or night conditions as well as in poor visibility.

(j) The cooled TI camera unit shall incorporate an integrated cooler with a life span of a minimum eleven thousand (11,000) operating hours. The EOSS shall be capable of indicating the accumulated operating hours of the current cooler of the cooled TI camera unit at the display unit.

(k) The cooled TI camera unit's detector, in the form of a focal plane array, shall have a resolution of not less than 640 x 480 pixels, a raw frame rate (frames per second) of fifty (50) or higher and operate in the three to five (3-5) micro-meter region.

(l) The cooled TI camera unit shall have a narrow optical field of view of 1.8 degrees x 1.6 degrees or smaller and a wide optical field of view of at least twenty (20) times the narrow optical field of view.

(m) The cooled TI camera unit shall be able to zoom in or out continuously between the narrow and wide fields of view.

(n) The ratio of the focal length to the useful aperture diameter of the lenses of the cooled TI

camera unit shall be four (4) or less under narrow field of view.

(o) The cooled TI camera unit shall incorporate self-diagnosis which will be initiated during powering up or can be activated by the operator at the control panel. The result of the diagnosis with the various internal statuses of the camera shall be shown on the display unit.

(p) The EOSS shall have a dedicated switch at the control panel (separate from the EOSS power switch) for powering the cooled TI camera unit on or off when the EOSS power switch is turned on. In case the cooled TI camera unit is powered off, all other components except the cooled TI camera unit, shall continue to operate.

(q) Stable and good quality cooled TI camera unit video shall be displayed at the display unit within eight (8) minutes of powering up the cooled TI camera unit.

(r) When the cooled TI camera unit video is selected, the EOSS shall be capable of displaying the video images on the display unit, continuously, in real time.

(s) The cooled TI camera unit shall comply with the latest version of United States Military Standard MILSTD-810 available in the market or its equivalent in terms of shock and vibration.

9.25.5 Laser Range Finder (LRF)

(a) The LRF shall be a laser module consisting of a laser transmitter, receiver and mechanical housing to be mounted on the pan-tilt stabilized pedestal.

(b) The LRF shall have range accuracy higher than five (5) meters for a target of size 2.5 meters x 2.5 meters positioned within six (6) kilometres.

(c) The LRF shall have a working range of up to eight (8) kilometres.

(d) The LRF shall be of an eye-safe type and comply with the IEC 60825-1 requirements.

(e) Distance shall be presented in nautical miles and meters within one (1) second on the display

9.25.6 Pan-Tilt Pedestal with Stabilization (Pedestal)

(a) The Pedestal shall be a platform which can rotate in both the azimuth and elevation directions and be fitted with purpose designed payload brackets to carry the TI and daylight cameras.

(b) The Pedestal's slew rate in both azimuth and elevation shall be higher than one hundred (100) degrees/second and the acceleration higher than one hundred and fifty (150) degrees/second without backlash.

(c) The Pedestal's azimuth travel limit shall not be less than three hundred and sixty (360) degrees and the elevation travel limit not less than thirty (30) degrees up and twenty (20) degrees down with stoppers to prevent any limit violations.

(d) The Pedestal shall have an electro-mechanical stabilizer of line of sight angular stabilization higher than 0.4mRad.

(e) The Pedestal shall have point accuracy in both azimuth and elevation higher than 0.1mRad.

(f) During operations, the pedestal shall maintain a visible fluctuation of less than 1/50 of both the vertical and horizontal sizes of the display unit under the narrow field of view of both the daylight and cooled TI camera units for a coastal craft (twelve (12) meters long by three (3) meters beam) at five (5) kilometres distance.

(g) The Pedestal's free drift shall be less than fifteen (15) degrees per hour.

(h) The EOSS shall have a 'Home' switch on the control panel. When activated by the operator, it shall lock the Pedestal in the horizontal and forward position with respect to the Vessel. In the 'Home' position, the operator shall be able to select video from either the TI or daylight camera to be shown at the display unit.

(i) The EOSS shall have a 'Stow' position in which the pedestal shall be locked in the stow position automatically when the EOSS is powered off. The stow position shall be a safe position which safeguards the Pedestal and cameras against strong winds and also safeguards both the daylight and cooled TI camera unit detectors from exposure to direct sunlight via the lenses.

(j) The Pedestal shall have the following modes selectable by the operator:

(i) Manual : Manual control of pan and tilt;

(ii) Stabilized : Stabilized against roll, pitch and yaw of the Vessel.

(k) The Pedestal's current pan and tilt angles shall be shown on the display unit.

9.25.7 Display Unit, Central Equipment, Uninterrupted Power Supply and Control Panel

(a) The central equipment, including the control panel, shall be located in the Wheelhouse where an operator will control and operate the EOSS. The control panel shall be fitted with necessary control buttons, joystick, indicators and displays, with ergonomic consideration as appropriate, to control the equipment mounted on the pedestal.

(b) The following functional switches / controls shall be available on the EOSS control panel for the operation of the EOSS:

(i) Power on/off switch for the EOSS with protection cover;

(ii) Power on/off for the cooled TI camera unit with protection cover;

(iii) Gain control for the cooled TI camera unit;

(iv) Offset Control for the cooled TI camera unit;

(v) Video polarity for the cooled TI camera unit;

(vi) Focus control for the cooled TI camera unit and daylight camera;

(vii) Button control for pan and tilt, in addition to joystick control;

(viii) Pan and tilt sensitivity control for the joystick;

(ix) Daylight camera mode switch (colour or black/white mode);

(x) Tracking control for video and radar tracking;

(xi) Stabilization on or off;

(xii) Pedestal 'Stow' control;

(xiii) Pedestal 'Home' control;

(xiv) Video recording and playback controls;

(xv) Main menu control;

(xvi) EOSS diagnosis button; and

(xvii) Joystick.

(c) The following functional switches and controls shall be available on the joystick of the EOSS control panel:

(i) Pan and tilt control;

(ii) Zoom control for the cooled TI camera and daylight camera;

(iii) Daylight camera or TI camera selector switch; and

(iv) Activation for the LRF.

(d) The display unit shall show a polygon display with the direction of the Vessel heading and the TI and daylight cameras. The polygon shall be displayed in North Up or Head Up mode as per the operator's selection.

(e) The display unit shall present the video from the daylight or cooled TI camera units on the screen simultaneously and shall be capable of presenting in picture-in-picture mode whereby the main window and a small window shall present the daylight and cooled TI camera unit respectively or vice-versa.

(f) The display unit shall present the following information, inter alia, on the screen:

(i) GPS position (latitude and longitude) of the Vessel;

(ii) GPS position of the target when the tracking function is on;

(iii) Elevation and zoom level of the TI and daylight cameras;

(iv) True bearing of the pedestal / bearing to observed target; and

(v) GPS derived local date and time.

(g) The uninterrupted power supply shall comply with the IEC 61000 and IEC 62040 standards. It shall be able to provide at least thirty (30) minutes backup power to the EOSS in case of mains failure.

9.25.8 Video Player and Recorder

(a) The video player and recorder shall be a high-quality player and recorder supporting at least H.264 compression suitable for installation onboard the Vessel.

(b) Performance requirements:

(i) The video player and recorder shall be self-contained with minimum controls and indicators for the following functions: RECORD, PLAY, STOP PAUSE, FAST FORWARD and REVERSE, and be such that it can be operated by personnel unskilled in video and audio recording.

(ii) The video player and recorder shall have an integrated solid-state drive hard disk with storage capability for at least three hundred (300) hours of video with a first-in-first-out overwriting function once the disk is full.

(iii) The video player and recorder shall have password protection and watermark data authentication security features.

(iv) The video player and recorder shall support resolution of at least 1280 x 1024 for the daylight camera, 640 x 480 for the cooled TI camera unit and a frame rate of thirty (30) frames per second or more.

(v) The video player and recorder shall be high-speed quick start type so that the hard disk can be ready for recording within one minute after the power is switched on.

(vi) The video player and recorder shall have high speed copying function for backing up videos from the hard disk to USB 2.0 or equivalent flash drive and SD card. This is to be discussed with and agreed by HKPF.

(vii) The recorded signal shall include the date and time, video and other information shown on the display unit. The recording shall be capable of being timed or activated as and when required.

(viii) The video player and recorder shall have the means for recording voice via a high-quality boom-type microphone provided by the Contractor onto a recorded video.

9.25.9 Video Tracking

(a) The EOSS shall have a video tracking function such that it shall control the Pedestal to track and follow a target of size one hundred and twenty (120) pixels or more (under any optical field of view) captured either by daylight or cooled TI camera unit and selected by an operator. The target shall be presented at the centre of the display unit.

(b) The EOSS shall track, follow and keep the target shown at the centre of the display unit continuously with the target not less than one (1) kilometre away from its own position and travelling at not more than ninety (90) knots relatively.

(c) To activate this function, the operator shall press the 'Video Track' button on the control panel and the EOSS shall respond by opening a separate track window on the display unit. The operator shall then use the joystick to control the track window to capture the target, confirm to the EOSS by pressing the 'Lock' button of the control panel and the EOSS shall respond with an indication on the control panel showing that it is in video tracking mode. To de-activate the tracking function, the operator shall press the 'Release' button on the control panel.

(d) In case the target is blocked by other objects after tracking commences, the EOSS shall be

capable of predicting the route of the target based on the track and speed before being blocked and lock onto the target again once the obstruction has passed.

9.25.10 Radar tracking for integration with MARSAS

(a) The EOSS shall have a radar tracking function which enables an operator to select any target from potential targets identified by either the detection or navigation radar and displayed on the display unit. A pull-down menu showing the radar tracks available is to be shown on the display, after selecting a target, the EOSS shall then track the target.

(b) The EOSS shall track through the NMEA 0183 and NMEA 2000 interfaces, follow and display at the vertical centre line of the display unit continuously any target not less than one (1) kilometre away relative to the Vessel, travelling at not more than ninety (90) knots. The operator shall adjust the tilt manually (i.e. elevation) to display the target in the centre of the display unit in elevation.

(c) A 'Radar Track' button on the control panel shall be provided for enabling the radar tracking function as specified in Paragraph (a). A 'Release' button of the control panel shall be provided for de-activating the radar tracking function. There shall be an indicator overlaid on the video footage on the display indicating that the radar track function is enabled.

9.25.11 The Contractor shall ensure that the EOSS can be directly shipped to and from Hong Kong and the supplier before and after maintenance and servicing. Otherwise, the EOSS is to be shipped from the supplier direct to and fitted in Hong Kong.

9.26 Wired and Wireless Intercom (Talkback) System

9.26.1 The Talkback System shall be robust, ergonomic and suitable for use in a maritime environment.

9.26.2 The Talkback System shall consist of the following components:

(a) The Talkback System shall be operating on 24V DC power or nominal AC Power, 220V±10%, 50Hz. The supplier shall be responsible for connecting the Talkback System to the 24V DC and 220V AC supply on the Vessel.

(b) The operator panel in the Wheelhouse shall be capable of initiating an intercommunication call to any talkback station. Each of the talkback stations shall be capable of initiating an intercommunication call to the operator panel in the Wheelhouse.

(c) One (1) gooseneck microphone shall be installed at the operator panel.

9.26.3 The Talkback System shall be capable of making a single call, a group call and a call to twenty (20) or more talkback stations. The locations of the operator panel and talkback stations shall be determined in the kick-off meeting or during the design phase after the Contract has been awarded.

9.26.4 The operator panel of the Talkback System shall include the following functions:

(a) Dimmable backlit panel;

(b) Buzzer indicating of incoming calls;

(c) Step volume control;

(d) Push-to-talk button; and

(e) Call signal button.

9.26.5 The talkback stations to be installed on the exterior or covered exterior of the vessel shall be IP 66 rated or higher and include a speaker of at least 10W or more.

9.26.6 The talkback stations to be installed internally shall include an indoor speaker that is suitable for use in a maritime environment.

9.26.7 Talkback stations shall be waterproof to IP 66 standard or higher and be installed in the following locations; talkback stations including speakers of 10W or more, associated with Combined Audible devices (Call Alert with Flashing Light & Ringer) and Portable Headsets for the use in noise areas (with 10 metres long cable, plug and headset holder).

9.26.8 The Talkback System shall also include a wireless talkback sub-system, comprising a waterproof

portable unit and handsets to connect with a wireless radio transceivers and antenna. The wireless talkback sub-system shall enable crew members on the main deck, who wear the portable unit, to make duplex communication calls with the talkback system operator in the Wheelhouse.

9.26.9 The Contractor shall install sufficient wireless talkback radio transceivers on the main deck to cover at least 99% on the main deck area.

9.26.10 The Contractor shall supply five (5) portable units including handsets with microphones, battery chargers for portable units and battery chargers for handsets in each Vessel.

9.26.11 The wireless talkback sub-system shall operate on the 1880MHz – 1900MHz Digital Enhanced Cordless Telecommunication (DECT) frequency band or other radio frequency band acceptable to both OFCA and the HKPF.

9.26.12 The wireless talkback sub-system shall not interfere with the TETRA radio system of the HKPF.

9.27 Direction Finder

9.27.1 The Contractor shall provide and install a direction finder and display unit in the Wheelhouse for search and rescue missions. The direction finder shall be a universal multi-band direction finder operating on four (4) frequency bands and automatically monitoring both civilian bands (121.5MHz, channel 16) and military emergency frequencies (243MHz).

9.27.2 The direction finder shall:

(a) support VHF aviation and marine band, UHF aviation band and Cospas-Sarsat frequencies;

(b) be able to automatically monitor emergency frequencies whilst other frequency bands are being monitored;

(c) incorporate with satellite and DGNSS via NMEA 0183 /2000 providing relative bearing and true bearing;

(d) provide normal mode and standby mode; and

(e) the display unit shall be 320 x 240 pixel resolution with max brightness of approximately 450 cd/m^2.

9.27.3 The Contractor shall provide and install the direction finder antenna unit at the appropriate location on the mast. All associated cables shall be provided and installed end-to-end from the antenna to the direction finder.

9.28 International Civil Aviation Organization (ICAO) Airband Receiver

9.28.1 The Contractor shall provide and install an International Civil Aviation Organization (ICAO) airband receiver in the Wheelhouse for receiving and broadcasting voice messages from airports/aircraft.

9.28.2 The ICAO receiver shall provide buttons to allow operators to search and select channels and shall be equipped with speakers to broadcast the received voice messages in the Wheelhouse.

9.28.3 The antenna shall be installed on the mast in a location free from interference caused by other antenna for receiving broadcast voice messages from airports/aircraft.

9.28.4 The ICAO receiver shall satisfy the following requirements:

(a)	Frequency coverage	: 118-137MHz
(b)	Mode	: AM
(c)	Usable temperature range	: -8°C to +50°C
(d)	Power supply	: 12V DC

9.29 Installation/Space/Cabling for the HKPF MRCS, MARSAS and SATCOM

9.29.1 The Contractor shall, at no cost to the Government, install onto each Vessel two (2) HKPF Marine Radio Communications Systems (MRCS).

(a) The present equipment includes the EADS TETRA TMR880i mobile radio with separate control panel and speaker box. The TMR880i is a wide-band version with a frequency range of 380 MHz to 430 MHz. The radio is powered by a +12V DC nominal supply. The HKPF reserves the right to use other radios in place of the present TMR880i, provided that the Government notifies the Contractor at least three months in advance of the on-site installation of the MRCS Radio. No additional costs associated with the installation of a radio of a different type shall be chargeable to the Government.

(b) The Contractor shall

(i) reserve sufficient space for the installation of the MRCS radios;

(ii) supply and install all RF signal, power and grounding cables and wires. COMMS will provide the specifications of all the RF cables and connectors to the Contractor;

(iii) supply and install all power converters and power supply terminals necessary for the MRCS radios installation; and

(iv) supply and install two (2) UHF antennae, one (1) each for the MRCS radios. The UHF antennae shall have an impedance of 50 ohms, unity gain and a frequency range of 380 MHz to 470 MHz at a VSWR of 1.5 or less. The Contractor shall provide and install suitable co-axial cable surge suppressors to these UHF antennae to protect the radio equipment from lightning surges.

9.29.2 The Contractor shall facilitate the installation by the HKPF Marine Situational Awareness System (MARSAS) Contractor of one (1) set of on-board MARSAS equipment to be interfaced with the INS, where approved and displayed on the multi-function displays in the Wheelhouse. The conceptual system interface diagram between the Vessel and MARSAS (see Figure 9.2 below) illustrates the system integration.

(a) The on-board MARSAS equipment shall include, but not be limited to, Local Processing Unit (LPU), radar signal converter, NMEA Converters, video encoders and batteries. The MARSAS terminal shall include a maritime Vessel Workstation, keyboard, mouse and speakers.

(b) The on-board MARSAS equipment shall be installed in equipment racks in the Server Room specified in Paragraph 4.9 of this Part VII. The MARSAS terminal and associated equipment shall be installed in the Wheelhouse at the Operations/EOSS Operator's console.

(c) The on-board MARSAS equipment, including the MARSAS terminal, will be powered by 200 to 240V AC and / or 24V DC.

(d) The Contractor shall:

(i) Coordinate and finalize the positions of the on-board MARSAS equipment including the MARSAS terminal during the detailed system design stage;

(ii) Supply at least one (1) equipment rack in the Server Room as specified in Paragraph 4.9.2 of this Part VII for the installation of the MARSAS equipment and reserve sufficient space in the Wheelhouse for the installation and integration of the MARSAS terminal;

(iii) Supply and install all power, grounding and data cables. COMMS will provide the specifications of all the cables and connectors to the Contractor;

(iv) Supply and install all power converters and power supply terminals necessary for the on-board MARSAS equipment and MARSAS terminal installation;

(v) Ensure that all the cable trunks shall be accessible and allow unimpeded access for the HKPF MARSAS Contractor to install cables as necessary;

(vi) Provide an Asterix Category 240 Ethernet interface for the radar as specified in Paragraph 9.10.2(e) and Paragraph 9.11.5 of this Part VII and provide an interface from radars that provide MARSAS with radar video signal, trigger, azimuth count pulse and azimuth reset pulse from the radars;

(vii) Provide navigational information, including but not limited to DGNSS, satellite compass

and AIS in NMEA 0183 and / or NMEA 2000 (Ethernet base) interfaces;

(viii) Provide one (1) Pelco-D standard control interface and/or one (1) ONVIF profile S standard control interface from the EOSS as specified in Paragraph 9.25.2(g) of this Part VII for MARSAS to control the EOSS;

(ix) Provide one (1) Ethernet interface from the EOSS for both the daylight camera video and TI camera video;

(x) Provide two (2) video input ports from the INS for extending MARSAS terminal videos to other display units within the vessel;

(xi) Provide one (1) video input port in MARSAS display unit and EOSS display unit as specified in Paragraph 9.3.1(e) for MARSAS terminal video direct connection to these two (2) display units;

(xii) Ensure that the MARSAS display unit and EOSS display unit can be displayed on all multi-function displays in the Wheelhouse via the INS;

(xiii) Provide one (1) 10/100BaseTX Fixed port from the encrypted mobile router as specified in Paragraph 9.22.1(a) of this Part VII. The location of this Ethernet port shall be located in the MARSAS equipment rack in the Server Room;

(xiv) Other than the mouse and keyboard of the MARSAS terminal, provide one (1) USB or equivalent female type socket flush-mounted with cover on the MARSAS console including extension cable with male type plug for connection to the MARSAS terminal. The cable length shall be sufficient to connect to the MARSAS terminal;

(xv) Provide one (1) pair of speakers flush-mounted on the MARSAS console including power and extension cable with one (1) male type 3.5mm audio port for connection to the MARSAS terminal. The cable length shall be sufficient to connect to the MARSAS terminal;

(xvi) Provide one (1) Cat-6 Ethernet cable terminating at an RJ-45 male connector from the MARSAS equipment rack in the Server Room to the MARSAS terminal in the Wheelhouse; and

(xvii) All interface ports as specified in Paragraph 9.29.2(d)(vi) to (ix) and (xiii) of this Part VII shall be installed into the MARSAS equipment rack in the Server Room as specified in Paragraph 9.29.2(b) of this Part VII. The signals drawn from these interface ports for the MARSAS shall not affect the normal operation of the corresponding Command and Control System.

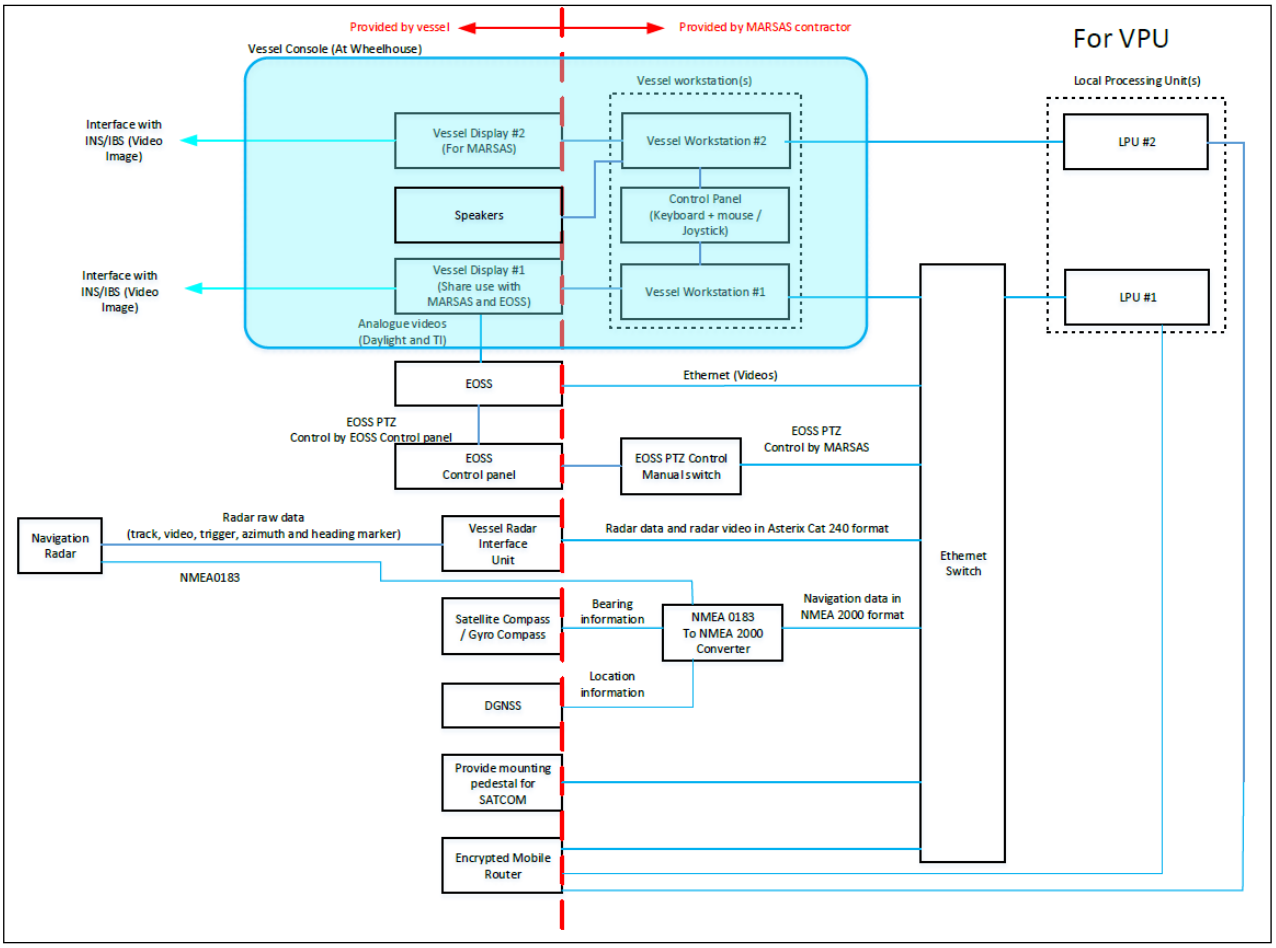


Figure 9.2 - Conceptual system interface diagram between vessel and MARSAS

9.29.3 The Contractor shall facilitate the HKPF Satellite Communications (SATCOM) Contractor in the installation of one (1) set of SATCOM equipment and interface it with the encrypted mobile router specified in Paragraph 9.22.1(a) of this Part VII as an additional communications bearer for communications from the Vessel to shore.

(a) The SATCOM equipment shall be installed in an equipment rack in the Server Room specified in Paragraph 4.9 of this Part VII. The SATCOM antenna shall be fitted on board the Vessel, either on the Wheelhouse roof or mast.

(b) The SATCOM equipment, including the MARSAS terminal, is powered by 200 to 240V AC or 24V DC.

(c) The Contractor shall:

(i) Coordinate and finalize the positions of the SATCOM equipment during the detailed system design stage;

(ii) Supply sufficient equipment racking, as specified in Paragraph 4.9.2 of this Part VII, for the installation of the SATCOM equipment;

(iii) Supply a mounting pedestal of sufficient structural strength to be fitted to the Wheelhouse roof or mast for the mounting of a SATCOM antenna dome of a diameter up to one (1) meter. The SATCOM pedestal is to be mounted such that no obstruction is caused to the beams of both the navigation radar and high performance radar. The SATCOM pedestal shall also be mounted in such a position that there are no obstructions within ten (10) degrees of the SATCOM field of view.

(iv) Supply and install all power, grounding and data cables. HKPF will provide the specifications of all the cables and connectors to the Contractor during the detailed system design stage;

(v) Supply and install three (3) LMR600 cables or equivalent and one (1) 3-core 2.5mm power cable from the Server Room to the SATCOM pedestal;

(vi) Supply and install all power converters and power supply terminals necessary for the SATCOM equipment installation;

(vii) Ensure all the cable trunks are accessible and allow the HKPF SATCOM Contractor to install cables as necessary; and

(viii) Provide one (1) 10/100BaseTX Fixed port from the encrypted mobile router as specified in Paragraph 9.22.1(a) of this Part VII for integration with the SATCOM.

(d) The HKPF has the right to change the model of the SATCOM equipment and SATCOM equipment installation requirements as specified in Paragraph 9.29.3 of this Part VII before the detailed system design is finalised with no additional cost to the Government.

Chapter 10 External Fire-Fighting System (EFFS)

10.1 General Requirements

10.1.1 The EFFS shall be designed solely for marine fire-fighting operations.

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

10.1.3 The design and installation of the external fire-fighting system (Fi-fi system) shall follow the RO Requirements.

10.1.4 At the Technical Acceptance, the Contractor shall demonstrate the design of the fire-fighting system, arrangements and equipment are suitable for fighting fire at sea to the satisfaction of HKPF and GNC.

10.1.5 The EFFS shall meet the following requirements:

(a) The water shall be piped through the main deck via a RO approved deck connection to one (1) fixed remote fire-fighting monitor.

(b) The fire main pipe shall be constructed of marine grade stainless-steel (316L) suitable for stagnant/low flow sea water with Molybdenum (Mo) content not less than 2.5% or equivalent material accepted by HKPF and GNC.

(c) One fixed remote water monitor, having a minimum capacity of 360 m3 per hour at 4-16 bar providing jet and fog patterns, shall be installed as part of the external fire-fighting system on the Vessel ("EFFS"). The monitor shall be fitted on the foredeck and be remotely controlled from the Wheelhouse. **[E]**

(d) The EFFS shall be capable of throwing water not less than 70m in a jet pattern at the maximum pressure. **[E]**

(e) The fire pump of EFFS shall be dedicated and independent from other systems. **[E]**

(f) The fire pump of EFFS shall be electrically driven whilst complying with the following: **[E]**

(i) avoiding a sudden build-up of water pressure (water hammering); and

(ii) avoiding a sudden impact upon the electrical system.

10.2 The Electrical Fire Pump

10.2.1 The fire pump shall have self-priming function.

10.2.2 The fire pump and its associated equipment are to be located in a compartment underneath the fore deck and close to fire monitor as practical as possible. This is to shorten the high pressure discharge pipeline routing through the internal compartments for the sake of safety and watertight integrity, and perfectly in the Bow Thruster Room.

10.2.3 The fire pump shall be driven by a Permanent Magnetic Motor (PM Motor) equipped with a variable speed control, so as to achieve a Soft Start process in order to prevent a sudden impact upon the Power Station onboard.

10.2.4 The compartment with the pump shall be adequately ventilated to carry the heat generated by the components, such as motor, variable frequency drive (VFD), starter panel and other associated parts, away so as to ensure the environmental conditions within the compartment remain similar to the ambient conditions outside the compartment.

10.2.5 The ventilation arrangement of the compartment shall ensure that dampness and condensation do not accumulate and specifically not to lower the insulation resistance of the electrical fire pump motor.

10.2.6 It should be noted that crew will normally work in this compartment and so the ventilation arrangement is to meet the requirements of the RO, GNC and HKPF with regard to crew safety.

10.2.7 The Variable Frequency Drive (VFD) and the system protection shall be the same as Paragraphs 7.11.6 and 7.11.7 of this Part VII.

10.3 Sea Connections and Sea Chest

10.3.1 Sea connection and the sea chest are to be designed and arranged so as to provide an adequate and uniform supply of water, which shall not be interfered by movements of the ship or water flow set up by thrusters and propellers.

10.3.2 The sea suction inlet shall be arranged as low as practicable in the Vessel in order to have the maximum net positive suction head. Irrespective of this, a priming device capable of being automatically operated and disengaged after the system has been sufficiently primed shall also be provided. The priming pump shall be capable of being manually isolated when required. Details shall be discussed in the Kick-off meeting.

10.3.3 The suction pipe line shall be designed so as to avoid cavitation.

10.3.4 The suction arrangement for the pump shall include one dedicated sea chest which shall not be used for any other purpose. The sea chest shall be located in a position, which shall avoid clogging by debris or oil intake from the sea, and more importantly to ensure the functionality of the Air Lock with the pitching and rolling movements of the vessel that will be experienced during daily deployment being taken into consideration. The sea chest opening is to be equipped with strum plates, which have a free sectional area equal to twice the free section of the seawater intake pipe as a minimum. An isolating valve shall be fitted between the sea chest outlet and the suction of the pump. An air vent is to be fitted at the upmost location of the sea chest casing/cover.

10.3.5 The fire pump suction velocity shall meet the manufacturer's designed limit and the requirements of the RO, GNC and HKPF.

10.3.6 The discharge velocity at the water monitors shall meet the manufacturer's designed limit and the requirements of the RO, GNC and the HKPF.

10.3.7 A means and/or facilities shall be provided to enable the gradual filling of the pipe line up to the monitor with water before the full capacity of pump can be engaged.

10.3.8 The intake to the fire pump shall be fitted with a means for clearing the debris while the vessel is underway.

10.4 Valves

10.4.1 All motor driven valves shall also be capable of being operated manually.

10.4.2 Monitors and the associated valves shall be of remote operated type.

10.4.3 The control for the remote operation shall be located in the wheelhouse.

10.4.4 In addition, local operation of the monitor and associated valves shall be provided.

The sea water inlet for the fire-fighting piping shall be equipped with a shut off valve. The leading edge of inlet pipe shall be rounded to avoid cavitation being created.

10.5 Piping System

10.5.1 The piping system shall be protected from over pressure.

10.5.2 All piping shall be suitably protected from corrosion and freezing as well as being capable of being drained.

10.5.3 Both the suction and discharge velocity inside the associated piping shall not cause excessive corrosion and erosion to the satisfaction of RO, GNC and the HKPF.

10.5.4 The pipeline, which supplies water to the monitor, shall be as short as practically possible. Where pipes supplying water to the monitor are passing through propulsion machinery spaces, the arrangement shall be such as to minimize the risk of water leakage due to a pipe bursting. The complete design of the piping system shall be acceptable to the RO, GNC and HKPF.

10.5.5 The piping system shall be designed so as to avoid water hammering and similar hydraulic shock loads within the system and have a means of purging air from the piping system at low flow velocities.

10.6 Operation of Pump and Valves

10.6.1 The fire pump, the sea water shut off valve and the sea water discharge valve shall be operated from various locations, such as the Wheelhouse Control Station (Engineering Console), the Engine Control Console in the Engine Room Control Office and locally. A facility should be provided to select or transfer the control between consoles.

10.6.2 When a shut off valve is closed, starting of the fire pump shall be prevented by providing an interlock system or equivalent together with audible and visual alarms at the Wheelhouse.

10.6.3 All fire pump discharge valves shall be motor driven screw-down non-return type and the suction valves shall be of motor driven type.

10.6.4 All motor driven valves shall be capable of being manual operated.

10.6.5 The On/Off control and indication for all valve positions shall be provided on a guidance schematic diagram control panel, which is displayed on the External Fire-Fighting Control Panel (EFCP).

10.7 External Fire-Fighting Control Panel (EFCP)

10.7.1 The external fire-fighting system shall be remotely controlled by a centralised 'External Fire-Fighting Control Console' located in the Wheelhouse. The system shall be powered by 24-volt DC.

10.7.2 The controls and instrumentation of the fire pump shall be designed for one-person operation. The instrumentation and controls shall be sufficient to control all aspects of the EFFS and shall include, but not be limited to:

(a) A schematic diagram of the whole fire-fighting system (from sea suction chest to the fire monitor on deck with on/off position indicator lamps for all the valves, including the suction and discharge valves of the fire pump, isolating valves for fire monitors and outlets on deck, inlet valves for the pump inductor, outlet valve, and other necessary parts);

(b) Start and stop;

(c) Fault indicating alarms;

(d) Protective devices such as overload of motor and any others recommended by the manufacturer;

(e) Lamp test button;

(f) Alarm mute push button; and

(g) Dimmer switch for the control panel.

10.7.3 A nameplate shall be provided for each control, gauge, and indicator.

10.7.4 All nameplates and instruction plates labels and marking shall be in both English and Traditional Chinese and be permanent in nature. They shall be capable of withstanding the effects of extreme weather and temperature, and shall be attached in a manner that requires mechanical means for removal.

10.7.5 The External Fire-Fighting Control Panel (EFCP) drawing shall be approved by the RO and must be acceptable to GNC and HKPF before installation of the fire-fighting system.

10.8 Fire-Fighting Monitor

10.8.1 The fire-fighting monitor of the EFFS ("fire-fighting monitor") shall be installed on the foredeck of the Vessel to enable an unobstructed range of operation without being impeded by the Vessel's structure and equipment.

10.8.2 The foundation and structural support of the fire-fighting monitor shall be designed for all modes of operation, with particular attention given to loadings at the maximum water output and the reactions of the water jet. Calculations demonstrating adequacy of design, including waterjet reactions specified by the fire-fighting monitor's manufacturer, shall be submitted to the RO and GNC for approval.

10.8.3 The fire-fighting monitor shall be constructed of corrosion resistant material. It shall be capable of achieving 135° (-65° to +70°) vertical travel and a minimum 165° horizontal rotation (equally split port/starboard about the Vessel centreline). The fire-fighting monitor shall be remotely operated and also capable of being operated locally.

10.8.4 The fire-fighting monitor shall be fitted with an adjustable waterjet spray nozzle, capable of discharging water from jet to fog.

10.8.5 The pitching and horizontal rotation mechanisms of the fire-fighting monitor are to be provided with self-locking function or locking arrangement to prevent swaying and sliding when the fire-fighting monitor is spraying at the angles set as required.

10.8.6 A pressure gauge having a precision level not less than 2.5 grade is to be fitted at an appropriate location on the surface along the external diameter of the fire-fighting monitor base.

Chapter 11 Hybrid System

11.1 General Provisions

11.1.1 The objective of the hybrid system is to provide a secondary smaller electric propulsion system as an alternative to the main diesel engine when the Vessel operates at slow speeds and is the application of an electric generator-motor (E-motor) system in combination with the main diesel engines ("hybrid system" or "hybrid propulsion system" in upper or lower case). The E-motor shall also be able to generate electricity as a generator or provide propulsion power as a motor depending on its role in the actual operating modes. When operating in electric mode with no main diesel engine power input, there shall also be a reduction in noise and vibration, as well as an increase in crew comfort. In the Position Keeping mode of operation, only electric mode shall be used. Other benefits shall be fulfilled:

(a) Increased time between overhauls for the diesel engines of the Vessel;

(b) Optimizing the combination of power from the main diesel engines, diesel generators and batteries of the ESS in order to increase fuel efficiency and reduce total fuel consumption. As a result, the total emission of harmful exhaust gases is reduced; and

(c) Improved engine performance.

11.1.2 The E-motor of the hybrid system shall have the power to propel the Vessel at a speed not less than 8 knots while running in electric mode only.

11.1.3 The reliability of the hybrid system shall be the paramount consideration. Design and arrangement shall ensure that a single failure of any key component, including but not limited to main diesel engines, E-motor, diesel generators, batteries of the ESS, Power Management System (PMS), Battery Management System (BMS), DC Grid, inverter, etc. shall not cause the total black out to the Vessel or fail to operate.

11.1.4 The hybrid system shall meet the RO requirements with appropriate notation wherever applicable. All components shall be RO type-approved. The hybrid system shall be submitted to the RO for approval and to GNC's satisfaction. The operating voltage (either AC or DC) shall be below 1000V.

11.1.5 The enclosure protection for the semi-conductor converter shall be commensurate with its working environment and equipment arrangement and shall be subject to the RO and GNC approval.

11.1.6 The Contractor shall note that the Vessel is for use in Hong Kong and it is essential that the hybrid system offered by the Contractor is supported and shall have good availability of spare parts. Good technical support and maintenance services shall be available locally in Hong Kong..

11.1.7 The provided Spare Parts shall be of the same model as supplied for the Vessel and shall equally comply with all specifications set out in this Chapter of Part VII.

11.1.8 Sufficient space and headroom in the vicinity of the hybrid equipment for local operation, inspection and routine maintenance shall be provided.

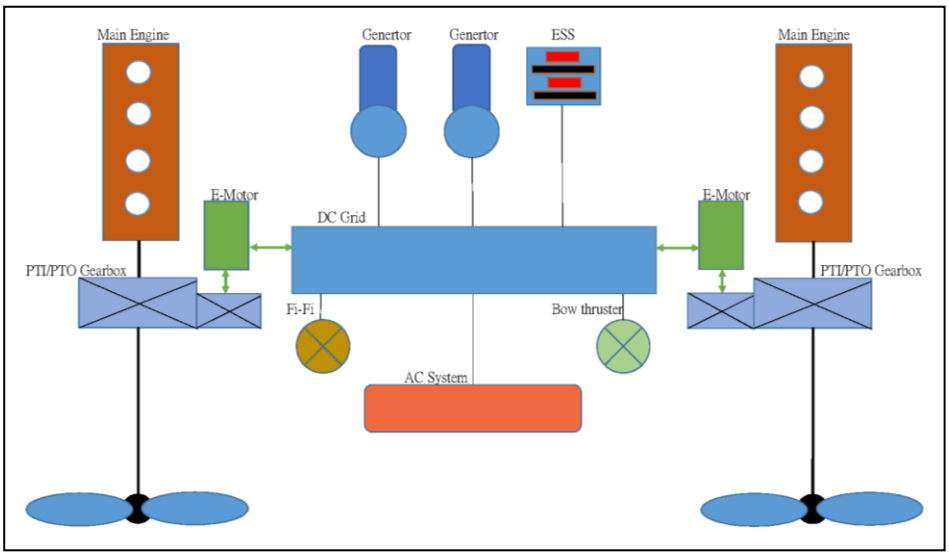
11.1.9 The hybrid propulsion system installation in the Vessel shall be suitable for operation as an unmanned machinery space. The control and monitoring shall be centralized in the Wheelhouse Engine Remote Control Console and the Engine Room Control Office Control Console.

11.1.10 In the event that there will be three (3) diesel main diesel engines installed due to the design of the Vessel, the E-motors shall be fitted onto the side engines while the centre engine shall provide a conventional drive.

11.2 General Requirement

11.2.1 The hybrid propulsion system shall consist of two (2) traditional direct diesel modules and two (2) electric modules. Each traditional direct diesel module consists of one (1) main diesel engine, one (1) PTI/PTO reduction gearbox, one (1) propeller shaft and one (1) fixed pitch propeller. Each electric module consists of one (1) E-motor, which shall be connected to the propeller shaft in parallel via the same PTI/PTO reduction gearbox, power supplies from the diesel generators or energy storage

system of the hybrid propulsion system, and the associate control devices. **[E]**



11.2.2 The parallel hybrid propulsion system described in Paragraph 11.2.1 shall allow the Vessel to be propelled by the power from either the main diesel engines or the E-motors. Furthermore, the Vessel shall also be propelled by both diesel and electric power at the same time.

11.2.3 A Power Management System (PMS) shall be implemented to automatically determine the most efficient power source subject to the power demands on board.

11.2.4 An Energy Storage System (ESS) with batteries is to be fitted onboard. It shall be sufficient to propel the Vessel independently, without diesel engine or generator, at a speed of 5 knots for a period of 1.5 hours with typical house loads. Typical house loads shall include air-conditioning but exclude the usage of bow thruster.

11.2.5 The integrated hybrid system shall include but not be limited to:

(a) the main diesel engines;

(b) gearbox with PTI/PTO and clutch functions;

(c) diesel generator(s);

(d) hybrid electric machine (namely E-Motor which is capable to serve as generator or motor in the hybrid arrangement depending on the selected PTI/PTO mode);

(e) an independent cooling system;

(f) Lithium ion batteries package [Energy Storage System (ESS)];

(g) DC/AC switchboards ("switchboard");

(h) a power management system (PMS);

(i) a battery management system (BMS); and

(j) electronic components [Semi-conductor Converter, AC/DC and DC/DC converters and DC/AC inverters including DC link wherever applicable, variable frequency drive (VFD) and/or other equivalent means wherever applicable].

11.2.6 The hybrid system shall be designed to avoid excessively high temperatures being generated in the components (i.e. motor, clutch reduction gear, electronic components, batteries, etc.). Impact loading to E-Motor and associated shafting, improper load sharing and interruption of power transmission, shall not occur during change over between different modes. An alarm shall be provided to indicate lengthy switching over time.

11.2.7 The switch board shall be so arranged that short circuit or faults on the DC side shall not induce excessive current or voltage on the AC side, or shall be protected from the induced excessive current or voltage on the AC side, and vice versa. The switchboard shall have, but not be limited to, the following protections:

(a) Overcurrent and short-circuit protection;

(b) Under voltage & overvoltage protection;

(c) Ground fault insulation alarm and monitor; and

(d) The DC busbar of the hybrid propulsion system shall be separated into different sections with power electronic protection devices fitted between sections in order to avoid a complete shut down due to a single electrical failure. **[E]**

11.2.8 The protection arrangement shall be arranged to trip the defective circuit only without undue interruption of other services.

11.2.9 The Hybrid System shall be so designed to avoid voltage spike, over-voltage and over-current of its component, i.e. electronic components, and also the system.

11.3 Hybrid System Functional Modes

11.3.1 The hybrid system shall provide the following functions:

(a) Diesel Mode

(i) Operate conventionally using main diesel engines only to propel the Vessel, with no additional power being supplied to or generated from the E-motors;

(ii) E-motors are disengaged from the propeller shaft; and

(iii) All required house loads and bow thruster are to be supplied by the diesel generator(s) and/or ESS.

(b) Electric Mode

(i) Propel the Vessel via E-motors alone, taking power from either the diesel generator(s) or the Energy Storage System (ESS);

(ii) Main diesel engines are to be cut-off completely from the power train; and

(iii) Automatic coordination of electric power supply by power management system (PMS).

(c) Docking Mode

(i) Similar to the Electric Mode, the Vessel shall be primarily driven by at least two (2) diesel generators and backed up by the ESS; and

(ii) This mode is specifically designed for docking purpose, approaching and berthing alongside a target vessel at sea.

(d) Power-Take-Off (PTO) Mode

(i) While running the main diesel engines for propulsion, electric power is taken from the E-motors to provide power for Vessel house loads and/or to charge the ESS.

(e) Power-Take-In (PTI) Mode

(i) Both main diesel engines are running, with extra power input from E-motors via the gearboxes' PTI function. E-motors are powered by either the ESS or the diesel generator(s).

(f) Berthing Mode

(i) This mode is for the purpose of berthing the Vessel alongside a pier, during which power source would be fed from either diesel generator(s) or the ESS as decided by the PMS in conjunction with the BMS to support the house loads. The preferred primary power source shall come from ESS. No propulsion thrust will be made by the power train through the propellers and the bow thruster.

11.4 Gearbox with PTI/PTO Function

11.4.1 Reduction gearbox is detailed in Paragraph 7.7 of this Part VII.

11.4.2 The gearbox shall be suitably sized for the hybrid system. An integrated PTO/PTI clutch is to be fitted in order to isolate the E-motor from the power train for service.

11.5 Hybrid Electric Machine (namely E-Motor)

11.5.1 The E-motor shall be of a permanent magnet type which shall be proprietary made (as defined in Clause 1.1 of Part IV).

11.5.2 The E-Motor can be used as either a motor for propulsion or as a generator for the on-board power station.

11.5.3 High winding temperature alarm shall be provided.

11.5.4 The E-Motor is to be interfaced with the position keeping system specified in Paragraph 7.12 of this Part VII. Besides properly interface arrangement, the motor and associated arrangement shall also be fit for this intended purpose (frequent start-stop operation without any overheat or adverse effect upon the Vessel electrical system).

11.5.5 Single-phase protection is to be provided.

11.6 Energy Storage System with Lithium Ion Batteries

11.6.1 The energy storage system ("ESS") with Lithium Ion batteries shall be compact and of a modular type.

11.6.2 The ESS shall be fully charged within one hour from fully discharged state.

11.6.3 The ESS shall propel the Vessel independently, without diesel engine or diesel generators, at a speed of 5 knots for a period of 1.5 hours while providing the house load of the Vessel without any usage of the bow thruster.

11.6.4 The ESS and its batteries are to be located in a dedicated space(s) within the Vessel. The space(s) are to be protected by structural fire protection, fire detection and fire suppression in accordance with RO Requirements to the satisfaction of the GNC.

11.6.5 The protection of the battery enclosure shall be commensurate with the cooling arrangement.

11.6.6 Ventilation shall be provided to the space in accordance with RO Requirement to the satisfaction of the hybrid system supplier/integrator and the GNC.

11.6.7 The location and arrangement of battery room shall comply with RO requirement and accepted by GNC.

11.6.8 An isolator shall be provided in the battery output circuit to allow normal maintenance work to be carried out.

11.6.9 The battery system shall be equipped with a battery management system (BMS) in order to monitor the working condition of the batteries. The BMS shall communicate with the PMS to optimise propulsion and vessel position keeping functions. The BMS shall also monitor the condition of individual cell and balancing between cells as required. Defective cells shall be isolated without affecting the performance of the whole battery system.

11.6.10 100% redundancy shall be provided for both the software and hardware of the BMS in order to avoid any sudden disruption to the system.

11.6.11 The operating temperature shall be properly monitored to ensure a safe working condition. The BMS and/or PMS shall ensure the safety of the ESS without excessive charge and discharge current.

11.6.12 Alarms shall include but not be limited to the following:

(a) Battery high temperature;

(b) Over voltage and under voltage;

(c) High hybrid battery room temperature;

(d) Hybrid battery room ventilation failure;

(e) Battery charging failure; and

(f) Earthing

11.6.13 Safety shall be the primary concern in the selection and arrangement of batteries including but not limited to, the following:

(a) the location shall be protected from collision; and

(b) the battery module shall minimize the extent of damages.

11.6.14 The system shall be so designed to allow the capacity of ESS to be enlarged, after being put in service for a period of time, by either adding more battery modules with the same specifications as those in use or replacing the existing batteries with higher energy density ones.

11.6.15 At the end of the battery life span or as required by the user, the Contractor's local agent shall provide new batteries with installation and commissioning services onboard. The Contractor's local agent shall also collect the existing batteries for disposal at no extra charges.

11.7 Power Management System

11.7.1 The Power Management System (PMS) of the hybrid system shall communicate, control and monitor all components within the hybrid system including the main diesel engines. The PMS shall enable control of the hybrid system to operate in the operational mode as selected by the user. This is also to achieve the user's objective together with optimum energy allocation.

11.7.2 During the operation, the following vessel operational modes shall be provided to the Coxswain:

(a) Diesel Mode

(b) Auto Mode

(c) Docking Mode

(d) Berthing Mode

11.7.3 Under the **Diesel Mode**, the PMS shall isolate the E-motors from the power train and the propulsion thrust shall be solely provided by the main diesel engines. The PMS shall optimise the efficiency of the electric power supply between the diesel generators and ESS according to the on-board instantaneous power demand condition.

11.7.4 Under the **Auto Mode**, all hybrid components will be engaged. The PMS shall optimise the efficiency of the power allocation according to the on-board instantaneous power demand condition, including propulsion and electric power, by automatically selecting the most appropriate **Hybrid System Functional Mode**, as detailed in Paragraph 11.3 of this Part VII**,** between the Diesel, Electric, PTI and PTO Modes. The optimisation shall primarily fulfil the propulsion power demand, of which the signal shall come from the control lever (throttle) of the main diesel engine remote control system. The PMS shall manage the changeover, cutting-in and cutting-out of different power sources according to the load profile.

11.7.5 Under the **Docking Mode**, main diesel engines are to be cut-off completely from the power train, which is primarily driven by diesel generator(s) and backed up by the ESS. The PMS shall coordinate and optimize the power supply. This mode is specifically designed for docking purpose or to approach and berth alongside a target vessel at sea.

11.7.6 Under the **Berthing Mode**, the power source would be fed from either diesel generator(s) or ESS as decided by the PMS in conjunction with the BMS to support the house load. The preferred primary power source shall come from the ESS. No propulsion thrust will be made by the power train through the propellers and the bow thruster. This mode is for the Vessel berthing alongside a pier only.

11.7.7 The PMS system shall provide a self-diagnostic function with a manual activation capability.

11.7.8 The power management system shall control and manage the available power and convert power as required according to the applied load profile, including the house load.

11.7.9 One hundred percent (100%) redundancy shall be provided for both the software and hardware of the PMS in order to avoid any sudden disruption to the system.

11.8 Electronic Components

11.8.1 Electronic Components are Semi-Conductor Converters, AC/DC and DC/AC inverter including DC link where applicable, Variable Frequency Drive (VFD) and/or other equivalent applicable means.

11.8.2 Electronic Components shall undergo shop test and high voltage test as required by the RO and the manufacturer before installing on board.

11.8.3 Electronic Components for power supply shall complete function tests with intended loading on board.

11.8.4 Functional test for Electronic Components for motor drives shall be carried out together with all relevant ship systems in simultaneous operation and in all characteristic load conditions.

11.8.5 The Electronic Components shall not be loaded unless effective cooling is provided. Alarms for loss of cooling shall be provided. The location and arrangement of the cooling pipework shall minimize the risk of damaging the Electronic Components in event of any leakage or condensation and shall preferably be positioned in the lower part of the assembly.

11.8.6 Electronic Components shall be equipped with overvoltage protection.

11.8.7 Electronic Components shall be equipped with over-current protection to avoid damage due to over-current arise and/or over-load.

11.9 Variable Frequency Drive (VFD)

11.9.1 The VFD has the maximum and minimum frequency limiting function, which makes output-frequency operated within the specified range. The protection to the VFD and E-Motors shall provide the following:

(a) Stall prevention;

(b) Overcurrent and Short-circuit protection;

(c) Under voltage & over voltage protection;

(d) Ground fault protection;

(e) Power supply phase failure protection; and

(f) Motor thermal protection through sensing of the motor winding temperature.

11.9.2 Means shall be provided to avoid any increases of DC bus voltage due to energy feed back into the VFD.

11.10 Associated Liquid Cooling System

11.10.1 Where a forced liquid cooling system is utilised, one hundred percent (100%) redundancy shall be provided to ensure the continuous functioning of the system irrespective of any breakdown of any individual component in the system.

11.10.2 System parameters (i.e. coolant pressure, coolant flow rate, coolant temperature etc.,) shall be properly monitored to ensure correct functionality. Alarms shall be provided to indicate any deviation of these parameters from the pre-set ranges.

11.11 Failure Mode and Effect Analysis

11.11.1 Failure Mode and Effect Analysis (FMEA) shall be carried out to identify the failure modes and their effect on the complete hybrid system which includes but not be limited to the following:

(a) Propulsion, Position Keeping, Electrical and Battery Systems with all system components;

(b) Power Management System; and

(c) Battery Management System.

11.11.2 A practical, realistic and documented assessment of the failure characteristics of the Hybrid System and its components shall be undertaken with the aim of defining and studying the important failure

conditions and their effects. The corresponding Failure Mode and Element Analysis shall be undertaken by experienced personnel. Corrective measures shall be identified in the event that failure modes cause disastrous outcomes. A test program shall be drawn up to confirm the conclusions of the FMEA which should incorporated in the technical acceptance test. The report shall be approved by the RO and submitted to GNC and HKPF for acceptance.

11.12 Factory Acceptance Test (FAT)

11.12.1 A Factory Acceptance Test (FAT) shall be arranged by the Contractor for the first Vessel to verify the hybrid propulsion system, which shall be operated in accordance with the design specifications, before installation on board. The FAT shall ensure that the components and controls are working properly according to the system functionality requirements including the PMS and BMS as stipulated in this Chapter and to the extent not inconsistent therewith, those specified in Schedules 6 and 7 of Part V. The FAT shall be carried out at the Contractor's or his sub-contractor's facilities upon completion of assembly of all the key components of the hybrid propulsion system. That shall be identical to the installation on board, including but not limited to the following:

(a) Main diesel engines;

(b) Diesel generators;

(c) DC grids and switchboards;

(d) Gearboxes;

(e) ESS;

(f) E-Motors;

(g) Bow thruster; and

(h) Any other necessary associated systems/equipment.

11.12.2 With no less than 30 calendar days prior to the FAT, the Contractor shall submit a plan to the RO for approval and to the GNC and HKPF for acceptance. The Contractor shall also make a comprehensive presentation at a mutually agreed time to the key technical personnel from the MD and HKPF, in order to introduce the in-depth design philosophy, working principles, safety standards, implementation of the design philosophy, and precautions in the operation of the hybrid propulsion system. The presentation materials shall be provided to the participants so that they can utilise these materials for internal briefing and training purposes.

11.12.3 The FAT shall be witness by the representatives from the RO, MD and HKPF. Upon completion of the FAT, a detailed and comprehensive FAT report shall be submitted to the RO for approval and to the GNC and HKPF for record purposes.

11.12.4 The details of the FAT shall be further discussed at the kick-off meeting.

11.13 Software System Verification

11.13.1 The Contractor shall request the RO to carry out a verification and validation approval for the software of the hybrid propulsion system including but not limited to the PMS, BMS and Position Keeping System.

11.13.2 A software functional specification and a Quality Assurance Plan shall be submitted to the RO for approval and, then, to the GNC for acceptance. The Quality Assurance Plan shall provide detailed information about the test for identifying and rectifying any bugs exist, and for the functionality of the software to meet the specifications.

11.13.3 Onboard testing of the software for the hybrid propulsion system shall be performed after the FAT but not later than Stage 1 of Technical Acceptance. The corresponding testing report shall be submitted to the RO for approval and, then, to the GNC for acceptance.

11.13.4 The onboard testing of the software shall cover but not be limited to the following:

(a) PMS;

(b) BMS;

(c) Position Keeping System;

(d) Functional test which includes unit test, integration test and system test; and

(e) Performance test.

11.13.5 The scope of testing shall also include the associated interfacing of the system.

11.13.6 Hazards associated with each function of the system shall be identified and evaluated. The corresponding onboard test report shall be submitted to the RO and GNC for approval.

11.14 Operation and Maintenance Manual

11.14.1 The Contractor shall provide the operation and maintenance manual for routine operation and maintenance of the Hybrid System. The manual shall include:

(a) Design philosophy;

(b) Schematic and line diagrams of individual systems;

(c) Information relating to key components;

(d) Operations and precautions;

(e) Maintenance information; and

(f) Maintenance schedule.

Chapter 12 Daughter Boat

12.1 General Provisions

12.1.1 Introduction

12.1.1.1 This Chapter sets out the requirements of the **twelve (12) Daughter Boats ("Boat" or "Boats")** to be supplied to the Government of the Hong Kong Special Administrative Region (HKSAR) of the People's Republic of China (hereinafter referred to as the Government) in conjunction with the supply of **twelve (12) Versatile Patrol Units** for use by the Hong Kong Police Force ("HKPF").

12.1.1.2 The primary and overriding aim of this procurement exercise is to provide the HKPF with **twelve (12)** high performance Boats with aluminium alloy hulls, powered by twin outboard engines. Robustness of construction, ergonomics, seakeeping, high and low speed control response, stable and predictable manoeuvrability at both high and low speeds, stability in adverse sea states and directional stability are of fundamental importance.

12.1.1.3 The offered Boat shall be a commercially available aluminium alloy-hulled craft.

12.1.1.4 After the Pre-Delivery Construction and Handling Inspection, the Boat shall then be delivered to the shipyard where the VPU Vessels are constructed for installation onboard. The Boat shall be part of the VPU and 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.

12.1.1.5 Unless otherwise expressly defined in the Contract, all technical terms and expressions used in this Chapter shall be interpreted in accordance with the professional or common usage in naval architecture, marine engineering, nautical navigation and the shipbuilding industry.

12.1.2 Statement of Purposes of the Boat

12.1.2.1 The Boat shall be safe, fit and suitable for the operational purposes for which it is intended, namely to be used as a daughter boat in supporting the operation of the mother Vessel navigated by the HKPF anywhere within Hong Kong Waters and beyond. The primary role of the Boat shall be undertaking sea safety patrol, search and rescue and law enforcement operations. As a secondary role, the Boat shall be used to provide logistical support to Hong Kong police officers. The Boat shall also be capable of operating as a standalone unit for achieving these primary and secondary roles. These roles involve considerably more than mere navigation and will include being swiftly released and retrieved from the mother Vessel.

12.1.2.2 When configured in accordance with this Part VII, the Boat shall meet or exceed the following key performance parameters ("KPP") under load conditions, if any, described in Paragraph 12.1.5.1(f) in this Part VII:

(a) KPP 1: Sea Keeping

The Boat shall be designed, engineered and constructed to conduct missions without substantial damage through sea states up to World Meteorological Organisation (WMO) Sea State 5. For these purposes, substantial damage is defined as any damage or structural failure that adversely affects the structural strength, performance, or integrity of the Vessel, thereby rendering it inoperable for HKPF missions. The Boat shall also be able to survive at WMO Sea State 6 if so required. For details of the WMO Sea State Code, please see Annex 8 of this Part VII.

(b) KPP 2: Patrol Speed

The Boat shall be capable of performing patrol duties under Light Operational Load Condition (as per Paragraph 12.1.5.1(f) of this Part VII) maintaining speeds of at least thirty (30) knots in WMO Sea State 3.

(c) KPP 3: Interception Speed

The Boat shall be capable of transition from patrol to interception speeds of at least thirty five (35) knots under Light Operational Load Condition (as per Paragraph 12.1.5.1(f) of this Part VII) in WMO Sea State 2.

(d) KPP 4: Manoeuvrability

The Boat shall be capable of safe, stable, predictable high-speed manoeuvrability in interdiction missions which involve the engagement of hostile, highly manoeuvrable and recklessly evasive watercraft

12.1.3 Design and Construction Responsibility

12.1.3.1 The Boats shall be designed and constructed in accordance with the latest edition of the rules and regulations of the Recognised Organisation (RO) specified in Schedule 9, in the version as at the Contract Date unless the rules and regulations of RO specify that version of such rules and regulations as at the keel laying date of the Daughter Boat shall apply in relation to the relevant requirements specified therein. Unless otherwise expressly stipulated in this Chapter, **(a) references to "RO" in this Part VII shall mean the RO as specified in Schedule 9; and (b) references to "RO Requirements" shall mean the requirement of the rules and regulations of the RO as specified in Schedule 9**. Notwithstanding the foregoing, where it is expressly permitted in this Chapter in relation to a particular requirement, instead of the RO specified in Schedule 9, another RO which is any one of the ROs listed in Paragraph 12.2.3.3 (a) to (i) may be designated for compliance with the relevant requirement, references to "RO" shall mean such other RO.

12.1.3.2 The Boats shall be issued with a hull construction certificate by the RO, as specified in Schedule 9. All plans, particulars and documentation which are required for the issuance of a hull construction certificate, by the RO, in addition to those listed in Annex 13 to this Part VII shall be approved by the RO before submission to GNC for endorsement and final approval prior to commencement of work. Any subsequent modifications or additions shall be treated in the same manner. Those drawings which are not required for facilitating the issuance of a hull construction certificate shall be submitted to GNC for approval before work is carried out.

12.1.3.3 Notwithstanding the submission of the preliminary plans and drawings by the Contractor as part of its tender for the Contract, all plans and drawings of the Boats except the design stresses and scantling, shall be submitted to GNC for approval before completion of the Boat design. The design stresses and scantling including internal structural members shall be determined according to the RO Requirements.

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

12.1.4 Survey and Inspection

12.1.4.1 Tenderers shall include the unit price of a Boat in the unit price per Vessel quoted in Schedule 1 – Price Schedule in Part V, which shall be deemed to have included the cost of surveys to be carried out by the relevant RO in respect of that Boat (if required to be arranged by the Contractor under the Contract).

12.1.4.2 All electronic items and their installation shall be approved and inspected by COMMS or COMMS representatives as part of the Technical and Operation Acceptance.

12.1.4.3 Subject to Paragraph 12.1.4.7 of this Part VII, an advance written notice of not less than ten (10) working days must be given to GNC before the representatives of GNC and other Government officers are invited to conduct a survey visit of the Boats. The Contractor shall be fully responsible for any delay if the Contractor fails to give adequate notice as aforesaid.

12.1.4.4 The Contactor shall provide:

(a) An Implementation Timetable, in the format set out in Annex 12 to this Part VII, setting out the major milestones and their scheduled completion dates incorporating the Delivery Dates specified in Schedule 2 of Part V;

(b) The Drawing Submissions Timetable in the format set out in Annex 13 to this Part VII; and

(c) The Main Items Inspection Timetable in the format set out in Annex 14 to this Part VII.

Each one of the above shall be submitted to GNC for approval within 14 days after the commencement of the Contract Period.

12.1.4.5 A weekly work progress report with photographs evidencing the progress with sufficient details agreed by GNC is required to be submitted to GNC during the construction of the Boat. The weekly report shall be submitted before noon of every Monday.

12.1.4.6 MD may designate consultant(s) from the private sector who will be authorised to represent the GNC in all technical matters including plan approval related to the construction of the Boats. The Contractor shall cooperate with the consultant(s) and afford unhindered access to the Boats at all times during working hours and shall furnish current copies of all drawings, sketches, correspondence, change notices, change orders, test agendas, schedules and other necessary documents where applicable.

12.1.4.7 After arriving at the site for a survey visit, if the MD officer / consultant considers 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 expense. The Government shall not be responsible for any delay arising from any postponement in conducting the survey visit due to any safety issues as specified in this Paragraph.

12.1.4.8 Where any fee charge and associated expenses 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 for paying 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.

12.1.4.9 The final survey and inspection visit for the Boats will be the Pre-Delivery Construction and Handling Inspection as specified in Paragraph 12.1.5.1 of this Part VII, the purpose of which shall be for the Government to satisfy itself that the Boat is, in all respects, ready for delivery to the Contractor. This inspection visit may have been preceded by one or more similar visits following which necessary modification work, if required, has been completed. The Contractor shall provide GNC with one (1) month's advanced written notice of its readiness to invite the Government to conduct the Pre-Delivery Construction and Handling Inspection at or near by the Boat manufacturer's site, or, otherwise, as agreed by the Government.

12.1.4.10 A Pre-Delivery Construction and Handling Inspection of the Boat, as detailed in Paragraph 12.1.5.1 of this Part VII, shall be conducted at sea in the country in which the Boat is built to confirm the Boat has been built to the requirements of this Part VII, and that the Boat does not exhibit any of the characteristics specified at Paragraph 12.2.10.3 of this Part VII.

12.1.5 Procedures for Boat Acceptance

12.1.5.1 Stage 1 of Technical Acceptance - Pre-Delivery Construction and Handling Inspection

(a) Safety of the Boat for Pre-Delivery Construction and Handling Inspection

Prior to conducting the Pre-Delivery Construction and Handling Inspection, an Inclining Experiment or other acceptable means in determining lightship particulars as specified in Paragraph 12.3.2.3 of this Part VII shall have been carried out and the final lightship weight and centre of gravity shall have been determined and approved by the RO and the GNC. All loading conditions used during the Pre-Delivery Construction and Handling Inspection shall be compiled using the approved final lightship weight and centre of gravity and shall meet the intact stability criteria as specified in Paragraph 12.3.2.5 of this Part VII. Other

documentary evidence acceptable to the Government showing that the Boat is safe to go to sea for the intended tests and trials specified in the Contract shall be submitted.

(b) Handling Assessment of the Boat

On completion of construction, a Handling Assessment for the Boat shall be conducted as in accordance with the requirements and procedures as stated in Annex 15 to this Part VII, at or near the site where the Boat is constructed.

(c) Pre-delivery speed trial

Prior to delivering the Boat to the location where the Vessel is constructed, a speed trial shall be carried out at or near the site where the Boat is constructed, and shall be carried out in the presence of GNC officers and HKPF representatives or their appointed agents.

(i) The actual mean speed shall be determined by taking the arithmetic mean of four (4) runs, with two (2) runs in each direction. No corrections shall be made due to wind, wave, tidal current, shallow water effects and weather conditions.

(ii) The pre-delivery speed trial shall be carried out with the engine power at the declared maximum (rated) power specified by the manufacturer under the Light Operational Load Condition as specified in Paragraph of 12.1.5.1(f) of this Part VII. If the Boat fails to achieve the Contract Speed stated in Paragraph 12.2.4.1 of this Part VII, the Government will deem that the Boat has failed to pass Stage 1 - Pre-Delivery Construction and Handling Inspection.

(iii) The instruments used in measuring the Contract Speed for the pre-delivery speed trial shall be provided either by:

- The Contractor on the conditions that the instrument has been calibrated by a certified body acceptable to GNC and the HKPF; or
- The Global Positioning System (GPS) supplied by the Government; or
- The GPS or Differential Global Positioning System (DGPS) which is properly calibrated (with supporting calibration documents) and installed onboard the Boat as acceptable to GNC and the HKPF; or
- Other speed measuring methods acceptable to GNC and the HKPF.

(d) Electronic Navigation Equipment (ENE) items

ENE items to be tested as per Paragraph 12.7 of this Part VII relevant to Pre-delivery Construction and Handling Inspection.

(e) Hull bottom inspection

Upon successful completion of the pre-shipment speed trial and Handling Assessment, the Contractor shall arrange for GNC officers to carry out a hull bottom inspection on the Boat to check for any hull damage before delivery. Any hull damage found shall be rectified at or near the site where the Boat is constructed.

(f) Loading conditions for tests and trials

The loading conditions to be used during tests and trials are specified below:

	Operational Load Condition		
	Light	Intermediate	Full
Fuel (minimum)	90%	90%	90%
Crew	2	2	2
Passenger	0	0	2
Kit	20 kg	20 kg	100 kg
Equipment	0 kg	200 kg	0 kg

All loading conditions being used during all tests and trials shall be compiled by using the approved final lightship weight and centre of gravity, and all such loading conditions shall

meet the intact and damaged stability criteria as specified in Paragraphs 12.3.2.5 and 12.3.2.6 of this Part VII respectively. Other documentary evidence acceptable to the Government showing that the Boat is safe to go to sea for the intended tests and trials specified in the Contract shall be submitted.

(g) Condition for proceeding to delivering to the VPU Vessel

After meeting all the requirements of this Stage 1 - Pre-delivery Construction and Handling Inspection, the Boat shall then be delivered to the shipyard where the VPU Vessels are constructed for installation onboard. Prior to the acceptance of the VPU Vessel, official sea trials of the Daughter Boat as detailed in Paragraph 12.1.5.2 shall be carried out.

12.1.5.2 Stage 2 of Technical Acceptance - Official Sea Trials of the Daughter Boat

(a) Condition and location of carrying out Official Sea Trial

The Official Sea Trail of the Daughter Boat shall be carried out in Hong Kong in the presence of MD's officers or consultants, and HKPF representatives.

(b) Official Sea Trial programme

The Contractor shall submit an Official Sea Trial programme of the Daughter Boat for MD's approval not less than ten (10) working days in advance of the Official Sea Trial of the Daughter Boat, which shall include details of proposed procedures for carrying out the official speed trial, endurance test, manoeuvring test, crash stop test, astern running test, emergency steering test, ENE items, and other tests as stated in this Paragraph 12.1.5.2 and required by MD and HKPF. This submission shall include the RO approved inclining experiment report as mentioned in Paragraph 12.3.2.3 of this Part VII and other documentary evidence acceptable to the Government showing that the Daughter Boat is safe to go to sea for the intended tests and trials specified in the Contract.

(c) Cost and expenses for carrying out tests and trial

As in all other tests and trials to be conducted for VPU Vessel acceptance, the Contractor is required to carry out the Official Sea Trial of the Daughter Boat in Hong Kong at its own expense (including the expense of fuel, lubrication oil, crew and other necessary expenses). Before the Official Sea Trial of the Daughter Boat, the Contractor shall observe the certificate of competency and third party insurance requirements under the laws of Hong Kong.

(d) Contractor's staff on board the Daughter Boat during trial

To ensure that the Official Sea Trial of the Daughter Boat can be conducted safely and in accordance with the laws of Hong Kong, the Contractor shall provide the MD with appropriate details about each one of the Contractor's staff who will be on board. These details shall include the name, post, duty, experience and certificate(s) of competency and are to be submitted at the same time as the Official Sea Trial programme specified at Paragraph 12.1.5.2(b) of this Part VII. The number of persons on board during a particular test or trial shall be agreed by the MD officers and HKPF representative. The location of each person on board (which can affect the centre of gravity of the Daughter Boat under trial) shall also be first agreed by the MD officers and HKPF representative.

(e) Loading conditions for tests and trials of the Daughter Boat

The loading conditions to be used during tests and trials of the Daughter Boat shall be as per Paragraph 12.1.5.1(f) of this Part VII.

(f) Official speed trial of the Daughter Boat

As part of the Official Sea Trial, the Contractor shall carry out the official speed trial to determine whether the Contract Speed of the Daughter Boat as specified in Paragraph 12.2.4.1 of Part VII can be achieved in Hong Kong.

(i) The actual mean speed of the Daughter Boat (i.e. NOT theoretical) shall be measured

during the official speed trial runs to determine if the Contract Speed of the Daughter Boat can be achieved. The speed calculations must NOT be corrected by wind, wave, tidal current, shallow water effects and weather condition.

(ii) The actual mean speed of the Daughter Boat 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 measured by the instruments provided either by:

- the Contractor on the conditions that the instrument has been calibrated by a certified body acceptable to GNC and the HKPF; or
- the Global Positioning System (GPS) supplied by the Government; or
- the GPS or Differential Global Positioning System (DGPS) which is properly calibrated (with supporting calibration documents) and installed on board the Daughter Boat is acceptable to GNC and the HKPF; or
- other speed measuring methods acceptable to GNC and the HKPF.

(iii) The Contract Speed of the Daughter Boat is considered not achieved if the Contract Speed of the Daughter Boat cannot be attained during the official speed trial after a total of FIVE runs in each direction.

(iv) The Contract Speed of the Daughter Boat stated in Paragraph 12.2.4.1 of Part VII shall be achieved by the Daughter Boat in the official speed trial with the engine power at the declared maximum (rated) power specified by the manufacturer under Full Operational Load Conditions as specified in Paragraph 12.1.5.1(f) of this Part VII. If the Daughter Boat fails to achieve the minimum Contract Speed of the Daughter Boat stated in Paragraph 12.2.4.1 of this Part VII, the Government will deem that the Daughter Boat has failed to pass the Official Sea Trial.

(v) All Equipment shall also be in operation during the Official Sea Trial unless explicitly exempted by MD or the HKPF. This Equipment shall have passed the Pre-shipment Construction and Handling Inspection.

(vi) 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) and the HKPF during the Official Sea Trial and shall form part of the Official Sea Trial Report of the Daughter Boat. The Official Sea Trial Report of the Daughter Boat shall be submitted to GNC before Delivery Acceptance of the VPU Vessel.

(g) Endurance test

The Endurance Test shall be carried out for different engine loading and speeds to obtain the speed/fuel consumption curves (or tabulated data) for the Daughter Boat, with the engines operating within the manufacturer's recommended engine operating conditions. The test results shall be recorded in accordance with the requirements stipulated in Annex 6 to this Part VII. The report submitted shall include a curve or curves showing ship speed versus propulsion engines' rpm and power, with particulars of the Daughter Boat loading and displacement in the test(s).

(h) Manoeuvrability test

Forward turning circle tests to port side, and to be repeated for starboard side, shall be carried out with:

(i) all engines running;

(ii) port engine running; and

(iii) starboard engine running.

The minimum time for turning to port side, and to be repeated for starboard side, at 15°, 90°, 180°, 270° and 360° shall be recorded.

(i) Crash stop test

The minimum time and distance achievable by the Daughter Boat when running from full ahead to stop, and then to full astern shall be determined at the crash stop test without damage to the engines and risk for the crew. The results shall be recorded.

(j) Astern running test

The maximum astern running speed achievable by the Daughter Boat shall be determined by the test. The results shall be recorded.

(k) Emergency steering test

An emergency steering test shall be carried out to ascertain that the Daughter Boat can still be steered satisfactorily when the electrical power supply to the steering system has been disabled. The results shall be recorded.

(l) Electronic Navigation Equipment (ENE) items

ENE items to be tested as per Paragraph 12.7 of this Part VII relevant to the on-site commissioning tests.

(m) Hull bottom inspection

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

(n) Submission of Official Sea Trial Report

The Contractor shall submit an Official Sea Trial Report to GNC after completion of the tests and trial specified in Paragraph 12.1.5.2 of this Part VII, the content of which shall include the results of all tests and trials as stated in Paragraph 12.1.5.2 of this Part VII. The report shall contain information regarding the method of test, engines' running condition, sea, weather and wind conditions, Daughter Boat loading condition, the heeling angles (steady or varying as the case may be) during each forward turning manoeuvre, and any other relevant information as required by GNC or GNC appointed consultant during the tests stated in Paragraph 12.1.5.2 of this Part VII. Such information shall be prepared in a format to be agreed by GNC.

12.1.5.3 Stage 3 of Technical Acceptance - Technical and Operation Acceptance

(a) All tests, trials and the experiment as required in this Chapter 12 of this Part VII should all have been conducted as part of the Technical and Operation Acceptance including Pre-Shipment Construction and Handling Inspection of the Vessel as stated in Paragraph 12.1.5.1 of this Part VII, the Official Sea Trial as stated in Paragraph 12.1.5.2 of this Part VII, the inclining experiment as mentioned in Paragraph 12.3.2.3 of this Part VII, the bench acceptance test and on-site commissioning test for ENE as mentioned in Paragraph 12.7 of this Part VII, 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 COMMS as part of the Technical and Operation Acceptance.

(c) The Contractor shall supply all necessary equipment and labour at its own cost for carrying out the tests and trials stated in Paragraphs 12.1.5.3(a) and 12.1.5.3(b) of this Part VII.

(d) If the Vessel cannot pass all of the tests comprising the Technical and Operation Acceptance by the deadline 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.

12.1.5.4 Delivery Acceptance

(a) The Daughter Boat, after its successful completion of the Official Sea Trials of the Daughter Boat, shall be delivered at the Contractor's expense together with the VPU Vessel to the Government Dockyard.

(b) The RO's hull construction certificate for the Daughter Boat as specified in Schedule 9 of

Part V shall be required before the Acceptance Certificate of the VPU Vessel can be issued by the Government.

(c) The Contractor must demonstrate to MD that all hull construction, outfitting, stability, machinery, electrical and electronic equipment of the Daughter Boat are in good working order; and must hand over the Daughter Boat, its fixtures and Equipment to MD in good and complete condition.

(d) Documentation required prior to and at Delivery Acceptance shall be in accordance with Paragraphs 12.8.2 of this Part VII.

(e) The Contractor must provide fourteen (14) days advance notice in writing for Daughter Boat delivery when the Daughter Boat 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 Official Sea Trials of the Daughter Boat, the Government does not consider that the Daughter Boat is in Ready to Use condition.

(f) On delivery, the Daughter Boat must be in a clean, tidy and fully fitted and operational condition.

(g) The Delivery Acceptance of the Daughter Boat shall be carried out by GNC in accordance with the terms stipulated in the Contract. The Delivery Acceptance of the Daughter Boat is only completed once the Director of Marine has issued the Acceptance Certificate for the VPU Vessel.

12.1.6 Warranty Services During the Warranty Period

12.1.6.1 Notwithstanding and without prejudice to the Contractor's obligation to provide the Warranty Services for the Boat 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 twelve (12) months from the date of the Acceptance Certificate of the Boat, shall be delivered to GNC upon Delivery Acceptance.

12.1.6.2 The full scope of the Warranty Services is set out in Annex 16 to this Part VII.

12.1.6.3 The Contractor is responsible for arranging the Boat for Guarantee Slipping commencing at the end of the 12-month Warranty Period. In addition to any defects which the Contractor may be required to rectify under Clause 18 of 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 16 to this Part VII.

12.1.7 Support Services

12.1.7.1 The Boat must be designed for through life support and easy maintenance in Hong Kong based on the operational profile and minimum life expectancy of fifteen (15) years under normal maintenance.

12.1.7.2 Support and maintenance services must be available (i.e. serviceable) in Hong Kong in respect of all Equipment installed on the Boat and return of the whole or part of the Equipment to the original place of manufacturer or the supplier shall not be necessary in order to carry out any repair work.

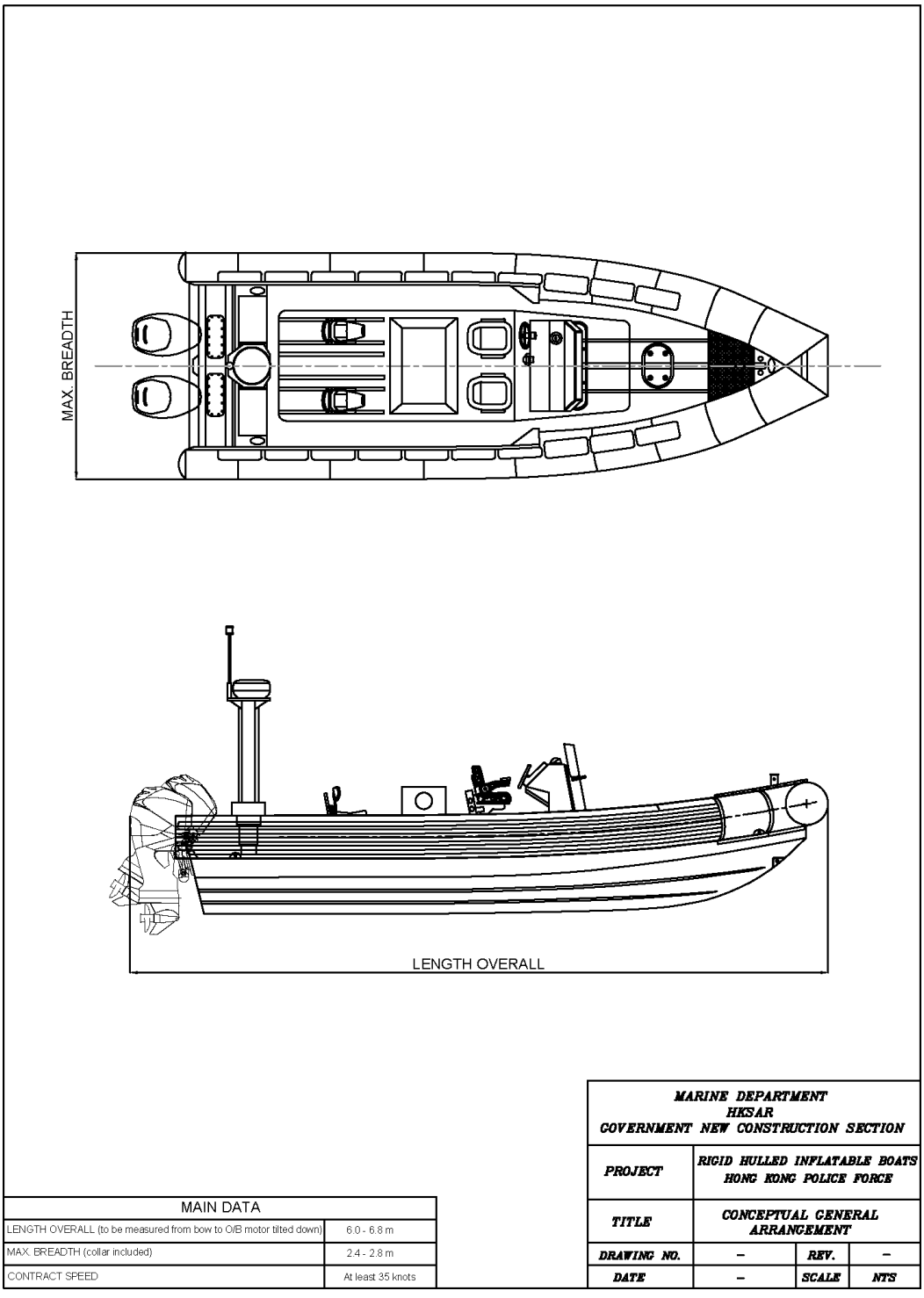
12.1.8 Asbestos Free

12.1.8.1 The Boat must not contain any asbestos or asbestos containing materials. The Contractor must comply with the Hong Kong Air Pollution Control Ordinance (Cap. 311), Part X. The Contractor shall engage a service supplier approved by one of the ROs as listed in Paragraph 12.2.3.3 (a) to (i) of this Part VII to verify that there is no asbestos on the Boat. An asbestos free certificate or a statement of compliance issued by the service supplier to this effect shall be provided upon

delivery of the Boat.

12.2 General Technical Requirements

12.2.1 Conceptual General Arrangement Plan



12.2.2 General Provisions

12.2.2.1 Without prejudice to the generality of Paragraph 12.1 of this Part VII, this Paragraph 12.2 contains the more particular technical specification for the Boat. The significance of Essential Requirements is explained in Paragraph 1.1 of Chapter 1 of Part VII.

12.2.2.2 The work to be undertaken in accordance with this Chapter 12 of Part VII consists of the design, construction, outfit, testing and delivery of **twelve (12) Daughter Boats ("Boat" or "Boats")** for the use of the Hong Kong Police Force ("HKPF"). Workmanship, functions, characteristics and performance shall be in accordance with this Chapter 12 of Part VII, best marine construction practices, and the regulatory standards herein specified or otherwise applicable.

12.2.2.3 The Conceptual General Arrangement Plan shown in Paragraph 12.2.1 of this Part VII serves only as a guidance and reference drawing to help explain the requirements stated in this Chapter 12 of Part VII.

12.2.2.4 ALL the machinery, equipment and facilities, furniture (if applicable), fixtures and fittings, including outfitting of the Boat that are described in this Chapter 12 of Part VII, together with their requirements for design and installation standards that are stipulated in this Paragraph 12.2 and in any other parts of this Part VII, are the items that must be included in the complete "As-built" Boat delivered to the Government.

12.2.3 Rules and Regulations

12.2.3.1 The Boats shall be designed and constructed in accordance with the rules and regulations of the RO acceptable to MD in the version as at the Contract Date unless the rules and regulations of RO specify that version of such rules and regulations as at the keel laying date of the Boat shall apply in relation to the relevant requirements specified therein. For each and every Boat, design approval and survey during construction shall be carried out by the RO, and examinations and tests shall be witnessed by the RO. A hull construction certificate shall be provided for the Boat on delivery.

12.2.3.2 With reference to machinery, systems and fire protection, the Contractor shall request an RO to provide specific requirements for the management of risks due to the presence onboard of fuel having a low flash point (petrol).

12.2.3.3 Without prejudice to the general requirement 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 Boat must comply with the requirements of the RO specified in Schedule 9 of Part V, or the requirements of any of the RO's listed below (where it is expressly specified in this Part VII). In relation to a particular requirement specified in this Chapter 12, that of another RO, other than the RO specified in Schedule 9 of Part V and which is any one of the RO's listed in sub-paragraphs (a) to (i) below may be designated as applicable. There may also be other requirements further specified in sub-paragraphs (j) to (n) below which are also applicable. In each of the aforesaid cases, the version as at the Contract Date shall be applicable unless any of these requirements specifies that version of requirements as at the keel laying date of the Daughter Boat shall apply:

(a)	American Bureau of Shipping	ABS
(b)	Bureau Veritas	BV
(c)	China Classification Society	CCS
(d)	DNV GL AS	DNV GL
(e)	Korean Register of Shipping	KR
(f)	Lloyd's Register	LR
(g)	Nippon Kaiji Kyokai	NK
(h)	Registro Italiano Navale	RINA
(i)	Russian Maritime Register of Shipping	RS

And other entities and regulations as specified below:

(j) International Electrotechnical 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 one of the ROs listed in sub-Paragraphs (a) to (i) above or the American Welding Society (AWS) or other applicable international standards or rules.

(m) International Regulations for Preventing Collisions at Sea 1972.

(n) ISO 12215-4 "Small craft – Hull construction and scantlings – Part 4 Workshop and manufacturing".

All equipment/fittings shall be designed and manufactured to at least the standards as specified in these Technical Specifications. If none of the rules and regulations in Paragraphs 12.2.3.3(j) to (n) 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 between the above requirements, rules and standards, those mentioned in sub-Paragraphs (j) to (n) shall prevail over the requirements of the relevant RO as listed in sub-Paragraphs (a) to (i) above.

12.2.4 Contract Speed

12.2.4.1 When all of the engines are running at their declared maximum (rated) power, the Contract Speed of the Daughter Boat proposed by the Tenderer in Schedule 7 of Part V shall not be less than 35 knots in WMO Sea States 0 to 2 under the Light Operational Load Condition as defined in Paragraph 12.1.5.1(f) of Part VII. **[E]**

12.2.4.2 The Contract Speed prescribed in Paragraph 12.2.4.1 above shall be achieved without the undesirable phenomenon as stated in Paragraph 12.2.10.3 (a) to (f) of this Part VII. The design of the Boat and the outboard engines so chosen shall minimise cavitation.

12.2.5 Principal Dimensions

The Daughter Boat to be proposed by the Tenderer in Schedules 7 of Part V shall comply with the following requirements:

Length Overall (LOA):	6.0 to 6.8 metres (both figures inclusive)	**[E]**
Breadth:	2.4 to 2.8 metres (both figures inclusive)	**[E]**
Draft:	Design to suit	
Deadrise angle:	not less than twenty-two (22) degrees at the transom and not less than twenty-three (23) degrees at midship	

12.2.6 Material of the Structure

Material of hull structure of the Daughter Boat shall be marine grade aluminium alloy. **[E]**

12.2.7 Boat Operating Profile and Environment

12.2.7.1 The Daughter Boat shall be designed to have sufficient space for carrying at least two (2) crew and two (2) other passengers. **[E]**

12.2.7.2 The Boat shall be designed for deployment by the HKPF for at least 6 hours per day and 340 days per year including both day and night time operational deployment. The Vessel shall be designed and built to operate in Hong Kong Waters.

Summary of Operational Hours / Range

(a)	Number of hours/day:	6 hours engine running time per day, broken down into: 0 to 20 knots – 2.5 hrs 20 to 30 knots – 2.5 hrs 35 knots – 1 hr
(b)	Number of days/year:	340 days/year
(c)	Endurance for fuel capacity:	Sufficient fuel for 2 hours at Contract Speed at the Light Operational Load Condition (as per Paragraph 12.1.5.1(f) of this Part VII) without refuelling.

12.2.7.3 The Boat shall be able to operate (fulfil its operational roles) safely within Hong Kong Waters in rough sea conditions up to and including WMO Sea State 5 and to survive WMO Sea State 6.

12.2.8 Markings and Colour Scheme

12.2.8.1 (a) The entire Boat is to be painted on all external exposed surfaces including but not limited to the surfaces of the bulwark, gunwale, console.

(b) The Contractor shall provide the markings and colour scheme for the Boat. All paints and the colour scheme for the Boat and fittings shall be approved by GNC before application.

(c) Draft marks, names, insignia and other colour markings should be in a colour contrasting with the hull and console's colour.

12.2.8.2 All labelling shall be in both traditional Chinese and English and as per applicable rules and regulations.

12.2.8.3 The Boat number shall be marked permanently on both sides of the console of the Boat. Details of the size, calligraphy and application method shall be confirmed by the HKPF.

12.2.8.4 Draft marks shall be permanently provided at the port and starboard stem and stern. A draft mark plan shall be produced by the Contractor and agreed by GNC before the draft marks are permanently marked onto the hull surface.

12.2.8.5 All other labelling, stencilling and marking (not limited to the hull but including all aspects of the Boat) 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.

12.2.8.6 Safety markings designed to prevent persons from tripping onboard the Boat shall be provided where necessary.

12.2.9 Tally Plates

12.2.9.1 The following information shall be displayed on the builder's plate:

(a) Builder's name;

(b) Boat's name;

(c) Year of build; and

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

12.2.9.2 Tally plates in both English and traditional Chinese characters shall be fitted for all spaces and all equipment as required by GNC 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, equipment on deck;

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

(f) Any other equipment/fitting as required.

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

12.2.9.3 Tally plates exposed to the external environment weather shall be made of durable and weatherproof material and be fastened securely.

12.2.9.4 All cable terminations shall be identified clearly for disconnection and reconnection.

12.2.10 Other Design Features

12.2.10.1 Permanent ballast can only be used as agreed by GNC.

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

12.2.10.3 The Boat shall perform at all speeds in WMO Sea States 0 to 2 without any of the following characteristics:

(a) dynamic instability including chine walking;

(b) porpoising;

(c) loss of horizon (meaning that the view of the horizon forward of the bow of both the coxswain and the commander both in the seated and standing positions at the console shall not be obstructed by the bow of the Boat at any time);

(d) loss of directional control;

(e) permanent list; and

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

12.3 Hull

12.3.1 Hull Construction and Scantlings

12.3.1.1 The hull shall be a continuous deep "V" with minimum deadrise angles of twenty-two (22) degrees at the transom and twenty-three (23) degrees at midship, with suitable appendages or other design features to minimise potential "side-kick" or "skidding" effects during high-speed manoeuvring.

12.3.1.2 The hull configuration specified at Paragraph 12.3.1.1 of this Part VII shall not incorporate a horizontal flat area at the keel unless the design also incorporates additional appropriate features to prevent "side-kick" or "skidding" during high speed manoeuvres.

12.3.1.3 The strength of the hull structure of the Daughter Boat shall be designed to meet the RO's requirements, while fulfilling the contract speed in WMO Sea States 0 to 2 under Light Operational Load Condition, as specified in Paragraph 12.2.4.1 of Part VII. **[E]**

12.3.1.4 The design stresses and scantling including internal structural members shall be determined according to the RO Requirements for the Boat's intended operations as specified in Paragraph 12.1.2.1 and 12.1.2.2 of this Part VII, including for being safely launched and recovered from the VPU Vessel, either by using the Davit Launch and Recovery System (LARS) or Stern LARS. In case of Stern LARS, the hull shall be designed to incorporate reinforcement for the impacts and sliding during launching and, especially, recovery operation.

12.3.1.5 The Contractor's quality control personnel shall carry out quality control throughout the construction of the Boat. Inspection shall be carried out by the RO's surveyors and MD assigned personnel or consultants.

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

12.3.1.7 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 for Design Category B or as per the RO Requirements.

12.3.1.8 The hull design shall incorporate a keel structure suitable for conducting beach landing operations.

12.3.1.9 The hull shall be fitted with appropriate sacrificial anodes.

12.3.1.10 The hull construction material shall be new and of a type which has been certificated by the RO in accordance with the RO Requirements. Mill certificates shall be obtained and records shall be strictly maintained to match them with the various sections produced during the Boat's construction.

12.3.1.11 Welding and Fabrication

(a) All welding and fabrication shall be implemented according to the applicable requirements of any one of the Classification Societies listed in Paragraph 12.2.3.3 (a) to (i) of this Part VII.

(b) Welded joints shall be designed and constructed carefully to conform to the latest established standards as at the Contract Date to prevent fatigue failure. 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.

(c) The Contractor shall submit certification of the qualifications of each individual welder and inspector. Welds installed using unqualified procedures or welding performed by non-certified welders shall be subject to removal by the Contractor at the Contractor's own expense.

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

(i) Inventory of incoming materials, consumables, components and machinery;

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

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

(iv) Welding and inspection procedures identifying clearly the type and extent of NDT inspection carried out on the Boat's structure. Normally, not less than 10% of the structure shall be subjected to Ultrasonic Test (UT) and Radiographic Test (RT);

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

(vi) Finish surfaces and bolting;

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

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

12.3.2 Stability

12.3.2.1 The Daughter Boat shall comply with the intact and damaged stability requirements stated in Paragraphs 12.3.2.5 and 12.3.2.6 of Part VII. **[E]**

12.3.2.2 Final stability calculations of the sea trial loading condition using final lightship data shall be delivered to GNC prior to conducting all tests and trials stated in Paragraph 12.1 of Part VII. All calculations and drawings must be in metric units.

12.3.2.3 Inclining Experiment or Equivalent Means in Determining Final Lightship Data:

(a) A lightship survey shall be carried out to determine the final lightship weight. The Boat shall be inclined to determine the position of centre of gravity by carrying out the inclining experiment, or by equivalent means, as agreed by the RO and by GNC.

(b) At least 14 working days in advance of the inclining experiment, the Contractor shall submit a "Scheme of Inclining Experiment" which includes:

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

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

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

(iv) The proposed number, location and lengths of pendulum to be used;

(v) Hydrostatic table and tank capacity tables. The increment of draft shall be every 5 mm in the hydrostatic table and the increment of sounding shall be every 5 mm in the capacity tables; and

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

(c) The inclining experiment shall only be conducted:

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

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

A request for attendance shall be made at least five (5) working days in advance. The lightship weight and centre of gravity shall be calculated and presented in the inclining experiment report. The GM of the Boat after each and every shift of inclining weights shall be determined. All spaces and tanks should be kept dry, or tanks pressed up with the intended liquid. Free surface of liquids remaining onboard shall be taken into account.

(d) If equivalent means are agreed by the RO and GNC in lieu of an inclining experiment, details in carrying out the equivalent means shall be submitted in advance at least 14 working days prior to carrying out such equivalent means.

(e) If inclining experiment is used in determining the final lightship weight and position of the centre of gravity of the Boat without the use of other equivalent means acceptable to GNC, only the first (1st) and the seventh (7th) Boat in the series are required to undergo the full inclining experiment, while the remaining Boats shall have their final lightship weight and position of centre of gravity determined by conducting lightship measurements. If the lightship weight and LCG of that Boat as measured deviate from those of the Boat most recently inclined by more than 2% of weight or 1% of LCG, inclining experiments for that Boat concerned shall be carried out. Extra inclining experiments on sister Boats shall be carried out on GNC and/or the RO's request.

(f) This inclining experiment report, or the report showing how the lightship data are determined by using equivalent means, shall be submitted to and approved by the RO and GNC. The

report must include a statement from the Contractor stating that the Boat shall be safe to go to sea for the intended sea trials specified in the Contract. No sea trials shall be conducted until GNC, based on the information given in the report determining final lightship data, agrees that it is safe to carry out sea trials.

12.3.2.4 Stability Information Booklet

(a) The Contractor shall supply to GNC three (3) copies of the Stability Information Booklet. The final version of the Stability Information Booklet must be submitted to GNC at the time of Delivery Acceptance.

(b) The final version of the Stability Information Booklet shall include:

(i) The Boat's particulars, a sketch of the general arrangement drawing showing different compartments and tank positions, hydrostatic curves and cross curves;

(ii) Tank calibration/sounding tables, including but not limited to the fuel oil tank(s). These tables shall consist of the locations of tanks (in terms of frame numbers), the levels from tank bottom, the capacities, the Vertical Centre of Gravity (VCG) / Longitudinal Centre of Gravity (LCG) / Transverse Centre of Gravity (TCG) and free surface moments and the location of sounding points. The trim and heel of the Boat where these tables are applicable shall be stated;

(iii) A stability calculation for each loading condition [as stated in Paragraph 3.2.5(c) of this Part VII], which shall include but not be limited to a profile drawing of the Boat and items of deadweight, lightship, displacement, drafts, trim, VCG, GM (solid & fluid), LCG, down-flooding angle and stability righting lever (GZ) curve, wind and other heeling levers etc.;

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

(v) The report in determining the final lightship data approved by GNC and the RO.

(c) Loading Conditions in the Stability Information Booklet

(i) The maximum free surface moments shall be used for calculating the stability of the Boat in all of the following conditions.

Loading conditions		Fuel oil	Supplies & Equipment	Persons and Effects
(1)	Lightship	Nil	Nil	Nil
(2)	4 persons plus Supplies & Equipment Departure	98%	0 kg	370 kg (2 crew, 2 passengers)
(3)	4 persons plus Supplies & Equipment Arrival	10%	0 kg	370 kg (2 crew, 2 passengers)
(4)	2 persons plus Supplies & Equipment Departure	98%	300 kg	185 kg (2 crew)
(5)	2 persons plus Supplies & Equipment Arrival	10%	300 kg	185 kg (2 crew)
(6)	Light Load Departure	98%	0 kg	185 kg (2 crew)
(7)	Light Load Arrival	10%	0 kg	185 kg (2 crew)
(8)	Launching and Recovering	50%	0 kg	185 kg (2 crew)

(ii) The weight of each person shall be assumed to be 82.5 kg, and effects per person to be 10 kg.

(iii) The VCG of each person and their effects shall be assumed to be 300 mm above the seat when seated, and 1000 mm above the deck when standing. The seated or standing

position, and LCG of each person, shall be in their most likely position onboard.

(iv) The weight of the supplies and equipment as stipulated in Paragraph 12.3.2.4(c)(i) of this Part VII shall be evenly distributed along the deck and the VCG of the additional payload will be assumed to be 500 mm above the deck.

(v) In addition to Paragraph 12.3.2.4(c)(i) above, the Contractor shall provide a pair of departure and arrival loading conditions for reference purposes in case of emergencies. This pair of loading conditions shall demonstrate the maximum possible number of persons that the Boat is capable of carrying while complying with the intact criteria as given in Paragraphs 12.3.2.6 of this Part VII. The pair of loading conditions should have two (2) police officers operating the Boat, no additional payload and the maximum number of survivors (each assumed to be weighing 82.5 kg), with 98% fuel at departure, and 10% fuel at arrival.

12.3.2.5 Intact Stability Criteria

Stability will be considered satisfactory for the loading conditions set out in Paragraph 12.3.2.4(c)(i) above if, after taking into account free surface effects, the following criteria are complied with:

(a) The intact stability criteria stated in Part A Chapter 2 of the Intact Stability Code as amended; or

(b) The criteria specified in ISO 12217-1 Operational Limit Category B and the applicable criteria specified in ISO 6185-3; or

(c) As per the stability requirements of the RO.

12.3.2.6 Damaged Stability Criteria

Transverse bulkheads shall be arranged to contain flooding of any one watertight compartment between the adjacent watertight transverse bulkheads, and asymmetric flooding due to damage of any smaller watertight spaces located within the compartment between the adjacent watertight transverse bulkheads. The residual stability shall be sufficient to maintain the Boat being afloat with the pre-damage payload onboard in case of damage.

N.B. Irrespective of whether the RO has requirements for damage stability or not, the Contractor shall obtain the agreement of the RO and GNC on the opening(s) to be used to determine the down flooding angle.

12.3.3 Painting

12.3.3.1 Paints shall be of a marine quality and be applied in accordance with the manufacturer's specification and normally available from paint suppliers in Hong Kong.

12.3.3.2 The Volatile Organic Compound (VOC) content limits of the paints shall comply with the Hong Kong Air Pollution Control (Volatile Organic Compounds) Regulations CAP 311W.

12.3.3.3 The Painting Schedule shall be submitted to GNC for approval before commencement of work. The proposal shall contain a list including the detailed specifications of the paint intended to be used. The thickness of each coating shall be specified.

12.3.3.4 The Contractor shall guarantee all painting work for one (1) year against defects in materials and workmanship. At Delivery Acceptance the Contractor shall provide GNC with a letter of certification from the paint manufacturer signed by qualified coating inspectors to certify that the paint has been applied in accordance with the paint manufacturer's quality control requirements including, but not limited to the surface preparation (blasting profile and water soluble salt content), surface temperature of the metal surfaces above dew point, atmospheric conditions (temperature and relative humidity), dry film thickness and method of application.

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

12.3.3.6 All deck areas shall be covered with hard wearing and anti-slip epoxy paint or a covering acceptable to the GNC/HKPF. This is to be discussed at the kick-off meeting.

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

12.3.3.8 All fastening preparation and other penetrations shall be completed before painting of any surface.

12.3.3.9 All surfaces and any parts of the hull, deck or machinery, fittings that may cause glare or reflection must be matt coated.

12.3.3.10 A painting report shall be submitted to GNC upon completion of work.

12.3.4 Operational Console

12.3.4.1 The offered Boat shall have an operational console (the console) constructed of marine grade aluminium. The layout of the console shall be submitted for GNC's approval before any construction work on the console commences. To facilitate the efficient visualisation and inspection of the design of the console, a full size mock-up console complete with deckplate, seats, mounting systems and any other fixtures that may influence the final design of the console, is to be manufactured for inspection, modification (if necessary) and confirmation by GNC and the HKPF. The mock-up console may also be used for the purposes specified in Paragraph 12.7.1.3 of this Part VII. The console of an existing craft may be used as the basis for initial discussions.

12.3.4.2 The Console

(a) The console shall be designed to deflect wind up and over the heads of the coxswain and the commander in both the seated and standing positions and to house the equipment required by the coxswain and the commander to control/monitor the Boat.

(b) The console shall be ergonomically designed to fit a coxswain of Asian stature (approximately 1.64 metres in height), with the controls and displays in immediate reach or view from both a seated and standing position to facilitate operation of the craft for extended periods. The crew shall also be provided with an unobstructed view over the console and bow from a seated as well as a standing position.

(c) The controls or displays of the following equipment shall be installed in the console and located in front of the coxswain in natural and logical positions, with the highest priority devices being located in prime positions.

(i) Helm;

(ii) Engine throttle control;

(iii) Trim control selector panel;

(iv) Engine monitoring display panel (see Paragraph 12.4.2.12 of this Part VII);

(v) Engine start/stop/emergency stop (dead-man lanyard) control;

(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) Satellite compass electronic digital display unit;

(viii) Fuel tanks level gauge;

(ix) PA/Loudhailer control unit and microphone;

(x) Radar and electronic chart display;

(xi) Electric horn;

(xii) Siren and flashing beacon control panel;

(xiii) Navigation lights, search lights and flood lights switch panel as appropriate;

(xiv) Radio communication controls and microphone as appropriate; and

(xv) Other display items to be included, the integration of which (e.g. echo sounder in combination with satellite compass and GPS location information) will be discussed at the kick-off meeting.

12.3.4.3 Controls, displays and equipment

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

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

(c) Lockers shall be provided as far as possible, if space permits, to allow for the watertight storage of items of police 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. Details to be discussed at the kick-off meeting.

(d) The arrangement shall be designed to protect the crew and persons onboard from injury inflicted by the console and the equipment installed in it.

(e) Sufficient legroom shall be provided to obviate the risk of impact injury during rough sea conditions or violent manoeuvres in both the seated and standing positions.

(f) A waterproof and ultraviolet radiation resistant black/grey cover shall be provided to cover the console down to deck level when the Boat is not in use.

12.3.5 Self-Righting/Aerial Mounting Frame

12.3.5.1 The Boat shall be provided with a self-righting system mounted on a frame at the stern of the Boat, which incorporates an inflatable bag with a heavy-duty coated fabric cover and a CO_2 bottle. In the event that the Boat capsizes, this self-righting system shall be capable of being activated automatically through a hydrostatic release, and manually (as a backup) by pulling a release handle. The system shall be dimensioned so that it is capable of righting the Boat at the Light Operational Load Condition as stipulated in Paragraph 12.1.5.1(f) of this Part VII.

12.3.5.2 The self-righting system mounting frame shall be positioned so that the head of a crew member standing at the stern of the Boat shall not come into contact with the frame during passage in heavy sea conditions.

12.3.5.3 The self-righting/aerial mounting frame shall be detachable for transportation purposes and designed to minimise wind resistance. This will be reviewed at the kick-off meeting.

12.3.5.4 The self-righting/aerial mounting frame shall be a strong and rigid structure to support the self-righting gear, lightning arrestor/dissipater, navigation lights, search light and other electronic and navigation equipment as appropriate under the dynamic responses at the design operating sea state in Paragraph 12.2.7.3 of this Part VII and shall be free of fatigue damage throughout its life span.

12.3.5.5 The self-righting/aerial mounting frame shall be provided with all necessary fittings including but not limited to brackets for all navigation lights and the lightning arrestor/dissipater as per the Conceptual General Arrangement Plan shown in Paragraph 12.2.1 of this Part VII.

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

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

12.3.5.8 The design of the mounting frame, self-righting system and aerial positions shall be discussed at the kick-off meeting, and shall be submitted to the HKPF and GNC for approval.

12.3.6 Lockers/Void Spaces

12.3.6.1 Lockers / Void Spaces

(a) A demountable pyrotechnics box fitted with internal closed cell foam padding shall be accessible to the crew during high speed manoeuvring. The box shall not obstruct the crew's operations or field of vision. This box shall be of a rigid construction, impact resistant, shockproof, waterproof and buoyant.

(b) Other watertight lockers and storage designed for installation on a deck track railing system, shall be provided if space permits. This storage shall be designed to be installed on the deck track railing attachment system specified at Paragraph 12.3.7.5 of this Part VII.

(c) The location and dimensions of lockers shall be discussed at the kick-off meeting and agreed by the HKPF.

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

12.3.6.3 The design of lockers or other storage acceptable to the HKPF, or void spaces and their mounting facilities, shall be discussed during the kick-off meeting and subsequently approved by the GNC and HKPF. Lockers or other storage shall be ready in the mock-up for inspection before finalisation.

12.3.7 Deck, Seating and Attachment Systems

12.3.7.1 High quality shock-mitigating seats, anti-vibration deck covering and handrails shall be provided to reduce the risk of impact injury and long-term health damage to both crew and persons onboard resulting from the harsh maritime environment in which the Boat will operate.

12.3.7.2 The seats shall be designed to optimise body posture and to prevent occupants from injuries including the following:

(a) falling or being thrown onto the deck or overboard;

(b) spinal injuries; and

(c) other injuries which may be caused by potentially harmful forces to which the Boat and crew conducting the type of operations specified in Paragraph 12.1.2.1 of this Part VII according to the operational profile specified in Paragraph 12.2.7 of this Part VII may be subjected.

12.3.7.3 Basic requirements of the seats:

(a) Specifically designed for use aboard small, high-speed marine craft at 35 knots or above;

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

(c) Materials of upholstery: Water resistance materials such as fire retardant foam/reinforced nylon laminated neoprene/heavy duty Cordura laminate.

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

12.3.7.4 Seating for two (2) crew, and at least two (2) passengers, shall be provided. The two crew seats shall be designed with progressive damping and adjustable shock absorbers for light/heavy personnel. Further specifications shall be discussed at the kick-off meeting and agreed by the HKPF.

12.3.7.5 A recessed track railing attachment system consisting of flush fitting seat mounting rails shall be fitted, if space permits, on the deck immediately in front and/or aft of the console to allow for the temporary installation of seating and stores tie-down points if required.

12.3.7.6 Notwithstanding the requirement for all deck areas to be covered with anti-slip epoxy paint as specified in Paragraph 12.3.3.6 of Part VII, all areas of the deck shall be covered by shock/vibration mitigating material or equivalent in such a manner that the removal of any of the shock-mitigating seating specified at Paragraphs 12.3.7.4 above will result in a surface free of

tripping or snag hazards.

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

12.3.7.8 All flat, horizontal surfaces above deck level, where personnel may step such as gunwales and bow boarding platform shall, if practicable, be coated with an appropriate anti-slip epoxy paint.

12.3.7.9 The designs of the fixtures, fittings and finishing specified at Paragraph 12.3.7 of this Part VII shall be discussed during the kick-off meeting and drawings shall be submitted to GNC and HKPF within one month from the date of the kick-off meeting for approval.

12.3.8 Foam Collar

12.3.8.1 A closed cell polyethylene foam collar such as Ethafoam 220E or equivalent shall be fitted to cover the bow, and full length of the port and starboard sides for hull protection. The foam collar shall be protected by a reinforced cover.

12.3.8.2 The collar shall be detachable but tightly affixed to the hull and flush with the sheerline. The method of attachment may be by adhesive recess belts, a track system, bolting or other non-adhesive mechanical means agreed by the GNC and HKPF. The design shall ensure that the collar cannot become detached or slide aft as a result of wave action or other intended or unintended external influences.

12.3.8.3 The collar must be clear of the water when planing at Full Operational Load Condition as per Paragraph 12.1.5.1(f) of this Part VII.

12.3.8.4 The collar shall be resistant to impact, abrasion, outdoor temperature extremes, degradation caused by ultraviolet radiation, ozone and contact with seawater, oil, petrol, diesel, lubricating oil or chemicals. The testing of the foam material shall comply with IMO MSC 81(70) as amended and ISO 6185-4 or other international standards or rules acceptable to the MD and the RO.

12.3.8.5 The bow section of the Boat shall be fitted with additional protection consisting of a tied down sacrificial covering with recessed tie-down points on the bow deck and stem.

12.3.8.6 Detachable swimmer grab strips/lines shall be provided along the sides of the Boat at intervals of approximately one metre. These shall be attached either at dedicated points or to grab/safety rails of sufficient strength. Stowage for these lines shall be provided when not attached to the Boat.

12.3.8.7 The collar shall incorporate a survivor recovery cut-out (or diver door) abaft the beam on both the port and starboard sides to facilitate the safe and efficient recovery of a person in the water by onboard crew members.

12.3.8.8 Mounting points shall be provided at the survivor recovery cut-out (or diver door) to which the 710mm wide Fast Rescue Craft (FRC) Jason's Cradles shall be affixed to assist in the recovery of unresponsive persons from the water. The mounting points shall be painted in a distinctive colour for easy identification.

12.3.8.9 Stowage space shall be provided at an appropriate location along both of the Boat's sides to assist in the recovery of unresponsive persons from the water.

12.3.8.10 Details of the design shall be discussed at the kick-off meeting and submitted to the GNC for approval before the completion date stipulated in Annex 12 to Part VII.

12.3.9 Bow

12.3.9.1 A bow sheer deck boarding platform or step at a height flush with the top of the side sheet and collar system, with intermediate steps for safe access if necessary, leading up to it, shall be provided at the bow to facilitate embarkation and disembarkation. The void cuddy space under this platform shall be enclosed and designed for watertight storage. Details of the design shall be discussed at the kick-off meeting and submitted to the GNC for approval before the completion date stipulated in Annex 12 to Part VII.

12.3.9.2 All gunwale fittings such as cleats and bollards shall be designed to minimise the risks of line tangling or snagging through being recessed/foldable and flush fitting. All deck level tie-down points shall be flush fitting or removable to minimise tripping hazards.

12.3.10 Transom and Stern

12.3.10.1 The transom and the propulsion systems and their respective attachment to the Boat shall be designed to comply with the rules of the RO and be capable of operating in sea conditions for boats complying with ISO 12217-1 Category B limits.

12.3.10.2 A tray with drains shall be attached to the fore part of the transom to accommodate the petrol filters, fuel supply water separator drain, control wires and hydraulic steering pipes.

12.3.10.3 The transom shall be designed to provide safe and easy access to the outboard engines for routine checking and troubleshooting even while underway at sea.

12.3.10.4 The outboard engines shall be protected by a suitable guard of a sturdy metallic tube construction. A separate towing bit shall also be provided near the stern. Details of the design shall be discussed at the kick-off meeting and submitted to the GNC for approval before the completion date stipulated in Annex 12 to Part VII.

12.3.11 Anchor, Chains and Strong Points

12.3.11.1 The Boat shall be equipped with one stainless steel anchor with certificate issued by the RO and suitable swivel, shackles and secured stowage shall be provided by the Contractor.

12.3.11.2 Two (2) pieces of 30 m long 16 mm diameter nylon wraps for mooring, towing and anchoring shall be provided by the Contractor in a suitable stowage.

12.3.11.3 The anchor shall be securely stowed in the bow compartment. The free end of the nylon wrap should be attached to an attachment point in the bow compartment.

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

(a) Anchoring/towing point(s) forward;

(b) The Daughter Boat needs to be equipped with a quick connect/release hook to ensure fast and safe operations during both launch and recovery with a davit LARS, as well as a docking head. It should also be equipped with a remotely released bow painter hook in the event that the Daughter Boat needs to use a sea painter line for launch and recovery when the Vessel is making headway. This to keep the Daughter Boat stabile and parallel to the ship.

(c) Towing points fore and aft capable of withstanding the forces involved when towing or being towed by a sister vessel or other craft of similar size.

(d) In case the Davit LARS is incorporated in the VPU Vessel, the forward towing point of the daughter boat shall be located on the stem immediately below the forepeak.

(e) In case the Stern LARS is incorporated in the VPU Vessel, the forward towing point of the daughter boat shall be the strong point used in the event the backup winch is used for launching and recovering by the Stern LARS. Details of the design shall be discussed at the kick-off meeting and submitted to the GNC for approval before the completion date stipulated in Annex 12 to Part VII; and

(f) Lifting strong points for a single-point lift.

12.3.11.5 Devices for Lifting the Boat

(a) The Boat shall be provided with three (3) means of lifting. It shall be designed for use with launch mounted davits, fixed jib cranes, telescopic cranes, travel hoists and truck mounted

cranes:

(i) Single-Point Lifting Method

The Boat shall be installed with a lifting arrangement, complying with the IMO LSA Code as amended, or as per the RO's requirement regarding lifting appliances. The lifting frame shall be made of duplex steel. The lifting structure, which is to be demountable, shall be appropriately positioned at the LCG and in accordance with the Requirements of the RO and GNC. An off-load release hook having received type-approval from any one of the ROs listed in Paragraph 12.2.3.3(a) to (i) of this Part VII shall be used. The swivel, davit docking and remote release shall comply with SOLAS or equivalent international standard.

In the event a davit LARS is adopted, an anti-pendulum unit shall be fitted onboard.

(ii) 4-Points Lifting Method

The Boat shall be designed with strong point lifting attachments permanently fitted to the hull. A spreader shall be provided if the bending stress induced during lifting exceeds the Boat's permissible tolerance or if the lifting wires/strops would otherwise foul the radar frame or equipment fitted thereto. The design of the lifting attachments, wires/strops and spreader, if any, shall be approved by the RO and shall match, where practical, the lifting facilities at the HKPF's operational bases.

(iii) Lifting Sling Method

The Boat shall be designed to allow the Boat to be hoisted ashore by means of lifting slings around the hull. The hull structure shall, if it is necessary, be strengthened appropriately and the locations at which the slings are to be positioned shall be marked clearly. If there are hull appendages (e.g. fins, spray rails, etc.) which may be in way of the lifting slings and may be damaged due to the use of lifting slings, protection device (e.g. matching protection blocks, spreader, etc.) shall be provided.

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

12.3.11.6 All the lifting devices/accessories shall be designed to withstand at least six (6) times the mass of the Boat with all the equipment. All devices and accessories shall be certified by the RO in accordance with the laws of Hong Kong prior to delivery. The lifting designs shall be discussed at the kick-off meeting and agreed by GNC and the HKPF. 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 the above lifting methods to GNC and the HKPF for compatibility checking with existing lifting facilities.

12.3.12 Trailers

12.3.12.1 The Contractor shall supply the Boat with one suitably designed metal slipping trailer for each Boat, i.e. twelve (12) in total, with appropriate safety features on which the Boat can be slipped ashore and tied down during tropical cyclones. The trailer shall have four stoppered double wheels units equipped with durable rubber tires or nylon wheels suitable for prolonged exposure to the outdoor environment including ultraviolet radiation. It shall be designed with a towing bar to facilitate towing by plant within the HKPF's operational base compounds and be steerable for manual positioning, with the front set of wheels capable of rotating through 360° about a hinge on the trailer. This trailer is not required for use on public roads. The design shall be submitted to the GNC for approval.

12.4 Machinery

12.4.1 General Requirements

12.4.1.1 The Boat is for use in Hong Kong and it is desirable that the outboard engines and any other

machinery offered are similar to those at present commonly used on the Hong Kong Government fleet, and shall have good availability of spare parts. Good technical support and maintenance services shall be available locally in Hong Kong.

12.4.1.2 The Boat shall be equipped and fitted with machinery that complies with the specifications set out in this Chapter. The critical spare parts to be provided shall be of the same model as supplied for the Boat and shall equally comply with all specifications set out in this Chapter.

12.4.1.3 The machinery, associated piping systems and fittings relating to the outboard engines shall be of a design and construction adequate for the service for which they are intended and shall be so installed and protected as to reduce to a minimum any danger to persons onboard. The design shall have regard to materials used in construction, the purpose for which the equipment is intended, the working conditions to which it will be subjected and the environmental conditions onboard.

12.4.2 Outboard Engines

12.4.2.1 The Daughter Boat shall be powered by twin (2) marine four-stroke outboard petrol spark ignition engines of adequate power to deliver the Contract Speed as stated in Paragraph 12.2.4.1 of Part VII. The engines shall drive stainless steel fixed pitch propellers through integral gearboxes. The propellers driven by the engines (port and starboard) shall be counter-rotating. **[E]**

12.4.2.2 The Contractor shall be responsible for ensuring the correct installation and setting up of the engines including the choice of propellers in accordance with the manufacturer's recommendations so as to avoid ventilation and cavitation.

12.4.2.3 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 International Council of Marine Industry Associations (ICOMIA) 28/83 requirements.

12.4.2.4 The engines of the Daughter Boat shall have a three-star rating (ultra-low emission) or higher as per the California Air Resources Board star system ("CARB star system") that sets out the standards of exhaust emissions of four-stroke outboard engines or standards equivalent to the CARB star system. **[E]**

12.4.2.5 The Boat shall be capable of navigating on one engine at lower speeds.

12.4.2.6 The engines in the Daughter Boat shall possess the following essential features to enable the Boat to be navigated following a capsize: **[E]**

(a) All propulsion systems should have an emergency stop facility with twin tilt-switches for dependable sensing of the capsize situation. **[E]**

(b) All engines and support systems should be capable of being immediately restarted following capsize. The post capsize system shall include the following features as a minimum: **[E]**

(i) Seal the engines against water ingress during capsize/ immersion;

(ii) Fully automatic and integrated to the engine electronic control unit;

(iii) No requirement of manual operation of taps or valves;

(iv) No requirement of removing engine cover; and

(v) Provide a 'Test Mode' for operational checks.

12.4.2.7 The two (2) engines shall be controlled using two throttles/levers (with reversing function). The two throttles/levers will be placed conveniently for one-handed simultaneous operation by the coxswain. The engine throttle/levers shall be designed/approved by the engine manufacturers. The throttle system shall be equipped with a mechanism that can enable the coxswain to synchronize the throttles.

12.4.2.8 The engines shall be equipped with power trim with switches on the throttle controls/levers that enable the operator to adjust the trim angles whilst making way. The engines shall be designed to

trim fully down to start and be trimmed up as the Boat gains momentum, until reaching the point just before ventilation begins. The power trim and switches on the outboard engines should also enable trimming up when not in use.

12.4.2.9 The engines located at the transom shall be easily accessible for maintenance, routine checking and troubleshooting, as specified in Paragraph 12.3.10.3 of this Part VII.

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

12.4.2.11 Each engine system shall include the following accessories:

(a) 12V electrical alternator and remote starting control;

(b) Emergency cut-off;

(c) Power trim and tilt system with trim gauge at the console;

(d) Engine protection system as required by the engine manufacturer, with audio and visual warnings at the console. These audio warnings shall be broadcast to the Boat's operators via the IC system as specified at Paragraph 12.7.7 of this Part VII; and

(e) Each engine shall incorporate one alternator for battery charging.

12.4.2.12 The Contractor shall supply the Boat with a comprehensive boat information system which shall be integrated with the Boat's GPS and other systems, to generate recorded data in NMEA 2000 format, to be displayed on an engine monitoring display panel located on the console, including but not limited to the following:

(a) Engine rpm;

(b) Engine running hours;

(c) Battery voltage;

(d) Steering and trim data;

(e) Course and speed;

(f) Engine faults and notification alarms (corresponding to real time instead of running hours);

(g) Trip history (corresponding to real time instead of running hours); and

(h) Any other data as required by the HKPF and shall be discussed in the kick-off meeting.

12.4.2.13 The boat information system specified at Paragraph 12.4.2.12 above shall generate an audible notification alarm over the Boat's IC system as specified at Paragraph 12.7.7 of this Part VII in respect of the notification alarms specified at Paragraph 12.4.2.12(f) above.

12.4.2.14 The data captured by the boat information system specified at Paragraph 12.4.2.12 above shall be stored for at least seven hundred and twenty (720) hours locally in NMEA 2000 format on the Boat on an appropriate storage medium provided by the Contractor and be transferrable to the Government data network as specified at Paragraph 12.7.5 of this Part VII to remote sites for review. The data storage medium shall be in a temper proof location with locks provided by the Contractor. Details of the security measures shall be discussed in the kick-off meeting.

12.4.2.15 The Contractor shall supply one (1) computer terminal and the software (with any necessary perpetual licences for use) required for reviewing and analysing the data stored in the Boat information system. Details to be discussed in the kick-off meeting.

12.4.3 Propellers

12.4.3.1 All propellers shall be made of stainless steel with a fixed pitch.

12.4.3.2 The Contractor shall consult the outboard engine manufacturer regarding the draft of propellers taking into account the full operating profiles of the boat as specified at Paragraph 12.2.7 above.

12.4.4 Steering System

12.4.4.1 The electro-hydraulic steering system shall be designed and approved by the engine manufacturer and approved by the RO. The arrangement of the steering system shall be accepted by GNC and HKPF before installation.

12.4.4.2 If the normal electrical power supply of the hydraulic steering system fails, an Uninterrupted Power Supply (UPS) shall be immediately available to ensure that the steering system shall continue to function.

12.4.4.3 Manual steering capability shall be provided. In the event of complete loss of electrical power supply onboard, the crew shall be able to manually operate the Boat at a reduced speed.

12.4.4.4 The hydraulic fluid tank shall be easily accessible for routine level checking and refilling.

12.4.4.5 The outboard engines shall be installed in such a way that, with any combination of engine turn and tilt, the engines shall not interfere with each other or any other part of the Boat.

12.4.4.6 Connections, fittings, oil fill openings and air bleeders shall be accessible with all engines and systems fitted and installed.

12.4.4.7 Components in the system shall be protected externally against corrosion. The complete hydraulic steering system shall be designed to withstand, without failure or leakage, the conditions of pressure, vibration, shock and movement expected in a boat conducting the type of operations specified in Paragraph 12.1.2.1 of this Part VII.

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

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

12.4.4.10 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.

12.4.4.11 The position of the helm shall be optimised ergonomically so that a coxswain of an Asian stature (approximately 1.64 metres in height) can use it for extended periods from both the seated and standing positions without incurring unnecessary physical strain. The helm shall be fitted with an anti-slip covering and be of a size acceptable to the GNC and HKPF. Operation of the throttle levers and other controls by gloved hands shall not be impeded by the size or position of the helm. The helm shall be user-adjustable for rake.

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

12.4.4.13 The steering system shall incorporate a function enabling the number of revolutions of the helm from lock to lock to be pre-set according to the HKPF's requirements. The usual number of revolutions from lock to lock would be five (5), and the details shall be discussed at the kick-off meeting.

12.4.5 Petrol Tanks

12.4.5.1 Petrol Tanks

(a) (i) A single or twin under deck petrol tanks with sufficient capacity to fulfil the endurance requirements specified at Paragraph 12.2.7.2(c) of this Part VII shall be provided. The design and tests shall comply with the RO's rules.

(ii) The tank(s) shall not be integral with the hull and shall be installed so that the loads due

to the mass of the full tank are safely induced into the structure, with due consideration given to the effects of vertical acceleration due to the Boat's movements at maximum speed at sea.

(iii) In respect of Paragraph 12.4.5.1(a)(ii) above, continuous flexible supports which spread the loads are preferable to rigid supports.

(b) Petrol tanks shall be filled with a coarse-pore expanded aluminium mesh baffle material or suitable open cell foam for explosion suppression and to minimise free surface effects which fulfil the requirements of the RO's rules. The foam or baffle must be removable through a soft patch in the top of the fuel tank for inspection purposes

(c) All seals such as gaskets, O-rings and joint-rings shall be of a non-wicking, i.e. non-fuel absorbent, material. All materials used shall be resistant to deterioration caused by the fuel for which the system is designed and other liquids or compounds with which the material may come into contact as installed under normal operating conditions, e.g. grease, lubricating oil, bilge solvents, fresh water and sea water.

(d) Internal surfaces of the petrol tanks shall be unpainted and cleaned thoroughly to the satisfaction of the GNC.

(e) Provisions in respect to the Petrol Tank(s)

(i) A tank content gauge and low level alarm shall be fitted on the console for each tank;

(ii) The material of which the petrol tank(s) are constructed shall comply with the requirements of the RO's rules and shall be resistant to corrosion. The thickness of the construction material shall be sufficient to sustain the inertial loads due to the mass of the full tank(s) without damaging the integrity of the petrol tank(s) with due consideration given to the effects of vertical acceleration due to the Boat's movements at maximum speed at sea;

(iii) Metallic filling pipes may be connected to the sides or ends of metal petrol fuel tank(s), provided that they are welded to the tank and reach above the top of the tank. All other fittings and openings shall be on the top of the fuel tank(s);

(iv) Rigid fuel suction tubes and filling pipes which extend to near the tank bottom shall have sufficient clearance to prevent contact with the bottom during normal operation of the Boat;

(v) For each petrol tank, an inspection manhole, air vent with flame trap on deck and petrol tank outlet valve, with a quick closing device, shall be provided. The quick closing devices shall be positioned between the petrol tank(s) and the outboard engines. The triggers for these quick closing devices shall be installed on the console in an easily accessible location for both the coxswain and the commander;

(vi) The tank supports, chocks or hangers shall either be separated from the surface of the metal tanks by non-metallic, non-hygroscopic, non-abrasive material or be welded to the tank(s);

(vii) An easily removable filter with water detector shall be built into the filling line;

(viii) The tank(s) shall be designed and installed to prevent water from being trapped on the exterior surface;

(ix) Tank drains are not permitted on the petrol fuel tank(s); and

(x) A water separator incorporating a drain valve shall be installed between the tank(s) outlet valves and the outboard engines. It shall be easily accessible for inspection and operation.

12.4.5.2 Petrol Fuel Tank Tests - Leakage Test

The tank shall be pressure tested in accordance with ISO 21487.

12.4.6 Bilge System

12.4.6.1 Electric bilge pump(s) with manual back up shall be provided by the Contractor. Details of the

design shall be discussed at the kick-off meeting and submitted to the GNC for approval before the completion date stipulated in Annex 12 to Part VII.

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

12.5 Electrical System

12.5.1 General Requirements

12.5.1.1 All the electrical equipment and installations on the Boat shall comply with RO requirements.

12.5.1.2 All electrical equipment, fittings, instruments, switches, cables, insulation, sheathing, circuit breakers, rating standards and their installations shall comply with the Regulations of the International Electro-technical Commission (hereinafter referred to as IEC) Electrical Installations in Ships in the version as at the Contract Date unless the regulations specify that version of such rules and regulations as at the keel laying date of the Vessel shall apply in relation to the relevant requirements specified therein. The electrical system shall be an insulated two-wire Direct Current (DC) system. The hull shall not be used as a current-carrying conductor.

12.5.1.3 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.

12.5.1.4 All 12-volt DC equipment shall function over a voltage range of 10.5 V to 15.5 V at the battery terminals.

12.5.1.5 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.

12.5.1.6 Switches and controls shall be marked to indicate their purpose. Each cable shall be labelled clearly and bear its own unique identification code.

12.5.1.7 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.

12.5.1.8 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 GNC's approval before the completion date stipulated in Annex 13 to Part VII.

12.5.1.9 Detailed wiring diagrams of the complete supply and distribution network, including wire size, insulation and sheathing shall be approved by the RO when required by the rules and submitted for the GNC's approval before the completion date stipulated in Annex 13 to Part VII.

12.5.1.10 The Equipment 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.

12.5.2 Batteries

12.5.2.1 Two groups of 12-volt maintenance-free batteries shall be provided, one for starting the outboard engines and the other for shipboard services. These two groups of batteries shall be connected to two independent DC circuits with a crossover network. They shall be interchangeable to back up each other, and be capable of being charged individually by any of the engine-driven alternators. Batteries connected in parallel are not allowed.

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

12.5.2.3 A separate battery shall be dedicated to the emergency services (e.g. radio communications and signalling, emergency and navigation lights) and shall conform to the RO Requirements.

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

12.5.2.5 Batteries shall be permanently installed in a dry, ventilated location above the anticipated bilge water level.

12.5.2.6 In consideration of the intended operational role of the Boat, the batteries shall be installed securely in a manner that restricts their movement in all directions.

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

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

12.5.2.9 Batteries shall be partitioned from the fuel system as far as is practicable.

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

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

12.5.2.12 All circuits will be connected to the battery via a master battery disconnecting switch, which shall be in a readily accessible location and installed as close as possible to the positive pole of the battery.

12.5.3 Distribution Network

12.5.3.1 12V 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 console;

(f) Content gauges for the petrol tanks;

(g) Two (2) hand-held searchlights;

(h) Siren;

(i) Blue flashing light;

(j) Electric bilge pumps; and

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

12.5.4 Cables

12.5.4.1 No electrical equipment, components or cables shall run through or be installed inside the petrol tank compartments.

12.5.4.2 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.

12.5.4.3 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.

12.5.4.4 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.

12.5.4.5 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.

12.5.4.6 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.

12.5.5 Overcurrent Protection

12.5.5.1 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.

12.5.5.2 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.

12.5.6 Switchboard (Panel Board)

12.5.6.1 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.

12.5.6.2 Connections and components on panel-boards shall be in locations protected from the expected conditions in conformity with IEC 60529.

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

12.5.7 Receptacles/Sockets

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

12.5.8 Lighting

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

12.5.8.2 Independently controlled high-powered white floodlight(s) shall be supplied to cover the fore and aft decks and Boat's sides.

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

12.5.9 Ignition Protection

12.5.9.1 Electrical components installed in compartments which may contain explosive vapour and gases shall be ignition-protected in accordance with IEC or other equivalent international standard acceptable to GNC and the RO.

12.5.9.2 Compartments which may contain explosive gases are those which contain or which have open connections with compartments containing such items as:

(a) A fuel tank; and

(b) Joints or fittings in fuel lines connecting spark-ignition engines with their fuel tanks.

12.5.10 Navigation and Signalling Equipment

12.5.10.1 Navigation Lights

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

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

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

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

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

(i) Port side light;

(ii) Starboard side light; and

(iii) Masthead light (All-round white light).

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

12.5.10.3 The Contractor shall provide the following signalling equipment approved by the HKPF:

(a) Two all-round blue flashing lights;

(b) One siren; and

(c) One horn.

12.5.11 Lightning Protection

12.5.11.1 The Boat shall be fitted with a proven lightning protection system (lightning arrestor/dissipator) to protect the personnel onboard and the electronic equipment installed onboard. The method and working principle of protection shall be approved by the RO before submission to the GNC by the completion date stipulated in Annex 13 of Part VII for endorsement.

12.5.12 Searchlights

12.5.12.1 The Contractor shall supply two (2) high-powered hand-held white LED searchlights. They shall be connected to sockets onboard with coiled extension cables of an appropriate length. Sockets shall be installed on both the port and starboard sides of the console. Facilities for storing the two (2) 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 HKPF.

12.6 Lifesaving Appliances (LSA) and Fire-fighting Equipment

12.6.1 General Provisions

12.6.1.1 The lifesaving appliances and fire-fighting equipment shall comply with the RO Requirements.

12.6.1.2 The lifesaving appliances shall include a life ring buoy with marker light and a rescue quoit with line attached.

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

12.7 Electronic Navigation Equipment

12.7.1 Electronic Navigation Equipment

12.7.1.1 The Contractor shall design, supply, deliver, install, commission, conduct trial test and provide warranty services for all of the Electronic Navigation Equipment and systems, public address system, siren and external broadcasting system, and international VHF radio, lightning protection, antennae and instruments and controls on the Boat's consoles (collectively, "Electronic Navigation Equipment" or "ENE") in Chapter 12 to this Part VII.

12.7.1.2 The main units of ENE shall be installed inside an equipment compartment(s) suitably protected from the weather, environment and sea spray while the associated control panels and displays will be flush mounted and/or recessed in console panels with appropriate watertight sealing. All designs and installation/mounting proposals shall be approved by the HKPF prior to the commencement of any such work.

12.7.1.3 In addition to the submission of a layout plan to the GNC and COMMS, to facilitate the optimal ergonomic design, user-friendliness, effectiveness and easy accessibility for inspection and maintenance of the console, the Contractor shall build a full sized mock-up console as specified at Paragraph 12.3.4.1 of this Part VII for approval and comments from the GNC and COMMS. The mock-up console shall show the positions and arrangement of the actual ENE components and other equipment and controls on the console panels before construction and installation.

12.7.1.4 The Contractor shall upon COMMS request submit a block diagram showing the conceptual connections of the ENE and integrated system design for evaluation.

12.7.1.5 In addition to all the electronic equipment that the Contractor is required to provide for each Boat under Paragraph 12.7 of this Part VII, the Contractor shall also provide two (2) complete Boat sets of this equipment upon the delivery of the Boat as Contract Spare Parts, including cabling, control panel, gauges etc. Please also see Schedule 1 of Part V. In the event of any equipment is substituted during the Contract Period, the Contractor shall also supply two sets of the substituted equipment as spare parts.

12.7.1.6 All the ENE onboard the Boat and spare parts shall have good technical support and maintenance services available locally in Hong Kong upon the completion of the Warranty Period.

12.7.2 General Requirements

12.7.2.1 All the ENE shall be marine type and comply with the relevant regulations of the Safety of Life at Sea Convention (SOLAS), International Electrotechnical Commission (IEC) and the International Telecommunications Union recommendations in the International Radio Regulations (ITU-R), unless explicitly stated otherwise. The ENE shall comply with all relevant International Maritime Organization (IMO) recommendations on performance standards and operational features. The ENE shall perform effectively even under the most adverse weather conditions. All radio communications equipment, including radars and radios, shall also comply with the requirements of the Office of the Communications Authority (OFCA) of the HKSAR.

12.7.2.2 The Contractor shall observe and adopt the International Commission on Non-Ionizing Radiation Protection (ICNIRP) Guidelines [formerly International Radiological Protection Association (IRPA) Guidelines] and the Code of Practice issued by OFCA of the HKSAR on the limits of exposure to radio frequency electromagnetic fields in the frequency range from 100 kHz to 300 GHz for the protection of operators, workers and the public against Non-Ionizing Radiation (NIR) hazards so as to provide a safe and healthy working environment under all normal conditions. In case of multiple simultaneous exposures, the combined effect of such exposure shall also be assessed in accordance with the ICNIRP Guidelines.

12.7.2.3 The Contractor shall warrant that all the ENE and materials used, irrespective of whether they are in operation or not, shall comply with the health and safety standards adopted by the World Health Organization in particular in relation to all harmful radiation. The Contractor shall also disclose in writing the existence of any radio frequency radiation hazard emitted from the Equipment, which is harmful to human beings under normal operating conditions, by the safety standards adopted by ICNIRP, American National Standards Institution (ANSI), or other equivalent national or international standards.

12.7.2.4 All ENE shall be suitable for round-the-clock operation on the Boat. Equipment displays shall have adjustable brightness levels and be suitable for viewing under different brightness conditions at sea, including under direct sunlight, day time, dusk, dawn and nigh time, without causing eye-strain, glare and/or discomfort. Equipment control keys and buttons shall be suitably back-lit with adjustable brightness levels to aid operation in the dark without causing eye-strain, glare and/or discomfort.

12.7.2.5 Design Standards

(a) Environmental Conditions

(i) All ENE shall be capable of operating continuously to the specifications throughout its normal life span in the HKSAR climate and environment. The following parameters shall apply unless otherwise stated:

1. Ambient temperature between 0°C and 40°C; and between -5°C and +50°C if the equipment (including display units and antennae) is exposed to the open air.
2. Relative humidity up to 95%, non-condensing.
3. Salt and chemical corrosion as found in a tropical coastal environment.
4. Materials that promote mould growth shall not be used.

(ii) ENE shall be capable of withstanding the knocks and jolts likely to occur during repair work or rough handling.

(b) Power Supplies

(i) The power supply for all ENE shall be protected by appropriate circuit-breakers.

(ii) All the ENE shall be capable of working normally when powered by the Boat's battery-backed DC supply system. A DC/DC converter shall be provided if the equipment cannot operate at this voltage.

(iii) Two spare power supply connections shall be required with a negative earth and be connected to a designated 12 Volt DC (nominal) battery-backed power supply. The battery shall be charged up when an engine generator is working.

(iv) There is a possibility of DC leakage through the negative grounding to the DC battery power bank on the supplied Equipment if it is not connected properly. The Contractor shall take precautions to prevent this type of leakage, e.g. by using an isolation converter.

(v) The ENE's power supply shall be compatible with the Boat's electrical system. If necessary, a voltage stabiliser or regulator shall be provided and installed to maintain the ENE in proper working condition when connected to the unsteady DC voltage from the generator.

(vi) Adequate provision shall be made to protect the ENE from the adverse effects of excessive voltage, current spikes and surges.

(vii) Suitable devices shall be incorporated for protecting the ENE and its accessories against damage due to lightning and unregulated DC power supply onboard.

(viii) All the displays of the ENE equipment shall be connected to an external switch for controlling the power on or off status of the ENE displays and the illumined device on the control panel. The actual devices to be connected to this external switch shall be subjected to approval by COMMS.

(c) Safety

(i) All ENE supplied shall be of a safe design and shall be installed in a safe manner as approved by the GNC and COMMS. The standard of installation shall enhance the Equipment's safety features and not present any hazards to the user.

(ii) All ENE shall be properly grounded to an electrical earth. The installation shall not present hazards to the user in any way, e.g. grounding of all metal parts exposed to the user.

(iii) Electrical contacts and PCBs shall also be protected in an appropriate manner that does not impair their electrical characteristics.

(iv) Lightning protection devices (e.g. lightning surge arrestors/dissipators) are required, particularly for antennae installed outside the protection zone of the Boat's own lightning protection device.

(v) The lightning surge arrestors/dissipators of each feeder cable shall be grouped and concentrated in a "lightning arrestor/dissipator panel" to be located inside the console for ease of maintenance.

(vi) Warning of any potential hazards associated with the ENE shall be displayed in traditional Chinese characters, English and universally recognised labels in easily seen and prominent positions.

(d) Design Practice

(i) All systems shall be designed for prolonged, continuous and reliable operation, i.e. twenty-four (24) hours per day and 365 days per year.

(ii) The normal serviceable life of the ENE shall be a minimum of five (5) years operation onboard the Boat. During the serviceable lifetime of the ENE, it shall be possible to maintain the ENE performance with reasonable repair and set up as defined in this Chapter 12 to Part VII.

(iii) The design and construction shall be performed to a standard of engineering acceptable to COMMS and the ENE shall withstand handling and transportation without degradation of performance.

(iv) The display digits in the ENE control panel shall be easily legible.

(v) To facilitate night time operations, ENE control panels shall have a dimming function enabling the light emitted from the ENE display to be regulated progressively.

(vi) All units, sub-assemblies, components and adjustable controls of the same type shall be both mechanically and electrically interchangeable without the need for changing connections or wiring. They shall be readily accessible for maintenance purposes.

(vii) Correct impedance matching shall be maintained at all interfaces between any items of any equipment (e.g. audio at 600 ohms or RF at 50 ohms).

(viii) Adequate testing points and other testing facilities, e.g. extension boards, testing probes, shall be provided to permit ease of maintenance.

(ix) Any equipment installed in an external position and exposed to the maritime environment shall have the level of IP protection appropriate to its function and position.

12.7.2.6 Appearance and Protective Finish

(a) Metal surfaces shall be either corrosion resistant or protected against corrosion for a period of at least three (3) years by high grade enamel painting, plating, galvanising, anodising, or any other suitable surface treatment.

(b) Any such protective layer shall be smooth, continuous, and free from blemishes and scratches.

12.7.2.7 Installation Standards

(a) All ENE, except portable ENE, shall be fixed firmly in place. Fastenings and supports shall support their loads with a safety factor of at least three (3).

(b) The ENE shall be supplied with all auxiliary items required including but not limited to the following for normal operation:

(i) Connectors;

(ii) Circuit-breakers;

(iii) Lightning arrestors/ dissipaters;

(iv) Power sockets;

(v) Plugs; and

(vi) Cables.

(c) RF connectors (of suitable impedance) shall be provided and used for connections of the RF cables, antennae and radio equipment.

(d) All exposed connectors shall be protected by weatherproof material (e.g. 3M self-adhesive tape or equivalent) to prevent water ingress.

(e) Special attention shall be paid to the compass safe distance [Marine Guidance Note MGN 57 (M+F) and IMO Resolution A.694 (17)] of the ENE and the Radiation Hazard Zone of the radar scanner in the Boat's design. Positioning of the ENE and the associated accessories shall be planned carefully in respect to their relative distances to eliminate any chance of radio interference that might occur during operational use.

(f) Installation shall be to the highest standard to ensure:

(i) The relevant Merchant Shipping Notices ('M' Notices) published by the Department of Transport (London), in the version as at the Contract Date unless it specify that version of such standard as at the keel laying date of the Vessel shall apply in relation to the relevant requirements specified therein, in respect of setting and installing the compass, VHF radio and sounding devices are observed;

(ii) Satisfactory performance of the ENE;

(iii) Protection from mechanical and water damage;

(iv) Ease of accessibility for maintenance and repair;

(v) Manufacturers' recommendations are followed strictly;

(vi) Precautions and measures shall be taken and adopted in the installation of the ENE to ensure that the g-forces and vibration encountered by the Boat travelling at high speed in rough seas will not affect the operation of the ENE; and

(vii) The installation in the external environment shall withstand the conditions stated in Paragraph 12.7.2.5(a)(i) above.

(g) Adequate measures to prevent interference between the electronic equipment shall also be provided, which for receiving apparatus and other electronic equipment that may be affected by frequency induced voltage shall include being earthed, screened and protected efficiently according to the rules, regulations and recommended practices regarding screening of electric wiring.

(h) The Boat is an open deck boat. All precautions and provisions shall be taken and made to minimise the effect of sea spray and exposure to weather on the console panels, equipment control and display units, and to protect the Equipment in such conditions. Suitable weather protection covers, which do not obstruct users from operating the equipment, shall be provided as necessary.

12.7.2.8 Cable Laying

(i) General Cable Requirements:

(i) All cables shall be rated and sized properly;

(ii) The signal cables shall be screened properly to reduce the cross-talk level as necessary; and

(iii) All feeder cables shall be of one length, without joints, from antennae to the Equipment

and from equipment to equipment, unless such joints are necessary under the specific installation conditions encountered or for ease of maintenance. All joints if provided shall be reliable and durable.

(j) Cables shall be laid in concealed cable trunks and trays inside consoles or other compartments or under the deck unless approved otherwise by the GNC and COMMS, with due consideration given to the ease of maintenance of the Boat as a whole. Solutions adopted shall not pose occupational safety and health risks such as tripping, snagging or impact hazards to the Boat's crew during operations.

(k) Watertight rubber grommets, insulated bushes or cable glands shall be used to protect the cables when passing through the metal covers of distribution boards, boxes, or any other metal work or exposed structure.

(l) The Contractor shall be responsible for the supply, installation and inter-connection of all cables and all related installation materials within the system, and the final connection between the power supply and the ENE.

(m) Wires and cables shall be as short as practicable with sufficient slack:

(i) To enable parts to be removed and replaced during servicing without disconnecting other parts.

(ii) To facilitate field repair of broken or cut wires.

(iii) To facilitate movement of the Equipment for maintenance purposes.

(n) All wiring terminations shall be finished in a neat and approved manner and shall be identified separately by a unique identification wiring code number.

12.7.2.9 Labelling and Marking

(a) All ENE supplied shall carry the name, trademark or other means of identifying the manufacturer.

(b) Major ENE units and sub-units shall carry a permanent label with serial numbers for identification purposes.

(c) All panels, ENE sub-assemblies and internal and external cables shall be marked or labelled clearly with their own unique identification codes in English, in a permanent manner, so as to identify each individual function. Such labels shall be recorded and organised properly in a document and handed over to COMMS through GNC prior to Delivery Acceptance.

(d) All switches, connectors, jacks or receptacles shall be marked clearly, logically and permanently during installation. All wires and cables shall be identified at every termination and connection point with permanent type markers.

(e) The DC circuit-breakers controlling the Equipment shall be labelled clearly.

12.7.2.10 Acceptance Test

(a) The acceptance tests for the ENE shall consist of three (3) parts: bench tests, Factory Acceptance Trials (FAT) and on-site commissioning tests as follows:

(i) ENE bench tests shall be performed to demonstrate technical compliance with the published specifications. The bench test, if not carried out in the HKSAR in the presence of COMMS representatives, may be accepted in the form of a test report from the original equipment manufacturers certifying that the tests have been conducted and passed satisfactorily before the Equipment left the factory.

(ii) The Contractor shall carry out the FAT in the presence of GNC and COMMS representatives to demonstrate that each ENE item individually and that all ENE as a whole were installed and implemented properly. If the Boat is not constructed in the shipyard constructing the Vessel, the Equipment FAT shall be conducted at the manufacturer's shipyard before the shipping of the Boat to the shipyard constructing the Vessel, in accordance with the procedures specified at Paragraph 12.1.5.1(d) of Part VII.

(iii) The on-site commissioning tests shall be carried out by the Contractor as part of the

Technical Acceptance in the presence of GNC and COMMS officers after completion of installation of all ENE.

(iv) The on-site commissioning tests shall include an inventory check, an NIR hazard test, an inspection of ENE installation and thorough technical, functional and integration tests of individual ENE items and all ENE together as a whole and, a sea trial, to verify that the ENE have been commissioned properly and are ready to be put into service on the Boat.

(b) The Contractor shall ensure and demonstrate, as part of the on-site commissioning tests, that the electrical and magnetic fields as well as the power density radiated from all installed ENE do not expose occupational personnel and members of the general public to radiation in excess of the limits contained in the 1988 IRPA Guidelines specified in Paragraph 12.7.2.2 of this Part VII. Prior to the issuance of the Acceptance Certificate, the Contractor shall provide a full written report stating that the installation of the ENE complies with the stated NIR safety standards.

(c) At least two (2) months prior to the bench tests, the FAT and the on-site commissioning tests, the Contractor shall submit details of the schedules and test procedures of all ENE for COMMS approval. When all of the test procedures have been established and agreed by the HKPF, they shall be followed during the relevant tests. Any delay in the submission of these procedures may lead to a corresponding delay in their agreement and, hence, in the commissioning of the Equipment for which the Contractor will assume the financial liability.

12.7.2.11 Documentation

(a) At least six (6) weeks prior to Delivery Acceptance, for each individual item of Equipment, the Contractor shall supply to COMMS, through GNC, three (3) paper copies of the operational manuals and maintenance manuals in English (at least one (1) original) and two (2) soft copies in DVD format. For the avoidance of doubt, these three (3) sets of operation and maintenance manuals are in addition to those required as part of the documentation for each Boat set out in Paragraph 12.8.2.2(h) of this Part VII. The manuals shall provide the information listed below:

(i) Description of the principle of operation;

(ii) Details of installation and setting up procedures;

(iii) Maintenance instructions including mechanical assembling and disassembling procedures;

(iv) Schematic diagrams and block diagrams with their respective descriptions; and

(v) Fault finding and calibration procedures;

(b) Drawings showing the proposed design of conduit/trunking routes for the Equipment installed onboard, including future maintenance considerations shall be submitted to GNC and COMMS for approval before installation.

(c) At Delivery Acceptance, the Contractor shall supply:

(i) Operational manuals and maintenance manuals specified in Paragraph 12.7.2.11(a) above [to have been supplied at least six (6) weeks prior to Delivery Acceptance];

(ii) Properly organised individual Equipment testing results including details of test and calibration procedures;

(iii) On-site commissioning and sea trial reports of all Equipment as witnessed by COMMS;

(iv) The initial parameter settings and readings of all Equipment at the time of the on-site commissioning;

(v) "As installed" drawings showing the positions of all individual items of the Equipment installed and the routing of the interconnecting cables between equipment;

(vi) A block diagram showing the interconnections between all equipment units complete with their technical protocols and the wiring schedule;

(vii) "As fitted" diagram showing the locations and positions of all circuit-breakers controlling the power to the Equipment; and

(viii) The completed NIR Report as required by Paragraph 12.7.2.10(b) above.

(d) The documents specified at Paragraphs 12.7.2.11(a) to (c) above and the training materials specified in Paragraph 12.9.1.4 of this Part VII shall be supplied in both paper copy and in DVD format or other format acceptable to COMMS.

(e) The Contractor shall not use confidentiality as a reason for withholding the supply of relevant documentation as required by the GNC and HKPF.

12.7.2.12 Electronic Components/ Spares Parts/ Spare Units / Maintenance

(a) The Contractor shall commit to provide spare parts for the Equipment for a period not less than five (5) years from the date of the successful commissioning of the last Boat.

12.7.2.13 Warranty Services

(a) The Contractor shall provide a one (1) year free Warranty Period without any qualification for all ENE with effect from the date that the Acceptance Certificate in respect of that Boat was issued.

(b) The Contractor shall rectify any fault within seven (7) days of first being requested by COMMS in writing to do so. The Contractor shall extend the Warranty Period for any item of ENE which has broken down and required repair for a period equal to the period between the date of breakdown and the resumption of operation and service.

12.7.3 Electronic Navigation Equipment Specifications

12.7.3.1 Integrated multi-functional display unit incorporating Radar, Secure AIS, DGNSS, Echo Sounding System and Electronic Chart System information.

(a) The radar shall be used as the primary radar. Its operational range shall be equal to or better than 0.125 to 36 nautical miles (minimum). It shall be a frequency modulated continuous wave solid state X-band radar.

(b) The radar shall provide a clear display even with severe sea and rain clutter at all ranges without missing small, elusive targets.

(c) The radar images shall remain at a constant brightness during each Point Position Indicator (PPI) sweep.

(d) The radar shall be fitted with an auto-track function which provides acquisition and tracking of at least six (6) targets in a way similar to Automatic Radar Plotting Aid (ARPA). The radar shall provide data on any chosen target. Such ARPA-like auto-track function shall support Closest Point of Approach (CPA) with target based and Time-based Closest Point of Approach (TCPA) features for the tracked targets.

(e) The display unit shall incorporate control keys and processor equipment to integrate, control, operate and display all radar, AIS and chart plotter functions. The electronic chart system shall be capable of both connecting to and being accessed remotely from the Government router through an Ethernet interface.

(f) The radar shall have at least the following operational controls/features:

(i) Operator selection of North Up, Head Up, Course Up modes;

(ii) True Motion (TM) and Relative Motion (RM) modes;

(iii) At least three (3) different brightness levels;

(iv) Information displaying Boat's own latitude/longitude, position and speed;

(v) Trails;

(vi) Fixed and variable range ring;

(vii) Variable Range Marker (VRM);

(viii) Electronic Range and Bearing Line (ERBL);

(ix) Manual rain and sea clutter suppression;

(x) Gain control;

(xi) Auto clutter sea control;

(xii) Range up;

(xiii) Range down;

(xiv) Vectors;

(xv) Centre picture;

(xvi) Acknowledge alarm; and

(xvii) Panel brilliance.

(g) The display unit shall comprise a flush-mounted Liquid Crystal Display (LCD) colour display of a type suitable for use on an open deck boat. 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 similar. The display shall indicate clearly the important parameters such as radar targets, range marker, bearing line, heading marker and range rings.

(h) The radar transceiver shall be a low radiation emission broadband type and shall be housed in a marine type radome antenna/scanner unit. It shall be designed for mounting aloft and be capable of operating satisfactorily when subjected to the g-forces, vibration and high relative wind speeds of not less than 70 knots encountered when the Boat is operating at high speed in the maritime environment.

(i) The antenna/scanner shall, as far as practicable, be installed well clear of any obstruction to minimise undue interference and NIR hazards.

(j) The radar shall be aligned with the heading of the Boat.

(k) The Contractor shall ensure at the design stage that unnecessary radar blind zones are not created. The Contractor shall, in particular, ensure that equipment installed before the radar scanner such as navigation lights, floodlights, horn speakers etc., do not obstruct the radar scanner's emissions. If such obstruction becomes apparent after installation, the Contractor shall rectify it.

(l) The radar shall have NMEA 0183 and/or 2000 interface ports capable of accepting navigational data from a wide selection of DGNSS receivers and electronic compasses, and of providing comprehensive data on all tracked targets in the form of a track table to a wide selection of electronic chart plotters.

(m) 10 Hz GPS/GLONASS-WAAS, EGNOS, SBAS antenna (integrated).

(n) Performance (radar):

(i)	Reference:	Magnetic and True North
(ii)	Warm-up Time:	< 120 seconds
(iii)	Distance Accuracy:	<1% of the range
(iv)	Bearing Accuracy:	<1°
(v)	Operational Maximum Wind Speed:	At least 70 knots
(vi)	Scanner Size:	>18 inches nominal
(vii)	Scanner Rotation:	48 rpm or greater rotation speed Beam Width H/V: < 5.2°/25°
(viii)	Transceiver Output Power:	at least 165mW
(ix)	Display:	12-inch or larger LCD colour display; resolution 800 x 600 pixels or better for 4:3

	aspect ratio. Other aspect ratios of equivalent size and resolution are acceptable. Brightness of 900 cd/m^2 or greater.
(x) Operating Temperatures:	Better than –5℃ to +55℃ for the antenna/scanner unit. Better than –5℃ to +45℃ for the display unit.
(xi) Waterproofing	Radome antenna: IPX6, Display unit: IPX6

(o) The crew operator shall be able to select the following modes of presentation at the radar display:

(i) Radar image only;

(ii) Plotter image only; and

(iii) Plotter image overlaid with radar image.

(p) The radar system's in-built chart plotter shall support the following functions:

(i) Operator selectable North Up or Course Up presentation;

(ii) Operator selectable TM or RM presentation;

(iii) Waypoints and routes;

(iv) Seamless and smooth zoom in and zoom out;

(v) Seamless and smooth chart panning;

(vi) Layers of chart details;

(vii) Monitor own Boat position and heading;

(viii) View information of charted objects;

(ix) Own Boat vector;

(x) Man-Over-Board (MOB);

(xi) One (1) plug-in chart card shall be used for providing detailed navigational sea charts covering the entirety of Hong Kong Waters using S-57 format digital sea charts;

(xii) The chart card shall be supplied with the latest version of sea charts covering the entirety of Hong Kong Waters with perpetual licence for use and ownership. The purpose is to ensure that the HKPF shall not be required to pay any periodic fees and charges for using the chart card with its contents, as the HKPF will thereafter obtain S-57 format chart updates and install them into the chart plotter.

(xiii) If the radar system and integrated multifunction display unit utilises the Microsoft Windows operating system, the operating system version shall be the latest version as and be equipped with Symantec Endpoint anti-virus software with perpetual virus definition update license.

(q) The radar system shall be interconnected with the GNSS and satellite compass systems so that real-time data from these two (2) systems shall be available at adequate data update rates to support the smooth and seamless operation of the radar system's various functions (including its in-built chart plotter functions). The satellite compass connection to the radar shall have a data update rate of at least ten (10) times per second. The satellite compass shall provide GPS location data to the radar system for resilience purposes.

(r) The system at the radar display shall be able to display the Boat's heading (in degrees north) and position (in latitude and longitude).

(s) The radar radome antenna/scanner unit shall comply with relevant requirements of the European Parliament and Council Directive 1999/5/EC and IEC 60945:2002.

(t) The radar display system/unit shall comply with relevant requirements of the European Parliament and Council Directive 2004/108/EC and IEC 60945:2002.

(u) The radar shall be capable of providing external (land-based) radar extractors and trackers with information which as a minimum includes, but is not limited to, analogue video signal, trigger, azimuth count pulse and azimuth reset pulse through the Government data network. The radar shall provide interface ports to integrate with external radar extractors and trackers for converting the above analogue radar information to digital format.

(v) The IP address of the radar and other units shall be set by setting the IP address directly on the equipment or using Dynamic Host Configuration Protocol (DHCP).

(w) The radar shall incorporate an interface for controlling and retrieving radar information using external software with the following requirements:

(i) Turn on and off the radar units;

(ii) Turn on and off the transmission of the radar;

(iii) Setting the gain of the radar;

(iv) Setting the range of the radar;

(v) Setting the sea clutter of the radar;

(vi) Setting the rain clutter of the radar; and

(vii) Setting the interference level of the radar.

12.7.3.2 Satellite Compass

(a) The Contractor shall supply and install one satellite compass set. The satellite compass shall consist of at least a sensor unit and an electronic digital display unit, and be compact, recessed in the console and easy to operate.

(b) The satellite compass sensor unit shall be connected directly to the radar.

(c) The sensor unit shall incorporate two or more satellite receivers from at least two types of satellite positioning system.

(d) The satellite compass shall incorporate integrated 3-axis rate gyro and acceleration sensors to deliver fast start-up times and provide heading updates even during temporary loss of satellite signals (i.e. during navigation under bridges).

(e) The maximum heading update rate for ARPA targets shall be 20 Hz for ARPA targets as specified in Paragraph 12.7.3.1 of this Part VII.

(f) The satellite compass shall provide the GPS source for the GMDSS function used by the fixed IMM VHF radio specified at Paragraph 12.7.4 of this Part VII.

(g) Performance:

(i) Reference:	Either Magnetic North or True North
(ii) Warm-up Time:	Less than one second
(iii) Accuracy:	+1.0° typical
(iv) Resolution:	0.1°
(v) Deviation Compensation:	Automatic
(vi) Operating Temperatures:	Sensor unit: 0℃ to 50℃; Display unit: 0℃ to 55℃
(vii) Waterproofing:	Sensor unit: IPX5, Display unit: IPX6.

12.7.3.3 Differential Global Navigation Satellite System (DGNSS System) integrated with Radar/GPS/DGPS and Electronic Chart System.

(a) The Contractor shall supply and install a DGNSS system which fulfils the following general requirements:

(i) The DGNSS shall support at least GPS and GLONASS satellite positioning system;

(ii) The DGNSS system shall consist of a DGNSS receiver integrated with the GPS antenna

and be suitable for mounting in the open air;

(iii) The GPS antenna/receiver shall be connected to the radar for the provision of GPS-related data, such as position fix, time, speed over ground and course over ground;

(iv) The DGNSS system shall be fully compatible with the radar;

(v) The DGNSS system shall support Serial NMEA 0183, Serial 26-pin D-sub, Serial 9-wire RS232, Serial 3-wire RS232 and Ethernet (NMEA 2000); and

(vi) The DGNSS system shall support at least the following data displayed either at the GPS display unit or the radar display:

1. Position (latitude/longitude): to at least four (4) decimal points
2. Horizontal Position accuracy (at speed of 15kt): less than or equal to 10m
3. Course: 1° resolution
4. Speed: 0.1 knot or 0.1 km/hour resolutions with at least three (3) digits
5. Date and time: selectable as GMT or local mode
6. Satellite status information

(b) The DGNSS system's antenna/receiver shall fulfil the following technical requirements:

(i) Receiver Type:	8 or more channel parallel receiver
(ii) Receiving Frequency and Code:	1,575.42 MHz (C/A code)
(iii) Position Accuracy:	Within + or - 30 metres rms or better 95% of the time
(iv) Warm Start Time:	Less than 30 seconds
(v) Ambient temperature:	0℃ to 55℃ or better
(vi) Waterproofing:	IPX7 or better
(vii) Correction:	IALA compliant Beacon RTCM SC-104

12.7.3.4 Public Address (PA)/Siren, Loudhailer/External Broadcasting System

(a) The PA/siren, loudhailer/external broadcasting system shall be an off-the-shelf product and no customization shall be required.

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

(c) 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.

(d) The master control unit shall be recessed into the console with the user control panel flush-mounted on the console and positioned within reach of the coxswain. The user control panel shall incorporate "Power ON/OFF", "Hail Volume Control" and "Function Control" controls.

(e) Verbal messages shall be broadcast through a fist microphone mounted on the console.

(f) The loudspeakers shall have a power rating of twenty (20) watts minimum and an impedance which shall match the amplifier.

(g) The system shall be waterproofed to IPX5 standard or better.

(h) The loudspeakers shall be equipped with a volume control system with which the volume can be adjusted to a minimum for night time operations and to a maximum level which will enable messages to be heard at least 0.2 km away.

(i) The positions of all the system's main components shall be discussed at the kick-off meeting.

12.7.4 International Maritime Mobile (IMM) VHF Radio

12.7.4.1 The Contractor shall supply one (1) IMM VHF fixed/integrated portable radio per Boat. The use of fixed/integrated portable radio will be decided by the HKPF at the kick-off meeting. The corresponding cost shall be included in the Total Purchase Price in Schedule 1 of Part V, which shall not depend on the decision at Kick-Off meeting. It shall:

(a) be an off-the-shelf product for marine application;

(b) comply with relevant requirements of the European Parliament and Council Directive 1999/5/EC;

(c) be fully compatible with the GMDSS;

(d) be equipped with the full range of IMM VHF voice channels, all of which shall be selectable;

(e) be delivered complete with all components, features and functions necessary for full functionality;

(f) be capable of operating in temperatures ranging from -5℃ to +55℃ and be protected to IPX7 or better;

(g) if portable VHF is to be chose by HKPF during the kick-off meeting:

(i) be supplied complete with antenna and two (2) re-chargeable batteries;

(ii) be supplied with a belt clip and a shoulder carrying case;

(iii) be supplied with one (1) 220V AC battery charger suitable for use ashore; and

(iv) be supplied with one (1) charger unit suitable for use onboard the Vessel when the radio is required to be charged at sea. It shall be directly connectable to the Vessel's own DC power supply;

(h) Specific Features and Requirements:

(i) Power ON/OFF;

(ii) "Transmit" indicator, volume and squelch controls;

(iii) Channel number indicator;

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

(v) Dual watch and triple watch on Channel 16 and selected channel(s);

(vi) Channel scanning between Channel 16 and selected channels; and

(vii) The spacing between the channels shall be 25 kHz or better.

12.7.4.2 Transmitter:

(a) Frequency Range:	156.025 MHz to 157.425 MHz, or better
(b) Frequency Deviation:	Frequency modulation with maximum frequency deviation of +5 kHz
(c) Spurious Emission:	-60 dB or better
(d) RF Output Power:	Transmission power selector for: (a) High at twenty five (25) watts nominal and (b) Low at one (1) watt nominal, or better.

12.7.4.3 Receiver:

(a) Frequency Range:	156.050 MHz to 162.000 MHz or better
(b) Sensitivity:	Less than 1 µV for 20dB SINAD
(c) Inter-modulation Rejection:	65 dB or better
(d) Adjacent Channel Selectivity:	65 dB or better
(e) Squelch:	Adjustable squelch control
(f) Spurious Rejection:	65 dB or better

(g) Audio Output Distortion: At least 0.2 watt at rated output with less than 10%

12.7.5 Government Data Network

12.7.5.1 The Government data network consists of Government Mobile Data Equipment and Antennae that shall include the following equipment:

(a) Encryption mobile router;

(b) Antennae; and

(c) Ethernet switch(es).

12.7.5.2 The encryption mobile router shall meet the following specifications:

(a) Wide Area Network (WAN) Interface:	2 x Embedded 4G Frequency Division – Long Term Evolution (FD-LTE) Modem with Multi-input Multi-output (MIMO) antennae 1 x Embedded 4G Time Division – Long Term Evolution (TD-LTE) Modem with MIMO antennae (FD-LTE Band: 2, 4, 5, 14, 17 and 27; TD-LTE Band: 38, 39, 40 and 41) 1 x Embedded 4G TD-LTE Modem with MIMO antennae (TD-LTE with operating frequency band between 1.785 GHz to 1.805 GHz) 1 x 10/100BaseTX Gigabit Ethernet 1 x 802.11a/b/g/n WAN interface with MIMO antennae
(b) Ethernet interface:	8 x 10/100BaseTX Fixed port with Power over Ethernet capabilities compliance with Institute of Electrical and Electronics Engineers (IEEE) 802.3at class 4 standard. 1 x 802.11a/b/g/n interface with MIMO antennae
(c) Requirement:	Load Balancing IPv4 and IPv6 support USB or equivalent LTE/3G Modem support (3G Band: 1, 2, 4, 5 and 8) WAN / Mobile Bandwidth Bonding which is compatible with the Multi-Wan Bonding router IPsec VPN 256-bit AES Encryption PPTP VPN Server QoS for VoIP Speed Fusion connections to existing HKPF router (Peplink380)
(d) Environmental:	The encryption mobile router specified at Paragraph 12.7.5.1(a) above shall be contained within a housing protected to IP67 and securely locked to the Boat. The whole housing shall be easily detachable for maintenance purposes.

Operation temperature at least between -20℃ and +65℃

Humidity: 15% – 95% (non-condensing)

12.7.5.3 The Contractor shall provide the six (6) pairs of weatherproof MIMO antennae specified in Paragraphs 12.7.5.2(a) and (b) above. The MIMO antenna and feeder cables shall also support 5G frequency bands.

12.7.5.4 The Boat's electronic equipment including the radar/DGNSS and electronic chart system specified at Paragraph 12.7.3 above and/or other systems shall be connected to the Government data network by means of the encryption mobile router specified at Paragraph 12.7.5.1(a) above.

12.7.5.5 The encryption mobile router and the associated equipment shall be housed in an IPX7 cabinet and mounted in a mounting frame with shock-absorbing cushions to securely mount the device onto the Boat. The device installation location shall be easy to access and the mounting design of the device shall facilitate ease of maintenance work and removal of the device. The Contractor shall provide one (1) Ethernet switch port to the console specified at Paragraph 12.3.4 of this Part VII. It shall be connected by IP67 protected plugs, jacks and cables. If, owing to the requirement to connect the Boat's electronic systems to the Government data network specified at Paragraph 12.7.5.4 above, the number of Ethernet connections to the system exceeds the eight (8) Ethernet interface connections available as specified at Paragraph 12.7.5.2(a) above, the Contractor shall provide additional waterproof Ethernet switches as specified at Paragraph 12.7.5.1(c) above to meet the requirement.

12.7.6 Secure Automatic Identification System (AIS)

12.7.6.1 The Supplier shall supply one (1) set of AIS transponder to be installed on the Boat.

12.7.6.2 The AIS shall be fully Class A type approved AIS transponder.

12.7.6.3 The AIS shall support cipher DES, AES and support cipher keys:

(a) up to 128 time limited keys;

(b) manual keys input; and

(c) external application input.

12.7.6.4 The AIS shall be equipped with internal GPS for time synchronisation and be connected the GPS system and Satellite Compass.

12.7.6.5 Each AIS shall be supplied with one (1) VHF Antenna of

(g) Frequency: 149-162.5MHz;

(h) VSWR: 1.5:1;

(i) Polarization: vertical;

(j) Max Power: 100W;

(k) Impedance: 50ohm; and

(l) Surge arrestor connecting to the lightning ground of the Boat

12.7.6.6 Each AIS shall be come with one (1) GPS Antenna with Antenna Element:

(e) Centre Frequency: 1575.42MHz;

(f) Output VSWR: <1.5:1;

(g) Polarization: Right Handed Circular Polarization; and

(h) Output Impedance: 50 ohms.

12.7.6.7 The GPS antenna shall come with a low noise amplifier with:

(f) Centre Frequency: 1575.42MHz;

(g) Power Gain 28 +/- 4.5dB;

(h) Band Width: at least 2MHz;

(i) Supply Voltages support 5V DC; and

(j) Output Impedance: 50 ohms.

12.7.6.8 The AIS shall be waterproof with IPX6 or better.

12.7.6.9 The AIS shall be able to select, operate and display in at least three (3) modes of operations including but not limited to:

(a) Normal mode – function as a normal SOLAS Class A AIS broadcasting and receiving without encryption;

(b) Secure mode – only encrypted AIS data will be broadcast, both encrypted and non-encrypted AIS messages will be received; and

(c) Passive mode – no AIS will be broadcast, both encrypted and non-encrypted AIS messages will be received.

12.7.6.10 The AIS shall provide an output to the display unit specified in Paragraph 12.7.3.1(e).

12.7.6.11 The AIS display unit shall be installed in the console to facilitate switching operation modes by the operators if console space is available. Otherwise, the Contractor shall supply and install an operation mode switch in the console with no extra cost to the Government for switching operation modes.

12.7.7 Intercommunication (IC) System

12.7.7.1 The Contractor shall supply and install a robust IP-based digital IC voice communication and data distribution system (such as SAVOX ImP system or equivalent) with an Ethernet backbone of at least 100Mb designed for use on open deck speedboats being used as specified in Paragraph 12.1.2.1 of this Part VII.

12.7.7.2 The IC system shall be compliant with the CE Electrical and Mil Std 461 EMC and Mil Std 810E standards in the version as at the Contract Date.

12.7.7.3 The IC system shall provide the Boat's crew with a modular and expandable platform on which they can communicate with each other within their own Boat via IC and with others elsewhere via radio, mobile telephone networks and the Government data network.

12.7.7.4 The IC system shall also be capable of integrating with the radar or other data systems so that the Boat operators may receive audio notification alarms as required. The IC system shall also be capable of receiving both remote voice communication and remote digital system configuration and programming instructions via the Government data network.

12.7.7.5 The IC system shall consist of a number of main equipment units forming an Ethernet network in ring topology. When any one of the Ethernet network paths or main equipment units fails, the IC system shall re-route to use an unaffected path. The Contractor shall propose adequate main equipment to fulfil the requirements stipulated in Paragraph 12.7.7.

12.7.7.6 One of the main equipment units of the IC system shall be powered by the Boat's DC supply and then distribute power to the other main equipment and associated equipment of the IC system via the Ethernet network.

12.7.7.7 The main equipment of the IC system shall be equipped with interface modules that include Ethernet Backbone Interface Units (EBIUs), the Radio Interface Units (RIUs) and Audio Gear Interface Units (AIUs).

12.7.7.8 The EBIU shall:

(a) Form a Ethernet network on the Boat;

(b) Be connected to at least three (3) radio transceivers, including one (1) unit of HKPF Marine Radio Communications System as specified in Paragraph 12.7.9.1(a) of this Part VII, one (1) unit of International Maritime Mobile VHF portable/fixed radio as specified at Paragraph 12.7.4 of this Part VII, one (1) HKPF 3G/LTE commercial radio or mobile telephone and

other HKPF data devices into the system;

(c) Be connect to the Boat's radar, navigation and engine notification alarms;

(d) Be connected to the Boat's PA system as specified at Paragraph 12.7.3.4 of this Part VII; and

(e) Be capable of routing system software configurations to each AIU, RIU, and PCU/FCU as appropriate.

12.7.7.9 The RIUs shall be:

(a) Fixed nodes, the purpose of which shall be to integrate onboard radio systems as specified in Paragraph 12.7.7.8(b) above;

(b) Able to form individual communication channels within fixed nodes into groups by the operators as specified in Paragraph 12.7.7.9 (a) above; and

(c) Connected to the Boat's DC power supply and the AIUs via the Ethernet network.

12.7.7.10 The AIUs shall:

(a) Be fixed nodes connected to the Ethernet network as specified in Paragraph 12.7.7.5 above and which, together, form the basic infrastructure of the IC system;

(b) Integrate the operator(s) with the IC system via extension cables;

(c) Connect to the Personal Communications Units (PCUs) / Fixed Communications Units(FCUs) via waterproof plugs and sockets;

(d) Receive and distribute voice communications; and

(e) Have a full duplex intercom capability.

12.7.7.11 The main equipment forming the IC system shall connect to PCUs/FCUs. The PCUs/FCUs shall:

(a) Be the operator's primary gateway to connect to both the operators' audio head gear and the major equipment as specified in Paragraph 12.7.7.7;

(b) Be installed in designated crew locations to be discussed at the kick-off meeting;

(c) Incorporate a voice-prompted menu selection control, a PTT for the intercom system and PTTs for at least two assigned radios;

(d) Enable the operator to select whether to mute the communications systems or to transmit on the IC system using PTT, VOX or live microphone, and

(e) Be protected to IP67 standard.

12.7.7.12 The IC system shall be capable of providing wireless extension(s) that shall:

(a) Comprise a wireless base station connected to the Ethernet backbone of the IC system as specified in Paragraph 12.7.7.8(a), capable of interfacing with the small belt-mounted wireless radio specified at Paragraph 12.7.7.12(b) of this Part VII;

(b) Enable the connection of small belt-mounted wireless radio operating on the 2.4 GHz or 5.8 GHz bands or other radio frequency band acceptable to both OFCA and the HKPF (current HKPF equipment, specifications to be provided at the kick off meeting), carried by the operator, to the wireless base station specified at Paragraph 12.7.7.12(a);

(c) Enable an operator who is no longer connected to the IC system by a PCU/FCU and extension cable, such as a boarding officer who has left the Boat, to carry out enforcement operations on another craft and have full duplex access to the IC system; and

(d) Not require the operator to carry any additional equipment other than a small belt-mounted wireless radio.

12.7.7.13 The audio headgear shall:

(a) Be compatible for use with both ballistic and impact protection helmets and connecting to the HKPF's existing Safety Helmet audio headgear (details to be provided at the kick off meeting) with the PCU/FCU;

(b) Consist of a microphone and two (2) speaker earmuffs connected by a comfortable and ergonomic strap system;

(c) Incorporate noise cancellation technology designed to reduce environmental noise such as engine noise, wind noise and the noise of gunshots or explosions to a maximum of 82dB or below;

(d) Be one (1) meter submersible water protection without losing level dependent performance.

12.7.7.14 For each Boat delivered under this Contract, the Contractor shall supply:

(a) Sufficient channels from RIUs for the devices listed at Paragraph 12.7.7.8(b) above and other systems as provided for in this Specification;

(b) Sufficient AIUs with plug-in points for four (4) crew locations as specified in Paragraph 12.7.7.10 above;

(c) Two (2) PCUs/FCUs including cables as specified in Paragraph 12.7.7.11 of this Part VII. The use of PCUs/FCUs will be decided by the HKPF at the kick-off meeting. The corresponding cost shall be included in the Total Purchase Price in Schedule 1 of Part V, which shall not depend on the decision at Kick-Off meeting.

(d) One (1) wireless base station as specified in Paragraph 12.7.7.12(a) of this Part VII;

(e) Six (6) sets of audio headgear which needed to connected to the HKPF's existing safety helmet (existing brand PRO TEC Full Cut Water helmet or other brand as advised by HKPF during kick-off meeting);

(f) Two (2) waterproof connections cables to be capable of connecting to the HKPF's existing Safety Helmet audio headgear (details to be provided at the kick off meeting) with the PCU/FCU;

(g) Four (4) small belt-mounted wireless radio as specified at Paragraph 12.7.7.12(b) of this Part VII and;

(h) All other components required that have not specified in this specifications to enable the IC system to operate.

12.7.7.15 The system administrator shall be able to configure the IC system by laptop computer either on site in the Boat or remotely via the Government data network and the Government Mobile Data Equipment as specified in Paragraph 12.7.5 above to permit or deny individual operators, or groups of operators to listen to or transmit on any of the communications to which the IC system is capable of being connected.

12.7.7.16 The Contractor shall, in respect of all of the Boat(s) delivered under this Contract, supply two (2) sets of laptop computers including system administrator software and perpetual software licence with which the IC system can be configured, programmed and troubleshot.

12.7.7.17 The IC system shall be suitable for continuous operation in the Hong Kong climate and maritime environment throughout its life span in accordance with the specifications in this Chapter. It shall be:

(a) Capable of operation in temperatures ranging from -5℃ to 50℃;

(b) Capable of withstanding the knocks and jolts likely to occur during repair work or rough handling on a workbench; and

(c) Protected to IP67 standard or be enclosed in an IP67 watertight box;

12.7.8 Echo Sounding System

12.7.8.1 The Contractor shall supply and install an Echo Sounding System with the sonar unit securely installed on the body of the Boat. It shall not require a through hull penetration.

12.7.8.2 The echo sounder supplied shall be connected to the radar multi-function display.

12.7.8.3 A separate display apart from the one mentioned in paragraph 12.7.3.1 above shall be installed in the console for displaying the current depth as well as all the current position information supplied by the GPS and the satellite compass above. This may be a combined display with the unit mentioned in Paragraph 12.7.3.2 with detailed arrangements to be discussed in the kick-off meeting.

12.7.8.4 The Echo Sounding System shall be equipped with a shallow depth alarm, which can be pre-set to a given depth and provide an audio and visual alert when entering an area with a depth shallower than the pre-set depth.

12.7.8.5 The sonar unit shall not interfere or be interfered with by other equipment on the Boat.

12.7.8.6 The sonar unit shall be capable of detecting the depth of water within Hong Kong Waters under any weather conditions.

12.7.9 Installation/Space/Cabling for the Existing HKPF Equipment

12.7.9.1 The Contractor shall, at no cost to Government, install onto each Boat one (1) unit of each of the following equipment (EQ-HKPF), which shall be provided by the HKPF. Details of location, space, cable, and power requirements shall be provided at the kick-off meeting.

(a) HKPF Marine Radio Communications System (MRCS Radio "A") TETRA mobile radio. The present equipment type is the EADS TETRA TMR880i mobile radio with separate control panel, speaker box and speaker microphone. The TMR880i is a wide-band version with a frequency range of 380 MHz to 430 MHz. The radio is powered by a +12V DC nominal supply. The HKPF reserves the right to use other radio types in place of the present TMR880i. Provided that the Government notifies the Contractor at least three months in advance of the on-site installation of the MRCS Radio "A", no additional costs associated with the installation of a radio of a different type shall be chargeable to the Government.

(b) A tablet or smartphone with a display of no more than 13 inches for which the Contractor shall provide a mounting location on the console to be discussed at the kick-off meeting. The mounting shall include a mounting bracket and shock-absorbing cushions to securely mounting the device onto the Boat. The model of the tablet or smartphone shall be provided at the kick-off meeting. However, the HKPF reserves the right to change the model of the tablet or smartphone. Provided that the Government notifies the Contractor at least three months in advance of the on-site installation of the tablet or smartphone, no additional costs associated with the installation of the tablet or smartphone of a different type shall be chargeable to the Government.

12.7.9.2 The Contractor shall:

(a) Coordinate and finalise the positions of all the radios, radar equipment and antennae systems during the detailed system design stage.

(b) Reserve sufficient space for the installation of the EQ-HKPF, including for flush mounted panels.

(c) Note that the TMR880i radio and its accessories are not intended to be mounted in a position exposed to the elements. Consequently, the Contractor shall provide suitable protection from the elements for the control panel, speaker box and microphone.

(d) Supply and install all RF signal, power and grounding cables and wires. COMMS will provide the specifications of all the RF cables and connectors to the Contractor.

(e) Supply and install all power converters and power supply terminals necessary for the EQ-HKPF's installation.

(f) Supply and install one UHF antenna for MRCS TETRA radio a frequency range of 380 MHz to 430 MHz at a VSWR of 1.5 or less. The Contractor shall provide and install suitable co-axial cable surge suppressors to the UHF antenna to protect the radio equipment from lightning surges.

(g) Design, rig and suitably mount the antennae to ensure EMC and avoid interference.

(h) Fit and install the EQ-HKPF in the HKSAR in the positions that were finalised during the detailed design stage, subject to any subsequent EMC-necessitated alteration; and

(i) Provide all necessary cables, materials, labour and transportation for the equipment installation.

12.7.9.3 COMMS shall:

(a) Connect up the EQ-HKPF using the connectors, cables and wires installed by the Contractor;

(b) Test the VSWR of the RF cables and UHF antennae to confirm that neither exceeds 1.5; and

(c) Commission the EQ-HKPF.

12.8 Services Support

12.8.1 General Philosophy

12.8.1.1 In determining the appropriate design for the Boat, all of the following factors shall be taken equally into account:

(a) Boat performance (e.g. engine rating, size);

(b) Initial cost;

(c) Recurrent cost (e.g. maintenance cost, petrol consumption, spare parts);

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

(e) Time interval between maintenance periods;

(f) Time to undertake scheduled maintenance (downtime); and

(g) All machinery and Equipment installed in the Boat shall be serviceable locally in the HKSAR.

12.8.1.2 Maintainability – The Boat shall be easy to maintain by ensuring that there shall be:

(a) Unimpeded access to all installed items for monitoring, service and overhaul; and

(b) Ease of access for in-situ servicing and maintenance locally in the HKSAR.

12.8.2 Information to be Provided Prior to and at Delivery Acceptance

12.8.2.1 Not later than six (6) weeks prior to Delivery Acceptance, the Contractor shall supply the Inventory List to the GNC for approval. At the Delivery Acceptance of the Boat, the approved Inventory List will be used to check that all the items have been delivered to GNC in a satisfactory state. The detailed inventory list for the whole Boat covering all discrete items down to major component/unit level-shall include the following:

(a) Item number on the inventory list;

(b) Description;

(c) Type or model (if applicable);

(d) Serial number(s);

(e) Quantity;

(f) Manufacturer;

(g) Manufacturer's reference number;

(h) Location in Boat;

(i) Local agent/supplier address, telephone and facsimile numbers and email address;

(j) Order lead time;

(k) Shelf life; and

(l) Unit cost.

12.8.2.2 At Delivery Acceptance, the Contractor shall provide the GNC with the following:

(a) Four (4) paper copies and two (2) soft copies on DVDs of the approved inventory list;

(b) Four (4) complete sets of paper printed "as fitted" drawings of the Boat and two (2) soft copies on DVDs;

(c) Four (4) complete sets of paper printed "as fitted" electrical schematic, cabling, wiring and single line diagrams for electrical equipment installed onboard and conduit/trunk route diagrams with two (2) soft copies on DVDs for the Boat delivered;

(d) Four (4) paper copies and two (2) soft copies in DVDs of a list of all bought-in machinery and electrical equipment installed on the Boat, where the list shall include:

(i) Description;

(ii) Type or model (if applicable);

(iii) Makers part number or equivalent (if applicable);

(iv) Location;

(v) Quantity;

(vi) Supplier or agents name and contact details;

(vii) Order lead time;

(viii) Shelf life; and

(ix) Unit cost.

(e) Four (4) copies [at least one (1) original] of the manufacturers' operation, maintenance and workshop manuals in English for all machinery and Equipment, including spares and stores, special tools and test equipment;

(f) Four (4) paper copies and two (2) soft copies on DVDs of the Contractor's "Docking Plan", which shall include the profile, plan and sections as per the Boat delivered;

(g) Four (4) paper copies and two (2) soft copies on DVDs of the Onboard Operator's Manual (English and traditional Chinese) for the Boat delivered covering:

(i) Daily user pre-start checks and operation procedures,

(ii) Operating details for each system, and

(iii) Emergency operation procedures.

(The precise format and details required shall be subject to the Government's approval when the configuration of the Boat and outfitting is decided); and

(h) One (1) set in paper format of the operational manuals and maintenance manuals in English as specified in Paragraph 12.7.2.11 of this Part VII for each individual item of ENE. For the avoidance of doubt, this set of operation and maintenance manuals is in addition to the sets which are required to be supplied in accordance with Paragraph 12.7.2.11 of this Part VII.

12.8.2.3 The first draft of the Onboard Operator's Manual (in both English and traditional Chinese) mentioned in Paragraph 12.8.2.2(g) of this Part VII shall be submitted to GNC for approval not less than one (1) month before Delivery Acceptance.

12.8.2.4 Tools and Test Equipment for Electronics

All tools and testing equipment for the Boat's electronic equipment shall be delivered directly to COMMS. All items shall be documented, preserved and packed properly.

12.8.2.5 Photographs

The Contractor shall at Delivery Acceptance provide the following:

(a) As-Fitted Photographs

(i) Two (2) sets of colour prints (130 mm x 90 mm) from different aspects to give an overall picture of the various parts/areas of the Boat; and

(ii) Each set of prints shall be presented in a suitable album, indexed and labelled

appropriately to ensure that the position from which the picture was taken and the position of the subject in the picture are clearly identifiable.

(b) Official Photographs

(i) Four (4) framed colour photographs of picture size not less than 350 mm x 270 mm and a frame size not less than 510 mm x 400 mm showing the profile of the Boat in Hong Kong Waters;

(ii) Four (4) 200 mm x 150 mm colour photographs showing the profile of the Boat in Hong Kong Waters; and

(iii) Four (4) 150 mm x 100 mm colour photographs showing the profile of the Boat in Hong Kong Waters.

(c) Softcopy of Photographs

(i) All of the photographs specified at Paragraphs 12.8.2.5(a) and (b) of this Part VII shall be taken using a digital camera with a resolution of at least 12 megapixels and be forwarded to the HKPF on a DVD in RAW and JPEG formats at Delivery Acceptance.

12.8.2.6 Certificates and Reports

Copies of the following documents [one (1) original with two (2) copies and one (1) softcopy stored on DVDs], filed in clear folders, shall be forwarded to GNC at Delivery Acceptance:

(a) Associated test certificates;

(b) Hull Construction Certificate of the Boat;

(c) Test performance certificates of Equipment (e.g. electronics, switchboards);

(d) Outboard engine performance test certificates;

(e) Complete record of the Official Sea Trial commissioning tests;

(f) Warranty certificates for all machinery, Equipment and apparatus on the Boat (valid for twelve (12) months from the date of Acceptance Certificate of the Boat);

(g) Certificates of light and sound signalling Equipment;

(h) Builder certificates;

(i) Certificates of building materials;

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

(k) Hull construction material certificates issued by one of the Classification Societies listed in Paragraph 12.2.3.3 (a) to (i) of this Part VII;

(l) Undertaking duly signed and sealed by the Contractor's (or its sub-contractor's) shipyard to provide Warranty Services in relation to all aspects of the Boat during the Warranty Period in the HKSAR as stipulated in Annex 1 of Part VII;

(m) Asbestos free certificate or statement of compliance; and

(n) Any other certificates as appropriate.

12.8.2.7 Boat Model

The boat model shall be provided as part of the VPU model as specified at Paragraph 13.2.10 of this Part VII.

Chapter 13 Services Support

13.1 General Requirements

13.1.1 In determining the appropriate design for the Vessel, all of the following factors shall be taken equally into account:

(a) Vessel performance;
(b) Operational requirements;
(c) Initial cost;
(d) Through life operational costs (e.g. maintenance cost, fuel consumption, spare parts);
(e) Reliability (frequency and time to repair);
(f) Time between maintenance periods;
(g) Time to undertake scheduled maintenance (downtime); and
(h) That all machinery and Equipment installed in the Vessel shall be serviceable in the HKSAR.

13.1.2 Maintainability – the vessel shall be easy to maintain by ensuring that there shall be:

(a) Good access to all installed items for monitoring service and overhaul; and
(b) Easy access to in-situ service and maintenance within HKSAR.

13.1.3 Allowable Vessel downtime (including scheduled preventive maintenance and unscheduled repair and maintenance) shall not exceed 10% of the total hours of operation per month based on the operational profile as specified in Paragraph 2.6.1, Chapter 2 of this Part VII.

13.2 Information to be Provided Prior to and at Delivery Acceptance

13.2.1 Not later than six (6) weeks prior to Delivery Acceptance, the Contractor shall supply the Inventory List to the GNC and HKPF for approval. The detailed Inventory List shall be for the whole Vessel, covering all discrete items down to major component/unit level. Full details of each item shall include:

(a) Item number;
(b) Description;
(c) Type or model (if applicable);
(d) Serial number(s);
(e) Quantity;
(f) Manufacturer;
(g) Manufacturer's reference number;
(h) Location of the item in the Vessel;
(i) Local agent/supplier address, telephone and facsimile numbers as well as email address;
(j) Order lead time;
(k) Shelf life; and
(l) Unit cost.

13.2.2 In conjunction with the Inventory list, to facilitate good stores management and scheduling practices, the Contractor shall supply with the Vessel an Integrated Through Life Maintenance and Support Package, excluding the Spare Parts listed in Part 2 of Schedule 1, that will include, but not be limited to, the following:

(a) Parts to be stored on the Vessel that may be required for preventive maintenance and consumable replacement;
(b) Parts to be stored at the base from which the Vessel operates to facilitate frontline preventative maintenance and replacement of consumable parts which cannot be undertaken when operating at sea;

(c) Parts to be stored at the base from which the Vessel operates as replacement for items that can be anticipated to be required and the interval at which they will likely be required;

(d) Parts to be stored at the Government Dockyard in anticipation of replacement and the interval at which they will be required;

(e) The schedule of maintenance and parts required;

(f) Lead time for delivery of major parts that may be required for replacement during scheduled maintenance;

(g) This Package shall be for the expected service life of the Vessel; and

(h) Other details the Contractor deems relevant.

13.2.3 "As Fitted" Plans and Drawings, in accordance with those given in (but not limited to) Annex 7 of this Part VII and any other relevant information required by GNC, shall be supplied to GNC for acceptance not less than four (4) weeks before the Delivery Acceptance of the Vessel. Four (4) hard copies of the final version of the "As fitted" Plans and Drawings and two (2) soft copies on USB or equivalent devices shall be provided by the Contractor to GNC upon delivery of the Vessel to Government Dockyard.

13.2.4 The first draft of the Onboard Operator's Manual (in both English and traditional Chinese) mentioned in Paragraph 13.2.5(g) of this Part VII shall be submitted to GNC for approval one (1) month before the documentation acceptance.

13.2.5 At Delivery Acceptance, the Contractor shall provide the MD with the following:

(a) Four (4) printed copies and two (2) soft copies on USB or equivalent devices of the approved Inventory List and the Integrated Through Life Maintenance and Support Package;

(b) Four (4) complete sets of printed copies and two (2) soft copies on USB or equivalent devices "as fitted" drawings of the Vessel;

(c) Four (4) complete sets of printed copies and two (2) soft copies on USB or equivalent devices "as fitted" mechanical and electrical equipment and schematics of cabling, wiring and single line diagrams for all electrical and electronic equipment installed onboard and conduit / trunk route diagrams as per the Vessel delivered;

(d) Four (4) printed copies and two (2) soft copies on USB or equivalent devices of a list of all bought-in machinery and electrical equipment installed on the Vessel. The list shall include:

(i) Description,

(ii) Type or model (if applicable);

(iii) Makers part number or equivalent (if applicable);

(iv) Location;

(v) Quantity;

(vi) Supplier or agents name and contact details;

(vii) Order lead time;

(viii) Shelf life; and

(ix) Unit cost.

(e) Four (4) printed copies (at least one (1) original) of manufacturers' operation, maintenance and workshop manuals in English for all machinery and equipment, including spares and stores, special tools, daughter boat, outfitting items and test equipment;

(f) Four (4) printed copies and two (2) soft copies on USB or equivalent devices of the Contractor's "Docking Plan", which shall include the profile, plan and sections as per the Vessel delivered;

(g) Four (4) printed copies and two (2) soft copies on USB or equivalent devices of the Onboard Operator's Manual (English and traditional Chinese) for the Vessel delivered covering:

(i) Daily user checks and operating procedures;

(ii) Operating detail of each system; and

(iii) Emergency operation procedure.

(The precise format and detail required shall be subject to the Government's approval when the configuration of the Vessel and outfitting is decided.); and

(h) One (1) set in paper format and one (1) softcopy on USB or equivalent device of the operational and maintenance manuals in English as specified in Paragraph 9.2.11 of this Part VII for each individual item of equipment that comprises the Command and Operations System. For the avoidance of doubt, this set of operation and maintenance manuals is in addition to the sets which are required to be supplied in accordance with Paragraph 9.2.11 of this Part VII.

13.2.6 Spare Parts and Consumable Parts for the Main Diesel Engines:

(a) All items of Spare Parts and Consumable Parts for the main diesel engines shall be delivered to the Government Dockyard as per the requirements stipulated in Schedule 2, Delivery Schedule of Part V;

(b) All items supplied shall be identical in make, quantity and size to the parts currently in use; and

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

13.2.7 Tools and Test Equipment for Electronics

(a) All tools and testing equipment for the Vessel's electronic equipment shall be delivered directly to COMMS.

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

13.2.8 Photographs

The Contractor shall at Delivery Acceptance provide the following:

(a) As-Fitted Photographs

(i) Two (2) 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. Two high resolution soft copies of As-Fitted Photographs shall also be provided; and

(ii) Each set of prints shall be presented in a suitable album, indexed and labelled appropriately to ensure that the position from which the picture was taken and the position of the subject in the picture are clearly identifiable.

(b) Official Photographs

(i) Four (4) framed colour photographs of picture size not less than 350 mm x 270 mm and a frame size not less than 510 mm x 400 mm showing the clearly the running profile and the name of the Vessel in Hong Kong Waters;

(ii) Four (4) 200 mm x 150 mm colour photographs showing the profile of the Vessel in Hong Kong Waters; and

(iii) Four (4) 150 mm x 100 mm colour photographs showing the profile of the Vessel in Hong Kong Waters.

(c) Softcopy of Photographs

(i) All of the photographs specified at sub-paragraphs (a) and (b) of this Part VII shall be taken using a digital camera with a resolution of at least 12 megapixels and be forwarded to the GNC on two (2) USB or equivalent devices in RAW and JPEG formats at Delivery Acceptance.

13.2.9 Certificates and Reports

Copies of the following documents [one (1) original with two (2) copies and two (2) softcopy stored on USB or equivalent devices], filed in clear folders, shall be forwarded to GNC at Delivery Acceptance:

(a) Associated test certificates;

(b) Equipment test performance certificates (e.g. electronics, switchboards, etc.);

(c) Main diesel engines performance test certificates;

(d) Electric propulsion system performance test certificates;

(e) Lithium Ion batteries performance test certificates;

(f) Complete record of the trial commissioning tests;

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

(h) Certificates of light and sound signalling equipment;

(i) Builder certificates;

(j) Certificates of building materials;

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

(l) Hull construction material issued by the RO;

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

(n) Certificate of Class issued by the relevant RO; and

(o) Any other certificates as appropriate to discretion of GNC.

13.2.10 Vessel Model

(a) The Contractor shall supply two (2) Vessel models for display and training purpose. One model is with a scale of 1:25 while the other is with a scale of 1:50.

(b) The purpose of the Vessel model shall provide a reasonable realistic appreciation to the viewer (who cannot see the actual vessel) of the shape, scale, construction of the Vessel and the machinery installations and fittings therein.

(c) The Vessel Model shall include the position and appearance of the major external fittings including but not limited to the ship hull, superstructure, ship name and number, skeg, appendages, shafts, propeller (propulsion units), rudders, fender, windows and wipers, lifesaving, fire-fighting, piping on deck, mast, mast fittings, radar, navigation lights, daughter boat etc. to the satisfaction of the Government. The Vessel shall be made to an overall exact scale standard.

Chapter 14 Training

14.1 General

14.1.1 This chapter stipulates the training requirements for (a) Launch Mechanic (Engineering Stream) Operational Crew Training, (b) Engineering Maintenance Training (c) Deck Operational Crew Training and, (d) Operational Systems Maintenance Training of the Vessel that shall be recommended and provided by the Contractor.

14.1.2 Each training course is to provide the trainee, all of who are experienced navigation and engineering professionals, with the level of knowledge to undertake the role of instructor to train operational crews to operate and/or maintain the Vessel and its systems.

14.1.3 'Vessel' for the purposes of the courses mentioned in Chapter 14 refers to both the mother launch and daughter boat.

14.1.4 All training courses shall include, but not be limited to, the following:

(a) Layout and structure of the Vessel;

(b) Introduction of all onboard equipment;

(c) Equipment construction and mounting;

(d) Working principles, function and operation of all equipment;

(e) Equipment block and schematic diagrams as well as functional descriptions;

(f) Equipment adjustment/calibration procedures and parameter settings;

(g) Equipment interfacing/networking; and

(h) Preventive maintenance and trouble-shooting.

14.1.5 The Contractor shall provide both classroom-based and vessel-based training, as appropriate. All training courses shall be held in the venue to be provided by HKPF or MD in the HKSAR. The training shall be conducted in Cantonese, or English through an interpreter who possesses marine technical and engineering knowledge, with relevant training materials supplied by the Contractor.

14.1.6 If any of the training instructor(s), trainer(s), and any other personnel providing the training are travelling from outside Hong Kong, all the training shall be provided by such personnel in one visit for each set of training.

14.1.7 Three sets of the four training courses are to be undertaken during the delivery of the class of 12 Vessels. The first set of courses shall be held immediately after the Delivery Acceptance of the first (1st) Vessel to the MD. The second set of courses is to be held after the Delivery Acceptance of the sixth (6th) Vessel and the final set of courses is to be held after the Delivery Acceptance of the twelve (12th) Vessel. Any engineering upgrades that have been implemented during the construction and commissioning of this class of vessel are to be fully reflected in the training.

14.1.8 The Contractor shall supply each participant attending a course with one (1) copy of the comprehensive training documents in both English and traditional Chinese in both printed copy and USB or equivalent format.

14.1.9 The Contractor shall submit copies of the training syllabus and training materials to the HKPF and GNC for acceptance two (2) months prior to Delivery Acceptance, which shall cover all corresponding aspects of boat handling and onboard Command, Operational and Engineering Systems. This shall include "hands on" demonstrations of the operation, daily routine, as well as first level troubleshooting and maintenance. The training syllabus shall include details of the scope, duration and scheduling of the proposed training course and the qualifications possessed by the proposed training instructor(s). The HKPF and MD shall have the right to reproduce all training documents for internal use.

14.1.10 The Contractor shall, upon successful completion of each course, issue each participant with a certificate as evidence of his/her attendance and the standard of competence achieved.

14.2 Launch Mechanic (Engineering Stream) Operational Crew Training

14.2.1 The purpose of the Launch Mechanic (Engineering Stream) Operational Crew Training Course is to provide each trainee, who will already have completed the requisite HKPF training and be an experienced Launch Mechanic (Engineering Stream) operational crewmember, with the knowledge and competence to fully operate and maintain the Vessel and all its equipment and mechanical and electrical engineering machinery whilst on operational duties. Throughout the training, the hybrid propulsion system including the DC grid shall be an essential subject. On completion of the training course, the trainees will be responsible for delivering further training courses to other HKPF officers.

14.2.2 Upon Delivery Acceptance, the Contractor shall then deliver this training course according to the approved syllabus to HKPF operational staff as follow:

(a) 30 staff at the 1st Vessel Delivery (shall be separated into two classes as needed);

(b) 15 staff at the 6th Vessel Delivery; and

(c) 15 staff at the12th Vessel Delivery.

14.3 Engineering Maintenance Training

14.3.1 The purpose of the Engineering Maintenance Training Course is to provide the HKPF and MD technical and maintenance staff with a comprehensive knowledge and understanding of all aspects of the design philosophy, integrated system operation, fault diagnosis, trouble shooting, routine maintenance, repair or replacement procedures of all mechanical and electrical machinery onboard as well as hull and structural repairs to the Vessel. Throughout the training, the hybrid propulsion system including the DC grid shall be an essential subject. This course shall provide the participants with sufficient expertise to enable them to effectively maintain and repair the Vessel and all mechanical and electrical onboard systems after the expiry of the Warranty Period. It shall include both practical demonstrations and hands on training.

14.3.2 The Contractor shall then deliver this training course to HKPF and Government Dockyard Maintenance Section (GDMS) technical and maintenance staff as follow:

(a) 10 HKPF and 10 GDMS staff at the 1st Vessel Delivery;

(b) 10 HKPF and 10 GDMS staff at the 6th Vessel Delivery; and

(c) 10 HKPF and 10 GDMS staff at thee12th Vessel Delivery.

14.4 Deck Operational Crew Training

14.4.1 The purpose of the Deck Operational Crew Training Course is to provide each participant, who will already have completed the requisite HKPF training and be an experienced deck operational crewmember, with the knowledge and competence to fully operate the Operational Systems onboard the Vessel during normal routine operations, typhoon mooring, and emergency situations including fire-fighting and damage control. Throughout the training, the hybrid propulsion system and position keeping shall be the essential subjects. On completion of the training course, the participants will be responsible for delivering further training courses to other HKPF officers.

14.4.2 Upon Delivery Acceptance, the Contractor shall then deliver this training course according to the approved syllabus to HKPF operational staff as follow:

(a) 30 staff at the 1st Vessel Delivery (shall be separated into two classes as needed);

(b) 15 staff at the 6th Vessel Delivery; and

(c) 15 staff at the12th Vessel Delivery.

14.5 Operational Systems Maintenance Training

14.5.1 The purpose of the Operational Systems Maintenance Training Course is to provide the COMMS technical and maintenance staff with a comprehensive knowledge and understanding of all aspects of the design philosophy, integrated system operation, fault diagnosis, trouble shooting, routine

maintenance, repair or replacement procedures associated with the Operational Systems of the Vessel. This course shall provide the COMMS technical and maintenance staff with sufficient expertise to enable them to effectively maintain the equipment associated with the Operational Systems of the Vessel after the expiry of the Warranty Period. It shall include both practical demonstrations and tests.

14.5.2 Upon Delivery Acceptance, the Contractor shall then deliver this training course to HKPF staff as follow:

(a) 15 staff at the 1st Vessel Delivery;

(b) 15 staff at the 6th Vessel Delivery; and

(c) 15 staff at the12th Vessel Delivery.

Chapter 15 Abbreviations

µs	Microsecond
µV	Microvolt
3G	3rd Generation
4G	4th Generation
A/C	Alternating Current
ABS	American Bureau of Shipping
AC	Alternating Current
AES	Advanced Encryption Standard
AFFF	Aqueous Film-Forming Foam
AGM	Absorbent Glass Mat
AIS	Automatic Identification System
AIU	Audio Gear Interface Unit
AML	Additional Military Layers
AMS	Asset Management System
ANSI	American National Standards Institute
ARCS	Admiralty Raster Chart Service
ARPA	Automatic Radar Plotting Aid
ASTM	American Society for Testing and Materials
ASWF	American Standard Window Film
AV	Audio Video
AVLS	Automated Vehicle Location System
AWS	American Welding Society
BNC	Bayonet Neill-Concelman
BNWAS	Bridge Navigational Watch Alarm System
BS	British Standards
BSB	Data Encoded in the BSB format
BWA	Beam Waist Analyser
C/A	Course/Acquisition
c/w	Complete With
CABA	Compressed Air Breathing Apparatus
CBRN	Chemical, Biological, Radiological and Nuclear
CCD	Charge-Coupled Device
CCTV	Close Circuit Television
CD	Compact Disc
cd/m2	Candela per metre squared
CD-ROM	Compact Disc Read-Only Memory
CFC	Chlorofluorocarbon
CH	Channel
cm	Centimetre
CO2	Carbon Dioxide
COG	Course Over Ground
COMMS	Communications Branch of HKPF
CPA	Closest Point of Approach
CPU	Central Processing Unit
CRT	Cathode Ray Tube
CWA	Cognitive Work Analysis
dB	Decibel
dBi	Decibel Isotropic
dBm	Decibel-milliwatts
DC	Direct Current
DDR	Double Data Rate
deg	Degree
DGPS	Differential Global Positioning System

DHCP	Dynamic Host Configuration Protocol
DISS	DNC Digital Nautical Chart
DPDT	Double-Pole, Double-throw
DRU	Data Recording Unit
DSC	Digital Selective Calling
DTRS	Digital Trunk Radio System
DVD	Digital Versatile Disc
DVI	Digital Video Interface
DVR	Digital Video Recorder
E/R C.C.	Engine Room Control Console
ECDIS	Electronic Chart Display and Information System
ECS	Electronic Chart System
EFCP	External Fire-Fighting Control Panel
EFFS	External Fire-Fighting System
EGNOS	European Geostationary Navigation Overlay Service
EIAPP	Engine International Air Pollution Prevention
EMC	Electromagnetic Compatibility
EMI	Electromagnetic Interference
ENC	Electronic Navigational Charts
ENE	Electronic Navigation Equipment
EOSS	Electro Optical Sensor System
ERBL	Electronic Range and Bearing Lines
ERC	Engine Control Room
ESS	Energy Storage System
FAT	Factory Acceptance Trials
FD	Frequency Division
FO	Fuel Oil
FOV	Field of View
FTP	Fire Test Procedures
g	Gravity
GB	Gigabyte
GeoTIFF	Format File
GGAP	Guidance General Arrangement Plan
GHz	Gigahertz
GLONASS	Global Navigation Satellite System
GM	Metacentric Height
GMDSS	Global Maritime Distress and Safety System
GMT	Greenwich Mean Time
GNC	Government New Construction Section
GPS	Global Positioning System
GRP	Glass-Reinforced Plastic
GZ	Righting Lever
H/V	Horizontal/Vertical
HazMat	Hazardous Material
HCFC	Chlorodifluoromethane
HD	Hard Disk
HDD	Hard Disk Drive
HDMI	High Definition Multimedia Interface
HEPA	High-Efficiency Particulate Arrestance
HKPF	Hong Kong Police Force
HKPF/COMMS	Hong Kong Police Force Communications Department
HPEAFS	High Performance Energy Absorbing Flooring System
HPS	Harbour Patrol Section
HSC	High-speed Craft
HVAC	Heating, Ventilation and Air Conditioning

Hz	Hertz
IC	Intercommunications
ICNIRP	International Commission on Non-Ionizing Radiation Protection
ICOMIA	The International Council of Marine Industry Associations
ICR	Information Collection Request
IEC	International Electrotechnical Commission
IHO	International Hydrographic Organization
IMM	International Maritime Mobile
IMO	International Maritime Organisation
INS	Integrated Navigation System
IP	Internet Protocol
IPsec	Internet Protocol Security
IR	Infrared
IRPA	International Radiological Protection Association
IRPCS	International Regulations for Preventing Collisions at Sea
IS	Intact Stability
ISO	International Organization for Standardization
ITTC	International Towing Tank Conference
ITU-R	International Telecommunication Union – Radio communication Sector
JPEG	Joint Photographic Experts Group
K	Kilo
kg	Kilogram
kHz	Kilohertz
km	Kilometre
km/h	Kilometre per hour
kPa	Kilo Pascal
kts	Knots
kW	Kilowatt
kΩ	Kilo Ohm
L/min	Litre per minute
L/s	Litre per second
LCD	Liquid Crystal Display
LCG	Longitudinal Centre of Gravity
LED	Light-Emitting Diode
LO	Lube Oil
LOP	Local Operating Panel
LSA	Lifesaving Appliance
LTE	Long Term Evolution
m	Metre
M/E	Main Diesel Engines
m/s	Metre per Second
m3	Cubic Metre
MARPA	Mini-Automatic Radar Plotting Aid
MARSAS	Marine Situational Awareness System
MCB	Miniature Circuit Breaker
MCR	Maximum Continuous Rating
MD	Hong Kong Marine Department
MED	Marine Equipment Directive (EU)
MEI	MEI Corporation
MFD	Multi-Function Display
MHz	Megahertz
MIMO	Multi Input Multi Output
MJ/m2	Megajoule per Square Metre
MKD	Minimum Keyboard Display
mm	Millimetre

MMC	Multi Media Card
MMSI	Maritime Mobile Service Identity
MOB	Man Overboard
mph	Mile per hour
MS PRO	Memory Stick PRO
MS PRO Duo	Memory Stick PRO Duo
MSC	Maritime Safety Committee
mV	Milli Voltage
NAVSEA	Naval Sea Systems Command
NDT	Non-Destructive Test
NFPA	National Fire Protection Association
NIR	Non-Ionizing Radiation
Nm	Nanometre
NMEA	National Marine Electronics Association
NORSOK	Norsk Sokkels Konkuranseposisjon
ns	Nanosecond
NTRIP	Networked Transport of RTCM via Internet Protocol
NUC	Not Under Command
OBE	On-board Electronics
OC Foam	Oleoresin Capsicum – Pepper Spray
OFCA	Office of the Communications Authority
ohm	Unit of Electrical Resistance
OOW	Officer of the Watch
OSHA	Occupational Safety and Health Administration
p.s.i.	Pounds per square inch
PA	Public Address System
Pa	Pascal
PAL	Phase Alternating Line
PCB	Printed Circuit Board
PCU	Personal Communications Unit
PPI	Plan Position Indicator
PPTP	Point-to-Point Tunnelling Protocol
PTO	Power Take Off
PTT	Press To Talk
PVC	Polyvinyl Chloride
QoS	Quality of Service
RAM	Random Access Memory
RAW	A file format that captures all image data recorded by the sensor when a photograph is taken
RCA	Radio Corporation of America
RF	Radio Frequency
RG58U	RG58U Type Coaxial Cable
RGB	Red Green Blue
RH	Relative Humidity
RM	Relative Motion
RMS	Root Mean Squared
RO	Recognised Organisation
ROT	Rate of Turn
rpm	Revolutions per Minute
RT	Radioactive Test
RTCM	Radio Technical Commission for Maritime Services
SATA	Serial Advanced Technology Attachment
SBAS	Satellite Based Augmentation System
SDME	Speed and Distance Measuring Equipment
SENC	System Electronic Navigation Chart

SINAD	Signal-to-noise and Distortion Ratio
SOG	Speed Over Ground
SOLAS	Safety of Life at Sea
SPL	Sound Pressure Level
SSD	Solid-State Drive
STANAG	NATO Standardization Agreement
TBT	Tributyltin
TCG	Transverse Centre of Gravity
TCPA	Time-based Closest Point of Approach
TD	Time Division
TETRA	Terrestrial Trunked Radio
TFT	Thin-Film Transistor
TIFF	Tagged Image File Format
TM	True Motion
TMR	TOPEX/Poseidon Microwave Radiometer
TOPEX	Topology Ocean Experiment
TS	Technical Specifications
UHF	Ultra High Frequency
UPS	Uninterruptible Power System
USB	Universal Serial Bus
UT	Ultrasonic Test
UTC	Coordinated Universal Time
uV	Nano Voltage
UV	Ultraviolet
V	Volt
V.S.W.R.	Voltage Standing Wave Ratio
VAC	Voltage of Alternating Current
VCG	Vertical Centre of Gravity
VDC	Voltage of Direct Current
VDR	Voyage Data Recorder
VGA	Video Graphics Array
VHF	Very High Frequency
VMAP	Vector Map
VOC	Volatile Organic Compounds
VoIP	Voice Over Internet Protocol
VOX	Voice Operated Switch
VPN	Virtual Private Network
VRM	Variable Range Marker
VSD	Variable Speed Drive
VTC	Vessel Traffic Centre
VTS	Vessel Traffic Services
W	Watt
W/H E.C.C.	Wheelhouse Engine Control Console
WAAS	Wide Area Augmentation System
WAN	Wide Area Network
WMS	Web Map Service

Part VII - Annex 1 - Warranty Services and Guarantee Slipping

1. Warranty Services

1.1 The Contractor shall provide Warranty Services in relation to all aspects of the Vessel during the Warranty Period, including Guarantee Slipping as stipulated in this Annex. Both the Warranty Services and Guarantee Slipping shall be carried out locally in Hong Kong. If the Contractor appoints an authorised agent to perform the Warranty Services, the Contractor shall ensure that the authorised agent appointed will perform the Warranty Services and Guarantee Slipping in full compliance with the requirements of the Contract including those as set out in this Annex 1. The Warranty Services and Guarantee Slipping for the Daughter Boat are separately set out in Annex 16 to Part VII. Reference to "Vessel" in this Annex 1 shall exclude the Daughter Boat.

1.2 The Government reserves all rights and claims against the Contractor in the event that any warranty claim has not been handled in accordance with the terms of the Contract.

1.3 For the Equipment in respect of which the manufacturer/supplier does not offer a one-year free warranty on such equipment, the Contractor shall provide the Warranty Services throughout the Warranty Period at the Contractor's own cost. For other loose equipment and installations, such as life-saving and firefighting equipment, etc., which are required to be serviced, inspected or renewed annually, the Contractor shall provide the servicing, inspection and renewal as per the manufacturer's requirements of that equipment or installation in the Warranty Period applicable to such items.

1.4 During the Warranty Period, when the Vessel is handed over for the Warranty Services and/or Guarantee Slipping, the Contractor shall be responsible for the due return of the Vessel in good order. Should there be any loss or damage of the Vessel or any Warranty Item (as defined in Paragraph 1.5 below) caused by any reason whatsoever while the Vessel is in the possession or control of the Contractor (including even when the Vessel is at the Government Dockyard or a maintenance base of the user department) or at the shipyard of the Contractor or an authorised agent appointed by it, the Contractor shall pay for the cost for the loss or damage plus 20% as and for liquidated damages but not as a penalty. Throughout the Warranty Period, notwithstanding anything to the contrary in the Contract, the Vessel and all Warranty Items are deemed to be at the Contractor's risks, and the Contractor shall insure and keep insured, at his own expense, a property insurance with the Government to be named as the sole payee, for an indemnity amount of not less than the purchase price of the Vessel plus 20% to protect the Government property against all risks. The Certificate of Insurance and evidence showing that the premium has been paid shall be available for inspection in advance. The Contractor shall provide this insurance policy before the commencement of the Warranty Services and/or Guarantee Slipping. Any excess payable under the insurance policy shall be borne by the Contractor.

1.5 Total Vessel Warranty

It is required that the Vessel is covered by free of charge Warranty Services for one year after the date of the issue of the Acceptance Certificate in respect of the Vessel. The Warranty Services shall cover the entire Vessel and all its Equipment (including all major Equipment specified in Schedules 6 and 7 in Part V and electronic navigational equipment), fittings and outfit (including spare parts, and documentation) (collectively, "Warranty Items") against defects of design, construction, workmanship or materials and against any non-compliance with any of the Product Warranties. The Warranty Services may be backed up by the Contractor using individual equipment suppliers/manufacturers' warranties but the Contractor shall remain solely liable to MD as a primary obligor to provide the Warranty Services. Notwithstanding and without prejudice to the Contract on warranty obligations for the total Vessel, any individual equipment supplier/manufacturer's warranty extending beyond the one year total Vessel warranty must be assigned to the Government as appropriate.

1.6 Procedures for Warranty Claim

Without prejudice to the provisions of the Contract, a detailed procedure for dealing with warranty claims must be proposed by the Contractor and agreed by MD before the issuance of the Acceptance Certificate of the Vessel. This shall be based on the following principles:

1.6.1 Any notification of claimed defect shall be sent from MD to the Contractor through a defined route.

1.6.2 There shall be a joint inspection to examine the defect and the Contractor shall propose the appropriate and necessary remedial action to the satisfaction of MD.

1.6.3 The Contractor shall undertake on-site Warranty Services (including provision of all replacement Warranty Items, spare parts, labour, materials, test equipment, and transportation) wherever, at the option of the Government, the Vessel is berthed in the Government Dockyard or maintenance bases of the user department. Taking the Vessel to the shipyard of the Contractor should be avoided unless absolutely necessary.

1.6.4 Rectification of defects must have a minimum effect on the operation of the Vessel by the provision of on loan equipment if the anticipated repair time exceeds the time frame as specified in Paragraph 1.7.1 below.

1.7 Throughout the Warranty Period, the Contractor shall be responsible for the provision of free of charge corrective maintenance and rectification of all defects in all and any of the Warranty Items including repair and replacement as necessary. This shall, at no cost to the Government, include Warranty Services to be performed by the Contractor described in the following sub-paragraphs:

1.7.1 To attend to the Vessel for inspection and repair within 24 hours (excluding Hong Kong public holidays) of receiving the report of a fault ("fault report") and to take immediate action to rectify the defect after inspection. Unless otherwise agreed by the Government, all corrective maintenance and rectification must be effected within 48 hours after the fault report is first issued. The MD must be informed of what corrective maintenance and rectification actions have been taken within 72 hours of receiving the relevant fault report.

1.7.2 To provide all necessary transport, replacement Equipment, spare parts, labour and materials, tools and testing instruments required for the corrective maintenance and rectification.

1.7.3 Any replacement item or part to be used shall originate from the manufacturer of the original Warranty Item to be repaired and must be able to be found in the latest spare parts list issued by such manufacturer. Alternative components shall not be used without the prior approval in writing of the MD.

If the Contractor fails to respond to any reported warranty claims within 48 hours, the MD may arrange corrective maintenance and rectification of the defect either on its own or by deploying a third party contractor as deemed appropriate with a view to minimising any downtime incurred. In such case, the Contractor shall compensate the Government for the full cost of such repairs plus 10% as and for liquidated damages but not as a penalty no later than 10 working days after a written demand has been served on the Contractor by MD.

1.8 Extension of Warranty

1.8.1 The Warranty Period for any Warranty Item shall be suspended whilst and if the Contractor fails to repair and correct satisfactorily the defects in such Warranty Item within seven working days counting from the date when the relevant fault report was first issued.

1.8.2 Warranty Items which are electronic equipment sub-assemblies, modules or components and which are replaced during the Warranty Period shall have a new warranty period of one year commencing from the date of replacement.

1.8.3 In relation to a Warranty Item, references to Warranty Period shall be construed to include such extended warranty period as mentioned in Paragraph 1.8.1 and/or 1.8.2 above, depending on whichever is applicable.

1.8.4 Equipment which is found to be defective during the trials at the Guarantee Slipping as mentioned in Paragraph 2.2.5 below shall have an extension of warranty of one year.

1.9 Recurrent Defects

During the Warranty Period, should a second and similar defect arise in relation to a Warranty Item, this shall be construed as conclusive evidence of the Warranty Item's unsuitability for the purpose intended, and the Contractor shall take immediate steps to conduct a thorough investigation jointly with MD at the Contractor's expense, to ascertain the reasons for any such defect and shall forthwith at the MD's option and the Contractor's expense, procure and deliver another replacement Warranty

Item with a new design suitable for the purpose intended to replace the original defective Warranty Item.

1.10 In the event that the Contractor proposes to modify any Warranty Item or any part of the Vessel in order to repair or replace the same or another Warranty Item, the Contractor shall obtain the Government's advance written consent to the proposed modification.

1.11 Throughout the Warranty Period, the Contractor shall maintain an inventory of spare parts, which shall be the same items as listed in Schedules 6 and 7 in Part V and in the same quantity in the shipyard of the Contractor which the Contractor shall use for performing the Warranty Services. The Government will not provide its own inventory of the Spare Parts to the Contractor for the provision of the Warranty Services.

1.12 Updated/Upgraded Information

It is expected that during the Warranty Period certain Warranty Items may be modified or changed. All documentation affected by this change must be updated to reflect the new situation. All the support documentation such as the Vessel inventory list, job information and maintenance scheduling in relation to these modifications and changes shall be provided at the expiry of the Warranty Period.

1.13 Warranty of Electronic Navigational Equipment

Please refer to the Chapter 9 of the TS.

2. Guarantee Slipping

2.1 As stated in the section "Warranty" above, Guarantee Slipping shall be carried out at the end of the original Warranty Period regardless of any subsequent extension in relation to any Warranty Item under the terms of the Contract.

2.2 At the Guarantee Slipping, the Contractor shall carry out the following work and provide all necessary materials, spare parts, labour and equipment in order to carry out such work:

2.2.1 Pre-guarantee slipping inspection and trial

(a) Joint inspection with trial to confirm the list of guarantee slipping items; and

(b) Collect vessel performance information beforehand for comparing when guarantee slipping completion

2.2.2 Engines and Gearbox

(a) Renew the lubricating oil and replace the filters for the main engines and gearboxes and top up the engine coolant as per the manufacturer's recommendations;

(b) Clean all the engine air filters and change the filter elements;

(c) Change all fuel/water separators elements and fuel filters for all engines;

(d) Clean the coolers of the engines and gearboxes and renew all zinc anodes if provided;

(e) Check all the engines' belts and adjust or renew if necessary;

(f) Check tappet clearances for the inlet and exhaust valves, ignition timing and idle speed and adjust if necessary;

(g) Conduct function tests for the engines' protection system and their associated sensors, gauges and other measuring devices;

(h) Disconnect and remove all engines and gearboxes sea water pipes (suction & discharge) for inspection, and clear off marine growth and obstructive materials in all pipes and fittings;

(i) Repair all damages and leakages in the metal and fibreglass pipelines; and

(j) Any other work required or recommended by the engine manufacturer.

All of the work listed at Paragraphs 2.2.2(a) to (j) shall be carried out by the manufacturer's authorised agent/dealer. All the work procedures and the spare parts used shall comply with the manufacturer's specifications and requirements.

2.2.3 Hull and Deck Items (where applicable)

(a) Paint Under the Water Line

(i) Paint under the water line shall be checked by the paint manufacturer's representative for the effectiveness of one year's protection against marine growth;

(ii) The hull shall be cleaned and readily for inspection of paint damage;

(iii) Damaged paint shall be repaired according to the paint manufacturer's procedures;

(iv) After the repair of the damaged paint as specified at Paragraph 2.2.3(a)(iii), two coats of touch up primer and one coat of touch up shall be applied; and

(v) One touch up anti-fouling paint of finishing coat shall be applied to the damaged paint as specified at Paragraph 2.2.3(a)(iii).

(b) Paint Above the Water Line

(i) Damaged paint on the hull above the water line and deckhouse shall be repaired properly. After repair, two coats of touch up primer and one coat of touch up (finishing) shall be applied;

(ii) Two coats of paint shall be applied on the Vessel's name, draft marks and insignia; and

(iii) One full coat of anti-slip paint shall be applied to the open and side deck.

(c) Inspect and clean and polish propellers.

(d) Inspect, clean and remove obstructed object on the propeller shaft.

(e) Water jet tunnel and impeller(s) inspection and cleaning (if applicable).

(f) Free, clean, grease and recondition all moving parts of the deck fittings, i.e. WT (water tight) hatches, vent covers, rollers and fairleads and anchor chain stoppers, etc.

(g) Renew all zinc anodes on hull, rudder(s) and tail shaft(s).

(h) Life-saving appliances (LSA) and Fire-fighting appliances (FFA) must be serviced and re-certified as required. (Free, clean, grease and recondition all fire control valves, hydrants and bilge suction and control valves)

(i) Free, clean and repaint the anchor chain and swivel set.

2.2.4 Mechanical, Electrical & Air-conditioning

(a) Dismantle all overboard valves for inspection and renew the defective parts;

(b) Check and clean the sea water system (including the grating, sea chest internal, sea suction and strainers) complete with renew their zinc anodes;

(c) Each of the compartment bilge suction to be checked and free of rubbish;

(d) Generator megger test and electrical circuit earth leak test; and

(e) Batteries condition check and switch over test.

2.2.5 The following shall be tested at the dock trial / sea trials as part of the Guarantee Slipping:

(a) Engine control and steering system including emergency/alternative method;

(b) Engine alarm and shut down function (including emergency stopping of engines at wheelhouse);

(c) Hybrid System

(d) Battery Generator

(e) Navigational equipment, lights and sound signals;

(f) Ahead and astern running and crash stop test;

(g) Steering trial;

(h) Speed Measurement;

(i) Bilge system function (including high level bilge alarm system);

(j) Fire pump(s) function (including fire detection system, alarms, ventilation fans /fuel

pump remote shutdown);

(k) The Dock Trial and Sea Trial Safety Checklist items, as listed below;

Dock Trial Check List

General items will be checked during dock trial	
1.	Engines start and stop testing
2.	Engines emergency stop check
3.	Engines speed and clutch unit testing
4.	Engines speed high and low idle speed testing
5.	Engines gauges and alarm check
6.	Propulsion system testing
7.	Anchor windlass testing
8.	Navigation lights testing
9.	Wheelhouse horn and windows screen wipers testing
10.	Fire protection system alarm check
11.	Portable fire extinguishers inspection
12.	Life-saving equipment inspection
13.	Engine room ventilation fans testing
14.	Air compressor and air conditioning system testing
15.	Cabin lights testing
16.	Bilge system in each compartment testing.
17.	Floor plate inspection
18.	Fuel tanks quick closing valves testing
19.	G.S. pumps testing
20.	Bilge pumps testing
21.	A/C cooling water pumps testing
22.	Tailshaft cooling water pumps testing
23.	Fire pumps testing
24.	Fuel oil pumps testing
25.	Sanitary pumps testing
26.	Sewage pumps testing
27.	Fresh water pumps testing
28.	Waste water pumps testing
29.	Steering system power assisted and manual operation testing
30.	Emergency rudder operation check
31.	Rudder indicator check

Sea Trial Safety Check List

General items will be checked during sea trial	
1.	Engines start and stop testing
2.	Engines emergency stop check
3.	Engines speed and clutch unit testing
4.	Wheelhouse horn and windows screen wipers testing
5.	Portable fire extinguishers are in place
6.	Life jackets and life buoys are in place
7.	Sea trial navigation flag hoisted
8.	Telecommunication system function check
9.	Approved coxswains are in control
10.	Sufficient fuel oil to perform the full course of sea trial
11.	Water tank is full

(l) Other trials or testing of equipment as required by the Government Representative; and

(m) Any item or component found defective shall be repaired or replaced.

2.3 After Guarantee Slipping, the Contractor shall submit the above works completion report (including engines trial/testing report completed with engines parameters) to the Government Representative.

Milestones		Completion Dates
1	Issuance of "Notification of Conditional Acceptance"	To be advised after Tender Evaluation
2	Contract Date (the date of the last party signing the Articles of Agreement)	The date when the last party signs the Articles of Agreement. The Government will not sign the Articles of Agreement until and unless the Contractor fulfils all of the conditions precedent as specified in Clause 25.2 of Part II Conditions of Tender (save to the extent waived by the Government, if any).
3	Kick-Off Meeting	To be held within two (2) months after the Contract Date at the Government Dockyard or the Contractor's Shipyard
4	Completion of hull and superstructure of the Vessel	The Contractor shall propose the completion dates of Milestones 4-8 for GNC's approval within two (2) months after the Contract Date.
5	Completion of installation of hybrid propulsion system, propellers and steering system	
6	Completion of design with HKPF approval and installation of Operational Systems	
7	Conduct of all tests, inspections and trials as part of the Technical Acceptance including the Official Sea Trial	
8	Conduct of the on-site commissioning tests for the Operational Systems on the Vessel (as part of the Technical Acceptance)	
9	Vessel Ready for Use (including without limitation the passing of the Technical Acceptance)	On or before the Delivery Date applicable to the same Vessel
10	Delivery Date	The Delivery Date for the Vessel shall be no later than the date set out in Schedule 2 (Delivery Schedule) of Part V

Part VII - Annex 3 - Drawing Submission Timetable

Item No.	Drawings Approval	Completion Date
1	General Arrangement Plan	*All the drawings are required to be submitted in two months after Signing of Articles of Agreement for GNC's approval / reference.*
2	Lines Plan	
3	Stability Analysis & Calculations	
4	Daughter Craft LARS Arrangement	
5	Typhoon Mooring Arrangement	
6	Structural Construction Plan in Mid-Ship and Bulkhead Section	
7	Construction Profile and Deck Plan	
8	Shell Expansion Plan	
9	Stem Construction and Stern Construction Plan	
10	Deckhouse Construction Plan	
11	Fuel Oil tank Construction	
12	Paint Schedule	
13	Tank Capacity Plan	
14	Engine Mounting Arrangement	
15	Power / Speed Estimation and Curve	
16	Intact and Damaged Stability Plan	
17	Details of Operational Systems	
18	Details of interfaces provisions of the Operational Systems for the HKPF supplied radio terminals, MARSAS and Satellite Communication System	
19	Details of Deck Equipment, Outfitting, Furniture, etc.	
20	Engine Room Arrangement	
21	Shaftline Arrangement	
22	Propeller Drawing	
23	Steering Arrangement & Rudders	
24	Bow Thruster Details	
25	Details of Diesel Generator Arrangement	
26	Energy Storage System	
27	Control Console Arrangement and Schematic Diagram	
28	Instrumentation and Control System	
29	Calculation of Fuel Capacity	
30	Details of Main Engines	
31	Details of Hybrid System – Main Engines, Diesel Generators, Gear Boxes (PTI/PTO), E-Motors, ESS, PMS, BMS, DC Grid, Electronic Components, etc. (Including design philosophy of PMS)	
32	Details of Stabilisation System	
33	Details of Position Keeping System	

Item No.	Drawings Approval	Completion Date
34	Engine Room Piping Diagrams including sea water system, bilge system, fresh water system, black water system, HVAC	
35	Engine Room Ventilation and Exhaust	
36	Details of the Air-Conditioning System	
37	Details of Electrical and Electronic Equipment	
38	Electrical Load Calculations	
39	Schematic Layout of Electrical Circuits	
40	Lightning Protection Arrangement	
41	Details of Galvanic Corrosion Prevention	
42	Torsional Vibration Calculation	
43	Fire Fighting Arrangement	
44	Lifesaving Arrangement	
45	Safety Plan	
46	Others as required	

Part VII - Annex 4 - Main Items Inspection Timetable				
VESSEL NAME: "Versatile Patrol Vessel (VPU) "			Inspection date	Outstanding / Reinspection / Remarks
Item	Items to be inspected			
	Hull Structure, Layout and Outfitting Inspection			
H-1	Hull Lofting			
H-2	Construction materials – steel plate mark checking for hull			
	a) Steel plate mark checking for hull			
	b) Material certification verification			
H-3	Construction materials – aluminium plate mark checking for deckhouse			
	a) Aluminium plate mark checking for deckhouse			
	b) Material certification verification			
H-4	Welding consumables and welders' certificates verification			
H-5	Keel lay inspection			
H-6	Fabrication of hull up to main deck in stages of work including			
	a) Alignment			
	b) Edge preparation			
	c) Welding			
	d) Workmanship			
	e) Compliance with approved plans			
	f) Non-destructive tests NDT (Xrays) of welds			
	g) Hull internal steel work inspection			
	h) Plating thickness gauging			
H-7	Engine girder fabrication and welding			
H-8	Deckhouse scantling and welding check			
H-9	Inspection and weld check of connection between deckhouse and main deck			
H-10	Welding construction and pressure test of tanks			
	Fuel oil tank(s)			
	a) Tank construction (internal/external/fitting)			
	b) Tank pressure test			
	Fresh water tank(s)			
	a) Tank construction (internal/external/fitting)			
	b) Tank pressure test			
	Grey water tank			
	a) Tank construction (internal/external/fitting)			
	b) Tank seating construction/securing			
	c) Tank pressure test			
	Oily water tank			
	a) Tank construction (internal/external/fitting)			
	b) Tank seating construction/securing			
	c) Tank pressure test			

VESSEL NAME: "Versatile Patrol Vessel (VPU) "			Inspection date	Outstanding / Reinspection / Remarks
Item	Items to be inspected			
	Hull Structure, Layout and Outfitting Inspection			
H-11	Hose test for hull and deckhouse			
H-12	Mock-up inspection for the wheelhouse			
H-13	Deckhouse console mock up			
H-14	Installation of the various outfitting items			
	a) Anchor and chain			
	b) Windlass			
	c) Hand pump			
	d) Hatches			
	e) Doors			
	f) Windows			
	g) Ventilators			
	h) Seating of heavy equipment and mast			
H-15	Function test of various outfitting items			
H-16	Water-tightness or weathertightness of openings			
	a) Manholes			
	b) Hatches			
	c) Doors			
	d) Windows			
	e) Ventilators and Air pipes			
	f) Cable glands			
H-17	Painting inspection of different layers			
H-18	Zinc anodes and lightning protection			
	a) Installation of zinc anodes			
H-19	Vessel dimension verification			
H-20	Draught marks verification			
H-21	Hull completion survey			
H-22	Arrangement of deckhouse, wheelhouse and accommodation			
H-23	Inspection of fire, heat and sound insulation			
	a) Fire Insulation			
	b) Heat Insulation			
	c) Sound Insulation			
H-24	Interior furnishings			
	a) Wheelhouse			
	b) Commander's Cabin			
	c) Crew Spaces			
	d) First Aid Room			
	e) Toilets spaces			
	f) Galley and mess area			

Part VII - Annex 4 - Main Items Inspection Timetable				
H-25	Lifesaving appliances and firefighting appliances			
	a) Lifesaving appliances			
	b) Firefighting appliances			
H-26	Inspection of sea chest and grating			
	a) Sea chest			
	b) Grating			
H-27	Inclining experiment			
H-28	Sea Trials including operation of outfitting			
H-29	Trial of Typhoon mooring arrangement			
H-30	Cleanliness inspection before acceptance			
H-31	Inventory check in HKSAR			
H-32	Acceptance and delivery			
H-33	Acceptance of As-Fitted drawings and Engine/Equipment manuals and Documentation			

Part VII - Annex 4 - Main Items Inspection Timetable				
VESSEL NAME: "Versatile Patrol Vessel (VPU) "			Inspection date	Outstanding / Reinspection / Remarks
Item	Items to be inspected			
	Machinery and Electrical Installation			
EM-1	General inspection and function tests on installation of machinery:			
	a) General inspection of the main propulsion engines			
	b) General inspection of the Hybrid propulsion system			
	c) General inspection of the generator sets			
	d) General inspection of the shafting			
	i. Propeller taper bedding test			
	ii. Coupling taper bedding test			
	iii. Coupling and rudder bolts fitting			
	e) General inspection of propellers			
	f) General inspection of bow thruster			
	g) General inspection of stabilization system			
EM-2	Main Engines:			
	a) Test of engine safety devices and alarms			
	b) Test of emergency stop			
	c) Inspection of exhaust pipe before lagging			
EM-3	Hydraulic test of sea valve			
EM-4	Inspection of the sea water suction strainers			

Part VII - Annex 4 - Main Items Inspection Timetable

VESSEL NAME: "Versatile Patrol Vessel (VPU) "			Inspection date	Outstanding / Reinspection / Remarks
Item	Items to be inspected			
	Machinery and Electrical Installation			
EM-5	Fresh water system:			
	a) General inspection and dimension checking of the fresh water system			
	b) Fresh water tank low level alarm test			
	c) Fresh water tank final cleaning/internal inspection before filling			
	d) Fresh water tank high level alarm test			
	e) Fresh water tank content gauge calibration and test			
	f) Inspection of piping penetration of bulkhead and deck			
	g) Hydraulic test of fresh water system piping			
	h) Functional test of fresh water system			
EM-6	Fuel oil system:			
	a) General inspection and dimension checking of the fuel oil system			
	b) Fuel oil tank(s) low level alarm test			
	c) Fuel oil tank(s) final cleaning/internal inspection before filling			
	d) Fuel oil tank(s) high level alarm test			
	e) Fuel oil tank(s) content gauge calibration and test			
	f) Inspection of piping penetration of bulkhead and deck			
	g) Hydraulic test of oil fuel system piping			
	h) Functional test of oil fuel system			
EM-7	Bilge system:			
	a) General inspection and dimension checking of the bilge system			
	b) Bilge tank low level alarm test			
	c) Bilge tank high level alarm test			
	d) Bilge tank content gauge calibration and test			
	e) Inspection of piping penetration of bulkhead and deck			
	f) Hydraulic test of bilge system piping			
	g) Functional test of bilge system			
EM-8	Black water/sanitary system:			
	a) General inspection and dimension checking of the black water/sanitary system			
	b) Black water tank low level alarm test			
	c) Black water tank high level alarm test			
	d) Black water tank content gauge calibration and test			
	e) Inspection of piping penetration of bulkhead and deck			
	f) Hydraulic test of black water/sanitary system piping			
	g) Functional test of black water/sanitary system			

Part VII - Annex 4 - Main Items Inspection Timetable				
VESSEL NAME: "Versatile Patrol Vessel (VPU) "			Inspection date	Outstanding / Reinspection / Remarks
Item	Items to be inspected			
	Machinery and Electrical Installation			
EM-9	Firefighting system:			
	a) General inspection and dimension checking of the firefighting system			
	b) Inspection of piping penetration of bulkhead and deck			
	c) Hydraulic test of firefighting system piping			
	d) Functional test of firefighting system			
EM-10	Fire extinguishing systems:			
	a) General inspection and dimension checking of the fire extinguishing system			
	b) Inspection of piping penetration of bulkhead and deck			
	c) Hydraulic test of fire extinguishing system piping			
	d) Functional test of fire extinguishing system			
	e) Test of fixed fire extinguishing alarm system			
	f) Test of fire detection (smoke and heat detection) alarm system			
	g) Installation and function test of water mist system			
EM-11	Hydraulic test of sea valve			
EM-12	Hydraulic system:			
	a) General inspection and dimension checking of the hydraulic system			
	b) Inspection of piping penetration of bulkhead and deck			
	c) Hydraulic test of hydraulic system piping			
	d) Functional test of hydraulic system			
EM-13	Engine room ventilation:			
	a) Inspection of E/R ventilation fan installation			
	b) Function test of start/stop at remote and local control for E/R ventilation fans			
EM-14	Air conditioning system:			
	a) General inspection and dimension checking of the air conditioning system			
	b) Inspection and hydraulic test of cooling water system			
	c) Functional test of air conditioning system			
	d) Full test of air conditioning during sea trial			
EM-15	Batteries:			
	a) Inspection and dimension checking of the batteries spaces including ventilation.			
	b) Inspection of battery connectors and battery boxes			
	c) Inspection of battery charger			
	d) Function, safety and performance test of Battery Management System			

Part VII - Annex 4 - Main Items Inspection Timetable

VESSEL NAME: "Versatile Patrol Vessel (VPU) "			Inspection date	Outstanding / Reinspection / Remarks
Item	Items to be inspected			
	Machinery and Electrical Installation			
EM-16	Electrical installation:			
	a) Inspection of lightning conductor			
	b) General inspection of cable layout and checking of cable sizes			
	c) Inspection of cable penetration of bulkhead and deck			
	d) Inspection of transformers			
	e) Inspection of tally plates			
EM-17	Main and emergency switchboard and panels:			
	a) Main switchboard and panels – high voltage primary injection test			
	b) Cable size checking of electrical switchboard installations			
	c) Inspection of AC distribution panel			
	d) Inspection of DC distribution panel			
	e) Megger test of the electrical system			
	f) Earth test of the electrical system			
EM-18	Control console(s):			
	a) Inspection of wheelhouse control console and wheelhouse remoteengine control console			
	b) Functional test of wheelhouse console controls and remote console controls			
	c) Inspection of navigation equipment control panel			
EM-19	Lighting:			
	a) Inspection and functional test of general lighting			
	b) Inspection and functional test of emergency lighting			
	c) Inspection and functional test of floodlight installation			
	d) Inspection and functional test of searchlight installation			
EM-20	Navigation Lights and Signals:			
	a) Inspection and functional test of navigation lights			
	b) Test of horn /whistle			
EM-21	Shafting (tailshaft and coupling) system:			
	a) Marking/Stamping and material check			
	b) Dimension check and taper bedding test			
	c) Shaft line checking of stern tube/shaft bracket and alignment of main engines and tail shaft			
EM-22	Steering system installation and testing:			
	a) Inspection and dimensional check of rudders			
	b) Inspection and dimensional check of steering gear system			
	c) Steering system functional test			

Part VII - Annex 4 - Main Items Inspection Timetable				
VESSEL NAME: "Versatile Patrol Vessel (VPU) "			Inspection date	Outstanding / Reinspection / Remarks
Item	Items to be inspected			
	Machinery and Electrical Installation			
EM-23	Hybrid System installation and testing (including function, safety and performance test of individual and complete system as a whole)			
EM-24	Control system installation and testing			
EM-25	Sea Keeping Device system, installation, structural arrangement and testing			
EM-26	Sea Keeping Capability Report			
EM-27	Station Keeping Capability Plot			
EM-28	Electronic Navigational Equipment installation and testing by COMMS			
EM-29	Daughter Craft LARS Davit installation, structural foundation and testing			
EM-30	Fire Monitor and system installation, structural foundation and testing			
EM-31	Marine knuckle boon crane installation, structural foundation and testing			
EM-32	Test of window wipers			
EM-33	Test of noise levels throughout the vessel during the sea trial			
EM-34	Inclining Experiment			
	a) Official Speed Trial			
	b) Other Official Sea Trials			
	Operational System			
OS-1	Installation inspection and functional test for Operational Systems			
OS-2	Inspection of tally plate and cable label			
OS-3	Inspection of space, cables and power reservation for other HKPF provided equipment e.g. MARSAS, radio terminals, satellite			
OS-4	Function and performance test during Sea Trial			

Note:

The inspection items are preliminary and not exhaustive, any items found necessary to be included at a later stage will be added to this list.

Part VII - Annex 5 – Vessel Condition During Respective Sea Trial

1) Official Speed Trial

Conditions at Speed-Trial		
1	Person on board	16 Persons (at 102.5 kg per person including effect)
2	Fuel oil tanks	not less than 80% fuel tank capacity
3	Fresh water tank	not less than 85% tank capacity
4	Grey water tank	not less than 85% tank capacity
5	Store/Utilities	1000 kg
6	Sea Conditions	Sea state 2 : wave height 0.1 - 0.5 metres

2) Endurance and Performance Test

Conditions at Endurance and Performance Test		
1	Person on board	16 Persons (at 102.5 kg per person including effect)
2	Fuel oil tanks	not less than 80% fuel tank capacity
3	Fresh water tank	not less than 85% tank capacity
4	Grey water tank	not less than 85% tank capacity
5	Store/Utilities	1000 kg
6	Sea Conditions	Sea state 2 : wave height 0.1 - 0.5 metres

3) Hybrid (Electric) Propulsion Test

Conditions at Hybrid Propulsion Test		
1	Person on board	16 Persons (at 102.5 kg per person including effect)
2	Fuel oil tanks	not less than 80% fuel tank capacity
3	Fresh water tank	not less than 85% tank capacity
4	Grey water tank	not less than 85% tank capacity
5	Store/Utilities	1000 kg
6	Sea Conditions	Sea state 2 : wave height 0.1 - 0.5 metres

4) Manoeuvrability Test

Conditions at Forward Turning Circle Test		
1	Person on board	16 Persons (at 102.5 kg per person including effect)
2	Fuel oil tanks	not less than 80% fuel tank capacity
3	Fresh water tank	not less than 85% tank capacity
4	Grey water tank	not less than 85% tank capacity
5	Store/Utilities	1000 kg
6	Sea Conditions	Sea state 2 : wave height 0.1 - 0.5 metres

5) Crash Stop Test / Astern Running Test / Emergency Steering Test

Conditions at Crash Stop Test / Astern Running Test / Emergency Steering Test		
1	Person on board	16 Persons (at 102.5 kg per person including effect)
2	Fuel oil tanks	not less than 80% fuel tank capacity
3	Fresh water tank	not less than 85% tank capacity
4	Grey water tank	not less than 85% tank capacity
5	Store/Utilities	1000 kg
6	Sea Conditions	Sea state 2 : wave height 0.1 - 0.5 metres

6) Seakeeping/Gyro Stabilisation Test

Conditions at Seakeeping/ Gyro Stabilisation Test		
1	Person on board	16 Persons (at 102.5 kg per person including effect)
2	Fuel oil tanks	not less than 80% fuel tank capacity
3	Fresh water tank	not less than 85% tank capacity
4	Grey water tank	not less than 85% tank capacity
5	Store/Utilities	1000 kg
6	Sea Conditions	Sea state 2 : wave height 0.1 - 0.5 metres

Part VII - Annex 6 – Endurance Performance – Diesel Propulsion

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

Conditions at Endurance and Performance Test			
Person On board		Dummy Weight	
Fuel		Other Equipment	
Sea Conditions			

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 Crushing Speed		>15 min						
50% of Rated Power/rpm			>15 min						
60% of Rated Power/rpm			>15 min						
70% of Rated Power/rpm			>15 min						
80% of Rated Power/rpm			>30 min						
90% of Rated Power/rpm			>30 min						
100% of Rated Power (Endurance Test)			>90 min						
Remarks:									

Witness by:	MD Representative	Shipyard Representative

Part VII - Annex 7 – As Fitted Drawings and Documents

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 (where applicable) files of the following plans and drawings that contain the technical information of the Vessel and its machinery and equipment as they are when the Vessel is on the day accepted by 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 information booklet and the inclining experiment report.

1.2.4 Hydrostatics, cross curves and intact and damage stability calculations for all ship loading conditions specified in the Technical Specifications.

1.2.5 Vessel subdivision drawings and stability calculations.

1.2.6 Painting scheme of the whole Vessel.

1.2.7 Vessel draught marking diagram.

1.2.8 Detailed arrangement and layout plan of the deckhouse, accommodation, decks showing the disposition of all main equipment, fittings and fixtures, furniture, doors, windows, hatches, manholes and access openings. The down-flooding openings (points) shall be clearing indicated on the drawings.

1.2.9 Equipment layout diagram.

1.2.10 Hull structural construction and hull scantlings drawings.

1.2.11 Hull shell and frames and the framings arrangement and construction plan.

1.2.12 Hull shell expansion plan.

1.2.13 Keel construction plan.

1.2.14 Steering system and steering arrangement diagrams.

1.2.15 Deckhouse and deck structural and construction plan.

1.2.16 Hull watertight bulkheads construction plan.

1.2.17 Deckhouse to deck connection detailed construction plan.

1.2.18 Deck edge details and construction plan, including detailed structural arrangement drawings of hull to deck connection.

1.2.19 Detailed cathodic corrosion prevention and arrangement plans and drawings for the Vessel throughout.

1.2.20 Mast structural and construction plan and mast equipment arrangement plan.

1.2.21 Anchoring arrangement plan.

1.2.22 Piping diagrams for fuel oil, freshwater, lubrication oil, bilge, firefighting, scuppers and drains, sewage system.

1.2.23 Fire prevention, fire control and firefighting system drawings.

1.2.24 External firefighting monitor and the corresponding system details and drawings.

1.2.25 Drawings of the main switchboard and all other switchboards and the electrical system.

1.2.26 Electrical Load Calculation

1.2.27 Electrical installation drawings

1.2.28 Details of the Operational Systems

1.2.29 Operational Systems equipment installation and location drawings, including ENE, communications, radio terminal, MARSAS and satellite communication antenna.

1.2.30 Operational Systems connection drawings

1.2.31 Wheelhouse and cabin sound and heat insulation system diagram.

1.2.32 Main engines and generator sets arrangement and siting plans and drawings of their fuel lines and exhaust gas piping and arrangement.

1.2.33 Hybrid system drawings

1.2.34 FMEA and test report for the Hybrid system.

1.2.35 Shaft line arrangement.

1.2.36 Propeller details and drawings

1.2.37 Bow thruster details and installation drawings

1.2.38 Stabiliser system details and installation drawings

1.2.39 Position Keeping system details and drawings

1.2.40 Vessel ventilation drawings for the wheelhouse, accommodation and other spaces.

1.2.41 Main fuel oil tank drawing and its associated piping and manifold(s), and filling, overflow and ventilation system.

1.2.42 Freshwater tank and its associated piping arrangement.

1.2.43 Fuel oil tank(s) and its associated piping system

1.2.44 Black water tank and its associated piping system

1.2.45 Grey water tank and its associated piping system

1.2.46 Energy Storage System and associated cooling and ventilation system

1.2.47 Drawings for anchor, windlass and the anchoring system.

1.2.48 Lifesaving appliance arrangement plan and fire safety plan.

1.2.49 Distress signals, alarm systems, and internal/external communication arrangement and system plan.

1.2.50 Navigation lights, sound and signal diagrams.

1.2.51 Vessel overall lighting arrangement and light control plan.

1.2.52 Vessel alarm and signals, internal communication systems and public address systems plan.

1.2.53 General layout and arrangement drawing of the air-conditioning system.

1.2.54 Piping layout drawing of the air-conditioning system.

1.2.55 Air-conditioning load calculation.

The lists are not exhaustive, additional as fitted drawings may be added if required.

1.3 Documents to be provided by the Contractor

1.3.1 In not less than one 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 8 – Definition of Waves and Sea

Beaufort scale number	Description	Wind speed	Wave height	Sea conditions	Land conditions
0	Calm	< 1 km/h (< 0.3 m/s) < 1 mph < 1 knot < 0.3 m/s	0 m 0 ft	Flat.	Calm. Smoke rises vertically.
1	Light air	1.1–5.5 km/h (0.3–2 m/s) 1–3 mph 1–3 knot 0.3–1.5 m/s	0–0.2 m 0–1 ft	Ripples without crests.	Smoke drift indicates wind direction. Leaves and wind vanes are stationary.
2	Light breeze	5.6–11 km/h (2–3 m/s) 4–7 mph 4–6 knot 1.6–3.4 m/s	0.2–0.5 m 1–2 ft	Small wavelets. Crests of glassy appearance, not breaking	Wind felt on exposed skin. Leaves rustle. Wind vanes begin to move.
3	Gentle breeze	12–19 km/h (3–5 m/s) 8–12 mph 7–10 knot 3.5–5.4 m/s	0.5–1 m 2–3.5 ft	Large wavelets. Crests begin to break; scattered whitecaps	Leaves and small twigs constantly moving, light flags extended.
4	Moderate breeze	20–28 km/h (6–8 m/s) 13–17 mph 11–16 knot 5.5–7.9 m/s	1–2 m 3.5–6 ft	Small waves with breaking crests. Fairly frequent whitecaps.	Dust and loose paper raised. Small branches begin to move.
5	Fresh breeze	29–38 km/h (8.1-10.6 m/s) 18–24 mph 17–21 knot 8.0–10.7 m/s	2–3 m 6–9 ft	Moderate waves of some length. Many whitecaps. Small amounts of spray.	Branches of a moderate size move. Small trees in leaf begin to sway.
6	Strong breeze	39–49 km/h (10.8-13.6 m/s) 25–30 mph 22–27 knot 10.8–13.8 m/s	3–4 m 9–13 ft	Long waves begin to form. White foam crests are very frequent. Some airborne spray is present.	Large branches in motion. Whistling heard in overhead wires. Umbrella use becomes difficult. Empty plastic bins tip over.
7	High wind, moderate gale, near gale	50–61 km/h (13.9-16.9 m/s) 31–38 mph 28–33 knot 13.9–17.1 m/s	4–5.5 m 13–19 ft	Sea heaps up. Some foam from breaking waves is blown into streaks along wind direction. Moderate amounts of airborne spray.	Whole trees in motion. Effort needed to walk against the wind.
8	Gale, fresh gale	62–74 km/h (17.2-20.6 m/s) 39–46 mph 34–40 knot 17.2–20.7 m/s	5.5–7.5 m 18–25 ft	Moderately high waves with breaking crests forming spindrift. Well-marked streaks of foam are blown along wind direction. Considerable airborne spray.	Some twigs broken from trees. Cars veer on road. Progress on foot is seriously impeded.
9	Strong gale	75–88 km/h (20.8-24.4 m/s) 47–54 mph 41–47 knot 20.8–24.4 m/s	7–10 m 23–32 ft	High waves whose crests sometimes roll over. Dense foam is blown along wind direction. Large amounts of airborne spray may begin to reduce visibility.	Some branches break off trees, and some small trees blow over. Construction/temporary signs and barricades blow over.

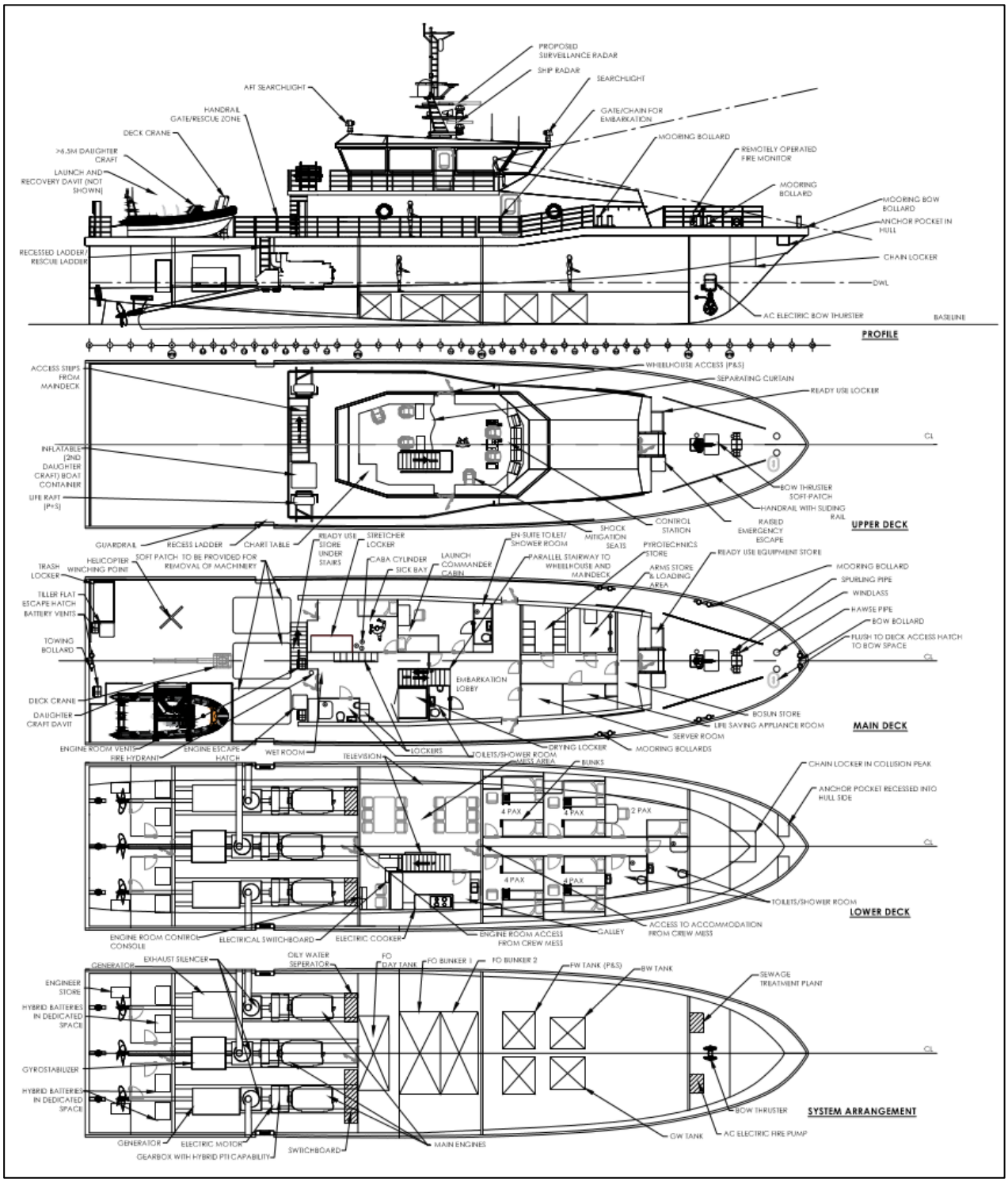
10	Storm, whole gale	89–102 km/h (24.7-28.3 m/s) 55–63 mph 48–55 knot 24.5–28.4 m/s	9–12.5 m 29–41 ft	Very high waves with overhanging crests. Large patches of foam from wave crests give the sea a white appearance. Considerable tumbling of waves with heavy impact. Large amounts of airborne spray reduce visibility.	Trees are broken off or uprooted, saplings bent and deformed. Poorly attached asphalt shingles and shingles in poor condition peel off roofs.
11	Violent storm	103–117 km/h (28.6-32.5 m/s) 64–73 mph 56–63 knot 28.5–32.6 m/s	11.5–16 m 37–52 ft	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.
12	Hurricane	≥ 118 km/h (≥ 32.8 m/s) ≥ 74 mph ≥ 64 knot ≥ 32.7 m/s	≥ 14 m ≥ 46 ft	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.

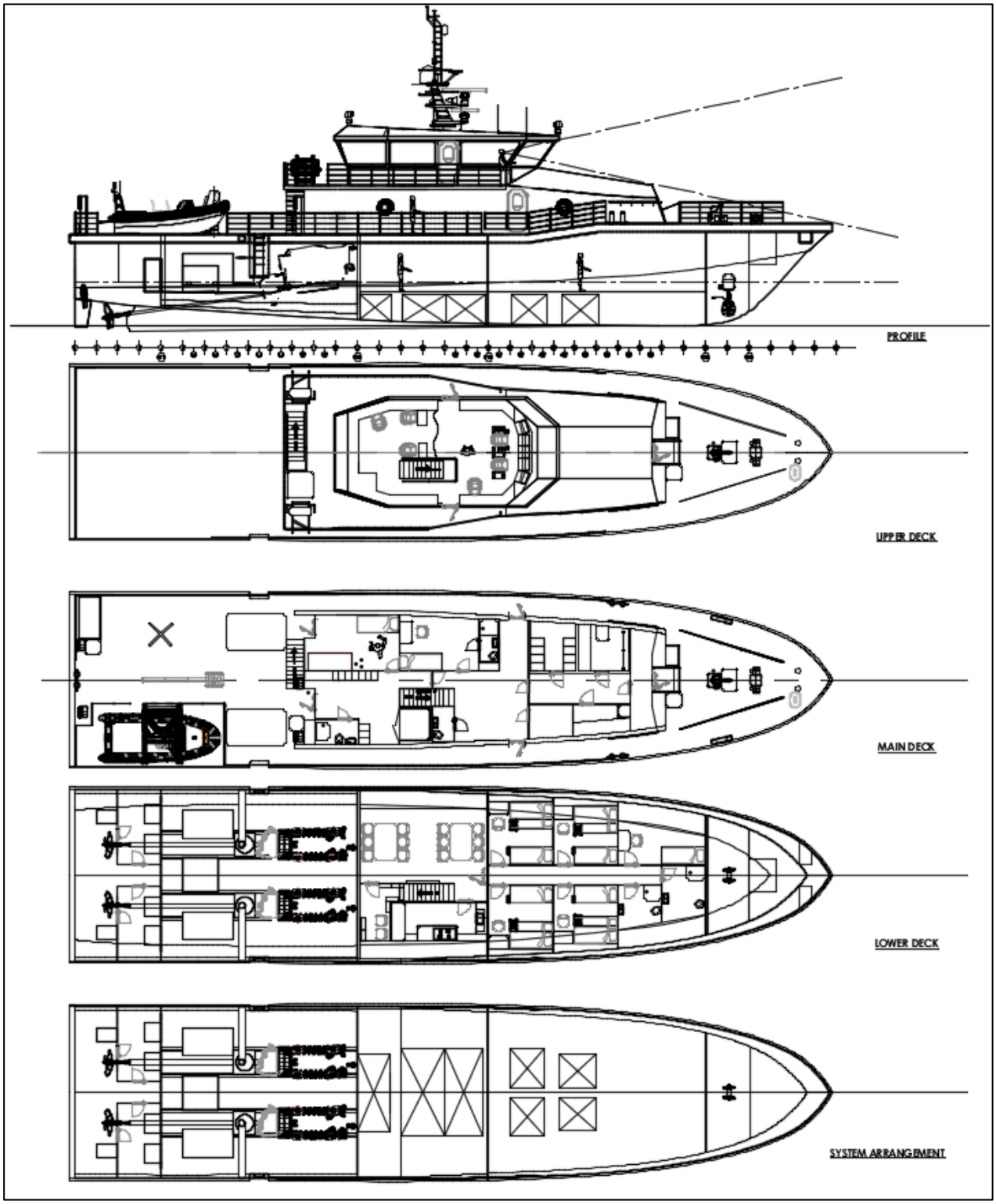
World Meteorological Organization (WMO) Sea State Code		
Sea State Code	Wave Height (meters)	Characteristics
0	0	Calm (glassy)
1	0 to 0.1	Calm (rippled)
2	0.1 to 0.5	Smooth (wavelets)
3	0.5 to 1.25	Slight
4	1.25 to 2.5	Moderate
5	2.5 to 4	Rough
6	4 to 6	Very rough
7	6 to 9	High
8	9 to 14	Very high
9	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	

Part VII - Annex 9 – List of Recognized Organisations

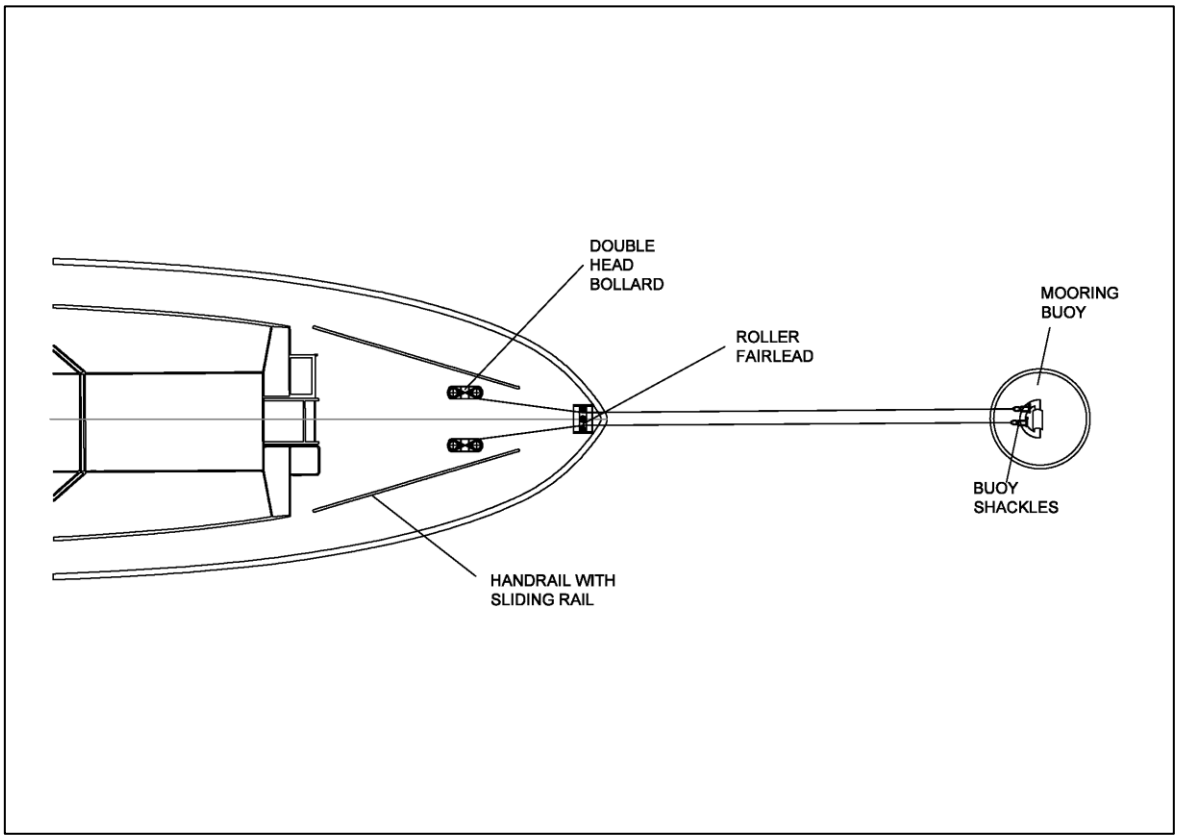
Acronym	Name
ABS	American Bureau of Shipping
BV	Bureau Veritas
CCS	China Classification Society
DNVGL	DNV GL AS
KRS	Korean Register of Shipping
LR	Lloyd's Register
NK	Nippon Kaiji Kyokai
RINA	Registro Italiano Navale
RS	Russian Maritime Register of Shipping

Part VII - Annex 10 – Conceptual General Arrangement Plan



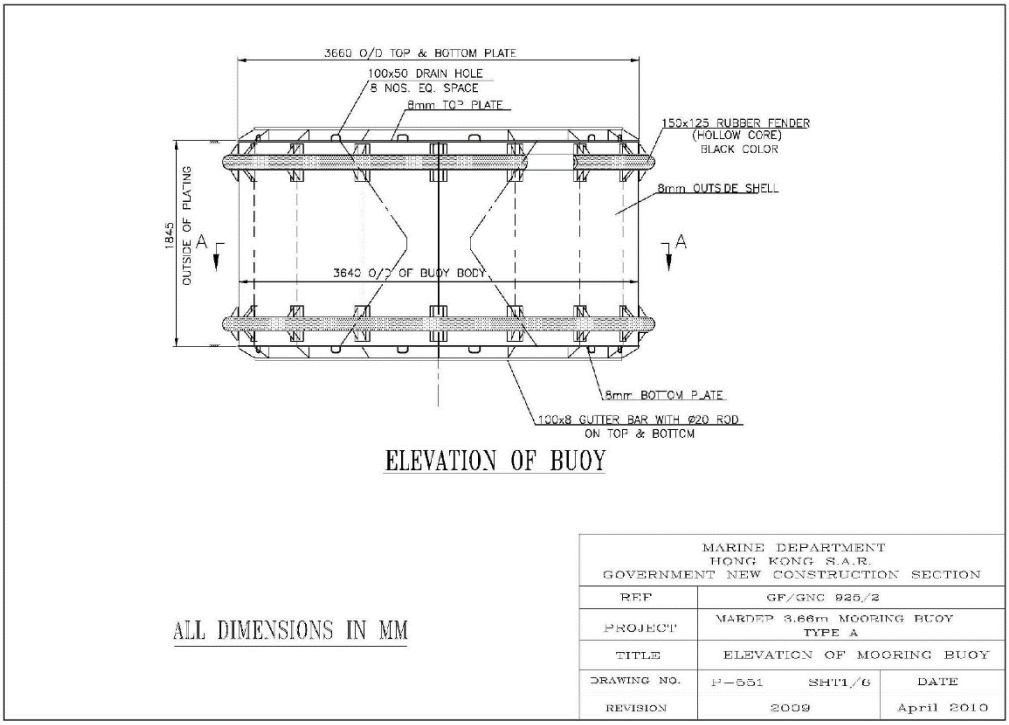

PROFILE
UPPER DECK
MAIN DECK
LOWER DECK
SYSTEM ARRANGEMENT

Part VII - Annex 11 – Typhoon Mooring Arrangement

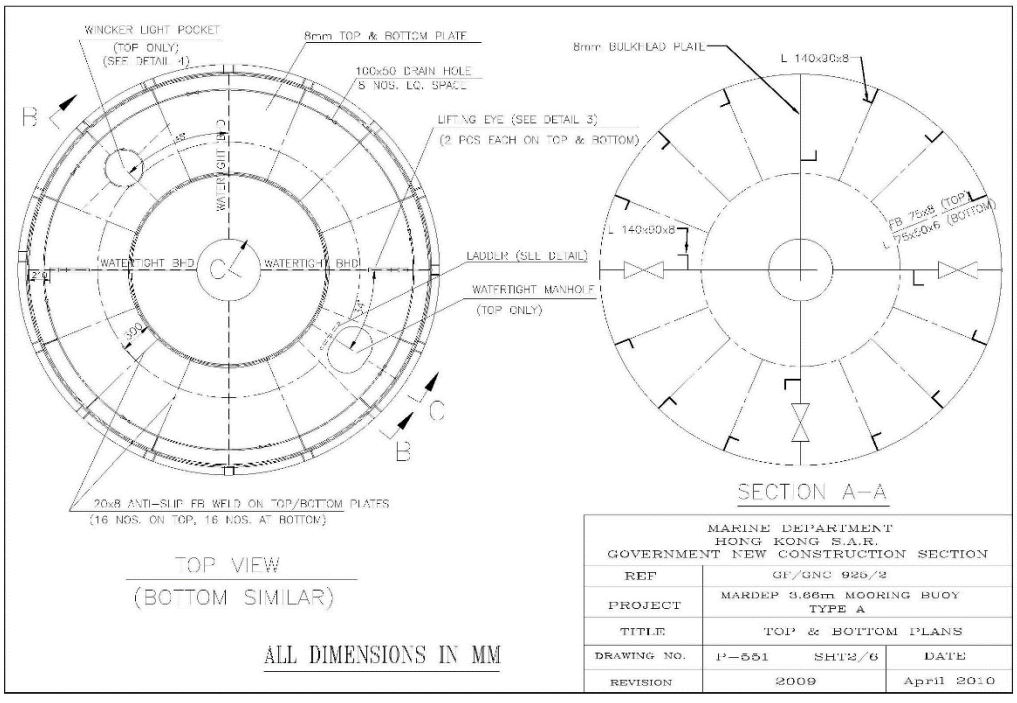


Operating on a MARDEP 3.66m Mooring Buoy

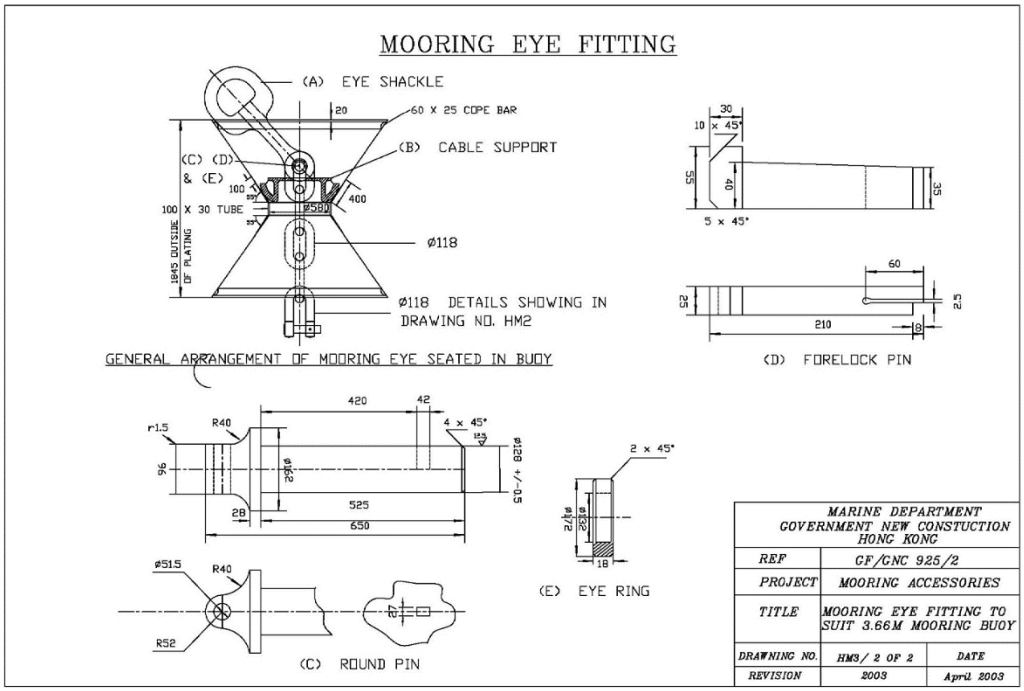
MARDEP 3.66m Mooring Buoy

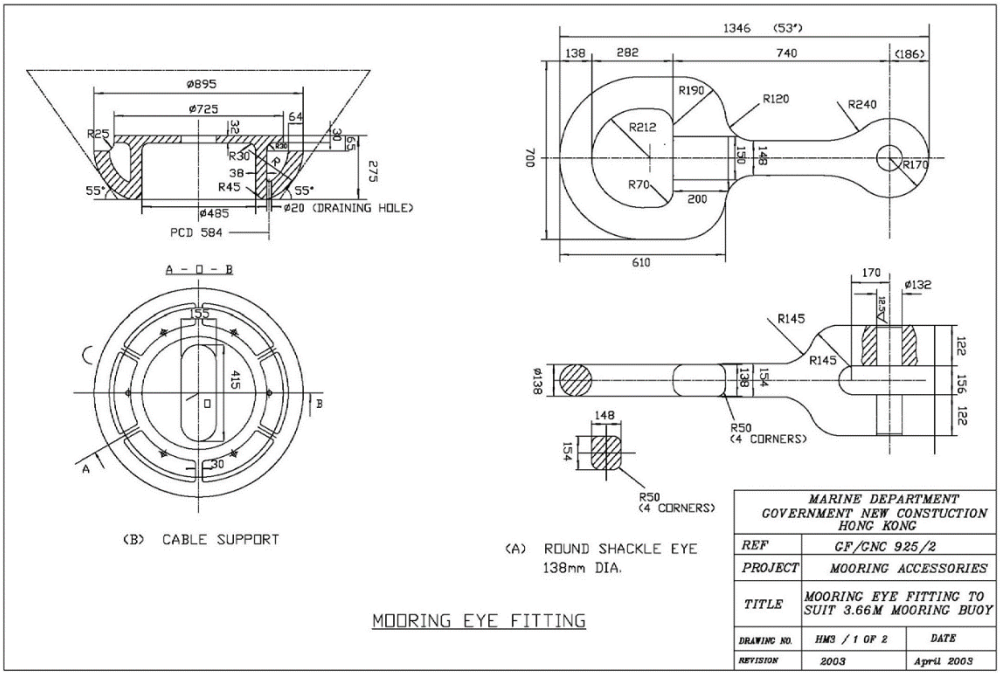


MARINE DEPARTMENT HONG KONG S.A.R. GOVERNMENT NEW CONSTRUCTION SECTION		
REF	GF/GNC 926/2	
PROJECT	MARDEP 3.66m MOORING BUOY TYPE A	
TITLE	ELEVATION OF MOORING BUOY	
DRAWING NO.	P-551 SHT1/6	DATE
REVISION	2009	April 2010



MARINE DEPARTMENT HONG KONG S.A.R. GOVERNMENT NEW CONSTRUCTION SECTION		
REF	GF/GNC 926/2	
PROJECT	MARDEP 3.66m MOORING BUOY TYPE A	
TITLE	TOP & BOTTOM PLANS	
DRAWING NO.	P-551 SHT2/6	DATE
REVISION	2009	April 2010


MOORING EYE FITTING
(A) EYE SHACKLE
(B) CABLE SUPPORT
(C) (D) & (E)
100 X 30 TUBE
Ø118
Ø118 DETAILS SHOWING IN DRAWING NO. HM2
GENERAL ARRANGEMENT OF MOORING EYE SEATED IN BUOY
(D) FORELOCK PIN
(E) EYE RING
(C) ROUND PIN
MARINE DEPARTMENT
GOVERNMENT NEW CONSTUCTION
HONG KONG
REF GF/GNC 925/2
PROJECT MOORING ACCESSORIES
TITLE MOORING EYE FITTING TO SUIT 3.66M MOORING BUOY
DRAWING NO. HM3/ 2 OF 2
DATE
REVISION 2003
April 2003


(B) CABLE SUPPORT
(A) ROUND SHACKLE EYE
138mm DIA.
MOORING EYE FITTING
MARINE DEPARTMENT
GOVERNMENT NEW CONSTUCTION
HONG KONG
REF GF/GNC 925/2
PROJECT MOORING ACCESSORIES
TITLE MOORING EYE FITTING TO SUIT 3.66M MOORING BUOY
DRAWING NO. HM3 / 1 OF 2
DATE
REVISION 2003
April 2003

Meaning of signals

1 A tropical cyclone is centred within about 800 kilometres (km) of Hong Kong and may affect the territory.

3 Strong wind is expected or blowing generally in Hong Kong near sea level, with a sustained speed of 41-62 kilometres per hour (km/h), and gusts which may exceed 110 km/h, and the wind condition is expected to persist.

8 Gale or storm force wind is expected or blowing generally in Hong Kong near sea level, with a sustained wind speed of 63-117 km/h from the quarter indicated and gusts which may exceed 180 km/h, and the wind condition is expected to persist.

9 Gale or storm force wind is increasing or expected to increase significantly in strength.

10 Hurricane force wind is expected or blowing with sustained speed reaching upwards from 118 km/h and gusts that may exceed 220 km/h.

Important points to note

- The weather in different parts of Hong Kong cannot be simply inferred from the signal issued. Simply knowing what signal is issued is not enough. You should take note of the latest tropical cyclone information and related announcements broadcast on radio and TV, and given in the Hong Kong Observatory's Internet website (http://www.hko.gov.hk and http://www.weather.gov.hk) and Dial-a-Weather system (Tel. No.: 1878 200) to decide on the actions to take in response to the signal issued.
- Tropical cyclone warning signals are to warn the public of the threat of **WINDS** associated with a tropical cyclone.
- Owing to local topographical conditions or the presence of buildings nearby, winds at your locality may be substantially different from the general wind strength over Hong Kong. Winds are often stronger over offshore waters and on high ground. Winds are less strong in areas sheltered from the prevailing wind direction.
- The Hong Kong Observatory provides to the public detailed information on regional wind and rain through a diversity of channels, especially the Internet. Members of the public should consider their own circumstances and level of acceptable risk when taking precautions in response to warnings.
- When the No.1 signal is issued, you should take the existence of the tropical cyclone into account in planning your activities and beware that strong winds may occur over offshore waters.
- When the No.3 signal is issued, secure all loose objects, particularly on balconies and roof tops. Secure hoardings, scaffoldings and temporary structures. Winds are normally expected to become generally strong in Hong Kong within 12 hours after this signal is issued. Winds over offshore waters and on high ground may reach gale force.
- When the No.8 signal is issued, complete all precautions before gales commence. Winds are normally expected to reach gale force generally in Hong Kong within 12 hours after No.8 signal replaces No.3 signal.
- When the No.9 or No.10 signal is issued, all precautions should be completed. Stay indoors and away from exposed windows and doors to avoid flying debris.

信號的意義

1 有一熱帶氣旋集結於香港約800公里的範圍內，可能影響本港。

3 香港近海平面處現正或預料會普遍吹強風，持續風力達每小時41至62公里，陣風更可能超過每小時110公里，且風勢可能持續。

8 香港近海平面處現正或預料會普遍受烈風或暴風從信號所示方向吹襲，持續風力達每小時63至117公里，陣風更可能超過每小時180公里，且風勢可能持續。

9 烈風或暴風的風力現正或預料會顯著加強。

10 風力現正或預料會達到颶風程度，持續風力達每小時118公里或以上，陣風更可能超過每小時220公里。

注意事項

- 香港不同地區的天氣情況不能夠單憑發出的信號推斷。只知道發出了什麼信號並不足夠，你應該留意電台、電視台及天文台網頁（網址為 http://www.hko.gov.hk 和 http://www.weather.gov.hk）及「打電話問天氣」系統（電話號碼：1878 200）所提供的熱帶氣旋最新消息及有關報告，然後就發出的信號決定採取適當的相應行動。
- 發出熱帶氣旋警告信號，是為了警告市民熱帶氣旋帶來的**風力**威脅。
- 受地形或鄰近建築物影響，你所在區域的風力與香港普遍風勢可能有顯著差異。離岸海域及高地風力通常較強，不當風的地區風力較弱。
- 天文台透過多種途徑，特別是互聯網，向公眾提供各區風力及雨量的詳細資料。市民應該因應各自的具體情況和可接受的風險水平，就警告採取適當的預防措施。
- 1號信號發出後，計劃活動時，要考慮熱帶氣旋的影響，並注意離岸海域可能有強風。
- 3號信號發出後，應把所有容易被風吹動的物件綁緊，置於露台及屋頂的物件更要綁緊；圍板、棚架和臨時建築物亦應鞏固。發出3號信號後，通常在12小時之內香港會普遍吹強風，在離岸海域及高地的風力更可能達烈風程度。
- 8號信號發出後，應在烈風吹襲前完成所有預防措施。8號信號取代3號信號後，通常在12小時之內香港普遍風力會達烈風程度。
- 發出9號或10號信號時，市民應已採取所有預防措施。這時切勿外出，並應遠離當風的門窗，以免被隨風吹來的碎片擊中。

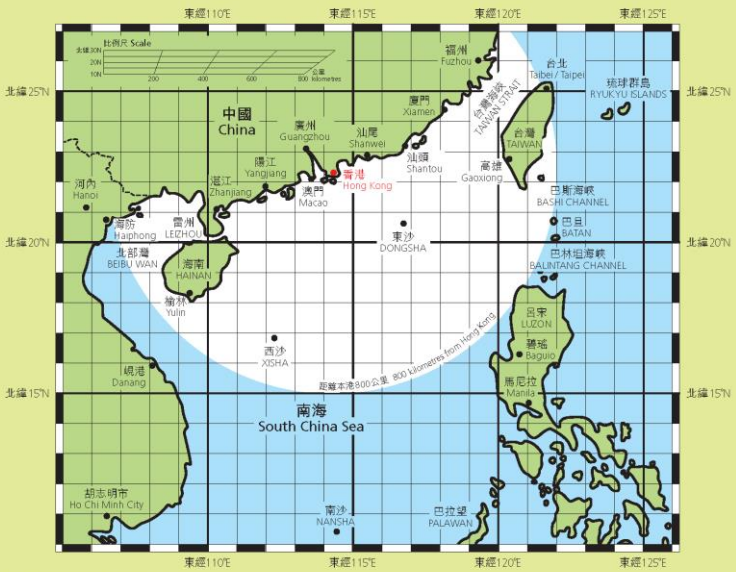
香港天文台
Hong Kong Observatory

香港熱帶氣旋警告信號
Hong Kong's Tropical Cyclone Warning Signals

1	T	戒備 Standby
3	⊥	強風 Strong Wind
8 西北 NW	▲	西北烈風或暴風 NW'LY Gale or Storm
8 西南 SW	▼	西南烈風或暴風 SW'LY Gale or Storm
8 東北 NE	▲▲	東北烈風或暴風 NE'LY Gale or Storm
8 東南 SE	▼▼	東南烈風或暴風 SE'LY Gale or Storm
9	⧗	烈風或暴風風力增強 Increasing Gale or Storm
10	✚	颶風 Hurricane

香港
Hong Kong

熱帶氣旋途徑繪畫圖
Tropical Cyclone Plotting Map



香港特別行政區政府新聞處設計　政府物流服務署印
Designed by the Information Services Department
Printed by the Government Logistics Department
Hong Kong Special Administrative Region Government

2012年6月
June 2012

熱帶氣旋按下表分類
Tropical cyclones are classified as follows

	中心附近之最高持續風速（公里/小時） Maximum sustained winds near the centre (km/h)
熱帶低氣壓 Tropical Depression	62 或以下 or below
熱帶風暴 Tropical Storm	63 - 87
強烈熱帶風暴 Severe Tropical Storm	88 - 117
颱風 Typhoon	118 - 149
強颱風 Severe Typhoon	150 - 184
超強颱風 Super Typhoon	185 或以上 or more

在繪畫熱帶氣旋中心的移動途徑時，應留意偶然會出現偏離了一般動向的短期不規則性移動。出現這類偏差的原因部份由於確定熱帶氣旋中心位置的困難，而部份亦由於中心移動的方向及速度有短期性波動。

熱帶氣旋移動方向及距離香港的方位均以十六點方位表示，因此報告中的方位與實際方位可能相差達11¼度。例如，一颱風中心位於香港79至101度的任何方位，向259至281度任何方向移動，均可稱為"集結在香港以東…向西移動…。"這並非一定表示該颱風直趨香港，因其移動途徑與"直指香港"途徑之間可能相差達22度。

When plotting the track of the centre of a tropical cyclone, it is important to note that there can be short term erratic departures from the general direction of movement. These departures are partly due to difficulties in locating the centre of the tropical cyclone, and partly due to short term fluctuations in the direction and speed of movement of the centre.

The direction towards which a tropical cyclone is moving and the bearing of its centre from Hong Kong are each given to the nearest point of a 16-point compass bearing. Thus the actual bearing will be within 11¼° of the reported value. For example, the centre of a typhoon on any bearing between 79° and 101° and moving on any heading between 259° and 281° is said to be "centred.....east of Hong Kong and moving west....." It will be seen that this statement does not necessarily mean that the centre is heading directly towards Hong Kong as its course could be as much as 22° off the direct "collision" course.

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	The Delivery Date for the Vessel shall be no later than the date set out in Schedule 2 (Delivery Schedule) of Part V

Part VII - Annex 12 - Implementation Time Table (Daughter Boat)
Supply of Twelve (12) Versatile Petrol Units tor the Hong Kong Police Force

Tender Ref.: Marine Department Shipbuilding Tender No. 2/2020

Part VII - Annex 13 - Drawings Submission Timetable (Daughter Boat)

Item No.	Drawings Approval	Completion Date
1	General Arrangement Plan	All the drawings are required to be submitted within two (2) months after the signing of Articles of Agreement for GNC's approval / reference.
2	Lines Plan	
3	Structural Construction Plan in Mid-Ship and Bulkhead Section	
4	Construction Profile and Deck Plan	
5	Shell Expansion Plan	
6	Tank Capacity Plan	
7	Engine Mounting Arrangement	
8	Power / Speed Estimation and Curve	
9	Intact and Damaged Stability Plan	
10	Details of Electronic Navigational / Communication Equipment	
11	Details of Deck Equipment, Outfitting, Furniture, etc.	
12	Details of Engines' Arrangement	
13	Consoles Arrangement and Schematic Diagram	
14	Instrumentation and Control System	
15	Calculation of Fuel Capacity	
16	Details of Electrical and Electronic Equipment	
17	Electrical Load Calculations	
18	Schematic Layout of Electrical Circuits	
19	Paint Schedule	
20	Lightning Protection Arrangement	
21	Torsional Vibration Calculation	
22	Others as required	

Part VII – Annex 14 – Main Items Inspection Timetable (Daughter Boat)

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

H-19	Interior furnishings	
	(a) Console area	
H-20	Lifesaving appliance	
H21	Fire fighting appliance	
H-22	Inclining experiment and lightship weight measurement	
H-23	Sea trials including operation test of outfitting equipment	
H-24	Towing test static bollard pull test	
H-25	Site towing demonstration trial	
H-26	Cleanliness inspection before acceptance	
H-27	Inventory check in the HKSAR	
H-28	Acceptance and delivery	
	Electrical and Machinery Installation	
EM-1	General inspection on installation of machinery:	
(a)	General inspection on installation of outboard engines	
EM-2	Outboard engines:	
(a)	Test of engine safety devices and alarms	
EM-3	Fuel oil system:	
(a)	General inspection & dimension checking of fuel oil system	
(b)	Fuel oil tank low level alarm test	
(c)	Fuel oil tank final cleaning/internal inspection before filling	
(d)	Fuel oil tank high level alarm test	
(e)	Fuel oil tank content gauge calibration and test	
(f)	Inspection of piping penetration of bulkhead and deck	
(g)	Hydraulic test of fuel oil piping	
EM-4	Bilge system:	
(a)	General inspection & dimension checking of bilge system	
(b)	Bilge tank high and low level alarms test	
(c)	Inspection of piping penetration of bulkhead and deck	
(d)	Hydraulic test of piping	
(e)	Functional test of bilge system	
EM-5	Functional test of drainage system	
EM-6	Batteries:	
(a)	Inspection of battery connectors and housing boxes	
(b)	Inspection of battery charger	
(c)	Operational test of battery charger Test of outboard engines and generator consecutive starting by each group of battery (start/stop at remote and local control)	
EM-7	Electrical installation:	
(a)	General inspection of cable layout & checking of cable sizes	
(b)	Inspection of cable penetrations of bulkhead and deck	
(c)	Inspection of transformers	
(d)	Inspection of tally plates	

(e)	Inspection of lightning conductor	
EM-8	Main switchboard & panels (as applicable):	
(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-9	Control console:	
(a)	Inspection of control console	
(b)	Functional test of console controls	
(c)	Inspection of navigation equipment control panel	
EM-10	Lighting:	
(a)	Inspection and functional test of general lighting	
(b)	Inspection and functional test of emergency lighting	
(c)	Inspection and functional test of floodlight installation	
(d)	Inspection and functional test of searchlight installation	
EM-11	Navigational lights and signals	
(a)	Inspection and functional test of navigational lights	
(b)	Test of horn/whistle/siren	
EM-12	Electronic equipment tested by COMMS	
EM-13	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 15 – Handling Assessment (HA) at Pre-shipment Construction and Handling Inspection (Daughter Boat)

1. General

1.1 The purpose of the HA is to:

(a) ensure that the offered Boat's performance characteristics are compatible with the HKPF's operational role; and

(b) mitigate the risks to all parties associated with potential rejection of a constructed boat at the Delivery Acceptance.

1.2 The Contractor shall arrange for a HA of the completed Boat to be assessed by the Contractor, in the presence of MD's and HKPF's representatives, at or near the site where the Daughter Boat is constructed. The HA shall be conducted and completed within two days. At least ten (10) working days in advance of the HA, the Contractor shall submit for MD's approval a HA programme proposal which includes details of the procedures under which the HA is to be conducted and the formats in which the Contractor proposes to capture and present the data recorded by the device(s) in accordance with Paragraph 1.4 of this Annex 15 and the digital video footage recorded in accordance with Paragraphs 1.5 and 1.6 of this Annex 15 during the HA. For the avoidance of doubt, this data and video footage shall be able to be copied, moved, deleted and played using Microsoft Windows' built-in software. Otherwise, the Contractor shall supply appropriate computer software that is compatible with Microsoft Windows for the reviewing of this data and the video footage at no extra cost to the Government. The HA shall be observed by the Government Representatives. At least one (1) of the HKPF's representatives shall be aboard the Boat to be assessed to monitor and verify the conduct and results of each attempt at an assessment.

1.3 The Boat to be assessed shall be completed and ready for delivery.

1.4 The Contractor shall ensure that an objective record (which can be reviewed by the Government Representatives or, if necessary, an independent third party such as an RO) of the date, time, position, speed, course, roll, pitch, yaw, trim, running angle and three-dimensional acceleration data generated during the HA. The HA shall be conducted in accordance with the assessment protocols stipulated in Paragraphs 2.1 to 2.2 of this Annex 15 and captured using a suitable device(s) which has/have been properly calibrated and, if required by the Government, with supporting calibration documents issued by the manufacturer or calibration laboratory.

1.5 The Contractor shall, throughout the HA, record date and time stamped aerial digital video footage of the Boat to be assessed and, using digital video recording equipment affixed at appropriate locations as agreed by the HKPF on the Boat to be assessed, record digital video footage of the:

(a) field of view from the control console forward over the bow to the horizon. For the avoidance of doubt, the camera shall be mounted on the longitudinal centre line at a height and distance from the bow which shall correspond with the eye position of a coxswain, 1.64 metres tall, seated at the helm;

(b) position of the helm and throttle controls at all times; and

(c) view facing astern with the field of vision centred on the longitudinal center line of the Boat to be assessed with the camera mounted as closed as possible at the transom.

1.6 The Contractor shall provide a suitable logistics boat from which the Contractor shall record digital video footage of the Boat to be assessed undergoing the HA. This logistics boat shall be capable of a comparable speed and be piloted at a distance and position from the Boat to be assessed.

1.7 The Contractor shall, immediately after the HA, provide to the Government Representatives the following:

(a) an electronic and printed record of the data recorded during the HA in a format(s) approved by MD in accordance with Paragraph 1.2 of this Annex 15 by the device(s) stipulated at Paragraph 1.4 of this Annex 15 which includes:

(i) the raw data captured in respect of each assessment protocol specified in Paragraphs 2.1 to 2.2 of this Annex 15;

(ii) a graphical depiction of each assessment showing the position and the track of the Boat to be assessed throughout the assessment; and

(iii) on one chart the speed in knots and the roll and the pitch in degrees;

(b) the following copies of the digital video footage stipulated in Paragraphs 1.5 and 1.6 of this Annex 15 stored on a digital storage medium in a format approved by MD in accordance with Paragraph 1.2 of this Annex 15, namely:

(i) aerial digital video footage;
(ii) fixed digital video footage captured from the Boat;
(iii) digital video footage captured from the logistics boat; and

(c) a certificate, signed by both the Contractor and a Government Representative, which records accurately the actual Loading Condition of the Boat as described in Paragraph 12.1.5.1(f) of this Part VII during each assessment of the HA.

1.8 The assessment protocols listed in Paragraphs 2.1 to 2.2 of this Annex 15 shall be conducted in sea states conforming to WMO Sea States 0 to 2 as specified at Annex 8 of this Part VII, unless otherwise agreed with the Government Representative.

1.9 The Boat to be assessed is required to complete and pass each of the assessments set out in Paragraphs 2.1 to 2.2 of this Annex 15. The Contractor shall have no more than five (5) attempts in total to complete and pass each of these assessments. If, at any time during an assessment, a Government Representative considers that it is unsafe to continue that assessment, the assessment shall be terminated immediately and that assessment shall be deemed to have been failed.

2. Assessment Protocols

2.1 Handling Assessment – Light Operational Load Condition

The following assessments shall be conducted at Light Operational Load Condition as specified at Paragraph 12.1.5.1(f) of this Part VII.

2.1.1 Straight Line Assessment

(a) Accelerate from stationary to the Contract Speed as specified in Paragraph 12.2.4.1 of this Part VII within twenty-five (25) seconds. At any time during this assessment, the bow of the Boat should not rise above the horizon line. Should the bow rise above the horizon line, it shall not be for more than five (5) seconds as evidenced by the digital video footage. If the Boat to be assessed does not achieve this it shall be deemed to have failed the assessment.

(b) If the Boat, maintaining the same course and settings, does not maintain the Contract Speed as specified in Paragraph 12.2.4.1 of this Part VII for a period of no less than one (1) minute, the Boat shall be deemed to have failed this assessment.

2.1.2 Speed Transition Assessment

(a) The coxswain shall accelerate from stationary to five (5) knots and, once the Boat reaches five (5) knots, maintain course and settings for a period of no less than one (1) minute.

(b) The coxswain shall then accelerate from five (5) knots to ten (10) knots and, again, maintain course and settings for a period of no less than one (1) minute.

(c) This assessment protocol shall be repeated incrementally at successive five (5) knot intervals until the maximum achievable speed has been reached.

(d) At each successive speed increment, the Boat shall hold that speed within a range of ± 10% for the full one (1) minute.

(e) During this assessment protocol, the bow of the Boat should not rise above the horizon line. Should the bow rise above the horizon line, it shall not be for more than five (5) seconds as evidenced by the digital video footage. If the Boat to be assessed does not achieve this it shall be deemed to have failed the assessment.

2.1.3 Directional Control Assessment

(a) The coxswain shall bring the Boat to a speed of thirty (30) knots.

(b) At this juncture the coxswain shall remove his hands from the controls. Without human interference in respect of helm, throttle or trim the Boat shall not deviate from its base heading by more than ten (10) degrees within a period of twenty (20) seconds.

(c) The Boat shall not deviate from its original heading by more than ten (10) degrees within a period of twenty (20) seconds.

2.1.4 Avoidance Line Assessment

An avoidance line test shall be conducted in accordance with the test procedures, but not

the loading condition, specified in ISO 6185-4. The Boat shall be required to demonstrate a maximal manoeuvring speed of no less than thirty-five (35) knots.

2.1.5 Slalom Assessment

(a) This assessment shall be conducted along a straight line of five (5) buoys, each positioned four (4) boat lengths apart. For the avoidance of doubt "boat length" shall mean the length of the Boat to be assessed measured from the bow to the aft most part of the Boat.

(b) The coxswain shall bring the Boat to a speed of twenty-five (25) knots and manoeuvre alternately port and starboard in a slalom in and out of the buoy line, maintaining the same speed.

(c) The Boat shall at all times remain within a maximum of one (1) boat length from the buoy line and shall not touch any of the buoys.

(d) This assessment protocol shall be repeated incrementally at successive five (5) knot intervals until the maximum achievable speed has been reached.

2.1.6 Figure of Eight Assessment

(a) This assessment shall be conducted around two (2) buoys positioned one hundred (100) metres apart.

(b) The coxswain shall bring the Boat to a minimum speed of thirty (30) knots and manoeuvre in a "figure of eight" pattern three (3) times around the two buoys, maintaining a minimum speed of thirty (17) knots at all times.

(c) The Boat shall turn around each buoy as close as possible without touching the buoy and make the passage between the buoys by the shortest route.

2.2 Handling Assessment – Full Operational Load Condition

The following assessment shall be conducted at Full Operational Load Condition as specified at Paragraph 12.1.5.1(f) of this Part VII.

2.2.1 Straight Line Assessment

(a) Accelerate from stationary to twenty-five (25) knots within thirty five (35) seconds. At any time during this assessment, the bow of the Boat should not rise above the horizon line. Should the bow rise above the horizon line, it shall not be for more than five (5) seconds as evidenced by the digital video footage. If the Boat to be assessed does not achieve this, it shall be deemed to have failed the assessment.

(b) If the Boat, maintaining the same course and settings, does not maintain the twenty-five (25) knots for a period of no less than one (1) minute, the Boat shall be deemed to have failed this assessment.

2.2.2 Speed Transition Assessment

This assessment contains two part.

(a) The Boat shall accelerate from stationary and transition to hydrodynamic planing mode within twenty (20) seconds.

(b) From stationary, the coxswain shall accelerate to five (5) knots and, once the Boat reaches five (5) knots, maintain course and settings for a period of no less than one (1) minute.

(c) The coxswain shall then accelerate from five (5) knots to ten (10) knots and, again, maintain course and settings for a period of no less than one (1) minute.

(d) Following on from (c) above, this assessment protocol shall be repeated incrementally at successive five (5) knot intervals until the maximum achievable speed has been reached.

(e) At each successive speed increment, the Boat shall hold that speed within a range of ± 10% for the full one (1) minute.

2.2.3 Avoidance Line Assessment

An avoidance line test shall be conducted in accordance with the test procedures as in ISO 6185-4, but with the Full Operational Load condition as specified in Paragraph 12.1.5.1(f) of this Part VII. The Boat shall be required to demonstrate a maximal manoeuvring speed of no less than twenty-five (25) knots.

Part VII - Annex 16 – Warranty Services and Guarantee Slipping (Daughter Boat)

1. Warranty Services

1.1 The Contractor shall provide Warranty Services in relation to all aspects of the Vessel during the Warranty Period, including Guarantee Slipping as stipulated in this Annex. Both the Warranty Services and Guarantee Slipping shall be carried out locally in Hong Kong. If the Contractor appoints an authorised agent to perform the Warranty Services, the Contractor shall ensure that the authorised agent appointed will perform the Warranty Services and Guarantee Slipping in full compliance with the requirements of the Contract including those as set out in this Annex 16. Reference to "Vessel" in this Annex 16 shall mean the Daughter Boat.

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 fire fighting equipment, etc., which are required to be serviced, inspected or renewed annually, the Contractor shall provide the servicing, inspection and renewal as per the manufacturer's requirements of that equipment or installation in the Warranty Period applicable to such items.

1.4 During the Warranty Period, when the Vessel is handed over for the Warranty Services and/or Guarantee Slipping, the Contractor shall be responsible for the due return of the Vessel in good order. Should there be any loss or damage of the Vessel or any Warranty Item (as defined in Paragraph 1.5 below) caused by any reason whatsoever while the Vessel is in the possession or control of the Contractor (including even when the Vessel is at the Government Dockyard or a maintenance base of the user department) or at the shipyard of the Contractor or an authorised agent appointed by it, the Contractor shall pay for the cost for the loss or damage plus 20% as and for liquidated damages but not as a penalty. Throughout the Warranty Period, notwithstanding anything to the contrary in the Contract, the Vessel and all Warranty Items are deemed to be at the Contractor's risks, and the Contractor shall insure and keep insured, at his own expense, a property insurance with the Government to be named as the sole payee, for an indemnity amount of not less than the purchase price of the Vessel plus 20% to protect the Government property against all risks. The Certificate of Insurance and evidence showing that the premium has been paid shall be available for inspection in advance. The Contractor shall provide this insurance policy before the commencement of the Warranty Services and/or Guarantee Slipping. Any excess payable under the insurance policy shall be borne by the Contractor.

1.5 Total Vessel Warranty

It is required that the Vessel is covered by free of charge Warranty Services for one year after the date of the issue of the Acceptance Certificate in respect of the Vessel. The Warranty Services shall cover the entire Vessel and all its Equipment (including all major Equipment specified in Schedules 6 and 7 in Part V and electronic navigational equipment), fittings and outfit (including spare parts, and documentation) (collectively, "Warranty Items") against defects of design, construction, workmanship or materials and against any non-compliance with any of the Product Warranties. The Warranty Services may be backed up by the Contractor using individual equipment suppliers/manufacturers' warranties but the Contractor shall remain solely liable to MD as a primary obligor to provide the Warranty Services. Notwithstanding and without prejudice to the Contract on warranty obligations for the total Vessel, any individual equipment supplier/manufacturer's warranty extending beyond the one year total Vessel warranty must be assigned to the Government as appropriate.

1.6 Procedures for Warranty Claim

Without prejudice to the provisions of the Contract, a detailed procedure for dealing with warranty claims must be proposed by the Contractor and agreed by MD before the issuance of the Acceptance Certificate of the Vessel. This shall be based on the following principles:

1.6.1 Any notification of claimed defect shall be sent from MD to the Contractor through a defined route.

1.6.2 There shall be a joint inspection to examine the defect and the Contractor shall propose the appropriate and necessary remedial action to the satisfaction of MD.

1.6.3 The Contractor shall undertake on-site Warranty Services (including provision of all replacement Warranty Items, spare parts, labour, materials, test equipment, and transportation) wherever, at the option of the Government, the Vessel is berthed in the Government Dockyard or maintenance bases of the user department. Taking the Vessel to the shipyard of the Contractor should be avoided unless absolutely necessary.

1.6.4 Rectification of defects must have a minimum effect on the operation of the Vessel by the provision of on loan equipment if the anticipated repair time exceeds the time frame as specified in Paragraph 1.7.1 below.

1.7 Throughout the Warranty Period, the Contractor shall be responsible for the provision of free of charge corrective maintenance and rectification of all defects in all and any of the Warranty Items including repair and replacement as necessary. This shall, at no cost to the Government, include Warranty Services to be performed by the Contractor described in the following sub-paragraphs:

1.7.1 To attend to the Vessel for inspection and repair within 24 hours (excluding Hong Kong public holidays) of receiving the report of a fault ("fault report") and to take immediate action to rectify the defect after inspection. Unless otherwise agreed by the Government, all corrective maintenance and rectification must be effected within 48 hours after the fault report is first issued. The MD must be informed of what corrective maintenance and rectification actions have been taken within 72 hours of receiving the relevant fault report.

1.7.2 To provide all necessary transport, replacement Equipment, spare parts, labour and materials, tools and testing instruments required for the corrective maintenance and rectification.

1.7.3 Any replacement item or part to be used shall originate from the manufacturer of the original Warranty Item to be repaired and must be able to be found in the latest spare parts list issued by such manufacturer. Alternative components shall not be used without the prior approval in writing of the MD.

If the Contractor fails to respond to any reported warranty claims within 48 hours, the MD may arrange corrective maintenance and rectification of the defect either on its own or by deploying a third party contractor as deemed appropriate with a view to minimising any downtime incurred. In such case, the Contractor shall compensate the Government for the full cost of such repairs plus 10% as and for liquidated damages but not as a penalty no later than 10 working days after a written demand has been served on the Contractor by MD.

1.8 Extension of Warranty

1.8.1 The Warranty Period for any Warranty Item shall be suspended whilst and if the Contractor fails to repair and correct satisfactorily the defects in such Warranty Item within seven working days counting from the date when the relevant fault report was first issued.

1.8.2 Warranty Items which are electronic equipment sub-assemblies, modules or components and which are replaced during the Warranty Period shall have a new warranty period of one year commencing from the date of replacement.

1.8.3 In relation to a Warranty Item, references to Warranty Period shall be construed to include such extended warranty period as mentioned in Paragraph 1.8.1 and/or 1.8.2 above, depending on whichever is applicable.

1.8.4 Equipment which is found to be defective during the trials at the Guarantee Slipping as mentioned in Paragraph 2.2.3 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 Schedules 6 and 7 in Part V and in the same quantity in the shipyard of the Contractor which the Contractor shall use for performing the Warranty Services. The Government will not provide its own inventory of the Spare Parts to the Contractor for the provision of the Warranty Services.

1.12 Updated/Upgraded Information

It is expected that during the Warranty Period certain Warranty Items may be modified or changed. All documentation affected by this change must be updated to reflect the new situation. All the support documentation such as the Vessel inventory list, job information and maintenance scheduling in relation to these modifications and changes shall be provided at the expiry of the Warranty Period.

1.13 Warranty of Electronic Navigational Equipment

Please refer to the Paragraphs 12.7.2.13 of Chapter 12 of this Part VII.

2. Guarantee Slipping

2.1 As stated in the section "Warranty" above, Guarantee Slipping shall be carried out at the end of the original Warranty Period regardless of any subsequent extension in relation to any Warranty Item under the terms of the Contract.

2.2 At the Guarantee Slipping, the Contractor shall carry out the following work and provide all necessary materials, spare parts, labour and equipment in order to carry out such work:

2.2.1 Engines and Gearboxes

(a) Renew the lubricating oil and replace the filters for the main engines and gearboxes 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 and their associated sensors, 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 and the spare parts used 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 two years' 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, clean and polish propellers.

(d) Free, clean, grease and recondition all moving parts of the deck fittings, i.e. WT (water tight) hatches, vent covers, rollers and fairleads and anchor chain stoppers, etc.

(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) Speed measurement;
(g) Other trials as required by the Government Representative; and
(h) Any item or component found defective shall be repaired or replaced.

Part VII – Annex 17 – As-fitted Drawings and Machinery/Equipment documents and information literature to be delivered to the Government at Delivery Acceptance (Daughter Boat)

1. As-Fitted Drawings

1.1 Upon delivery of the Daughter Boat, the Contractor shall deliver to the Government four (4) hard copies and two (2) soft-copies in pdf. and dwg. formats of the following plans and drawings that contain the technical information of the Daughter Boat and its machinery and equipment as they are on the day when the Daughter Boat is accepted by the MD. These are termed the final version of the "As-Fitted" Plans and Drawings, and they shall consist of the following plans and drawings as well as any other plans and drawings that may be required by GNC/MD during the design and construction of the Daughter Boat and before the Daughter Boat is accepted by the Government.

1.2 The As–Fitted Plans and Drawings shall be prepared by professional ship draughtsmen in the professional manner, scale, size and style normally required in the ship design and construction business sector. All plans and drawings shall show and be clearly marked with the profile, plan, and section views of the layout, arrangement details, and construction details in the manner required by GNC.

1.2.1 General Arrangement Plan.
1.2.2 Lines plan and offsets data and table.
1.2.3 Stability information booklet and the inclining experiment report.
1.2.4 Hydrostatics, cross curves and intact and damage stability calculations for all ship loading conditions specified in the Technical Specifications.
1.2.5 Subdivision drawings and stability calculations.
1.2.6 Painting scheme of the whole Daughter Boat.
1.2.7 Draught marking diagram (if applicable).
1.2.8 Detailed arrangement and layout plan showing the disposition of all of the main equipment, fittings and fixtures, furniture, hatches, manholes and access openings. The down-flooding openings (points) shall be indicated clearly on the drawings.
1.2.9 Equipment layout diagram.
1.2.10 Hull structural construction and hull scantlings drawings.
1.2.11 Hull shell and frames and the framings' arrangement and construction plan.
1.2.12 Hull shell expansion plan.
1.2.13 Keel construction plan.
1.2.14 Steering system and steering arrangement diagrams (if applicable).
1.2.15 Superstructure or consoles and deck structural and construction plan (if applicable).
1.2.16 Hull watertight bulkheads' construction plan.
1.2.17 Superstructure or consoles to deck connection – detail construction plan (if applicable)
1.2.18 Engine casing to deck connection detailed construction plan (if applicable).
1.2.19 Deck edge and bulwark (if any) details and construction plan, including detailed structural arrangement drawings of hull to deck connection.
1.2.20 Detailed cathodic corrosion prevention and arrangement plans and drawings for the Daughter Boat throughout.
1.2.21 Mast structural and construction plan and mast equipment arrangement plan.
1.2.22 Piping diagrams for fuel oil, lubrication oil, bilge, firefighting, scuppers and drains system (as applicable).
1.2.23 Fire prevention, fire control and firefighting system drawings (if applicable).
1.2.24 Drawings of the main switchboard and all other switchboards and the electrical system (if applicable).

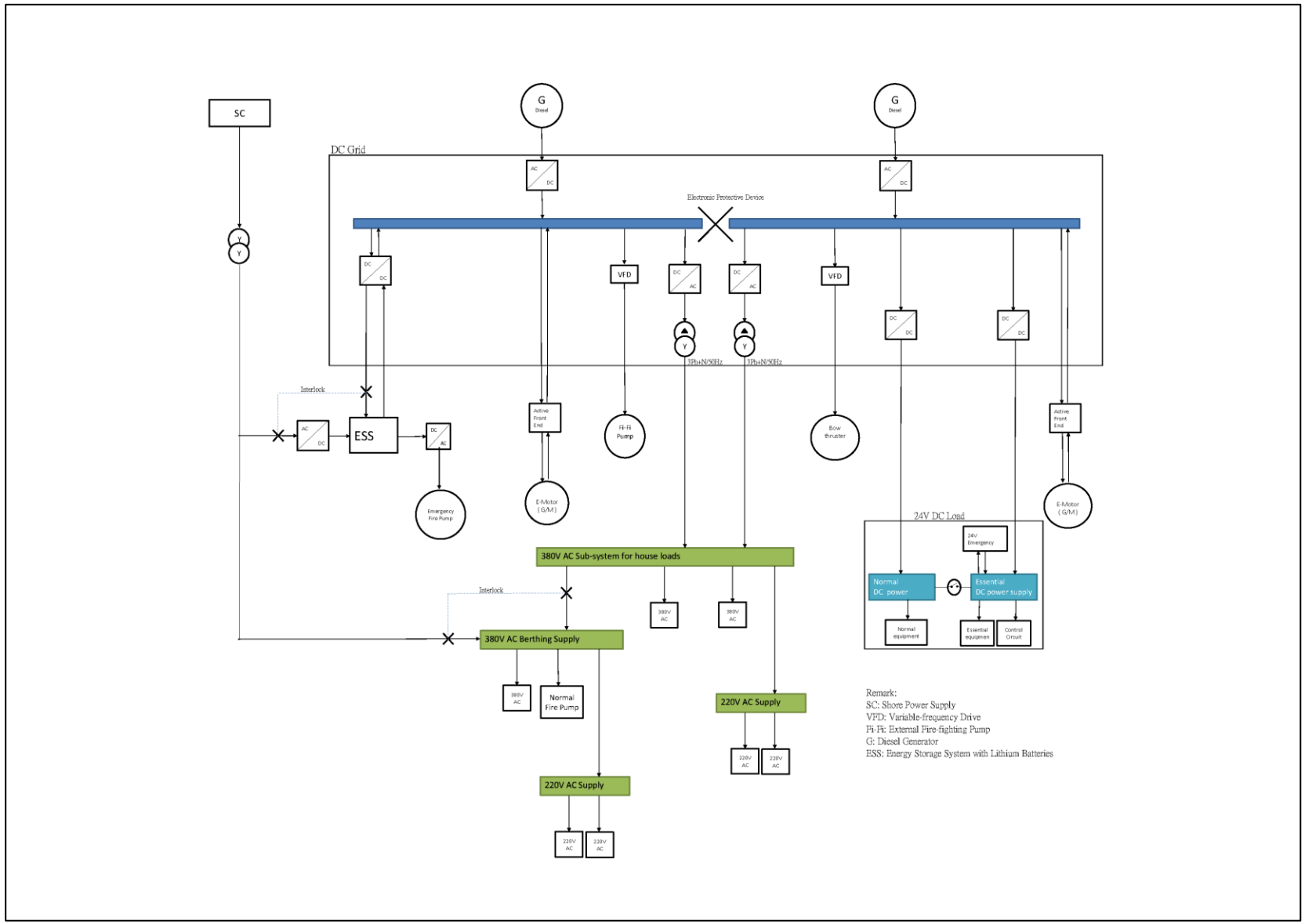
1.2.25 Main propulsion engines (inboard or outboard as applicable) arrangement and setting plans and drawings of their fuel lines and exhaust gas piping and arrangement (as applicable).
1.2.26 Main fuel oil tank drawing and its associated piping and manifold(s), and filling, overflow and ventilation system.
1.2.27 Drawings of the anchor, and the anchoring system/arrangement.
1.2.28 Lifesaving appliance arrangement plan and fire safety plan (if applicable).
1.2.29 Distress signals, alarm systems, and internal/external communication arrangement and system plan (if applicable).
1.2.30 Navigation lights, sound and signal diagrams and any other external lighting arrangement plan.
1.2.31 Overall lighting arrangement and light control plan.
1.2.32 Alarm and signals, internal communication systems and public address systems plan.
1.2.33 Other drawings as appropriate.

1.3 Documents to be provided by the Contractor

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

When the Daughter Boat is delivered to the Government Dockyard, the Contractor shall deliver to the Government all the technical information, leaflets, literature, manuals and booklets etc. and whatsoever items that are necessary for the operation, handling, services, maintenance, spare parts, repairs and the technical understanding of all the engines, machinery, motors, pumps, equipment, fittings and outfitting items of the Daughter Boat.

Part VII - Annex 18 – Schematic Diagram for the Electrical System



Part VII - Annex 19 – Tenderer's Presentation

1. General

1.1 Those Tenderers, who passed the Stage 1 and 2 of the Tender Evaluation Procedures, are required, at their own costs and expenses, to make a verbal presentation of their proposals to the Government Representatives within twenty one (21) calendar days upon notice. The presentation shall be conducted by a team of qualified persons who are authorized by the Tenderer. Face-to-face presentation in person is preferred, where should be held at Government premises as designated by the Government Representatives as far as practicable. Presentation by way of video conference may also be considered at the Government's discretion.

1.2 The Tenderer shall introduce, explain and clarify their tender proposals during the presentation. In no circumstances should additional information or new/amended proposal not set out in their tender submissions be accepted. Tender assessment will be made solely based on the Technical Proposal submitted before the Tender Closing Date. The presentation will **not** be taken into account in marking under the Marking Scheme in Annex D to Part II – Conditions of Tender.

1.3 The Tenderer shall focus in presenting the Technical Proposal submitted in respect of its proposed design, philosophy and solutions to be adopted, Counter-Proposals as well as the Excess Proposals therein involving higher standard of specifications and proposed innovative suggestions, if applicable. The scope of presentation shall be strictly based on and within the contents of the Tenderer's Technical Proposal submitted, without any disclosure, clarification or deliberation of the Price Proposal submitted. Organisation introduction and brief of the company profile should be kept to the minimum, which should not be more than five (5) minutes. The length of presentation shall not exceed three (3) hours.

1.4 The presentation shall be followed by a Question and Answer Section for the Government Representatives to make further enquiry about the Tenderer's Technical Proposal and presentation. Such Question and Answer Section should not be construed as any commitment by the Government. Any requests from the Tenderer for the Government to provide additional information about the tender requirements laid down in the Tender Documents or other vessel project plans of the Government will **not** be accepted.

2. Scope of Presentation

2.1 According to the requirements set out in Paragraphs 1.1 to 1.3 above, the presentation shall cover the following topics and follow the numbering sequence below.

(1) Organisation Introduction (not more than five minutes)

(2) Hull and Deckhouse

(3) General Arrangement

(4) Fire Safety Equipment

(5) Lifesaving Appliances and Arrangements

(6) Machinery

(7) Electrical System

(8) Command and Operational Systems

(9) External Fire-Fighting System

(10) Hybrid System

(11) Daughter Boat

(12) Innovation Suggestions